

VIII International Symposium of Temperate Zone Fruits in the Tropics and Subtropics

**Abstracts: Lectures, Oral and
Poster presentations**



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Apresentação

A cadeia de frutas de clima temperado tem grande importância econômica e social para o Brasil. Em algumas espécies como a maçã, por exemplo, o país passou de importador para exportador; em outras como a pêra, 90% da fruta comercializada é importada. No plano agrônomo, diversos problemas precisam ser solucionados para melhorar a competitividade (maçã) e até mesmo a viabilidade de exploração (pêra).

Deste modo, a realização de um evento internacional específico sobre a produção de frutas temperadas em condições marginais, reunindo técnicos, pesquisadores e professores de diversos países com problemas similares aos nossos, é de suma importância para o desenvolvimento da fruticultura, não só brasileira, mas de todo o Hemisfério Sul. Caracterizado por países em desenvolvimento que têm na produção de frutas temperadas um potencial para exploração comercial, fornecendo frutas temperadas frescas, na entressafra dos países desenvolvidos do Hemisfério Norte.

O evento realizado em Florianópolis,SC, no período de 21 a 25 de outubro de 2007, teve por objetivo reunir os pesquisadores e professores que trabalham em diferentes países para divulgar os recentes resultados de pesquisas e tecnologias, adaptadas e/ou geradas, para produção de frutas de clima temperado em condições subtropicais e tropicais. Outro aspecto que merece destaque, por sua grande importância para o meio científico brasileiro, é a possibilidade de intercâmbio com outros centros internacionais que desenvolvem pesquisas nas áreas de interesse para o Brasil.

João Carlos Costa Gomes
Chefe-Geral
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**Abstracts: Lectures, Oral and
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Lectures

L-01

Effect of Winter Chilling on Deciduous Fruit Production: a Practical View

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Deciduous fruit trees need winter chilling in order to complete their normal cycle of growth and production. The rate of temperature change, the maintenance within a range of chilling temperatures during dormancy, and the duration of the winter chilling period may influence the metabolic processes of the plants; processes that at the same time affect the formation of flower buds, vegetative growth potential, pollination, and other important physiological processes. As southern hemisphere countries, such as Chile, continue to extend their growing regions to meet both earlier and later opportunities in the marketplace, differences in latitude must be considered in combination with altitude, winter precipitation, and the effects of marine currents and winds in order to generate sufficient levels of winter chilling necessary for optimal orchard performance. Additionally, a number of significant phenomena affect both tree and fruit development within these production zones. These include but are not limited to: variable dates and rates of leaf fall, warming periods, use/nonuse of dormancy breakers, and variable fruit maturity levels at harvest attributable to extended flowering and pollination periods.

L-02

Environmental Challenges of Breeding Peaches for Low Chill Regions

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Low chill is a relative term and in this presentation I am referring to environments in which the trees experience a mild winter in which less than 500 hours of chilling is routinely received. These mild winter environments range from the cool highland mountains of Mexico where peaches can be induced to flower in the summer months so the fruit is harvested in the off season winter months, to hot dry deserts where flower induction is needed to synchronize bloom in the absence of a distinct cool season, to humid and cool spring lowland environment of southern Brazil, to the humid but warm spring lowland environment of south and central Texas, and to the greenhouse environment of peach protected culture in Asia. The major abiotic environmental challenges are for adaptation to low chilling accumulation, cold damage during bloom, and in many cases also to high heat especially during bloom time but also during subsequent growth of the fruit and the tree. These factors affect

productivity as well as fruit ripening time, size and quality. In addition to this, biotic problems can be a challenge especially in the humid regions with powdery mildew and peach leaf curl in the cool regions and brown rot, bacterial leaf spot, peach rust, and anthracnose in the warm regions being significant limitations to the expansion of production.

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L-03

Apple Production under Conditions of Sub-Optimal Winter Chilling in South Africa

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Roughly 20.000 ha of apples are grown in South Africa, mostly under conditions of inadequate winter chilling. Apples are widely accepted to need ca. 1000-1200 Utah model chill units to break dormancy. In South Africa apples are often produced with 500 chill units. Numerous chilling models are used locally to quantify winter chilling. These models will be discussed in light of their shortcomings. Branching in spring on year-old shoots is acrotonic (from the most distal buds). Dominance of these distal buds develops slowly during winter and is clearly defined before budburst in spring. It is the lack of an extended dormant period associated with the mild local winters that impedes the development of acrotony. This is due to an inherent low growth rate of the buds (increased endodormancy), and less synchronization among buds at the time of spring budburst, resulting in both a delayed and more erratic budburst. Furthermore, a considerably increased paradormant inhibition by the distal shoot parts is observed. Paradormancy accounts largely for the inhibition of budburst of the upper lateral buds under conditions of sub-optimal chilling. The causes of delayed foliation may reside more in the shoot piece than in the buds themselves. Cytokinins are known to release buds from dormancy, especially when applied in late winter. Also, under normal winter conditions, a flush of endogenous cytokinins is observed shortly before budburst. This cytokinin flush is triggered by the application of rest-breaking agents. The practical use of rest-breaking agents will be discussed. Finally, other practical manipulations of branching on both young and mature trees will be discussed.

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L-04

Epidemiology and Management of Diseases of Temperate Fruit Crops in Subtropical Climates

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Production of many temperate fruit crops has expanded to subtropical regions of the world. These subtropical regions are warmer, and in many cases wetter than temperate regions, and consequently the environment in the subtropics is conducive to diseases that are rare or nonexistent in temperate regions. As a result the disease complex tends to be much more diverse and many diseases are more severe than in subtropical regions. This paper will discuss differences in the disease complex on apples and grapes between temperate and subtropical regions and examine how these diseases are managed in the different regions. Specific pathosystems will be used to illustrate differences in their epidemiology between regions and how it affects the management strategies used. While disease management in both regions is based on a combination of cultural practices and chemical control, the relative importance of the strategies used and how they are deployed varies between regions.

O-01

Spatial Features of the Path from the Chilling Receptor to the Bud Endodormancy Release: Experimental Contribution on Peach Tree

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Not many studies have been carried out that aimed at knowing the spatial features of the transduction of external signals that influence bud endodormancy release in woody perennials: which structures are able to perceive the signals which buds are targets (at the endodormancy release level) of the transduction process borne in a given receptive structure. Some of these studies concerned temperature at rather large scales; they generally could not afford definite conclusions at the bud endodormancy level. Very few studies were at smaller scale: they used warm baths or active substance application on single buds. Surprisingly, though temperature is undoubtedly the main natural factor driving the bud endodormancy release, to our knowledge, no work addressed the effect of temperature conditioning at this scale. We carried out experiments which consisted in selective chilling of some buds on shoots of 'Redhaven' peach tree under full endodormancy (containers put into warm greenhouse at the beginning of October and maintained there until June under total cold deprivation). A device (temperature conditioned localized air jets) was designed in order to provide an as sharp as possible temperature gap between given chilled buds and the 'non-chilled' rest of the tree structure (the adjacent shoot tissue included). During 2 experimental seasons we tried different chilling durations. Got from thermocouples at some treated nodes, the overall temperature was about 9-10°C in the chilled buds and about 13-14°C in the adjacent shoot tissues. The chilled vegetative buds broke or did not, depending on the chilling dose; most of the broken buds begot long shoots. This confirm the results of the experiments using external factors different from temperature: i) the bud or a part of it, is a receptor of the 'chilling' signal, sufficient for initiating a process that releases its endodormancy; ii) the transduction process that is initiated in a given bud does not reach any other bud. Neither the chilled nor the non-chilled floral buds broke. Different aspects of the results will be discussed and prospects for further experiments on the topic will be given.

Keywords: endodormancy release, chilling receptor, bud, peach tree

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O-02

Time of Erger Application for Budbreak Induction in Apple Trees

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More than 50% of the Southern Brazilian apple production is located in areas where chilling varies from 800 to 1.200 cold units by the North Carolina model, or from 400 to 600 hours of temperature below 7.2°C. This low chilling results in budbreak and blooming delay, which requires artificial budbreak induction. Erger, an inorganic nitrogen compound, combined with calcium nitrate, has a similar effect to that of hydrogen Cyanamid, with the advantage of being less dangerous to the environment. Budbreaking products are influenced by environmental factors, but mainly by the temperature at the time of application or during the following days, which should be at least 20°C.

The aim of this experiment was to evaluate the effects of time of Erger 5% + Calcium Nitrate 5% application on budbreak induction of Imperial Gala and Suprema apple trees. The experiment was carried out in Caçador, Brazil (lat. 26°46'31"), in a RCB design with five treatments and six single tree replications. The treatments were a check and four fortnightly Erger applications. Phenology, axillary and terminal budbreak, fruit set, mean fruit weight, and yield per tree were evaluated. In comparison with the check treatment, Erger 5% + calcium nitrate 5% anticipated up to 28 days the full bloom of Imperial Gala when applied on August 08, but only up to 13 days if applied on September 15. The effect on Suprema was at a lesser extent than on Imperial Gala. The axillary's budburst of Imperial Gala significantly increased when the plants were treated on August 01, differing from the check up to 60 days after application. The axillary's budburst on 'Suprema' was greater than on the check trees except for the application on August 15 because of the low temperature that persisted also during the following days. The low temperature affected the response in both cultivars. Fruit set of 'Imperial Gala' was not affected by the time of treatment application, but it was reduced in 'Suprema' when applied on August 01. There was a tendency of mean fruit weight increase on treated plants, probably related to a longer bloom-ripening period.

Keywords: Budbreak induction; apple tree; time application

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O-03

Impact of the Global Warming on the Accumulated Chilling Hours in Southern Region of Brazil

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One of the consequences in the process of global warming, which is mainly due to the anthropogenic influence (IPCC, 2007), would be changes in the accumulated chilling hours in the southern region of Brazil. Simulations were done to verify the effect of increasing minimum air temperature by 1°C, 3°C and 5,8°C in the chilling hours, on temperate fruit crops. Data from 80 meteorological stations of Paraná (Iapar), Santa Catarina (Epagri) and Rio Grande do Sul (Fepagro) States were used to develop a model to estimate the chilling hours (Ch) as a function of the average minimum air temperature from May to September ($T_{min\ may-sep}$) and the annual average of the minimum air temperature ($T_{min\ annual}$). The generated model was used into the geographical information system (GIS) to create, through regression equations, information plans of the actual average minimum temperature (May to September) and actual annual average minimum temperature. The equations used were:

$$T_{min\ may-sep} = 2,961 + 0,773 * latitude - 0,0687 * longitude - 0,0038 * altitude \quad (r^2=0.77)$$

$$T_{min\ annual} = 0,185 + 0,696 * latitude - 0,094 * longitude - 0,0042 * altitude \quad (r^2=0.85)$$

To the information plans generated by the equations were added the temperatures of 1°C, 3°C and 5,8°C. These data were used to generate, with GIS, maps of actual and future chilling hours based on the equation:

$$Ch = 1436,266 - 2,500 * T_{min\ may-sep} - 6,044 * T_{min\ annual} \quad (r^2=0,81)$$

If the scenario of increasing 1°C is confirmed, it would occur a decrease in the areas with higher

accumulated chilling hours (ACH) and an increase in the areas with lower ACH. This pattern is more pronounced with an increase of 3°C, culminating with an increase of 5,8°C when practically all areas with ACH would disappear, with the exception of small areas on the highest places of Rio Grande do Sul State and Santa Catarina State where the maximum ACH would be 334 hours. In order to minimize the impact of the global warming, four tools could be used: new cultivars adapted to low chilling requirements (probably genetically modified); an agro-forestry management system to reduce, through shading, the canopy temperature; artificial shading of the orchard by applying caolin over the plants; physiological product to promote dormancy in the temperate fruit crops even without chilling hours accumulated. All these tools should be extensively studied before being recommended for the producers.

Keywords: climate change; modeling; global warming; chilling hours

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O-04

Supplementation to Compensate for Insufficient Chilling Associated with Global Warming to Improve Dormancy and Flowering for Japanese Pear

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The mean winter temperature in Japan has increased in the past half century, with nights warming more than days. There has been increasing concern that warmer winters are providing insufficient winter chilling for deciduous fruit crops in the warmer regions in southwest Japan. In recent years, some Japanese pears grown under protected cultivation in these regions have been affected severe floral bud disorder, severely damaging flowering and fruit production. The disorder resembles "budjump" reported by Kingston et al. (1990). Similar problems were reported in southern Brazil (Nakasu and Leite, 1992). This study was conducted to develop the means to compensate for insufficient chilling associated with global warming to improve dormancy and flowering control for Japanese pear. The effect of high temperature on bud break was studied by using two Japanese pear cultivars (cv. 'Kousui' and 'Housui') grown under insufficient chilling requirements. And, covering was applied alone or in combination with an evaporative cooling device. Covering over the trees before endodormancy break forced flowering, while covering during ecodormancy delayed flowering. In contrast, mulching under the trees during ecodormancy forced flowering. Such methods of controlling flowering of Japanese pear were more effective with using the evaporative cooling device. The potted trees of 'Kousui' and 'Housui' with flower buds were placed in a growth chamber controlled at 32-33°C for 12 or 24 hours following 640 chilling hours below 7.2°C under natural conditions. In high temperature treated 'Kousui', the percentage flowering ranged from 70 to 90% within 25 days after treatment, whereas percentage in the control dropped below 40%. In the heated plants, the floral bud abortion was 45% less compared with the control. The results showed that high temperature treatments increased bud break and suppressed floral bud abortion caused by insufficient chilling temperatures.

Keywords: dormancy, evaporative cooling, flowering, high temperature, *Pyrus pyrifolia*

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O-05

Comparative Fitness of three Contrasting Functions of Temperature for Estimating the Chilling Requirements in Apricot tree under Mediterranean Conditions

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Since a long time, a wide literature showed that the flowering process in deciduous fruit trees is mainly determined by the accumulation of chilling effects. They must reach a specific amount for each genotype to avoid phenological disorders as excessive durations of flowering time within the tree. Also, a slower rate of the completion of the chilling requirements can induce disorders in the pollination process because of excessive intervals between the flowering times of cultivars and pollinator trees due to genetic differences in the chilling requirements. Furthermore, the global warming clearly increased since the end of the 1980s in the European countries, particularly in the Mediterranean cropping areas where a slow rate of chilling satisfaction is more frequently observed. In this context, tree species literature is offering different types of mathematical functions for estimating the chilling requirements, although they have rarely been compared one with the other. Most of the time, the chilling function was chosen rather arbitrarily. This work therefore aimed to improve the choice of the chilling function by comparing in same conditions three contrasting functions each one being represented by a calculation method of chilling requirements proposed in the literature. The first one was the sum of hours when the flower primordia were perceived temperatures at or below the threshold of 7°C (example of binary function). The second one was the sum of chilling actions (CA) calculated according to an increasing exponential function with the decrease of temperatures, proposed by Bidabé in France (1967). The third one was the sum of chill units (CU) proposed by Richardson et al. (1974) and now termed the 'Utah' method, considering weighting effects of temperatures (comparable to a normal function). Regarding the assessment of the chilling period, we used the time-course variation of the mean weight of apricot floral primordia during nine years in same orchard conditions (lower Rhône valley) for the cultivar 'Rouge du Roussillon' (medium chilling requirements). The accumulation of chilling effects according to the three methods was considered from fixed or variable dates in the early autumn to the estimated date of the end of the slow growth of floral primordia (appropriate estimate of the dormancy break in our conditions). The results showed a higher variance of the sum of the chilling effects estimated by the number of hours below 7°C (coefficient of variation > 20%). On the other hand we clearly recorded a lower variance using both sums of CA and CU (coefficient of variation around 8-9%). These results corroborate some previous works highlighting that the number of hours below 7°C is not satisfactory for estimating the chilling requirements, although always mainly used in breeding and growing works. Thus, we suggest that other functions of temperature as CA and CU could be used in the future by fruit breeders and growers face to climate change.

Keywords: dormancy break, floral primordia, global warming

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O-06

Optimization of Endodormancy Release Models, Using Series of Endodormancy Release Data Collected in France

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In fruit tree species evaluation of models of endodormancy release has generally been indirect, as part

of the global evaluation of budbreak-date models that include an endodormancy release module. Due to the lack of date, their direct evaluation based on the knowledge of the dynamics of bud dormancy states has been very succinct. Consequently, they have not been optimized, except for the 'amount of chill units required to break endodormancy' taken as the genotype specific parameter. As part of different studies on bud state during the rest period, near 30 yearly dynamics of the dormancy state of Redhaven peach vegetative buds under natural conditions have been recorded; based on the biological 'one node cuttings' test under standard conditions (25°C). These data were used to optimize classic models (Weinberger-W; Utah-U Bidabé-B; Dynamic-D) of endodormancy release in fruit tree species with temperature as the only input variable to compare their fitness and their predictive capacity. The fitted parameters were the 'amount of chill units required to break endodormancy', those of the temperature functions $f(T)$ describing the rate of endodormancy development and, for some models, the starting date of endodormancy release. The results and practical conclusions for predicting dormancy release date will be presented. The optimization method was the minimization of the MSE between the observed (biological test) and the computed dates of endodormancy release and was carried out using the NLS module of R software. As main results: i) the lower limit of temperature for endodormancy release effect in the optimized form of U than in the standard one; ii) the sharp transition, in the optimized U model, from positive to negative $f(T)$ values that makes it alike to W; iii) the optimization of W resulted in an increase of the standard threshold temperature. Results will be discussed and perspective will be presented.

Keywords: endodormancy, peach, optimization, chilling, one-node-cutting test, endodormancy release models

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O-07

Influence of Rest Breaking Treatments on Fruit Set and Yield of Apple Trees in Insufficiently Chilled Trees

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Chemical treatments that hasten bud-burst and bloom may have variable effects on fruit set, in part because of variability in origin and phytotoxicity. In South Africa, most apple production areas receive insufficient chilling to break dormancy, and an annual application of a chemical rest-breaking treatment (RB) is included as standard practice in such areas. Hydrogen cyanamide (HC) became the replacement for dinitro-o-cresol (DNOC) when this was withdrawn from the market. HC has been effective for dormancy release of apple tree, though variable effects on yield, fruit quality, fruit set and blooming period have been observed. Thidiazuron (TDZ) has showed the capacity to release lateral buds from dormancy in apple buds and it reduced the number of chilling units required to achieve bud break. In this paper we report on the effect of DNOC/oil, HC and TDZ plus oil on bud burst, fruit set, yield and return bloom on mature apple trees (*Malus domestica* Borkh.), under marginal winter chilling conditions. The research was carried out in the Elgin area (34°S, 300 m), South Africa, over a period of three years. All the experimental sites were orchards under standard commercial cultivation practices. In 2001 the effect of HC was compared to that of a mixture of DNOC and oil. The treatments were: HC as Dormex® (49% v/v HC) at two rates (0.5% and 1% v/v for 'Gala'; 1% and 2% for 'Golden Delicious') in combination with oil at 4%; 6% DNOC/oil (DNOC 3% + mineral oil 72% v/v); and one unsprayed control. The 2002 and 2003 trials included HC plus oil and TDZ/oil. Treatments consisted of HC at the same two concentrations used the previous year in combination with oil at 4% for both cultivars; TDZ/oil as Lift® (TDZ 3 gL⁻¹, oil + coadjuvants) at two concentrations, namely 3% and 5% for 'Gala' and 4% and 6% for 'Golden Delicious'. There was one unsprayed control for each cultivar. Bud-burst, fruit set and return bloom and yield were assessed. The rest breaking treatments improved the bud-break of reproductive and vegetative buds. Dormex at 1% and TDZ/

oil at 4% in 'Golden Delicious' and Dormex 0.5% and TDZ/oil at 3% in 'Royal Gala' were enough to break dormancy and improved the yield and fruit size. Dormex at 2% reduced fruit set in 'Golden Delicious'. Higher concentrations of TDZ/oil affected fruit shape and reduced the return bloom the following season in 'Golden Delicious'.

Keywords: hydrogen cyanamide, thidiazuron, dormancy break, budbreak.

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O-08

The Analysis of Flowering Date in Apple and Pear and Bud Break Date in Vine Through Statistical and Phenological Modelling in Various Cropping Areas of France in Relation to the Global Warming

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A marked increase in air temperature has been observed in France since the end of the 1980s regardless of the vine and fruit tree cropping areas. As phenology is mainly influenced by temperature, changes in vegetative and flowering phenology timing will have agronomic consequences on these perennial productions. It is thus necessary to characterize the present and future trends of phenology in the context of the global warming. Firstly, long-term series of phenological data extracted from a national data base devoted to vine and fruit species (named PhénoClim®) have revealed visible changes in the time-course variations of flowering and vegetative phenology. Surprisingly, quite similar trends toward an advance of flowering dates in various fruit trees and bud break dates in vine have been observed in the different French cropping areas. In apple and pear trees, a statistical study of phenological series using multiple change-points models clearly support the idea of an abrupt change in the mean dates of flowering stages at the end of the 1980s, the most likely period for this discontinuity being between 1988 and 1989. Similar results were obtained considering phenological series of bud break date in vine. The concomitancy with the global warming recorded in France at the end of 1980s leads to conclude that these phenological advances could be actual impacts of the recorded warming. Secondly, regarding the analysis of the phenological evolution in terms of temperature effects, different modelling ways based on the same conception of two successive effects of temperatures (chilling and heat effects) were applied to study the impacts of the global warming. For apple tree, we exploited a user-oriented software (named Pollenoscope) including various chilling and heat sub-models, previously validated for the modelling of pollen emissions. The results suggest that two opposite trends simultaneously occurred in France since the end of the 1980s: a slower rate of the chilling process (later dormancy break) and a higher rate of the heat process. Nevertheless, the observed advance of mean flowering dates could result of the more pronounced increase of temperatures from January to April, corresponding to the active growth period of buds in France. In vine, a new model (named Brin) was developed introducing a chilling sub-model contrary to traditional vine models. The optimal parameters were defined on the basis of the PhénoClim® data. The simulation of bud break date was improved by the model Brin. Moreover, a simulation over a future period (2070-2099) was realized using the Brin phenological model and the Arpege climatic model on the basis of the B2 scenario of IPCC. An increase of the mean advance of bud break was predicted for vine in France, although the dormancy break would have a tendency to be later as previously simulated for apple tree in a recent past.

Keywords: chilling requirement, dormancy, heat requirement, climate change

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O-09

Floral Biology, Pollination and Fertilization of Apple in the Temperate Zone, Subtropics and Tropics

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This study summarizes the knowledge on the floral biology, pollination and fertilization of apple (*Malus domestica* Borkh.) based on the authors' research results and world literature up to the present day. Stigma receptivity and pollen production of apple flowers as well as the flowering times are different under different ecological conditions. As a result of the latter fact, the relative blooming order of apple varieties is different there and sometimes different variety association is needed to establish in orchards. As temperate zone, subtropics and tropics have various pollinator insects, their efficiency in the pollination and the pollination itself are also different in these climate zones. Fertilization often shows differences too, and time changes of fruit set and fruit drop during the season occur in different rate. Based on the scientific results this paper also discusses the possibilities in order to increase the efficiency of pollination and the rate of fruit set.

Keywords: apple, floral biology, pollination, fruit set, tropics, subtropics, temperate zone

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O-10

Influence of Chilling Accumulation Time on "Flower Bud Abortion" Occurrence in Japanese Pear Grown Under Mild Winter Conditions

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Mild and highly fluctuated temperatures during autumn-winter season in Japanese pear production area of Southern Brazil provoke a phenomenon called "flower bud abortion", which reduces the number of flower, resulting in low production. The main objective of this work was to realize phenological observation of the "flower bud abortion" phenomenon in Japanese pear potted plants which received insufficient chilling. For this purpose, two cultivars "Housui" and "Kousui", which had different performance under insufficient chilling condition, were used. The experiment was carried out in two consecutive winter seasons, and plants were exposed to three different timing to start the chilling accumulation: treatment 1 received chilling temperature under natural condition (started at the first hour above 7.2°C on field condition); treatment 2 started chilling accumulation one month after the first treatment; and treatment 3 received chilling two months after the first treatment. After accumulated 75% of chilling requirement, the potted plants of all treatments were transferred to greenhouse for heating accumulation, necessary to release the ecodormancy phase (flowering). For determination of dormancy overcoming, it was used different models: the classic amount of chilling hours (CH) below 7.2°C during endodormancy phase and the growth degree hours (GDH) during heating accumulation of ecodormancy; another model, called developmental index (DVI), was used for both phases of dormancy. This model, proposed by Sugiura (1991, 1997), characterizes the relationship between dormancy developmental rate and temperature range. The "flower bud abortion" symptoms could be observed in all treatments, and the incidence was higher in 'Housui' than in 'Kousui'. With delaying chilling treatment, the occurrence of this phenomenon increased. Compared to the first year of experiment, the second year had higher average temperatures during period of chilling accumulation in all treatments, and reflected on DVI progression in both stages of dormancy. The time necessary to accumulate 600CH increased and the GDH necessary for flowering also increased in all treatments during the second year of experiment. These results suggested that the temperature's range at the initial phase of endodormancy and the timing of chilling treatments affects on "flower bud abortion" occurrence, chilling requirement, and duration of dormancy stage more in "Housui" than in "Kousui".

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O-11

The Glutathione Accumulation on Mixed Bud Tissues During the Dormancy of Japanese Pear

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In some temperate fruit species, the glutathione (GSH) content has been shown to increase significantly during the dormancy process. Glutathione can exert effects in the regulation of growth and development, redox signaling, protein folding, gene expression, and cell cycle control. These functions depend on the concentration and/or redox state of the glutathione pool in the cell. Upon oxidation, the GSH is converted to GSSG and it can be restored by glutathione reductase (GR). Considering that glutathione can play an important function during the bud dormancy of Japanese pear, it is important to attempt the understanding of the glutathione pool on bud tissues through the dormancy period. For this purpose, during two consecutive autumn-winter seasons, the experiments were carried out using 2-4 year-old potted trees of cv. Kosui maintained in the field under natural condition of cold accumulation (NC) or transferred to a growth chamber at 21 degree centigrade as a complete cold deprived treatment (CD). The dynamics of the bud endodormancy were estimated by keeping one-year old bearing shoots under 'forcing conditions' and the total glutathione content (GSH and GSSG) and the GR activity were determined in different parts such as mixed bud, bud cushion and 1 cm-long portion of the stem which was taken immediately bellow the bud cushion. Mixed buds of plants under NC presented a significant increase in the total glutathione content as well as in the GSH/GSSG ratio in concomitance with the endodormancy overcoming. A correspondingly greater GR activity was also found in the bud tissues. Bud cushion and shoot tissues presented a less significant increase in the GSH content. CD plants did not shown bud break and a considerable decline on the glutathione content and GR activity was observed in the buds. Genes encoding the GR, gamma-glutamyl Cys synthase (gamma-ECS) and glutathione synthase (GSH-S), enzymes responsible for GSH turnover and biosynthesis were isolated and sequenced. From these results, it can be assumed that the chilling exposure has an important influence on the GSH accumulation and on the GSH/GSSG ratio in mixed bud at breaking time, through the increasing of the transcriptional level of related genes. This trait can be considered as a part of the complex dormancy overcoming process.

Keywords: *Pyrus pyrifolia*, endodormancy, glutathione synthesis, cold deprivation

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O-12

Evaluation of Peach Germplasm Under Subtropics for its Commercial Exploitation

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The present investigation was carried out during the year 2006 on four years old peach plants of different cultivars, planted 6m x 6m apart at Udhevwalla Research Farm of Sher-e-Kashmir University of Agriculture & Technology, Jammu (India). Evaluation of peach germplasm comprising 10 cultivars indicated a wide range of variability in physico-chemical characters of different cultivars within the same species. Out of the 10 peach cultivars evaluated under sub-tropical conditions of Jammu, the cultivars Shan-e-Punjab found to be most promising cultivar followed by Florida Prince, Tropic Beauty and Early Grand, whereas the cultivars Early Grand gave the higher yield, followed by Florida Prince and Shan-e- Punjab. Significantly Shan-e-Punjab peach proved best in terms of fruit length (58.13 mm), fruit weight (78.85 g), flesh weight (73.06 g) and total sugars (7.79%). The statistically higher

value for ascorbic acid (10.55 mg/100 g fresh weight) and fruit firmness (15.13 lbs) were registered with Florida Prince. Whereas the greater value in terms of fruit diameter perpendicular to suture (50.07 mm) and along the suture (52.86 mm) were observed with the cultivars Tropic Beauty. The cultivars Valley Grand registered the lower value for fruit length (37.27 mm), fruit diameter perpendicular to suture (36.44 mm) & along the suture (39.66 mm), fruit weight (30.14 g), flesh weight (26.8 g) and total sugars (4.91%).

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O-13

Present Status, Future Prospect of Growing Temperate Fruits in Bangladesh (a Tropical Environment) with Special Reference to Contribution to Nutrition and Poverty Alleviation

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The paper deals with the present status of production of temperate fruits in Bangladesh a strictly tropical country. A number of temperate fruits are now growing in Bangladesh. They are also contributing in nutrition and poverty alleviation of our land scarce, malnutrition affected and poor peoples. Bangladesh Agricultural University also established the largest fruit repository including a number of temperate fruits here in Mymensingh. Export and import situation are also addressed in the paper.

Keywords: Bangladesh, temperate fruits, tropical environments

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O-14

Genetic Study of Quantitative Traits of Low-Chill Peaches and Nectarines in Thailand

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Narrow sense heritability (h^2), genetic and phenotypic correlation and response to selection of seven tree traits: flower density (FLD), blind node number (BNN), internodes length (INL; cm), flowers per node (FLN), flowering period (FLP; days), fruit density (FD) and fruit set (FS; fruit density to flower density proportion) and eight fruit traits: fruit shape (FSH), ground color (GC), fruit blush (FB; %), fruit weight (FW; g), fruit length to fruit diameter (LD), flesh firmness (FF; Newton), total soluble solid contents (TSS; °Brix) and titratable acidity (TA; %) were estimated for two years using 61 crosses progenies resulted from 42 parents; 2005 and 2006. Three hundred and five seedlings were planted at the Angkhang Royal Agricultural Station, Chiang Mai, Thailand (1,200 m alt). The heritability estimates for all traits varied from relatively low to high values. The FLD and FS had the highest (0.28) and lowest (0.02) heritability values for tree traits, respectively; while FB had the highest heritability values (0.82) and FSH had the lowest heritability values (0.02) for fruit traits. Genetic and phenotypic correlations between both tree and fruit traits showed that most of the genetic correlations were much higher than the corresponding phenotypic correlations. It was concluded that all these almost traits were controlled by additive genes. Beside on these correlations, FLN could be used as an indirect selection for FLD, BNN, FD and FS for tree traits. In addition, FW could be used as an indirect selection for FSH, LD and TSS in low-chill peach and nectarine populations. Predicted responses to selection for tree and fruit traits were low to high values. Selection responses varied from 1.9-16.9% for the tree

traits and from 1.0-97.3 % for the fruit traits. Selection for FLD and FB had the highest progress for tree and fruit traits in these populations.

Keywords: *Prunus persica* (L.) Batsch, narrow-sense heritability, genetic and phenotypic correlation, response to selection

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O-15

Advances in Low-Chilling Peach Breeding at Instituto Agronômico, São Paulo State, Brazil

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Peach (*Prunus persica* L. Batsch), a typically temperate fruit tree, was introduced in Brazil through Portuguese colonization probably in the 1530s. The peach trees established at low latitude regions require climatic adaptation to subtropical-temperate conditions of low-chilling. First Brazilian peach breeding program was initiated by O. Rigitano in the late 1940s at the Instituto Agronômico (IAC). Research continued at IAC, aiming full adaptation of selections to different climates of São Paulo State and other similar ecosystems. Pioneering peach crosses involved local and North American germplasm material of medium chilling requirement. Various low-chill and productive cultivars with high quality fruits were released. In the last decades, the best IAC cultivars (F1 and F2 hybrids) were intercrossed with peach and nectarine selections from the University of Florida. Fifty eight cultivars were released to areas with 0-200 chilling hours below 7.2°C. The main fruit traits are: epidermis - green (Talismã, Nectar, Cristal), yellow (Canário), rose (Jóia-1 and 2), red (Centenário); flesh - yellow (Petisco-2, Dourado-1), white (Natal, Delicioso Precoce, Jóia-4); texture - firm, non-melting (Aurora-1), soft (Tutu, Catita, Jóia-3); stone - cling (Colibri, Brasão), free (Dourado-2, Jóia-5); flavor - sweet (Supermel, Ouromel-2), sweet-acid (Petisco, Arlequim); canning (Régis, Real, Biuti); maturation - early (Tropical-1 and 2), medium (Aurora-2, Doçura-2), late (Bolão, Momo); extra-large size (Douradão), and others as shape - globose, oblong, round, with or without tip; pubescence - high, medium, low; dual purpose (fresh-canning). About 46% of 58 cultivars has yellow flesh, 54% white flesh, 47% rose and red skin, 53% green and yellow skin, 65% freestone and 35% clingstone, being 10% canning. IAC peach harvest occurs from August to February, about 80-180 days after full bloom. These cultivars, and other selected genotypes with better pomological characteristics, have been widely accepted by fruit growers and consumers due to the adequate evolution of peach cultivation at subtropical areas.

Keywords: *Prunus persica*, stone fruits, subtropical areas, cultivars, quality fruits

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O-16

Pre-Selection of Apple Seedlings for Climatic Adaptation: Correlation between Beginning of Bud Breaking and the Percentage of Final Bud Dormancy Breaking on Apple Breeding

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The whether conditions on MeddleWest of Santa Catarina State, Southern Brazil, are characterized as sub-temperate and with a very atypical climate, with quite warm and uneven winter chilling combined

with real risks of late frosts. To overcome this situation in order to get success with apple production, new varieties of low chilling requirement and at the same time of late blooming, are necessary. On this way, this study had as objective to verify the correlation between beginning of bud breaking – BBB - and the final percentage of bud dormancy breaking – PBB, of different apple progenies. It was evaluated 935 pre-selections of five different progenies, from three different parental combinations: 1) Intermediate x low chilling parents; 2) intermediate x high chilling parents; 3) high chilling x high chilling parents. It was observed a strong negative correlation between BBB and PBB on all the progenies. This means that the later the BBB, the poor the PBB. The most prominent differences between the three groups were as follow: a) as expected, the progenies of group 1 started BBB 3 weeks before the group 2 and 4 weeks before the group 3; b) the progenies of group 1 had a much longer period of BBB and at a higher PBB than the progenies of the groups 2 and 3; c) For the group 1, during the first two weeks from the beginning of the growing season – September 1th -, only 33,5% of the pre-selections showed BBB. From the beginning of growing season of the group 2 – September 23th -, 71,7% of the pre-selections showed BBB for that same period; and for the group 3, during the same period, 90,6% of the pre-selections showed BBB. On these two last groups, there was a very strong concentration of BBB in a short period of time. This feature from the group 1 offers to fruit breeders the opportunity to select superior genotypes of good local climatic adaptation in a much longer time, combining all of the other important agronomical and commercial traits for a long period of blooming. It is also expected to allow extending the period of harvesting and, at the same time, avoiding damages by late frosts in this region by selecting for late blooming.

Keywords: Apple breeding, Chilling requirement, Dormancy segregation

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O-17

Inheritance of Chilling Requirement in Progenies of Apricot (*Prunus Armeniaca* L.)

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This research had the aim to study, under the Mediterranean climatic conditions, the genetic variation of the 'chilling requirement' (C.R.) character in progenies originated from parents with low-medium and high-very high C.R. Seven year old apricot seedlings, growing under the climatic conditions of the Tuscan coastal area, Italy (lat. 43,02 N, long. 10,36E), were randomly selected from two families obtained by crossing cultivars with different C.R.: 1) 30 genotypes from 'Portici X Stark Early Orange' (medium and very high C.R., respectively); 2) 24 genotypes from 'Sungold X Monique' (medium and high C.R., respectively). The following determinations were periodically performed on flower buds during the winter season: a) endo- and ecodormancy overcoming through biological observations (forcing method: 7 days at 25°C, 60-70% relative humidity, 12/12 h photoperiod); b) changes on glutathione (GSH, GSSG) contents through biochemical analysis; c) blooming entity. The results confirm that the female parents ('Portici' and 'Sungold') need a medium C.R., while the male parents ('Stark Early Orange' and 'Monique') are characterized by a high or a very high C.R. with a scattered flowering. Analysing the flower bud dormancy evolution of genotypes of the two progenies, it was observed a different distribution of character 'Chilling Requirement', in relation to the cross combination. From deep to the end of dormancy, the glutathione oxidised form GSSG was depleted and the active reduced form (GSH) increased, altering the GSH/GSSG ratio. Although, this behaviour was different according to the genotypes, glutathione can be considered as one of the putative key compounds inducing the resumption of flower bud growth.

Keywords: glutathione, endodormancy, growth resumption, chilling requirement, inheritance

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O-18

Peach Cultivar Releases by Embrapa in 2007.

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The peach breeding program of EMBRAPA Temperate Climate has basically three lines for cultivar development: processing industry, fresh market and dual purpose fruits. Among the objectives of the program is the development of fresh market cultivars which can fulfill the preferences of the largest national consumption centers. As a result of this effort, a new yellow fleshed cv. 'Rubimel' is being released. It is from a cross made in 1991, between the cvs. Chimarrita and Flordaprince. This sweet, low acid cultivar, tested as Cascata 952, has an excellent fruit appearance, due to its round shape and attractive color. Fruits ripen in the first half of November. The firmness is considered good which will benefit its transport to the market. 'Rubimel' is recommended for areas of 200 to 300 chilling hours, protected against the dominant winds, since it is moderately susceptible to bacterial leaf spot. On the processing type cultivars, EMBRAPA is releasing a cv. Bonaio. This originates from a cross made in 1995 between the selection Conserva 594 and the cv. Pepita. It was tested as Conserva 1124, not only at EMBRAPA but also in collections of private fruit growers of southern Brazil. The harvest is at the end of October or beginning of November depending on the year. Fruits are large for the season, with round-conic shape and may have a small tip and bulge suture. The chilling requirement is estimated in 200 hours.

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O-19

Consumer Preference for Selected Apple Varieties Grown in the Temperate Zone, Subtropics and Tropics

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Authors investigated the preference of Australian, Asian and European consumers for seven selected apple varieties ('Fuji', 'Golden Reinders', 'Granny Smith', 'Pink Lady', 'Red Delicious' and 'Royal Gala'). Fruit samples came from Australian, Korean and Hungarian supermarkets during two years. Apple fruit from Australia, Austria, Argentina, Belgium, Brazil, Chile, China, Germany, Hungary, Italy, New Zealand, Poland and South Africa were evaluated by untrained consumer panels. Estimation of appearance, flavour (sweetness, tartness) and texture of apple fruit were analysed in this study. Authors also evaluated fruit quality parameters of the above mentioned apple varieties and compared them to the consumer preference. The following fruit quality parameters were measured: fruit weight (g), diameter (mm), height (mm), fruit shape index, skin colour (%), flesh firmness (N), soluble solids content (%), fructose (%), glucose (%), pedicel length (mm) and seed content (n°/fruit). It is interesting to correlate the descriptive sensory data to the consumer preference for examining how consumers prefer apple fruit in terms of sensory attributes and chemical components. It is also concluded that degree of liking of apple varieties varies across geographical regions, probably due to differences in traditional food habits and availability of regional fruit sources.

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O-20

Relationship Between Total Phenolic Content, Mineral Nutrition and Vigor of Some Selected Dwarf Mahaleb (*Prunus mahaleb* L.) Genotypes

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This study was conducted at Khorasan Natural Resources and Agricultural Research Center on some selected mahaleb possessing different degrees of vigor to determine the relation between vigor, total phenolic content and mineral nutrition. Total phenolic content was determined with the Folin-Ciocalteu reagent. The potassium (K) iron (Fe) levels were quantified by an atomoc absorption spectrophotometry. Nitrogen was determined by Kjeldahl procedure and phosphorus (P) by a spectrophotometric method. Results showed leaf and stem bark total phenol content of the different genotypes differed significantly. The ranges of variation for stem bark and leaf total phenol content were 185.6, 165.50 in selected dwarf mahaleb genotypes and 43.25, 55.94 (mg CAT/g dw) for high vigor genotypes respectively. We found that there was a direct relationship between vigor and total phenol content. The highest N, P, K and Fe element concentrations were found to be high vigor genotypes. Correlation coefficient showed significant correlation between tree vigor with crown width ($R=0.812$), trunk diameter ($R=0.893$), crown volume (0.827), leaf total phenolic content ($R=-0.784$), stem bark total phenolic content ($R=-0.808$), nitrogen ($R=0.543$), phosphorous ($R=0.603$) and potassium ($R=0.666$).

Keywords: Mahaleb; cherry; Dwarf rootstock; Phenolic content; Mineral nutrition; N- nitrogen; P- phosphorus; K- potassium; Fe- iron

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O-21

Optimization of Extraction Conditions of Antioxidant Phenolic Compounds from Blueberry Fruits.

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It is well established the correlation of fruits and vegetables consumption and good health; however there are many fruits that need to be studied considering the environmental conditions where they have grown. Also, the methods to extract the bioactive compounds need to be adapted to the specific studied tissue. Optimal conditions for the extraction of antioxidant phenolics from blueberry were determined using the conventional liquid-solid method. For the optimization process blueberry cultivar bluegen was used. Total phenolic content was measured by spectrophotometer at 725 nm using the Folin-Ciocalteu reagent mix and expressed as chlorogenic acid equivalent. Antioxidant activity was measured by spectrophotometer at 515 nm using the estable radical DPPH and expressed as Trolox equivalent. The following parameters were considered: solvent volume, extraction time, different solvents, mixture of solvents, acidity/ph. After the optimization of the extraction process fourteen blueberry cultivars, from the highbush and rabbiteye groups, were analised. According to the results, total phenolics content did not changed with the volume increasing of methanol; however, the antioxidant activity increased as the volume increased. The maceration time did not interfered on the extraction of the bioactive compounds. Mixtures of solvents showed no difference on total phenolic content; however, the antioxidant activity was higher with the mixture of methanol, ethanol and acetone. Methanol was the most efficient solvent to extract phenolic compounds when compared to ethanol or water mainly when acidified with HCl. Blueberries from the rabbiteye group had higher phenolic concentration when compared to cultivars from the highbush group. Some selections from the Embrapa Clima Temperado breeding program showed similar phenolic concentration as the rabbiteye group. Antioxidant activity showed the same behavior. Also, there was a positive correlation between phenolic content and antioxidant activity. In conclusion, acidified methanol was more efficient to extract antioxidant phenolic compounds from blueberry tissue. The bleberries

from the rabbiteye group have higher phenolic content and antioxidant activity what may help on the marketing of this produce, since this group is the most cultivated in Brazil.

Keywords: Health, cultivars, extractors

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O-22

Economic Analysis of Certification of Mangos and Grapes in the Juazeiro/BA and Petrolina/PE Region

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Having certification along the productive fruit chain exported to the European Union (EU), United States (US) as well as for other potential countries, became a necessity to continue to export and to remain in the market. Concerns about food safety and standards had been required and increased not only from consumers but also from buyers, retailers and wholesalers. The objective of this paper was investigate the role and importance of different certification schemes such as Integrated Fruit Production (PIF), Euro-Retailer Produce Working Group (Eurepgap) and Fair trade Labeling Organizations (FLO). Data were obtained from interviews with 303 small, medium and large mango and grapes producers in Juazeiro/BA and Petrolina/PE region in Brazil in 2007. Some first results show that I) there is a high expectancy of receiving price premium due to certification in Petrolina, but not in Juazeiro among the small producers without certification; II) higher prices were received mainly from producers certified by FLO; III) additional people were hired due to certification; IV) the average production cost is high in Petrolina than Juazeiro; V) the irrigation system between the regions shows the inefficient in Juazeiro production.

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O-23

Characteristics of Responses of Fruit Trees to Climate Changes in Japan

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IPCC reported that the global mean temperature has been rising for the 20th century at the rate of 0.74°C per 100 years. Japan Meteorological Agency reported that the mean temperature in Japan rose at the rate of 1.06°C per 100 years at same time. Our institute and the Japanese government collected data on cases of influence of global warming on fruit tree production in Japan in 2003 and 2006, respectively. These results indicated that tree species were classified in to two types by responses of fruit development to climate changes. One group was the earlier development type and the other was the prolonged development type. The former were tree species in which both flowering and maturation periods had accelerated. These included Japanese pears, peaches and Japanese apricots. The latter were tree species in which the flowering period had accelerated, while maturation period had not accelerated. This type included apples, Japanese persimmons, grapes and satsuma mandarins. Fruit qualities of the prolonged development type had clearly changed, for example coloring faintly, enlarging, reduction of acid, softening and spoiling rapidly.

Keywords: coloring faintly, development, flowering, global warming, maturation

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O-24

Ratio Between Length and Diameter in Different Fruiting Structures of Three Apple Cultivars

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The Brazilian apple production increased in the last three decades, with prominence to the Santa Catarina and Rio Grande do Sul states (95% of the national production). The apple tree is characterized by producing fruits in different structures. This characteristic leads to a discontinuity of the production, however in the literature remains unclear this relationship. The length/ diameter ratio is a standard measure to evaluate fruit shape in apple, and the reason of its variation is attributed to several causes. The objective of this experiment was to evaluate the possible influence of the fruiting structure and the bud size in the length/diameter ratio in three apple cultivars (Gala, Fuji and Daiane). Twenty trees of each cultivar had been selected in the Caçador Experimental Station of the Institute of Agricultural Research and Rural Extension of Santa Catarina State, Brazil (26°49'07"S 50°59'06"W). Six fruiting structures were characterized: 1- spur (<10 cm) of weak bud! (<3,5mm); 2- spur of vigorous bud (> 4,5mm); 3- short twig of terminal growth (<30cm) of weak bud; 4- short twig of terminal growth of vigorous bud; 5- long twig of terminal growth (>30cm) of weak bud; 6- long twig of terminal growth of vigorous bud. Five buds of each structure were analyzed. No significant variation in the length/ diameter ratio was observed in Gala and Fuji cultivars, however in Daiane the long twigs and the short twig of vigorous bud showed more elongated fruits than the other fruiting structures. Regarding the bud size, the short twig of vigorous bud showed a higher length/diameter ratio than the short twig of weak bud, but in spur of weak bud the fruits were more elongated than in the spur of vigorous bud. According to this data, no relation was found between bud size and the length/diameter ratio.

Keywords: apple, fruiting structures, length/diameter ratio

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O-25

Seasonal Evolution of Macronutrients in 'Gala' and 'Fuji' Apples in Santa Catarina State, Brazil

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The Brazilian apple production increased significantly during the last three decades. The current production is about 800,000 tons per year. Cold storage became imperative to supply consumers with good fruit quality all year long. A good storage keeping depends on several interactive factors, including the nutrient balance in the fruit. Physiological disorders, such as bitter pit and lenticel spot, have been related also to nutrient unbalance, involving mainly N, K and Ca. Pre-harvest fruit analysis has been used for knowing the nutritional status, and to predict the occurrence of disorders in apples during and after cold storage. Early fruit analysis could help to predict the fruit storage capacity, and to anticipate any possible corrective measure. The objective of this work was to establish standards for macronutrient content in 'Gala' and 'Fuji' apples throughout the growing season for Southern Brazil. More than 70 'Gala' and "Fuji' commercial orchards, growing in a quite variable soil and climate conditions, grafted on various rootstocks, and with variable production potential and nutritional status, were sampled. Fruit samples were taken biweekly from about 25 days after full bloom (DAFB) up to harvest, in the growing seasons 2002/03 to 2005/06, and analyzed for N, P, K, Ca and Mg content. Yield was recorded, and samples of fruits from each orchard were cold stored to evaluate fruit quality and the occurrence of physiological disorders. The nutrient concentration

in the fruit fitted an exponential equation, with faster decrease in content up to 60-70 DAFB. The curves show the way each nutrient is absorbed, transported, and redistributed in the trees. The best orchards regarding to yield and fruit quality during storage were used to establish the normal range for macronutrient concentration in 'Gala' and 'Fuji' fruit at any time during the season. These data were assumed as applicable for the apple growing conditions in this region, and can be helpful for predicting the fruit nutritional status at harvest and their keeping quality during and after storage.

Keywords: Fruit analysis, nutrient concentration, seasonal trends, physiological disorders, nutrient balance

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O-26

Influence of High Temperatures at Blooming Time on Pollen Production and Fruit Set of Peach cvs. Maciel and Granada

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Regions under subtropical conditions commonly have temperature fluctuations and it is not rare, at late winter time the occurrence of temperatures above 25°C followed by 10°C. This is probably one of the causes for production inconsistency over the years. Several field and laboratory tests were conducted using two peach cultivars, Granada and Maciel, aiming to study the effect of high temperature (e" 25°C) at blooming period temperature. In vitro pollen viability at different temperatures were tested using a culture medium with 1% agar plus 10% sugar in distilled water. Pollen production per anther was also evaluated. In field experiments, twigs of these two cultivars were submitted to temperatures 2°C to 8°C above field temperatures, using plastic bags or transparent bottles (pet). The observed parameters were: in vitro pollen viability, pollen production per anther (total and normal pollen grains), length of pistils and fruit set. In laboratory tests, pollen germination was lower at 32°C, then 24°C and 28°C for both cultivars. Higher temperatures did not significantly influenced length of pistils, probably because the field temperature were already high. Total pollen production did not differ among tested temperatures, however percentage of normal pollens was significantly lower in cv. Granada and did not differ for cv. Maciel. The same was true for fruit set. The conclusion is that the negative effect of high temperatures at blooming time is larger for cv. Granada then for cv. Maciel.

Keywords: *Prunus persica*, climatic adaptation, fertilization, reproductive organs, pollen viability.

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O-27

Environmental Assessment of Integrated Fruit Production Practices for Strawberry in São Bento do Sapucaí (SP, Brazil)

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Integrated Fruit Production (IFP) has been defined as the set of agricultural, organizational, and environmental normative food safety standards established for compliance with the demands of higher quality and export markets. An IFP-Strawberry Program is being carried out in São Bento do Sapucaí (SP-Brazil), aiming at establishing the terms of reference for integrated production for the culture, and checking the contributions of IFP practices for the sustainability of the adopting farms. In order to tackle this latter objective, two rural establishments, one very diversified (Establishment A) and the other (B) specialized in strawberry production were studied with the APOIA-NovoRural System, which consists of a set of 62 indicators, integrated into five sustainability dimensions: (i) Landscape Ecology; (ii) Environmental Quality; (iii) Socio-cultural Values; (iv) Economic Values; and (v) Management and Administration. The results pointed out important contributions of the IFP-Strawberry Program, owing to several managerial and organizational procedures observed. Sustainability indices were in accordance with or above the baseline sustainability level (set at 0.70) for all dimensions, resulting in favorable environmental performances (mean value coincidentally = 0.79) for both studied establishments. The mean sustainability indices for Landscape Ecology reached 0,72 and 0,75 for establishments A and B, respectively, despite the restrictive relief of the region. A main contrast occurred in the Productive diversity indicator (indices = 0,47 and 0,69, respectively, for establishments A and B; with the latter reaching Shannon-Wiener index = 0,70 for productive areas), which is an important measure of the alternatives for income generation, and economic security of the farms against market fluctuations. Excellent water quality (mean values = 0,92 and 0,88 for establishments A and B, respectively) and remarkable improvements in soil quality (0,69 and 0,70) were associated with IFP-Strawberry. Important contributions were also associated with the Economic and the Socio-cultural Values. The main contrast observed between the establishments was the improved influence of the IFP-Strawberry Program on the Management and Administration dimension in the diversified farm (Establishment A), due to much better conditions of commercialization rendered by the integration of the many productive activities. [Supported by CNPq (proc. 48.0016/2004-6) and Embrapa Environment.

Keywords: APOIA-NovoRural, Environmental management, Impact assessment, *Fragaria ananassa*, Sustainability indicators.

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O-28

Introduction and Evaluation of Persimmon (*Diospyros kaki*) Varieties under Irrigation in the Brazilian Semi-Arid Region

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Persimmon (*Diospyros kaki*) is a subtropical leaf dropper species native to China, that belongs to the Ebenaceae family. The plants are arboreous, rustic, with high adaptation ability. It was introduced in Brazil at the end of the 19th century, as an alternative crop for the temperate regions of Brazil by the Agronomic Institute of Campinas – IAC. São Paulo is the greatest state producer of persimmon. Other important producers are the States of Rio Grande do Sul, Paraná, Rio de Janeiro, Minas Gerais and Santa Catarina. The yield varies from 15 to 35 ton/ha/year in properly managed orchards. The most cultivated varieties in Brazil are Rama Forte, Guiombo and Taubaté, and the production is concentrated from February to June. With the objective of making available new alternative crops available to fruit growers of the irrigated areas of the Brazilian semi-arid region, a collection of 13 persimmon varieties was established in the Experimental Station of Embrapa, at Petrolina, Brazil. Evaluations were performed to generate information about the new cultivars on adaptation for local climatic conditions, phenology, occurrence and management of insect pests and diseases. All practices were addressed to make fruit production feasible in different seasons for the traditional region producer. A trial was established and made up of six plants of each variety, spaced by 6.0 m x 4.0 m. The following parameters were evaluated: phenology (plant vigor, canopy type, branch emission, leaf type, yield);

use of plant growth regulators; beginning of flowering sprout date; branch size; number of leaves, flowers and fruits per branch; cycle; fruit set; period of ripening; fruit characteristics (size, shape, skin color, flesh texture, color and succulence, total soluble solids content, titrable total acidity, and post-harvest conservation). The results showed that it is possible to produce persimmons at any time of the year in the semi arid region under irrigation and doing applications of hydrogen cyanamide for sprouting induction. The evaluations showed that all the varieties responded well to bud induction. In Brazil, persimmon is traditionally produced in the southeast and south regions from March to June. From July to February, persimmon fruits are imported from Spain and Israel and sold at prices four times higher for customers. Taking advantage of the favorable climatic conditions of the Brazilian semi-arid region, it is possible to develop a cropping system to produce persimmon when national fruit offer in the market is low. Based on these results, the persimmon cultivars will be evaluated for one more year and recommendations will be available for commercial growing under irrigated conditions in the fruit planting areas of the Brazilian semi-arid.

Keywords: *Diospyros kaki*, Brazilian semi-arid, irrigation.

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O-29

Effect of Foliar Application of Polyamines on the Flower Bud Retention in Pistachio Tree

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The present study was conducted in order to examine the role of polyamines in flower bud abscission of pistachio (cv. Ahmad-aghaei) trees in heavy cropping year. Aqueous solutions (0, 0.01, 0.05 and 0.1 mM) of polyamines (putrescine, spermine and spermidine) containing a surfactant Tween -20 were sprayed on to flower buds, leaves and fruits of pistachio trees at June (beginning of filling kernel). The factorial experiment was arranged in randomized completely block design with four replications. The results showed that polyamines significantly increased the flower bud retention. However, spermine was most effective than other polyamines. There was a significant interaction between the type and concentration of polyamines. There was an increased in the flower bud retention using 0.1 mM spermine. The data suggest that polyamines particularly spermine, could be involved in the regulation of pistachio flower bud abscission.

Keywords: Pistachio, Polyamines, Flower bud retention

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O-30

Resveratrol on the Physicochemical Maintenance of Postharvest Blackberry cv. Tupy

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Blackberry is a very perishable fruit with high respiration rates and a rapid postharvest loss, which limit the in natura fruit market. Among the diseases control that have been investigated, special attention has been given to the indirect means, once they act on the product physiology by delaying the biochemical process of maturation and senescence and reducing the respiratory rates and transpiration. Resveratrol shows antioxidants properties that may bring out benefic effects on the fruit conservation. The objective of this study was evaluated the use of resveratrol as an alternative method to extend the postharvest conservation time of blackberry cultivar Tupy. After harvest, the berries were sprinkled with resveratrol at 1500, 1000, 500, or 0 mg.L⁻¹. Then, the fruits were packed into recipients of Polyethylene terephthalate (PET) and stored at 0°C of refrigeration during eight

days. The berries were evaluated in the day zero, two and four and kept at $23\pm 2^{\circ}\text{C}$ after removed them from storage refrigeration. The experimental was set in a complete randomize design with three replications. The data were submitted to analyses of variance F-test and the means differences were separated with Duncan test at 5% level of significance. Matter loss (%), total soluble solids content (TSSC), pH, total titrable acidity (TTA), TSS/TTA relation, decay incidence, physiological disorders, color, anthocyanins and total phenolics contents were assessed. The values of TSSC, TTA, TSS/TTA relation and color, only varied regards to storage time. Applying $100\text{ mg}\cdot\text{L}^{-1}$ of resveratrol the decay incidence and physiological disorders decreased (0% for both), and the fruits had the higher values of anthocyanins ($25.87\text{ mg}\cdot 100\text{g}^{-1}$) and phenols ($373.67\text{ mg}\cdot\text{L}^{-1}$); regarding to treatments and storage time. Consequently, this contributes for the storage of blackberries fruits 'Tupy' in PET packing for eight days at 0°C followed by two days at $23\pm 2^{\circ}\text{C}$.

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O-31

Hydrogen Cyanamide on Budbreak and Yield of 'O'Neal' Highbush Blueberry in South Uruguay.

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Southern Highbush Blueberry cultivars are becoming a high value crop in Uruguay since 2002. A rapid increase in surface area is due to the good prices of blueberries at the beginning of the off-season fresh market. The application of Hydrogen Cyanamide (H_2CN_2) in our mild and variable winter is one of the cultural practices that may improve yields and advance harvest. This study was conducted in two commercial blueberry orchards in the south of Uruguay ($34^{\circ} 44'$ south latitude). O'Neal (*V. corymbosum* L. Hybrid) plants were sprayed with 0, 1, 1.5 or 2 % H_2CN_2 (v/v) at two moments (May and June). The experiments had a randomized complete block design with 6 plants per treatment with 3 replications in 2005 and 6 replications in 2006. Variables measured were: total length plant, nodes number per plant, reproductive and vegetative budbreak, fruit number and total fruit weight (picked twice per week in harvest). June applications of H_2CN_2 accelerated vegetative and reproductive budbreak in both evaluated years, advancing fruit ripening. The H_2CN_2 applied at 1%, increased by 13, 2 and 8% the total Kg/plant harvested in the first 10 days in 2005 and 2006 respectively. The 2% H_2CN_2 spray in June injured apical flower buds mainly at stages 2 and 3. This removal of the apical dominance stimulated growth of lateral vegetative buds one month earlier than the control. Even though the final number of vegetative budbreak was higher, the fruit weight was improved only on the first harvest date. The effect on fruit number and total harvest weight depended on the doses and chill hours accumulated at each application moment. The chilling conditions were different between years.

Keywords: *Vaccinium corymbosum*, Dormex, Flower bud, vegetative bud, chilling hours

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O-32

Evaluation of Graft Compatibility Between Quince Rootstocks and Pear Scions

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Commercial pear varieties worldwide are grafted on rootstocks of *Pyrus* and *Cydonia*. Quinces rootstocks have been widely used due to two beneficial characteristics provided to the scion tree as size reduction and yield precocity. However, most pear cultivars exhibit graft incompatibility when grafted on quince rootstocks due to physiologic and biochemical factors. Aiming to compare compatibility levels, 41 five-year-old scion/rootstocks combinations trained in medium/high density (2000 trees/ha) were measured in the region of Pelotas – RS, Brazil during 2007. The pear cvs. tested were Carrick, Seleta, Packham's Triumph and William's Bon Chretien; and the rootstocks were *Pyrus calleryana* and 19 quinces cvs: Adams, Alaranjado, Alongado, BA 29, Bereczcki, Champion, De Patras, Du Lot, D'Angers, Vranja, EMC, Inta 267, Lageado, Apple, Melliforme, PineApple, Portugal, Radaelli and Smyrna. Evaluations were performed by visual observations and measurements of the graft-point development (mm), five cm above and five cm below. Experimental design utilized was a randomized complete block with three replications of five trees each. The largest trunk diameters of the cvs. Carrick, Seleta and William's (42.56, 59.29 and 45.74 mm, respectively) were provided by the rootstock *P. calleryana*. Regarding to scion trunk diameter in relation to the rootstocks: 1) 'William's' had the smallest diameters with the utilization of 'EMC', 'Portugal' and 'Radaelli' (16.42, 16.57 and 17.64 mm, respectively); 2) 'Packham's' had the smallest diameters provided by 'EMC', 'Portugal' and 'Adams' (15.03, 17.34 and 19.09 mm, respectively); 3) 'Carrick' was affected by lesser trunk development when raised on 'Alaranjado', 'Du Lot', 'Adams', 'Bereczcki' and 'Champion'. 'Portugal' and 'EMC' had a considerable visual and measured incompatibility whether grafted into 'Carrick'. For 'Packham's' this incompatibility was observed with the use of *P. calleryana*, 'Adams' and 'Portugal'. Among the interactions for 'Seleta' only *P. calleryana* did not show accentuated hypertrophy in the graft-point. In the 'William's' combinations this hypertrophy was more pronounced when grafted on rootstocks 'EMC', 'Bereczcki', 'Champion' and 'Melliforme'. Requesting for a better visualization and confirmation between quince/pear compatibility, it will be necessary further evaluations observing the development and behavior of each interaction scion/rootstocks.

Keywords: *Cydonia*, *Pyrus*, cultivars, grafting, trunk diameter.

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O-33

Effect of Potassium, Calcium and Copper Phosphite to Control Leaf Rust and Brown Rot in Peach

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The phosphites have been recommended as plant protector and inducer host resistance against plants diseases. The aim of the present study was to evaluate the effectiveness of phosphites for the control of peach leaf rust (*Tranzschelia discolor*) and peach brown rot (*Monilinia fructicola*) in fruits. The experimental area was located in Agrarian Sciences Center of the Federal University of Paraná and two peach cultivars were evaluated: 'Chimarrita' and 'BR-1'. The experimental design was completely randomized block with six replication and four treatments: Copper (Cu) phosphite, potassium (K) phosphite, calcium (Ca) phosphite and control. The phosphite application was made each 30 days, September until December of 2006. The incidence and severity of peach leaf rust was evaluated between November and January. The area under the disease progress curve (AUDPC) was calculated. The fruits were stored in shelf with continuous illumination, and after three and five days of the harvest, as assessed the incidence of peach brown rot symptoms. The obtained information was submitted to analysis of variance and comparisons of means by Duncan test ($p < 0.05$) using SASM statistical program. There was no significant difference in brown rot incidence between treatments to rust to 'BR-1', to 'Chimarrita' the severity was reduced by copper phosphite. For peach brown rot the potassium phosphate reduced the incidence in fruits five day after harvest ('chimarrita' but with 'BR-1' no control was observed. 'Chimarrita' cultivar was more susceptible

for both diseases.

Keywords: fungicide, phosphorous acid, induced resistance, *Monilinia fructicola*, *Tranzschelia discolor*.

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O-34

Evaluation of Resistance to Fire Blight on Apple and Pear Cultivars by Usda System in Qazvin Climatic Conditions

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Fire blight is the important and danger diseases of stone fruits that take very economic damages in quince, pear and apple trees at some place of Iran. Implication intensity of shoot blight is relationship with special climate and high susceptibility of utilize genotypes. In this research susceptibility or resistance level of apple and pear cultivars of Qazvin orchards evaluated at natural implication conditions by standard groping system (USDA). To perform research, tree defined pilot selected at pear and apple Qazvin orchards that contained important and prevailing cultivars of province. In each pilot after recognition of cultivars selected 5 trees with same growth and characteristics form each cultivar. Implication intensity determined on 13 apples and 8 pear cultivars. At near the summer end after discontinuance development of disease characters on shoots recorded attributes, continued infected shoot age, shoots situation and disease development level in different parts of tree by USDA evaluation system. Between pear and apple cultivars of pilots observed different reaction to fire blight agent significantly ($\alpha=1\%$). Pear cultivars of province showed high sensitivity to fire blight. From 13 pear studied cultivars in natural implication, appointed Spading, Biotic, Shah-Peasant, Hag-Alias, Argali, Nazify and Mashed in very sensitive group, Koshia, Domkaj, Doshas and Shah-Miveh in semi sensitive group, Chini cultivar In middle and Kohl in very resistance group. Apple cultivars of province showed expander reaction rang to fire blight. So that form 8 apples studied cultivars, appointed Shafie-Abadi and Ghandak in very sensitive group, Janati and Golab in middle and Golden Delicious, Red Delicious and Orlean in very resistance group.

Keywords: fire blight, apple, pear, resistance, *Erwinia amylopora*, cultivars.

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O-35

Infection by *Cryptosporiopsis perennans* in Virus-Infected Apple Fruits cv. Maxi Gala

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The relevance of the disease known as bull's eye rot caused by *Cryptosporiopsis perennans* is increasing as a post-harvest disorder. The present study had the objective of to analyze if susceptibility to this disease in fruits from virus infected apple trees is affect and analyze biochemical parameters which could be indicative of host resistance mechanisms triggered by viruses. Treatments consisted of infections by Apple stem grooving virus (G), Apple chlorotic leafspot virus (C), Apple stem pitting virus (P), and Apple mosaic virus (M) individually or in mixed infections in apple cv. 'Maxi Gala': C, CPM, G, GP, GCP, GCPM as well as a non-infected control. The fungus was inoculated directly on to

fruit lenticels by means of PDA-disks and fruits were incubated in humid chambers. Fourteen days later evaluations began with records of the area under the disease progress curve (AUDPC) every 3 days, for 32 days post-inoculation. Disease incidence (fruit with necrotic lenticels) and severity (number necrotic lenticels) by means of the AUDPC, as well as the activity of peroxydases (PO) and polyphenol oxydases (PPO) in the treatments G, GCPM and control were evaluated. The experiment was conducted twice: at harvest and after 1 month post-harvest storage. The results showed that treatments G and GCPM induced higher incidence of bull's eye rot (90%), as well as low activity of the PO, without any statistically significant effect on the PPO. The treatments GP, GCP and CPM showed intermediate results (50%) and C did not differ from the control treatment. The virus infections induced significantly higher disease severity only after storage. To our knowledge, this is the first study to reveal that virus infections increase the incidence, severity of infections caused by *C. perennans* and interfere negatively with the activity of the enzyme peroxydase in apple fruits.

Keywords: bull's eye rot, AUDPC, lenticel rot, peroxydase, polyphenol oxidase

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O-36

Peach Integrated Production System Related With Diseases Occurrence

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Integrated Fruit Production (IFP) aims to improve technical used, integrate agronomical areas, reduce chemistry applications and environmental impact. The objective of this work was compare disease occurrence in two system: integrated production (IP) x conventional production (CP) in peach orchard, cultivar 'Chimarrita' in Lapa (10 replications) and Araucária (eight replications) regions, Paraná State, Brazil. The treatment CP was characterized as practices used by the producer and IP as defined by "Brazilian Norms for Integrated Peach Production". The incidence and severity of rust leaf peach (*Tranzschelia discolor*) and shot hole (*Wilsonomyces carpophilus*) were quantified in marked branches during 2003/4 seasons, and also was calculated the defoliation. For monitoring the severity was used diagrammatic scale for each disease. The presence of the peach brown rot (*Monilinia fructicola*) symptoms was observed in the flowers (blossoming) and in the fruits (postharvest). The flowers were maintained three days in BOD (25°C) and three days at 4°C. The incidence of brown rot was carried out with immersion of the fruits in hypochlorite solution (0,5%) and without treatment, after three and five days. The brown rot in flowers was lower in integrated system (both regions), but the number of pulverization used was reduced almost 50% in IP. The brown rot in postharvest was best controlled in CP probably because in this case was used an application during harvest. Relating to foliar diseases, no differences were observed in shot hole incidence and severity, rust was more severe in IP system comparing to CP causing early defoliation. Research in methods of monitoring and climate correlations has to be improved for disease reducing fungicides applications in integrated systems production.

Keywords: fungicide, *Monilinia fructicola*, *Tranzschelia discolor*, *Wilsonomyces carpophilus*, monitoring.

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O-37

Researches about the Duration of Developmental Stages for the Leaf Miner - *Phyllonorycter corylifoliella* Hb. (Gracillariidae, Lepidoptera)

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Although in Romania *Phyllonorycter corylifoliella* Hb. was considered until now a secondary pest as importance and special treatments against him were not necessary to apply, an invasion was ascertained within the last years in some conditions, producing visible damages to the trees even if treatments for other pests control had been applied. The knowledge of its biology has a special importance, mostly when protection measures are necessary. Researches were conducted between the years 2004 – 2007 in an apple trees orchard from the experimental field of the FruitTrees Research Institute – Mărăcineni, Arge^o, Romania. *Phyllonorycter corylifoliella* Hb. had three generations in one year. The average period for the development of the Ist generation was 62 days, for the IInd generation, 49,5 days and for the IIIrd generation, the longest, 261 days. The developmental stages of *Phyllonorycter corylifoliella* Hb. had a duration according to the averages of temperatures as following: the incubation averaged 11 days at 11,50C, the larval stage - 26 days at 15,50C, the pupal stage - 12 days at 19,30C and the adult stage – 4,5 days at 24,30C.

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O-38

Sprayer Inspection System in Brazil

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In order to ensure the quality of the agrochemicals application, it is very important to know the technical features of the sprayer machines and how to calibrate and to regulate them. With the frequent use, the consuming of the equipment is inevitable and it is necessary to adopt measures of maintenance. In diverse European countries, the periodic inspection of the spraying equipment is a common routine that could be required or made by voluntary action. In Brazil, the periodic inspection does not have requirement defined by law or any other guideline. Until recently, many producers have not carried through the inspections because they have not had qualification or adequate methodology and instruments to make them. To facilitate the evaluation and to grant the correct application of agrochemicals according to the technical recommendations established by the Fruit Integrated Production, EPAGRI introduced a program that is called in Brazil "Sistema de Inspeção de Pulverizadores" (Sprayer Inspection System). The inspections are made in the field and the technicians go to the proprieties by using the "Mobile Unit", an adapted van that has all equipments necessary to carry out the inspections and evaluations. Besides the direct benefits to farmers, as a consequence of the improvement of the application's quality, there is a significant reduction in the levels of agrochemicals residues in the fruits and it contributes to reduce the risks of soil, water and workers contamination. Since 2002 when the program was started the number of evaluated and approved equipments has been increasing, from 49 in the beginning to 414 in 2006. In this period of time the % of not approved sprayers had reduced from 57,7% in 2002 to 18% in 2004 and 2005, achieving 11,3% in 2006. The program contemplate the main apple growing regions in Brazil (Santa Catarina, Rio Grande do Sul and Paraná States). The partnership between EPAGRI and BASF has been benefiting farmers in many ways: more than 10,350 ha are sprayed with machines evaluated by the program and these area is equivalent about 1/3 of all area that produces apple in Brazil. Considering the farmers that follow the rules and guidelines of the integrated production, the Sprayer Inspection System has been achieved the whole area of Apple Integrated Production in Brazil.

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O-39

Grapevine Performance and Production Strategies for Tropical Environments

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Viticulture, a traditional activity in countries with a temperate climate, has been gaining importance in several hot climate regions in the world. The performance of the grapevine under tropical conditions differs considerably from the one observed in temperate regions. The absence of a dormancy period, associated with the use of adequate cultivation technology, offers the possibility of timing the harvest for any day of the year. This feature brings about the perspective of a great expansion for the tropical viticulture, be it for the continuous market supply with table grapes, be it for the possibility to produce large volumes of wine and juice in small industrial plants. The climatic variability found in intertropical zones, mainly due to the altitude, has allowed for the identification of regions with a great potential for the production of grapes for fine vintage wines. In this study relevant aspects of the grapevine performance in hot climates are presented and the management techniques employed in the tropical viticulture in Brazil are discussed. Furthermore, aspects related to the harvest timing according to the regional and seasonal climatic variations are dealt with, as well as the kind of products (table grapes, wine, juice), the intrinsic characteristics of the cultivars used and the market opportunities. Some Brazilian winegrowing regions are presented as examples.

Keywords: tropical viticulture, wine grape, juice grape, table grape, grape cultivar, vineyard management

O-40

Effect of Low Temperature on Carbohydrates and Proline Content in Canes and Buds of Table Grape During Dormancy

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Deciduous fruit trees of the temperate zone enter annually a period of rest which must be overcome. Dormant buds must receive an adequate amount of chilling for growth to resume the following spring. The aim of this research was to investigate the dynamic changes in carbohydrates and proline content in grapevine buds and shoots during dormancy. At leaf fall, one-year-old shoots of Superior Seedless table grape were selected randomly from a commercial vineyard and subjected to 0, 100, 200, 300, 400 or 500 hours of chilling (CH) at 5°C in a cool chamber. Buds and surrounding stem tissues were collected from these shoots at regular intervals during this vernalization and were analyzed for starch, sucrose, glucose, fructose and proline. At leaf fall, carbohydrates consisted mainly of starch. Low temperature treatment triggered a quick hydrolysis of starch which decreased by 25% and 27% in bud and stem, respectively. This decline was accompanied by an increase in sucrose. After 100 CH, the levels of sucrose and starch declined concomitantly with an increase of hexose concentrations. We also observed a rapid accumulation of proline in both organs which reached a maximum at 300 CH. During the final stage of vernalization towards chilling satisfaction (400 and 500 CH), hexoses continued to accumulate in the buds but not in the surrounding stem tissues implying a possible import of carbohydrates into the bud. Proline, however, decreased and sucrose content increased considerably in both structures. It appears that proline was used in the beginning to providing protection against low temperature and then as source of nitrogen and carbon for new growth, later. Our results suggest that dormancy can be divided into two stages. The first one (from 0 to 300 CH) is an acclimatisation period characterized by a high level of proline, the second is a preparation for growth resumption marked by a high level of soluble sugars and a low level of proline.

Keywords: Superior Seedless, dormancy, Low temperature, sugars, proline.

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O-41

Vigor Indicators and Yield of Grapevines Cultivated in São Joaquim, SC, Brazil

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Grapevine culture in Brazil is in expansion. São Joaquim/SC is a new region of production of *Vitis vinifera* varieties. In this region the vineyards produce grapes with complete maturation, resulting in wines with special characteristics. The aim of this work was to evaluate the vigor and the production of the varieties Cabernet Sauvignon, Merlot and Sauvignon Blanc in São Joaquim during the 2005/2006 season. The vineyard implanted in 2002 is located at 1,293 meters above sea level and planted using a vertical trellising system. For red grape varieties the spacing between plants and rows is 0.75m x 3.00m, respectively. The white grape varieties have 1 m between plants, and 3 m between rows. During the wine grape cycle the leaf area index, the yield, the total soluble solid content, the total acidity and the weight of pruned parts (at 15/09/2006). For Sauvignon Blanc the cycle from pruning to the harvest lasted 182 days, yielded 2.625 kg/plant, reaching 23.8 °Brix and acidity of 134 meq/l. The leaf area index was 9.99 m² and the Ravaz index was 2.1. The variety Merlot presented a 212 days cycle, yielding 1.520 kg/plant, being harvested with 23.9 °Brix and 87.3 meq/l of acidity. The leaf area index was 7.01 m² and the Ravaz index was 1.6. The variety Cabernet Sauvignon reached 23.3 °Brix and 114 meq/l of acidity during the cycle of 226 days. The leaf area index was 5.51 m², with an average yield of 1.409 kg, resulting in a Ravaz index of 1.5. More studies should be conducted to establish parameters for these varieties in the region. The good adaptation of the grapevine and the excellent quality of the grapes produced, indicate the potential of the wines produced in the region of São Joaquim, Santa Catarina, southern Brazil.

Keywords: *Vitis vinifera*, Ravaz index, leaf area, maturation, wine quality

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Quo Vadis, Brazilian Viticulture? Globalization and the Legacy of Santos Neto

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While Europe uproots vineyards to diminish overproduction of wine, Brazil strives to expand the geography of 'noble' European cultivars to substitute growing importation of "fine wines" with prestigious denominations of origin. Moreover, Brazilian viticultural research and development policy proposes competitive insertion in the global economy with creole versions of such vintages, already in oversupply. Concomitantly, Brazilian viticultural science has dismissed the legacy of Santos Neto, pioneer of a more promising agroecological model that is mainly resorted to for the rootstocks that sustain its neocolonial viticulture: tropical interspecific hybrids such as IAC 572. The unfinished project of Santos Neto proposed development of hybrids between classical *Euvitis* cultivars and tropical *Vitis* species adapted to the vast peritropical highland latitudinal belt of Brazil. Such native selections would have distinctive organoleptic attributes desirable for a global market that increasingly demands product diversity, and organically sustainable agronomics.

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O-43

Curve of Growth, Seasonal Content and Accumulated Amount of Macronutrients on Syrah Grapevine, in São Francisco Valley

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The quantification of nutrients used by the plant to grow, to flower and to fructify, as well as, those that are exported through the crop and are lost through defoliation and pruning of the branches, can foresee with larger level of safety the amount of nutrients that should be available to the plants in function of the chemical and physical attributes of the soil in which they are established. This work had as objective to establish a curve of vegetative growth and to verify nutrients contents in each phenological stage, during two productive cycles, establishing the possible deficits or excesses, in 'Syrah' grapevine. To every two weeks they were collected, in three plants, all the branches grown until that moment of the cycle. The fresh biomass was separated in branches, leaf blades, leaf petioles and bunches. The evaluations consisted of the mensuration of leaf area and determination of N, P, K, Ca and Mg contents in each portion of the biomass, being calculated the accumulated amount. The plants presented an increase of leaf area described through third degree equation, with the point of maximum area about 60 days after pruning. The reduction of the foliage in the end of the productive cycle is due to defoliation for exposing the bunches to the solar radiation. Trunk and stem supply N to the leaves and bunches formation until the early flowering, 25 to 30-days after pruning. Leaves and bunches present in early flowering high N content, that decreases along with berry maturation. There was an increase in K content in all the organs of the vine starting from flowering. The concentration of Ca and Mg stay stable in all the organs until flowering, and the leaves and petioles start to concentrate Ca 52 DAP. Leaves concentrate S up to 30 DAP and the concentration decrease after flowering. P was the nutrient that presented larger decrease starting from the half of the cycle. It seems to occur P deficiency as the phenological cycle proceeds in consequence of the low P contents and Ca excess in the soil. The accumulated amount of nutrients in the plants denotes that there is an excessive Ca absorption in detriment of K and Mg. The future fertilization should be more balanced, so that severe deficiencies will not develop in the vines.

Keywords: Grapevine, phenology, vegetative growth, mineral nutrients

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P-001

Spacing and Mume Clones as Rootstocks for 'Aurora-1' Peach in São Paulo State, Brazil

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Dwarf rootstocks allow to plant the high density peach (*Prunus persica*) orchards and increase the productivity. Since 1998, large research project, has being carried out at the Faculdade de Ciências Agrárias e Veterinárias (FCAV/UNESP), Jaboticabal *Campus*, Brazil, involving the use of mume clones (*Prunus mume*) as rootstocks for peach tree, which has presented promising results. In this research, two mume clones ('Clone 15' and 'Rigitano'), propagated by herbaceous cuttings were tested, as rootstocks for peach cv. Aurora-1, in three spacing: 6 x 2 m, 6 x 3 m and 6 x 4 m. The experiment was carried out under field conditions, in Vista Alegre do Alto (21°10'14" S, 48°37'45" W, 700 m of altitude), São Paulo State, Brazil. The region has an average accumulation of temperatures d" 7.0 °C of 17.9 hours per year. The evaluations were realized in 2005 and 2006 (2° and 3° year after transplant, respectively). Rootstocks did not influence none of the parameters evaluated: number of mixed branches/plant, number of fruits/branch before and after fruit thinning, number of sprouts/mixed branch, number of fruits/plant, the length, diameter and weight fruits, production/plant and productivity/ha. The fruit diameter was larger and productivity/ha higher in 6 x 2 m space in relation to 6 x 4 m, in both years. In 2006, in spite of lower relative humidity than the historical average of the region, the 6 x 2 m space also presented the best results, because increased the number of mixed branches/plant, fructification, sprout, fruit length and the production/plant. The 6 x 2 m space can be also recommended for peach culture aiming the reduction of the adverse effect of low air relative

humidity and high temperatures. No incompatibility symptoms were found between rootstocks and scion, which makes possible the use of 'Rigitano' and 'Clone 15' of mume as rootstocks for 'Aurora-1' peach. (Financial support: FAPESP n° 04/12110-6 and 05/50157-7).

Keywords: *Prunus mume*, *Prunus persica*, fructification, physical fruit characteristics, productivity, low chill requirement.

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P-002

Selection of Peach Genotypes with Low Requirement Chilling, Adapted to Subtropical Climatic Conditions

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Low chilling requirement is essential for of economic cultivation of peaches in subtropical climate, therefore it should be the most important objective in breeding programs for these regions. The aim of this work was to evaluate and to select peach progenies with low chilling requirement through detached twigs methodology, to indicate a good genotype for parent in the breeding program. The work was carried out at Federal University of Viçosa (UFV), State of Minas Gerais, Brazil, in 2004. A total of 180 genotypes, from 25 peach progenies, were observed. Each progeny had from three to nineteen plants. The twigs detached were submitted to 50, 100, 150, 200 and 400 chill units. Once the treatments were concluded, the twigs detached were transferred to a greenhouse and after twenty one days the budbreak and flowering were evaluated. The results obtained allowed to select five populations and twenty nine genotypes with low chilling requirement. The cultivar Real was an efficient female parent for obtaining low chilling requirement offspring.

Keywords: *Prunus persica*, detached twig methodology, subtropical adaptation.

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P-003

Some Aspects of the Reproductive Biology Study on Flavorcrest and Dixiland Peach Cultivars (*Prunus persica* [L.] Batsch) Used in the Argentine Improvement Program.

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In the northeast region of the Buenos Aires province, stone fruits, mainly peach are cultivated. The harvest period is extended from October to January but some lapses are not covered because there are few varieties available or the varieties are not accepted by the market. For this reason, a varieties improvement project has begun. Flavorcrest and Dixiland cultivars are varieties well adapted to the zone and cultivated at present, so they have been selected as parents for the new hybrids production. The present study shows the results obtained since two years from the sequence of the pollinations and fertilization until the fruit collected and the final embryo growth were registered. Pollen viability, pollination efficiency, fruit set and fruit and seed measure were evaluated in comparative way between those obtained from the self-fertilization and those obtained by cross-pollination. All these events were studied in relation to the climatic conditions registered in the respective period. Flavorcrest did not display auto-incompatibility or self-fertility problems. Nevertheless, ninety days after the pollination, the weight, length and thickness of the fruits collected from the cross-pollination treatment

with Dixilan cultivar, were significantly greater than those obtained from the autogamy.

Keywords: *Prunus persica*; floral biology; breeding program

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P-004

'Big Aurora': New Yellow-Fleshed Clingstone Peach Selection from IAC for Mild Climates Similar Those Prevailing to the State of São Paulo

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'Big Aurora' (IAC 680-13) is a new red-skin-yellow-fleshed-clingstone peach selection of the Capta-frutas, Jundiaí, Instituto Agronômico, State of São Paulo, Brazil, well adapted to mild winter regions. It was originated as a special material originated as an open-pollinated seedling of 'Ouromel-3' (IAC 471-8: 'Tutu' peach x 'Colombina' nectarine) hybrid. The low chilling requirement, high plant vigour and productivity, large fruit size besides the excellent red fruit appearance, flesh firmness, superior quality and taste are the main characteristics which justify the inclusion of this new IAC selection in the commercial peach orchards of State of São Paulo and for other areas of similar climate.

Keywords: *Prunus persica* L., genetic breeding, tree fruit production, fruit size and quality, low chilling requirement, a new IAC peach selection for subtropical areas.

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P-005

'Aurojima': New Yellow-Fleshed Nectarine Selection

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'Aurojima' (IAC N 2680-91) is a new red-skin-yellow-fleshed nectarine selection of the Instituto Agronômico, Capta – Frutas, Jundiaí, State of São Paulo, Brazil, adapted to mild winter regions. It was originated as an open-pollinated seedling of 'Ouromel-4' (IAC 1870-2) – one of F1 hybrid obtained by cross between the 'Ouromel' (IAC 2-76) an ancient IAC peach with 'Sunred' a nectarine introduced from Flórida, USA. The low chilling requirement, high plant vigour and productivity, medium-large fruit size, besides the excellent fruit appearance, quality and taste, are the main characteristics those justify the inclusion of this new IAC selection in the commercial peach orchards of São Paulo and regions of similar climate.

Keywords: *Prunus persica* (L.) Batsch: *P. persica* nucipersica, genetic breeding, new selection, 'Aurojima', fruit production and quality, low chilling requirement

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P-006

Susceptibility of Peach Trees Cultivars to Leaf Rust (*Tranzschelia Discolor*)

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The aim of this work was to estimate the reaction of thirty-six peach cultivars to leaf rust, caused by *Tranzschelia discolor* (Fuckel) Tranzschel & Litv. The incidence and severity of the disease as well as defoliation in peach trees of an experimental orchard Universidade Tecnológica Federal do Paraná (UTFPR), Campus Dois Vizinhos, in the growing season of 2004/2005 and 2005/2006 were evaluated. Immunity to leaf rust was not observed among the studied cultivars. There are differences in leaf rust intensity depending of the growing seasons conditions. 'Pilcha', 'Sinuelo', 'Chirua', 'Sulina', 'Eldorado' and 'Pampeano' cultivars showed tolerance to leaf rust, whereas 'Vila Nova', 'Fla 1372', 'Coral 2', 'Chimarrita', 'Della Nona', 'BR-1' and 'Guaiaca' showed high susceptibility.

Keywords: disease tolerance, disease resistance, *Prunus persica*, disease incidence, disease severity.

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P-007

Roots Distribution of Four Peach Rootstocks

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The distribution of the root system of peach rootstock was considered outstanding to enhance the efficiency in the cultural management 'Forastero' peach [*Prunus persica* (L.) Batsch] grafted on seed propagated 'Cuaresmillo', and on 'in vitro' propagated 'Ferdor Julior' (FJ), 'Mr.S 2/5' and 'GF 655/2' was tested. The experimental orchard was planted in 1998 at the San Pedro Agricultural Experiment Station in a plot with argiudol vertico soil, with 2.8 % organic matter . To study the distribution of the root system 16 trenches were made. The excavations were made in 4 plants of each treatment. Each excavation was 0,50 m away from the tree, between the rows. Each trench was 1m wide and 0,8m deep. The trunk was in correspondence to the middle of the trench width. Profile wall methods were used to record the number of roots at different depths. The roots were classified in very thin (<0,5mm in diameter), thin (0,5 – 2 mm), medium (2 – 10 mm) and thick, (>10mm). There were not significant differences between rootstocks when very thin roots were considered. Compared with the other treatments, 'Cuaresmillo' showed significant higher amount of thin, medium and thick roots either in the upper level (0 to 30 cm in depth) of the profile or the lower level (30 to 75 cm in depth). All treatments showed that 70 % of very thin and thin roots were in the first 30 cm of soil profile.

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P-008

Chilling Requirement Evaluation of Peach Híbridos Obtained Among Cultivars with High and Low Chilling Requirements

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The high chilling requirement genotypes introduction can be useful to wide the genetic base of the low chilling requirement germplasm, manly considering fruit quality. However, the hybrids among high and low chilling requirement genotypes can have poor adaptation in mild areas, with erratic budbreak and flowering. The aim of this work was to evaluate the chilling requirement of peach progenies obtained among low and high chilling requirement cultivars. The work was carried out at the Universidade Federal de Viçosa (UFV), State of Minas Gerais, Brazil, in 2005. The evaluated progenies were 'Alô Doçura' x 'Zaragozano Rojo'; 'Aurora-1' x 'Calanda San Miguel'; 'Relíquia' x 'Miraflores'; 'Setembrino' x 'Carson'; 'Setembrino' x 'Zaragozano Rojo'; 'Setembrino' x 'Adafuel'; 'Talismã' x 'Sudanell-2' and 'S.388-1' x 'Miraflores'. Low chilling genotypes were used as female parent and high chilling as male parents. The high chilling requirement genotypes were introduced as pollen from the Estación Experimental de Aula Dei (CSIC), Spain. Each hybrid progeny had from two to eleven plants. The chilling requirement was evaluated through the detached twigs methodology. The twigs detached were submitted to 410, 460, 510, and 560 chill unities. Once submitted to the chill units treatments, the detached twigs were transferred to a greenhouse and, after twenty one days, the budbreak and flowering were evaluated. The detached twigs present low budbreak (< 30.9%) and flowering (< 7.94%), indicating high chilling requirement of the hybrids. The results indicate that it is necessary more recombination generations before selecting low chilling requirement (< 400 chill unities) genotypes.

Keywords: *Prunus persica*, selection, adaptation.

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P-009

Genetic Variability Promoted by Controlled Cross Pollination Between Two Peach Cultivars (*Prunus persica* L. Batsch)

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The fruit-growing sector of the northeast region of the province of Buenos Aires (Argentina) requires new materials of *Prunus*. For this purpose the EEA INTA San Pedro has initiated a peach breeding program. The process has been focused in obtaining genetic variability from cross pollination between 'Flavorcrest' and 'Dixiland' cultivars. These peach varieties are well adapted to the agro-ecological conditions of the region, displaying an outstanding productive and quality performance. The embryos obtained from these cross pollination were cultivated in vitro in WPM medium, without growth regulators. Embryos were stratified under darkness conditions and 4°C during 20 - 24 days according to the peach cultivar. Subsequently they were conditioned to 23°C and 16 hours of light. The proportion of germinated embryos was very variable (78.9%; 43.5%; 7.27%) depending on the cross, the year and the initial size of the embryo. A positive correlation between germination and the largest embryos was only observed in some years and in part of the cross pollination treatment. Nevertheless, a great amount of plants lost due to post-germination death and this deficit was variable according to the year and the cross, too. The hybrid plants obtained are now being cultivated for field evaluation.

Keywords: peach, breeding program, embryo culture

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P-010

Ecophysiological Performance of Olive Genotypes (*Olea Europaea* L.) in the Semi Arid Brazil

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In the irrigated areas of the Semi Arid Brazil, the introduction of new cultivations is part of a strategy in which research and developmental groups are searching for cropping alternatives. In this context, olive has been tested aiming at studying its adaptation to the different environmental conditions of the region. Thus, a study was carried out in the Embrapa Tropical Semi-Arid, at Petrolina, State of Pernambuco, Brazil, during December, 2006, in order to characterize the daily patterns of water relation and gas exchange of four olive genotypes from different origins: a) Manzanilla (Spain); b) Barnea (Israel); c) Ma'alot (Israel), and d) Sepoca (Italy). The study was carried using one-year old plants that had been propagated by stem cuttings and planted spaced by 4.0 m x 7.0 m. The soil of the experimental area was a red-yellow oxisol and the irrigation water was applied by dripping. The evaluations were based on leaf water potential, measured with a pressure chamber (PMS, M-600), and gas exchange data accessed with a portable IRGA (LICOR, LI-6200), connected to a ¼ liter assimilation chamber. was initially observed at 04:00 (predawn) and together with stomatal conductance (g_s), leaf transpiration (E) and photosynthesis (A), from 06:00 h to 18:00 h, during two cloudless days. Predawn ψ reached around -0,5 MPa in all genotypes. However, during moments of higher evaporative demand (around 1,800 $\mu\text{mol m}^{-2} \text{s}^{-1}$ PAR, 37 °C air temperature and 30% RH), Ma'alot showed the lowest value (-2,85 MPa), followed by Barnea (-2,65 MPa), Manzanilla (-2,57 MPa) and Sepoca (-2,32 MPa). Recovery was initiated at 16:00 h, and by the end of the day, the genotypes reached around -1,0 MPa. In relation to the gas exchange variables, the highest values were observed at 10:00 h. At this time, Ma'alot showed g_s , E and A of 0,46 $\text{mol m}^{-2} \text{s}^{-1}$, 8,7 $\text{mmol m}^{-2} \text{s}^{-1}$ and 14,4 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively, followed by Barnea (0,54 $\text{mol m}^{-2} \text{s}^{-1}$, 12,7 $\text{mmol m}^{-2} \text{s}^{-1}$ and 13,1 $\mu\text{mol m}^{-2} \text{s}^{-1}$), Manzanilla (0,58 $\text{mol m}^{-2} \text{s}^{-1}$, 15,5 $\text{mmol m}^{-2} \text{s}^{-1}$ and 14,1 $\mu\text{mol m}^{-2} \text{s}^{-1}$) and Sepoca (0,58 $\text{mol m}^{-2} \text{s}^{-1}$, 10,4 $\text{mmol m}^{-2} \text{s}^{-1}$ and 11,0 $\mu\text{mol m}^{-2} \text{s}^{-1}$). From this point, g_s , E and A decreased linearly in all genotypes, reaching around 0,05 $\text{mol m}^{-2} \text{s}^{-1}$, 1,5 $\text{mmol m}^{-2} \text{s}^{-1}$ and 0,0 $\mu\text{mol m}^{-2} \text{s}^{-1}$, respectively, by the end of the day. The Manzanilla genotype showed the highest values on these variables, during most part of the experimental period.

Keywords: Water potential, stomatal conductance, transpiration, photosynthesis.

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P-011

Study of the Factors that Influence the Nectarines in Vitro Germination

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The success for the in vitro germination and viability on pollen grains depends of the adjustment of many factors, among them: culture mean pH, the storage temperature and the emission time of the pollen tube. To evaluate the effect of each one of these factors, three experiments were realized. In these, the objective was to establish the best pH value, the ideal temperature for the pollen grains germination and the emission time of the pollen tube in two Nectarine cultivars. For the study realization, the pollen grains of 'Centenária' and 'Colombina' were inoculated in Petri dishes containing 20 mL of culture mean constituted by 60 g.L⁻¹ of sucrose and 6 g.L⁻¹ of agar. Different values of pH were tested (4.0; 4.5; 5.0; 5.5; 6.0 and 6.5), as well as different temperature (20; 25; 30 and 35) and emission time of the pollen tube (1, 2, 3, 4, 5, 6 and 12 hours after inoculation). The

percentagepercentile of germinated pollen grains were obtained adjusting the culture mean pH to 6.0 and stored at 25° C of temperature. It was verified that the pollen tube emission started with one hour after inoculation in both varieties, stablishing its growth at six hours for the Centenária variety and at twelve hours for the Colombina.

Keywords: palinology, nectarine, pH, temperature, growth, and tissue culture.

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P-012

Adjustment in Basic Compounds Concentration of the in Vitro Germination Mean of Nectarines Pollen Grains

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The medium pH was adjusted to 5,8. The pollen was uniformly distributed in Petri dishes containing 20 mL of the medium with a number 2 brush. The concentration of 6 g.L⁻¹ of agar combined with 53 to 57 g.L⁻¹ of sucrose provides the best percentage of the 'Centenária' and 'Colombina' nectarines in vitro germination of pollen. Regarding the calcium nitrate and boric acid, there is no need to add them in the in vitro germination of pollen grains 'Centenária' and 'Colombina' nectarines. The pollen grains used were obtained from the Centenária and Colombina varieties, removed from flowers anthers in the "balloon" stage. In the first, different concentrations of agar (4, 6, 8 and 10 g.L⁻¹) and sucrose were tested (0, 30, 60 and 90 g.L⁻¹). Based on the best result of the first experiment, a second experiment was realized, in witch different concentrations of calcium nitrate (0, 200, 400 and 800 mg.L⁻¹), and boric acid (0, 400 e 800 and 1200 mg.L⁻¹) were tested. The objective was to adjust the basic components concentration for the culture medium to evaluate the in vitro germination of nectarine pollen grains. So, were realized 2 experiments with the purpose of define the best agar, sucrose, calcium nitrate and boric acid concentrations.

Keywords: palinology, *Prunus persica* nucipersica.

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P-013

Occurrence of Parthenocarpy in Nashi Pears on two Different Locations

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As a rule for commercial production of pears it is indicated using high percentage of pollinizer varieties (from 10 to 20%) as its flowers produce low amount of nectar, with very low sugar content (10-15%). This makes the flowers of low attractiveness to pollinator insects. Due to the frequent yearly variation of winter chilling amount at the Sough South of Brazil, it is usual the occurrence of non-coincidence of blooming between the target variety and its pollinizers. Even so, quite frequently occurs reasonable fruit cropping. In this study, it was tested three forms of flowers pollination were tested: a) simply emasculation; b) self-pollinated flowers; c) hand-pollinated flowers. Just after pollination at open-field, the flowers were bagged with two forms: a) paper bags; b) voal tissue. The pear varieties used were Housui and Kousui grown at two different climatic regions in terms of winter chilling at the Sough of Brazil: a) Caçador county, where there was 1.000 chilling units; and b) São Joaquim with 2.000 chilling units – CU measured according to the Modified North Caroline Method. It was not detected anemophyle or self-pollination or pseudo-compatibility among flowers. The fruit set was good to very good as an effect of parthenocarpic event on both locations. For the hand-pollinated flowers, as a result of the tightly contact of the brush used for pollination of the stigma, the fruit set was higher. This indicates that there probably was a stimulating parthenocarpic action working. The

fertility rate of the two cultivars tested was low to very low.

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P-014

The Effect of Salt Concentration in the Culture Medium and Explant Type on the Micropropagation of the Rootstock 'Gxn-9'

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The plant propagation makes possible the cloning of several species allowing the formation of identical individual. Nevertheless, in vitro multiplication allows the production of a large number of genetically homogeneous plants in a short lapse of time and reduced physic space in comparison to traditional plant propagation procedures. However, during multiplication phase physiologic abnormalities in the explants might occurs causing the phenomenon known as vitrification. The research aimed to study the effect of compositions in different medium cultures and type of explants on in vitro multiplication of the rootstock 'GxN-9'. The culture mediums used to induce the shoot formation from different explants were constituted by salts of MS, half-strength MS (reduction of 50% of nitrogen concentration), QL and WPM, enriched with the MS vitamins: 100 mg L⁻¹ of myo-inositol, 3% of sucrose, 0.7% of agar, 0.01 mg L⁻¹ of IBA and 0.5 mg L⁻¹ of BAP. Explants with or without apical excision (basal and apical) were inoculated under aseptic conditions in the different culture mediums. After inoculation the explants were kept in growth room under 16 hours photoperiod with 25 μmol m⁻² s⁻¹ radiation and temperature of 25, 2°C. The experiment was conducted in a complete random design with four replications with five explants each. At 40th days after test installation it was assessed the average percentage of shoot, vitrification and shoot growth, shoot average number per explant and explant average length. Basal explants cultivated in QL and WPM medium showed the better responses to shoot percentage (80%). Regarding to shoot number per explants the use of QL medium with basal explants increased the number (3). For growth of formed shoot, the more diluted compositions in macronutrients (QL and WPM) had a superior performance as for growth percentage as for shoot average length in both types of explants. Basal explants cultivated in QL medium showed 55% of vitrification whereas explants in WPM medium did not show this abnormality. Therefore, this research concluded that reducing salt concentration there is a decrease in vitrification promoting increase in shoot growth without affects the rates of shoot formation.

Keywords: *Prunus*, rootstock, vitrification, propagation

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P-015

Juvenility of Apple Seedlings: Correlation between Growth Habit of Trees and Flowering Index on Different Apple Progenies at the Meddle West of Santa Catarina State - Brazil

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It is well known among apple breeders that one of the main causes of the high costs of apple breeding research is the length of the juvenile period of apple seedlings. A lot of investigations have already been done to overcome this obstacle. This study had as objective to investigate the correlations between patterns of tree growth habit and seedling juvenility, expressed here as flowering index - FI. Were evaluated eight apple progenies, on a total of 1.287 pre-selections on the third growing season – 2,5 years after grafting on the rootstocks Marubakaido/M-9 interstem or 3,5 years from seed germination. The variables evaluated were as follow: a) plant height - PH; b) length of the last annual growing of the leader - AGL; c) length of the internodes - IL; d) type of leader - TL. The correlation analyses involving the flowering index with growth habit of trees showed the following results: a) only for TL there was reasonable good correlation with FI on the apple pre-selections studies. There was significant negative correlation between length/thinness of the leader and intensity of blooming on all the eight apple progenies studied. The values of correlation varied from $R = 0,27$ for the progeny Imperatriz x Fred Hough to $R = 0,49$ for Imperatriz x M-46/94 and Imperatriz x Catarina., with an average value of $R = 0,44$. b) For all the other variables, the correlation was very pore, even not significant on many cases. c) Worthy of note was the PH, mentioned in the literature as a good parameter for selecting apple seedlings to shorten juvenile period. In this study it was observed either a very poor correlation between FI and PH, or some negative correlation between both. The average for all progenies for this parameter was $R = 0,07$ only, being not significant. d) For IL, a variable believed to be well correlated to early bearing on apple, as it is a typical feature of the spur type apples, even showing a negative correlation for all progenies as expected, the correlation values were highly variable. The best negative correlation was observed for the progeny Imperatriz x M-46/94 – $R = -0,42$ - and the poorest for the progeny M-72/90 x Gala – $R = -0,017$. These results indicate that for apple progenies grafted on Marubakaido/M-9, the only criterion that seems to offer a certain guarantee for pre-selecting leading short juvenile period on apple seedlings, is the type of leader.

Keywords: Apple breeding, Pre-selection, Plant vigor, Plant lider

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P-016

The Self-Incompatibility S-Alleles of Brazilian Apple Cultivars

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The research purpose of this study was to identify and to characterize the S-alleles of the gametophytic incompatibility among apple cultivars developed in Brazil, seeking to give support for choosing right combinations of parent in the apple breeding programs. It also seeks to identify correct combinations of scion/pollinator cultivars of commercial apple orchards. For the molecular characterization, 16 specific S-alleles primers were tested. The molecular analysis confronted to the reference cultivars, showed that the cultivars Daiane, Imperatriz and Princesa have the same incompatibility alleles S3 and S5, while 'Lisgala' showed the alleles S2 and S5; 'Suprema', S1 and S9; 'Catarina', S1 and S19; 'Joaquina' and 'Fred Hough', S5 and S19; 'Baronesa', S3 and S9; 'Duquesa', S2 and S3; and for 'Primícia' and 'Condessa' it was only possible to identify one of the S-alleles, namely S24 and S2, respectively, remaining to be identified the second allele.

keywords: *Malus x domestica*, apple breeding, polymerase chain reaction

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P-017

Molecular Characterization of the SCC8 Scar Marker and Evaluation of its Usefulness for Marker Assisted Selection in Seedless Vs. Seedless Crosses, in Grapes.

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The PCR-specific marker SCC8 is linked to a major locus involved in seedless and berry weight in grapevine, *sdl*. The codominant nature of the SCC8 marker allows a better evaluation of the genotype at the *sdl* locus and thus an estimation of its contribution to the phenotypic variation of seedlessness in a progeny. In order to establish tools for more efficient selection of the seedless character, we have evaluated the usefulness of the SCC8 marker in the distinction of seeded and seedless plants in a segregating progeny from a seedless vs. seedless cross. According to our results, in seedless plants, the distribution of the different alleles at the SCC8 locus is skewed towards the presence of at least one SCC8+ allele whereas in the subset of seeded plants the distribution of the alleles is skewed in favor of the absence of the SCC8+ allele. Moreover we have cloned and determined the complete nucleotide sequence of two alleles of the SCC8 locus (the *scc8*- - wild type allele, and the SCC8+ - seedless type allele). Both alleles were 1011bp long and comparing their nucleotide sequences, 31 single nucleotide polymorphisms were detected, among them a single;T transition being responsible for the polymorphism previously described for the SCC8 locus alleles.

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P-018

Julieta, a New Early Low Chill Requirement Apple Cultivar

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Most of the high quality apple cultivars need high chill accumulation during the wintertime to both break bud dormancy and to grow normally in the spring. Insufficient chilling accumulation to fulfill its needs will decrease both fruit production and fruit quality, and even may limit production. The apple breeding program at IAPAR, Paraná State, Brazil, started in 1979. The aim of this program is to develop low chill, disease resistant apple cultivars with commercial fruit quality, which would be capable to perform well in subtropical climatic conditions. 'Julieta' is a new early cultivar selected within this program. It performs well in location that accumulates 100-500 chill units (CU). It is resistant to necrotic leaf blotch (*Colletotrichum* spp), the main apple disease in humid regions in the South of Brazil. It is highly productive, fruits have good quality for the season, and it is a good pollenizer for 'IAPAR 75 – Eva', a previous cultivar released by this program that is in expansion. 'Julieta' ripen 10-14 days before 'IAPAR 74 – Eva', fruits have regular shelf life, and they can be stored 30-45 days in cold room storage.

Keywords: *Malus x domestica*, dormancy, breeding

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P-019

Changes in the Antioxidant Activity With the Processing of Blueberry (*Vaccinium Ashei* Reade)

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The consumption of fruits and vegetables has increased mainly as a result of their nutritional value and therapeutical effect. These foods contain different phytochemicals, many of which possess an antioxidant property that can be related to retardation of aging and the prevention of certain disease. Among all the small fruits, blueberry is classified as the richest fresh fruit, in terms of antioxidant content, ever studied, having a high content of polyphenols both in the peels and pulp. Its availability, versatility, and variety of forms during almost all year allows the blueberry to be incorporated in an ample variety of formulations. The present work had the objective to elaborate foods that use blueberry as raw material and/or ingredient, and measure phenolic compounds and the antioxidant capacity of blueberry in natura and the final products (nectar and cereal bar), verifying the decurrent changes of the processing. The phenol content was determined by spectrophotometric determination following the Folin Ciocalteu method. The antioxidant activity of phenolic compounds present in blueberry fruits in natura and in processed products was determined by the inhibition of the enzymatic darkening of guaiacol catalyzed by peroxidase from potato. The total phenolic levels varied between 486,4 and 851,2mg of gallic acid $1*00g^{-1}$ of the cultivar sample Florida and Woodard, respectively. The processed products had phenolics losses, mainly in the nectar, due to losses of peels and pulp. As for the inhibition of the peroxidase enzyme, it could be verified that the fruit in natura had a greater antioxidant capacity, when compared with the processed products.

Keywords: phenolic compounds, cereal bar, juice, berries

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P-020

Evaluation of Pear (*Pyrus Sp.*) Explants Sensitivity to Mannose

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Genetic improvement of pear by conventional breeding is extremely slow due to the long juvenile period and high level of heterozygosity of this perennial tree. Genetic transformation is a promising alternative for improving plant characteristics. Plant transformation relies on the use of selectable marker genes, which are co-introduced with the gene of interest. For pear transformation, the most common selection system is based on antibiotic resistance genes. There is, however widespread concern about the use of such genes. The phosphomannose isomerase gene, which allow the plant to metabolize mannose, is an alternative to these systems and is based on mannose as selectable agent. The first step to use this selectable system is to determine the concentration of this sugar that can suppress the regeneration of escapes but allow the regeneration of transgenic plants. The objective of this work was to evaluate the sensitivity of pear explants (Carrick and Yali cultivars) to mannose. The experiment was carried out in the Tissue Culture Laboratory of Embrapa Temperate Agriculture. Leaf discs, obtained from 4-week-old in vitro pear shoots were placed, adaxial side down, on regeneration medium (B5 supplemented with 30 g.L⁻¹ sucrose, 100 mg.L⁻¹ myo-inositol, 5 mM TDZ, 2 mM ANA, 7.5 g.L⁻¹ agar) supplemented with several concentrations of mannose (0, 0.5, 1.0, 3.0, 5.0 and 10.0 g.L⁻¹). After eight weeks the explants were evaluated for callus formation and necrosis. The experiment consisted of three Petri dishes with 10 explants per treatment. The Petri dishes were

maintained in darkness for three weeks and then at 25 °C in 16/8 h photoperiod. The experiment was replicated three times. In preliminary results, although no regeneration was obtained on the tested medium, the calli formation allowed us to suggest that mannose concentrations between 1.0 and 3.0 g.L⁻¹ are the most appropriate. At these concentrations no necrotic explants were observed but some callus were able to form, although they were smaller and in less amount in comparison to the control (0 g.L⁻¹ mannose). No callus formation was observed at higher concentrations and at 10 g.L⁻¹ the explants presented necrosis to some extent. Callus formation at lower concentrations did not differ from the control. The concentrations suggested were similar to that used with success in apple transformation. Other regeneration media are now being tested in order to obtain higher regeneration rates.

Keywords: alternative selection systems, genetic transformation

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P-021

Phytochemical Content and Antioxidant Capacity Measurement of Blackberry (*Rubus Spp*) and Blueberry (*Vaccinium ashei* Reade)

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Due to the current interest of people for foods that brings additional benefits to health, the berries consumption as rabbiteye blueberry, blackberry, strawberry and raspberry has been increase. These fruits are rich sources of several phytochemicals, like carotenoids and phenolics, that are substances with biological properties such as: antioxidant, anticancer and anti-inflammatory activities. The aim of this study was to quantify the phytochemical composition and the antioxidant activity in two cultivars of rabbiteye blueberry and blackberry, both donated by Embrapa Temperate Climate, including Xavante and Tupi blackberries and Powder Blue and Delite rabbiteye blueberry. The total content of phenols, anthocyanins and carotenoids, and the antioxidant activity were evaluated by spectrophotometric determination. The antioxidant activity of the berries extracts was measured through the DPPH method. The Xavante cultivar presented the highest anthocyanin content, 96,1mg1*00g⁻¹, comparing to Tupi that presented 90,4mg1*00g⁻¹ of fresh weight. However, these values were lower than rabbiteye blueberry content, 256mg1*00g⁻¹ for Powder Blue and 144 mg1*00g⁻¹ Delite cultivate. The same happened with the antioxidant activity and the total phenol content that was higher in rabbiteye blueberry than in blackberries. The total phenol content in rabbiteye blueberry was 816,9mg of galic acid1*00g⁻¹ for Powder Blue and 750,5mg of galic acid1*00g⁻¹ for Delite cultivate, and for blackberry it was 731,4mg of galic acid1*00g⁻¹ for Xavante and 645,5mg of galic acid1*00g⁻¹ for Tupy cultivate. The total carotenoid content was inverse, the highest content are present in the blackberry, which was 1,4ig of â carotene*g⁻¹ for Powder Blue and 10,8ig of â carotene*g⁻¹ for Delite cultivate, and for blackberry it was 6,0ig of â carotene*g⁻¹ for Xavante and 9,0ig of â carotene*g⁻¹ for Tupy cultivate. According to the results, these fruits are rich source of phytochemicals and natural antioxidants.

Keywords: Anthocyanin; phenolics; carotenoids; DPPH

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P-022

Polyphenols Content in Apple and in Strawberry Fruits: an Evaluation of Extractors

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Epidemiological studies have shown that fruits and vegetables are involved with protective effects against degenerative diseases. This beneficial health effect is tied up to diverse metabolic compounds: vitamin C, carotenoids, sulphur compounds, polyphenols and several other antioxidant molecules. Phenolic compounds have one or more aromatic rings with hydroxyl groups and are the most studied of the phytochemicals. These molecules are classified as phenolic acids, avonoids, stibenes, coumarins, tannins and each of these groups is again subdivided according to the chemical characteristics. The analytical content of total phenols of the samples depends upon the extraction ability of the organic compounds used. The most extractors used are ethanol, methanol, and acetone in different concentrations. This paper presents the influence of different concentrations of ethanol, methanol, and acetone on the phenolic compounds extraction in apples (Gala) and strawberries (Aromas). The samples were prepared using liquid nitrogen to aid in pulverizing the skin and the flesh of both apple and strawberry. Extractions were carried out in 0, 25, 50, 75 and 100% (v/v) of each solvent for 15 hours at 4°C. Total phenolic content was obtained with Folin-Ciocalteu reagent, having gallic acid as standard. The results have showed that, for acetone and ethanol, the most efficient concentration for extraction was between 50 and 75 % for both apple and strawberry. The highest values of gallic acid equivalent (GAE) were obtained with acetone. For apple flesh, highly significant differences in extractions were found between acetone and ethanol and between ethanol and methanol at concentrations of 50% and 75% ($P < 0.01$). The polyphenols of the skin were more efficiently extracted with acetone ($P < 0.01$). For strawberry and at concentration of 50%, no significant differences among extractors were found ($P > 0.05$). At concentration of 75%, however, the extraction of polyphenols from strawberry was higher with acetone than with ethanol ($P < 0.05$) and with methanol ($P < 0.01$). No difference was found between ethanol and methanol ($P > 0.05$). The results showed that solvent with different polarity had significant effect on polyphenol extraction.

P-023

Preliminary Findings on the Progression of Bud Dormancy in Apricot in a Mild Winter Climate

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This paper describes recent studies of bud dormancy in *Prunus armeniaca* L. In the first study the progression of endodormancy and paradormancy were evaluated in 'Palsteyn' apricot. The rate of budburst [$1/(\text{days to } 50\% \text{ budburst})$] in terminal vegetative, lateral vegetative, and reproductive buds was calculated. Three shoot treatments (control, upper 10 centimetres disbudded, and upper 10 cm removed) were evaluated. No clear paradormant effect was found during the period studied, nor were we able to see differences between the terminal and lateral vegetative budburst. Treatment effects were only observed on reproductive budburst where flowers opened faster following disbudding. In the second study the dormancy progressions of five apricot cultivars from four locations in South Africa was evaluated. Cultivars ranged from low (Palstein) to high (Orange Red) chilling requirements. Locations ranged from low (Robertson, Ladismith) to high (Ceres) chilling accumulation. Rate of budburst was determined in terminal vegetative, lateral vegetative, and reproductive buds. During autumn, all cultivars showed an important increase of rate of budburst, thus indicating an apparent end of endodormancy. An ecodormant period followed throughout winter while chilling accumulated. These results contrast with the accepted concept that chilling accumulation during winter results in the release of dormancy.

Keywords: Apricot, endo-, para-, and eco-dormancy

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P-024

The EMBRAPA - TAMU Low Chill Stone Fruit Breeding Program

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There has been active research into the development of low chill peach and nectarines for more than 60 years. This initial work took the low chill trait from small, soft, and late ripening peach genotypes into peaches that ripened from very early to late that had the firmness, attractiveness, and quality for the regional market. In the 1980s and 1990s, the number of programs, both private and public that develop low chill peach varieties increased dramatically. Recently, the Stone Fruit Breeding Programs at Texas A&M University and EMBRAPA – Clima Temperado have begun a joint breeding program to take advantage of the unique germplasm each has developed over the last 50 years as well as the geography which allows them to have two seasons every year. The major objective of this joint program is to develop low chill fresh market varieties designed for the regional needs of the fruit market.

Keywords: adaptation, fruit quality, mild winters

P-025

Soluble Sugars Content and Sucrose-Related Enzyme Activities During Development of the Fruit of Three Loquat Cultivars

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Loquat (*Eriobotrya japonica* Lindl) fruit from Mizumo (IAC 1567-411), Centenária (IAC 1567-420) and Néctar de Cristal (IAC 866-7), developed by Instituto Agronômico de Campinas, were harvested during the season of 2006. Thirty fruit of each cultivar were harvested, once a week, from development (8th weeks after fruit set - AFS) to overripe stages (18th weeks AFS). The aim of this work was follow the changes on sugar soluble levels of these fruit throughout the period mentioned. Moreover, the activity profiles of sucrose synthase (SuSy - E.C. 2.4.1.13) and sucrose-phosphate synthase (E.C. 2.4.1.14), the main enzymes associated to sucrose metabolism, were evaluated. The profiles of sugar enzyme activity changes were almost the same for the three loquat cultivars. Sucrose, glucose, fructose and sorbitol were the main soluble sugars found on young and mature fruit. Sucrose was the major sugar throughout the development. A phase of rapid increase in sucrose levels was observed around the 11th week AFS. The glucose and fructose levels increased around the 13th week AFS. The sorbitol levels had little changes during the development, being the minor sugar among the four studied. The SuSy and SPS activity increased throughout the development paralleled to sucrose rising. Although the SPS levels were lower than SuSy ones, both enzymes were closely correlated to sucrose biosynthesis on loquat. The high levels of SuSy indicated an intense sugar uptake even on the ripe stages. The correlation of these enzyme activity profiles and sugar synthesis will contribute to a better understanding of the biochemistry of these new loquat cultivars and their possible roles on fruit quality.

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P-026

Study of Physiological and Chemical Changes During Fruit Development and Ripening of Five Loquat (*Eriobotrya japonica* Lindl.) Cultivars

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Loquat, commonly known in Brazil as “yellow plum”, is a pome fruit cultivated mainly in the state of São Paulo. Although this fruit reaches high market values, there are few information about its attributes and ripening behavior under subtropical climatic conditions. Five loquat cultivars were selected by Instituto Agronômico (IAC) in a farm located in Jundiaí (50 km from São Paulo) and developed using classical genetic breeding. Fruits samples from five cultivars (Centenária, Mizuho, Mizumo, Néctar de Cristal and Mizauto) were harvested at various development stages (green to mature) to study physiological and chemical changes during fruit growth. Changes on the respiration profiles and ethylene production were analyzed by gas chromatography. The main chemical components evaluated were soluble sugars (glucose, fructose, sucrose and sorbitol) and organic acids, very important in fruit’s metabolism and sensorial attributes. These components were determined by HPLC. The respiration rates were higher at the initial period of fruit development and decreased progressively, with little increase at the end associated with the evolution in ethylene production. These events occurred also associated with fruit weight evolution and color changes (from green to yellow/orange color) in fruits of all loquat cultivars. These facts can indicate a possible climacteric ripening behavior to these loquat cultivars. The sugar levels were very low in the first phases of fruit growth on the five cultivars, and increased during fruit ripening. Fructose was the main sugar found in green fruits, and after color changing sucrose increased becoming the main sugar. The organic acids levels decreased constantly during development fruits, and the malic acid was the predominant organic acid in all period. The study of physiological and chemical changes on the five loquat cultivars during development made possible to know better each variety and to auxiliary the best harvest period for specific commercial ends, like fresh fruits and processed products.

Keywords: subtropical, sugars, organic acids, ethylene, respiration, climacteric.

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P-027

Identification and Collection of Hazelnut Genotypes in Iran

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Hazelnut populations of several areas in Iran, including Qazvin, Gilan, West and East Azarbyjan and Ardabil provinces were selected. In each area, superior genotypes of selected orchards were selected. Qualitative and quantitative characteristics were investigated in details. One hundred genotypes were identified in initial stages (2 yeras) and from them, 30 superior genotypes were selected and propagated at Astara Research Station. During the second phase of the research, superior genotypes will be evaluated according to climatic adaptability

Keywords: Iran native genotypes, selection, characterization

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P-028

The genetic resources of Temperate Fruit Tree in the Tropical and Subtropical Zones of the Asia, their conservation and utilization for the breeding

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Planned conservation and utilisation of local plant genetic resources is of prime importance for food security, as it permits small scale farmers of developing countries to have permanent access to seed and planting material adapted to their region. Conservation of and access to these resources are most important in disaster prone areas, as farmers of these regions often lose all of their seed stocks during disasters. Furthermore, disasters cause the loss of local varieties or genotypes, hence leading to the erosion of genetic diversity. To ensure seed and plant material security, it is necessary to protect the vital genetic diversity of the important food crops and promote and strengthen the conservation of locally adapted varieties and genetic resources at the farm and local community level. Such conservation would complement, but not be an alternative to, national and regional gene banks. Though important to re establish seed security quickly following disaster, locally conserved varieties are more vulnerable to disaster than nationally or regionally held genetic resources. Thus it is also necessary to develop early warning systems to monitor qualitative and quantitative changes in the status of genetic diversity in locally and regionally adapted crop genetic resources. Difficult or even impossible may be to restore fruit production with appropriate varieties to be introduced from outside the region. In such circumstances, the choice of a wrong genotype may result in a second and irreversible disaster. Additionally, the introduction of such foreign varieties induces uncontrolled crossings with local genotypes adapted to the region. This "genetic pollution" is responsible for the definitive loss of local genetic resources and, as a result of the disruption of the sustainable agricultural system of the region concerned. The protection and preservation of crop genetic diversity should be addressed, as a first measure, in order to be able successively to develop strategies for the rehabilitation of agricultural production in regions affected by calamities through the seed multiplication and re introduction of the same crops and varieties that were cultivated prior to the disaster. Genetic erosion, or the loss of biodiversity, is often presented as an ecological problem, but the underlying fundamental causes are socio economic and political. The lack of economic incentives to conserve diversity within agriculture and nature is a key cause of continuing degradation. It is a vital challenge for our societies to properly reflect the precious value of nature's diversity in the world economy, in all market exchange rules and regulations. Currently the basic genetic raw material with which breeding and biotechnology industries work is essentially available free of charge from nature or farmers' fields. In both developed and developing countries, economic and social measures should encourage farmers who continue to grow local varieties and produce "diversity rich" crops, on genes from which the development of new high yielding crop varieties throughout the world depends. Hundreds of species used at local level (most often managed and harvested by women) are neglected, although many contribute substantially to household food security. These crops should therefore be given new attention, and marketing should be improved. The tangible added benefit of these and other initiatives would be the broadening of the genetic base of our food crops, thereby furthering crop stability and world food security.

P-029

Metabolic Activity Evaluation of Temperate Tree Fruit Buds by using the Tetrazolium Test

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A way to estimate bud dormancy intensity, and to predict if breakage of dormancy in moderate winter areas is necessary, is the determination of its metabolic activity. The objective of this work was to develop an easy, precise and quick method to evaluate metabolic activity of apple, pear, peach, plum, persimmon, grape and kiwi buds. The method was based on the tetrazolium salt (2, 3, 5-triphenyl-tetrazolium chloride) mechanism, which functions as receptor of hydrogen ions released from cellular respiration and produces a stable, only soluble in ethylic alcohol, red substance. Redder alcoholic solution means higher bud metabolic activity, which may be measured by absorbance with a spectrophotometer at 560 nm. Eight to twelve 1-year-old buds were collected and longitudinally

sectioned for internal tissue exposition to five concentrations (2, 4, 6, 8 and 10 g/L) of 5mL tetrazolium solutions during five different exposition times (2, 4, 6, 8 and 10h). A completely randomized design, using 5 x 5 factorial treatments and 4 replications was used. Results were analyzed by polynomial regression and optimal tetrazolium concentration and time exposition were detected. Two hours exposition was suitable for all the species studied herein. Ideal tetrazolium concentration for apple, pear, peach, plum and persimmon buds was 10 g/L and for grape and kiwi buds was 8 g/L. The proposed test is viable, quick and easy and may be used as a tool for bud dormancy evaluation by means of metabolic activity determination.

Keywords: *Malus domestica*, *Pyrus communis*, *Prunus persica*, *Prunus salicina*, *Diospyros kaki*, *Vitis labrusca*, *Actinidia deliciosa*.

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P-030

Preharvest Treatment With Giberellic Acid Prevents Woolliness Occurrence After Cold Storage of 'Chiripá' Peach

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In 'Chiripá' peach, woolliness is a major physiological disorder that affects the postharvest quality. We have previously observed that woolliness occurs in approximately 30–40% of the fruit after 25–35 days of cold storage (CS) at 0°C and 90–95% relative humidity (RH). Supplying CS with ethylene application or intermittent warming, or using controlled atmosphere, the woolliness can be prevented, as a result of better ripening process with a good balance of polygalacturonase (PG) and pectin methyl esterase (PME) activity. In addition, some studies showed that giberellic acid (GA3) in preharvest delays ripening, increases fruit size and extends the shelf life of peaches. In order to confirm this hypothesis, GA3 (100mg.L⁻¹) was tested in 'Chiripá' peach: T1) GA3 at the beginning of pit hardening (GA3-1); T2) GA3 at the end of the pit hardening (GA3-2); and T3) no GA3. During growing was measured the perimeter of fruits and immediately after harvest Chiripá peaches were CS at 1±1°C and 90-95 % of RH for 30 days. The evaluations were carried out just after harvest and 6, 24, 48 and 72 hours after CS. Peaches treated with GA3 at beginning of pit hardening (GA3-1) showed bigger size (40% bigger) and higher PME activity than the other treatments, but the ripening process was not delayed. After CS, the fruits corresponding to treatment T1 showed very low incidence of woolliness, attends less than 16% of fruits. In contrast, mostly of fruits from T2 and T3 treatments exhibited this chilling injury. These results showed that GA3, when supplied at beginning of pit hardening, increases peaches size and becomes a good way to prevent woolliness incidence, inducing PME and PG activity, simultaneously.

Keywords: Giberellic Acid (GA3), woolliness, Polygalacturonase(PG), Pectin methyl esterase (PME), 'Chiripá' peach.

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P-031

Occurrence Time and Intensity of Flower Bud Necrosis and Inflorescence Duplication in Pear Trees Cv. Housui (*Pyrus Pyrifolia* (Burm.) Nak.) During the Dormancy Period in Pelotas, RS

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The commercial exploration of the pear culture in Brazil has little expression, due to the low productivity of the plants, being the internal consumption supplied by imports. The lack of adaptation and flower bud abortion, are the main problems for the development of the crop. Inflorescence duplication is an abnormal phenomenon that occurs during the flower bud development, characterized by the existence of more than one inflorescences into the same flower bud. Floral bud abortion has characterized by the necrosis of the flower primordial during the winter dormancy or in the pre-bloom stages, decreasing the potential of productivity of this crop. The flower bud necrosis as well as the inflorescence duplication are physiological disorders strongly related with the cultivars and with the climatic conditions. The aim of this work was to evaluate the occurrence time and the intensity of the flower bud necrosis and of the inflorescence duplication in pear trees cv. Housui (*Pyrus pyrifolia* (Burm.) Nak.) during the dormancy period. The experiment was conducted in 2007, using 14-year-old pear tree, and it was carried out in a completely randomized design, with three replicates. In each replicate, five terminal and axillary buds of shoots and five spur buds were collected in four dates from May 24th, in an approximate 30day interval, until August 24th. These buds were fixed in a solution of formalin, acetic acid and alcohol (FAA) and dissected under a stereoscopic microscopy in the Laboratory of Immunology and Electronic Microscopy of the Embrapa Clima Temperado, Pelotas - RS. In each sampling the parameters evaluated were the percentage of healthy buds, buds with moderate and severe necrosis and beyond, the percentage of buds with duplicated inflorescences. In the beginning of winter, practically all the buds analysed already presented inflorescence duplication. However, during this phase, the flower bud necrosis symptoms were not present. The Housui cv. was seriously affected by the necrosis only in the final period of dormancy, with high index of buds affected. The symptoms of necrosis began rising from a negligible level in the beginning of the winter to a sharp peak near to the onset of flowering. The inflorescence duplication causes the formation of a very large number of less vigorous floral primordial that increase the competition for the nutrients and assimilates and can provoke the exhaustion of the nutritional reserves, leading the necrosis of the flower primordial tissues.

Keywords: Pear tree, flower bud abortion, duplication.

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P-032

Effects of Preharvest Spraying With AVG and Ethephon on Fruit Quality of 'Imperial Gala' Apples

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This research was carried out to assess the effects of preharvest spraying of 'Imperial Gala' apple trees with aminoethoxyvinilglycine [AVG, sprayed 40 days before anticipate commercial harvest, at 0, 90, and 125 mg (a.i.) L⁻¹] and Ethephon [sprayed 10 days before anticipate commercial harvest, at 0.0 and 140 mg (a.i.) L⁻¹] on fruit maturity and quality at harvest. The experiment followed a randomized block design, with six treatments (three doses of AVG x two doses of Ethephon) and three replications of three plants. Fruit harvested at commercial maturity were evaluated in terms of flesh firmness, titratable acidity (TA), total soluble solids content (TSSC), starch index (SI), skin background color, percentage of blush in the fruit skin and texture attributes of skin and flesh tissues. The increment of AVG dose delayed changes at harvest of SI, skin background color, flesh firmness, and texture attributes of skin and flesh tissues. Fruits from apples trees sprayed only with AVG exhibit lower percentage of blush in the skin. The combined spraying of AVG and Ethephon provided a higher percentage of blush in the fruit skin, equivalent to the control treatment. The results show that the beneficial effect of AVG in delaying fruit maturity at harvest might be enhanced by the combined spraying with Ethephon, to improve red color of the skin.

Keywords: *Malus domestica* Borkh., growth regulators, ethylene, maturity, fruit skin color.

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P-033

Ripening of 'Bruno' Kiwifruit Treated with Elicitors of Decay Resistance.

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This work was carried out to evaluate the effects of postharvest treatment with elicitors of decay resistance on fruit ripening of 'Bruno' kiwifruit. Fruit were treated by immersion (2 minutes) in water (control), in a complex of organic acids and bioflavonoids (at 2,000mL L⁻¹), or in a mannaoligosaccharid derivative of the leavening wall (at 2,000mL L⁻¹). The experiment followed a completely randomized design, with three replicates of ten fruits. Fruit were left 9 days under ambient conditions (18±2°C/60-70% RH) and then assessed in terms of flesh firmness, titratable acidity (TA), soluble solids content (SSC), flesh color, and texture (skin rupture force, and flesh penetration and to flesh compression resistance). Respiration and ethylene evolution rate were evaluated 2, 5, 7, and 9 days after fruit treatment. Fruit treatment with resistance elicitors reduced respiration, ethylene evolution rate, increased flesh firmness, penetration and flesh compression resistance, especially with mannaoligosaccharid derivative of the leavening wall (2,000mL L⁻¹). The resistance elicitors did not affect TA, SSC, flesh color and skin rupture force. The results show that elicitors of decay resistance might suppress metabolism and, therefore, delay ripening of 'Bruno' kiwifruit under ambient conditions.

Keywords: *Actinidia deliciosa*, ethylene, respiration, postharvest quality.

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P-034

Phytochemical Content and Antioxidant Capacity Measurement of Native Fruits

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The possibility to explore the market of native fruits, brings an idea of healthy and clean products, for an urban population. More concerned with the health, it is motivating the research of some fruit species that until now have been a little studied, as the surinam cherry (*Eugenia uniflora* L.) and pindo palm (*Butiá capitata*). These fruits contain different phytochemicals, and many of them present antioxidant, which can be related with aging retarding and the prevention of certain diseases. The phenolic composition is responsible for the antioxidant activity of several vegetables. The anthocyanins are part of the flavonoid group; they are part of the phenol related pigments. The carotenoids seems to play some fundamental role in the human health, being essential for the vision. In face of this, this work had for objective to evaluate the content of phenols, anthocyanins, carotenoids and antioxidant capacity of surinam cherry (purple, red and yellows) and pindo palm. The total phenols, total antocianins, carotenoid content and antioxidant potency were described, respectively, by Badiale-Furlong et.al., 2002; Lees & Francis, 1972; Rodriguez-Amaya, 1999 and Brand-Williams et.al., 1995. The content for purple, red and orange surinam cherry and for pindo palm was respectively, for phenols: 420,8; 239,2; 201,8 and 328,6 mg of galic acid/100g of fruit; and for anthocyanins: 277,4; 19,2; 8,2 and 0,0 mg of cianidin/100 g of fruit. The literature reports among 252- 325mg of galic acid/100 g of fruit for phenols content, depending on cultivating. The same source relates anthocyanin content in purple Surinam cherry peel about 420 mg cianidin/100g of fruit, which is higher than the content found in this study, and that this pigment is present in higher

concentration in the peel of the fruit. The carotenoid content for purple, red and orange surinam cherries and for pindo palm was 45,3; 152,96; 30,3 and 28 µg/g of β -carotene, respectively. Even so the carotenoid is the predominant pigment in the pindo palm, it was present in lower concentration than in surinam cherries. It was observed that the purple surinam cherry presented the highest phenol and anthocyanin content, and the red surinam cherry presented the highest carotenoid content, being these fruits a promising source of antioxidant compounds.

Keywords: phenolic compounds, anthocyanin, carotenoids, DPPH and native fruits

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P-035

Dormancy Index of Apple tree Buds Measured by the Single Node Cutting Biological Test

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In the test known as single node cutting biological test, which is widely used for dormancy intensity evaluation of temperate tree fruit buds, one-bud cuttings are placed in a local propitious for their growth and the average shooting time (AST) is directly related to the bud's dormancy intensity. However, AST analysis alone generates not so conclusive results since other factors such as final shooting (FS), shooting velocity (SV), and vigorous shooting final rate (VSR) are also indicators of dormancy. The objective of this work was to reunite these four parameters in a single formula so that dormancy may be more precisely evaluated by a dormancy index (DI). The data used to develop the DI were obtained by testing 1-year old 'Imperial Gala' apple tree buds. DI was directly proportional to AST and inversely proportional to FS, SV and VSR. Each parameter was multiplied by a constant factor, accordingly to its importance in the dormancy analysis. The general formula is $DI = \frac{AST}{k \cdot FS + w \cdot SV + VSR} - 1$. The constant variables k and w must be calculated accordingly to the species being studied. As for apple, they are k = 3 and w = 2. By using the DI, the dormancy intensity was classified in 5 groups: lack of dormancy ($DI \leq 2$); weak dormancy ($2 < DI \leq 5$); moderate dormancy ($5 < DI \leq 9$); intense dormancy ($9 < DI \leq 14$) and deep dormancy ($DI > 14$). For other fruit species, a new DI should be formulated.

Keywords: Shooting, 'Imperial Gala', equation modeling

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P-036

Germination Percentage of 'Yellow Cattley' (*Psidium Cattleianum* Sabine) under Different Gibberellic Acid Concentration, Containers and Substrates

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The myrtaceae 'cattley' (*Psidium cattleyanum Sabine*) occurs in wild-type throughout Brazil, from Minas Gerais to Rio Grande do Sul as well as in the Northeast region of Uruguay. Plant production of 'araçazeiro' is commonly by seeds. The 'araçazeiro' propagation by seeds is preferred due to the germination facility. Among the factors that affect plant growth and seedling quality the substrate and the container are pointed out as having large influence. The objective of this research was to evaluate the germination percentage of 'yellow cattley' seeds under the action of gibberellic acid into different containers and substrates. During the work development it was used gibberellic acid at 0, 500 or 1000 mg/L in different containers (tubet or cell tray) with two mixes of substrates (Plantmax[®]+vermiculite or Plantmax[®]+sand). The experiment was carried out in nethouse under intermittent irrigation. The experimental was conducted in a complete random design with three replications of 32 seeds each, consisted of factorial arrangement 3x2x2. After 50th days after sowing it was evaluated the germination percentage. The obtained results were submitted to variance analysis and the means compared by Tukey at 5% error probability. There was interaction among variables. Gibberellic acid at 1000 mg/L + cell tray + Plantmax[®]-sand had the best seed germination of 'yellow cattley'. (SUPPORT CAPES).

P-037

Adaptation of Temperate Fruit Trees to Warm Climate Zones

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Cultivation of temperate fruit trees (apple, peach) in warm climate zones has been attempted by numerous countries for many years. The success of these attempts encountered two kinds of problems linked to climate specificities of these countries: - mild temperatures during autumn and winter may interfere with bud dormancy dynamics : under these conditions, budbreak is often uneven and delayed, branching is disorganized making tree training difficult, many flower buds die thus limiting tree productivity ; - high level of temperature during spring and summer has unfavourable consequences on fruit quality (texture, nutrients content, storability). Those unfavourable traits can be counteracted by genetic improvement or agronomic practices. In this paper, we summarized information from literature on the interactions between climatic factors, cultural practices and biology of bud dormancy, and elaboration of fruit quality. This knowledge can be used to help in fruit trees breeding and for a better orchard management.

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P-038

Prediction Models for Chilling and Heat Requirements to Estimate Full Bloom of Almond Cultivars in the Central Valley of Chile

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In the past, Chilean almond production was traditionally associated to marginal lands with a low level of productivity and technology. Nevertheless, during the past few years the orchards destined

to reach high yield and quality have increased. To reach this, the introduction of new varieties of almond trees in different zones from the traditional ones has taken place; which make necessary to perform studies on the phenology under the new conditions. The chilling and heat requirements to reach a certain phenological stage can be determined by predictive temperature models. However, these models were developed in different climate zones, and for different species and cultivars. Thus, models as the Utah Model are more appropriate for cold areas and the Dynamic Model are more reliable for warmer zones. In this sense, the objective of this study was to estimate the chilling and heat requirements for almond trees phenology by means of predictive models, developed in different conditions from the Chilean production areas. During seasons 2003, 2004 and 2005 different chilling models were evaluated in three cultivars of almond trees, in three unwatered-land areas in the Central Valley of Chile (34° 30' S, 71° 15' W). The varieties in study were Desmayo Langueta, Non Pareil and Ferragnes. The methodology described by Ashcroft et al., (1977) was used. This method considers that the winter chilling enough to break dormancy, is which generates a lower variation in the heat requirements to reach full bloom (FB). The following chilling models were used: a) number of hours below 7.2 °C (Weinberger, 1950), b) Utah (Richardson et al., 1974), c) North Carolina (Shaltout and Unrath, 1983), d) Florida (Gilreath and Buchanan, 1981) and e) the Dynamic Model (Fishman et al., 1987). For the heat accumulation (growing degree hours, GDH) from end of dormancy to full bloom, the used model was the Utah (Richardson et al., 1975). The results for the chilling requirements to break dormancy for Desmayo Langueta, Non Pareil and Ferragnes cultivars were: 230, 360 and 240 chill units (CU) for the North Carolina model; 280, 300 and 440 CU for the Florida model; and 230, 260 and 260 CU for Utah model, respectively. For the Dynamic Model the determined requirements were 28, 23 and 28 chilling portions, respectively for the three cultivars. The models which presented less variation to estimate the GDH for full bloom were the Utah and the North Carolina models.

Keywords: chilling models, growing degree hours, blossom, almond

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P-039

Rest Breaking Agents on Apple Endodormancy Release under Southern Uruguayan Conditions.

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Apple (*Malus domestica* Borkh) commercial production in Uruguay, it is mainly located on the southern area (35° SL), where winter conditions not always satisfy chilling requirements for an adequate sprouting. Limitations as poor bud break percentage and extended flowering period are usually overcome with rest breaking agent sprays. In the present work, we evaluate the response of four apple cultivars ('Royal Gala', 'Granny Smith', 'Red Chief' and 'Fuji'); to four or five rest breaking product sprays in three moments, during 2005 and 2006. A factorial experiment with two factors, product per moment, was applied. The products applied were: Hydrogen Cyanamid (1.25%), paraffin mineral oil (3.0%), paraffin mineral refined oil (2.0%) in all cases; and Hydrogen Cyanamid (0.75%) + paraffin mineral oil (2.0%) combination on 'Red Chief' (2005 and 2006), 'R. Gala' and 'Fuji' (2006). The first application was performed considering 250 CU (UTAH model) registered from sensors located in the trees (first 15 days of August). Following applications were performed on the first and third week of September. Bud break percentage on field conditions was evaluated weekly. Bud type (reproductive or vegetative), position (lateral or apical) and branch age were registered. In addition, shoot length was quantified. At harvest, flesh firmness, soluble solid and starch contents were measured. For most cases, 'moment x product' interaction and the main 'product' effect on bud break were no significant, while the main 'moment' effect had high significance. Treatments applied at the second and third moment showed a significant rise on bud break percentage, regarding the control; while treatments applied at the first moment, had precocious bud break. Hydrogen Cyanamid applied alone or combined in 'Royal Gala', also accelerate fruit ripening.

Keywords: Chilling Unit, Bud break, *Malus domestica*, Mineral oil, Hydrogen Cyanamid.

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P-040

Models for Quantifying Effective Winter Chill on Apple Endodormancy.

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Under southern Uruguayan conditions (34° 37' SL, 56° 11' O, 40 m, ca.) winter chilling requirements are not always satisfied for the main commercial apple (*Malus domestica* Borkh) cultivars. The use of chemical rest breaking agents (mineral oils and hydrogen Cyanamid) to compensate these requirements is widely used; therefore winter chill quantification should be a relevant issue to adjust this technique. To do so, adequate models to represent the advances in the endodormancy process as a function of climatic conditions are necessary. The UTAH and CH models are usually applied, regardless of which specie or cultivar is considered. Although these models have the advantage to be widely spread and incorporated to commercial production, there are evidences of the lack of adjustment to the phenologyc behaviour of the main cultivars. This work's goal was quantifying the occurrence of winter chill during the endodormancy period with six models, in four apple cultivars ('Red Chief', 'Granny Smith', 'Royal Gala' and 'Fuji') during 2005 and 2006. The models used were CH, UTAH, UTAH+, Dynamic Model, North Carolina Model and Model for Subtropical Conditions. The beginning of endodormancy release was determined when 50% of leaf fall was reached and the process finished when 50% of one-year-old shoot buds sprouted in a forcing chamber. All model quantifications were based on hourly temperature data, obtained from sensors located in the tree and at the nearest weather station. The greatest temperature amplitude registered at field conditions, compared to weather station conditions, modified up to 2.5 times, the quantifications performed by the same model, being the UTAH model, the most affected by this phenomenon. These results show differences among models and years, consequently, in order to determine the viability of them in southern Uruguayan conditions, a longer evaluating period is need.

Keywords: *Malus domestica*, Chilling Unit, Dynamic Model, North Carolina Model, Model for Subtropical Conditions, Bud break.

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P-041

Stimulation of Floral Development in Sweet Cherry (*P. avium* L.) by Summer Pruning and its Implications for Production in Warm Climates

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Floral development of sweet cherry is an extended and complex process. Floral induction of apical meristems and floral initiation (axillary meristem pre-formation) occurs during summer, with floral differentiation continuing during spring/summer of the following year. Floral budbreak occurs in

spring of the third year, after buds have been released from endodormancy by exposure to sufficient chilling temperatures during winter, and upon arrival of temperatures conducive to growth (release from ecodormancy imposed by cold temperatures). Although the steps in floral development are tightly regulated by climatic conditions, we have observed that summer pruning of cultivars Sweetheart, Rainier, Regina, and Bing can alter the normal floral developmental sequence and considerably anticipate flowering. In one type of response, heading current season wood stimulated growth of latent lateral buds adjacent to single axillary buds. In the following spring such lateral buds produced a cluster of functional flowers capable of setting fruit. Thus, summer pruning reduced the normal time to floral budbreak by one year. Another type of response to summer pruning consisted of extemporary floral budbreak of differentiated floral buds in autumn (mid September), about 7 months before normal flowering in the spring. Notably, in this case floral budbreak occurred without buds undergoing endodormancy. Presumably, pruning released buds from paradormancy prior to entrance for endodormancy floral differentiation and flowering proceeded in the presence of favorable temperatures. This response was particularly noticeable in 'Rainier' and appears unrelated to the chilling requirement. Responses to summer pruning will be discussed in relation to production of sweet cherry in climates with insufficient chilling.

Keywords: flowering, chilling requirement, dormancy, budbreak, shoot growth

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P-042

Floral Bud Initiation and Development of Three Pear Tree (*Pyrus* Sp.) Cultivars in Two Subtropical Regions During the Summer Period

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The flowers formation in fruit trees is in the spring, actually, begins in the previous summer. Flowers are induced in the apex of the buds, which were vegetative previously. After flower induction, which is a still unknown process, occurs successive steps of physiological processes and morphological differentiation. The floral initiation, when the apex becomes organized into a primordia of flower (or inflorescence). The first morphological change that occurs in the meristem is a 'broadening' of the apex, which also becomes convex, followed by its lengthening into a cylindrical shape and the formation of sepal primordia in the terminal flower (king flower). After this transformation, organ primordia become differentiated laterally. The time of floral bud formation in the fruit trees is of great importance, because it will determine the development level that these buds will reach before beginning the dormancy period, having a decisive effect on the quality of the produced inflorescence. The objective of this work was to investigate the time of floral bud initiation and development in three pear tree cultivars (Packham's Triumph, Abate Fetel and Housui) in two subtropical regions of Rio Grande do Sul state (Pelotas and Vacaria) during the growth period in 2007. To evaluate the floral bud initiation, terminal and axillary buds of shoots and spur buds were collected from January 9th, in a 15-day interval, until March 14th, fixed in a solution of formalin, acetic acid and alcohol (FAA) and dissected under a stereoscopic microscopy in the Laboratory of Immunology and Electronic Microscopy at Embrapa Clima Temperado, Pelotas-RS. The time of floral bud initiation differed between cultivars and, also, the three cultivars presented a differentiated behavior in the flower bud development. In the beginning of the observations, the spur buds of Housui had already initiated and presented in more advanced stages of floral development than others two cultivars in the both regions observed. The floral initiation in the Packham's spur buds and in the Housui terminal buds occurred in late January in the two locations analysed. The spur buds of Abate Fetel, terminal buds of Packham's and axillary buds of Housui were initiated in early February in both regions. In the middle of March, the spur buds of Housui and Packham's and the terminal buds of Housui reached the carpel primordia stage (stage 7) in both regions.

Keywords: pear tree, flower bud formation, summer

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P-043

Floral Bud Abortion on Pear Trees in Some Localities of Brazil, Uruguay and Argentina: Climatic Factors and Abnormalities in Buds.

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Floral bud abortion or necrosis in pear, is the most limiting factor for the development of that fruit crop in southern of Brazil. This problem has also occurred in other traditional pear producer countries. From about 10 years ago, several research teams have been working with the purpose of to determined the causal factors for the pear floral bud abortion, however up to now, only few hypotheses have been formulated such as insufficient chilling, temperature fluctuations during dormancy, incidence of the bacteria *Pseudomonas syringae*, carbohydrate depletion, etc., however none of them was unequivocally proved. Flower bud samples were collected, from different pear orchard trees in Brazil, Uruguay and Argentina, during Summer, Autumn and Winter, 1999; 2001, 2002; and 2003. These buds were fixed in F.A.A. and later desiccated and analyzed under a stereoscopic microscope. Some of the flower primordial that had tumor formation were analyzed with scanning microscope. Flower primordial were already noticed in flower buds in Pelotas, RS and in Canelones, Uruguay as early as the beginning of the Fall seasons. No floral bud abortion occurred in Alto Valle del Rio Negro in Argentina. No significant relationships was found between percentages of flower primordial with necrosis versus: number of flower primordial per bud; total chilling hours during the Winter. However the climatic condition during the final part of the Summer increased the severity of necrosis of the flower primordial. It was found a close direct relationship between number of primordial with tumor and the percentages of flower primordial affected by necrosis.

Keywords: Pear, flower bud, abortion, floral bud disorder, budjump,

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P-044

Floral Buds Abortion in Housui Pear Cultivar at Campanha's Region of Rio Grande do Sul State

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The Campanha's region, in the Rio Grande do Sul state, Brazil, has presented great potential for pear production, in special the Asian cultivar Housui. One experiment was conducted in a nine years old orchard with the objective to evaluate the floral abortion in pear Housui cultivar, in 2004 and 2005. Four branches each plant were selected, in a total of eight plants. The selected branches were marked with red ribbon tags and the total floral bud number for branch corresponds to the buds visualized between tags in each branch. The branches tagging and bud counting were carried out in 03/08/2005. The visual evaluation of floral buds abortion and blossom were carried out in the days 23/10/2005 and 02/11/2005. The evaluation of fructification was carried out in 15/11/2005 by counting of number of fruits per plants. There was variation in the abortion index between the observed years. In 2004, the average percentage of abortion was 30% and the average number of flowers to each inflorescence was 3.0. Whereas, in 2005, the abortion percentage was 75.3% and there was 2.5 flowers to each inflorescence. The floral abortion variation among plants in 2004 was lower than in 2005. Analyzing the data of chilling hours in the two years of experiments, in 2004 the number of chilling hours was 345, whereas in 2005 it was only 200 hours. This factor may have great influence

in the obtained results. The effective fructification in two years was very close, varying between 50 and 55%, approximately.

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P-045

Influence of Hydrogen Cyanamide, Mineral Oil and Chilling Hours on the Blooming, Leafing and Fruit Set of Three Peach Cultivars

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The present work had the aim of evaluating the effect of chilling hours and hydrogen cyanamide with mineral oil on blooming, leafing and fruit set of three low to medium chill peach cultivars, in plastic recipients. The results allow the conclusions that 300 chilling hours of continuous temperature of 6°C, combined or not, with application of 0.25% CH₂N₂ + 1.0% MO caused the anticipation of leafing and blooming besides the simultaneous occurrence of both. The cultivars Planalto and Riograndense require, respectively, around 300 to 200 chilling hours of continuous temperature of 6°C while the chilling requirement of 'Della Nona' is over 300 hours. Different peach cultivars differ in the flower bud sensibility to hydrogen cyanamide. Fruit set generally increases as chilling accumulation increases.

Key words: dormancy break; cold compensators; phenology; chilling requirement; *Prunus persica*

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P-046

Surinam Cherry's Seeds Germinative Behavior (*Eugenia uniflora* L.)

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The Surinam Cherry (*Eugenia uniflora* L.) is a fruit tree originated from the region which begins since central Brazil till northern Argentina, however its distribution occurs along almost all over the Brazilian territory, as well as in other places over the world. It develops well on tropical and subtropical climate regions, where is much appreciated by its colored fruits and attractive taste. This fruits are rich in calcium, phosphorus, anthocyanin, flavonoids, carotenoids and vitamin C. Due to all these factors, its pomace has been widely exported to the European market. The propagation of this specie may be through cleft grafting or seeds and both present satisfying results. Many species of *Eugenia*, despite of ecological importance and commercial exploration potential, present low occurrence density. This fact, difficult the obtaining of seeds in a quantity which permits the production of seedlings in large scale, either to commercial goals, with orchards plantations, or to vegetal re-propagation. The present study aimed to research the surinam cherry's germinative behavior submitted to different procedures to maximize the use of them at seedlings production, despite of the high percentage of germination, the propagation in commercial scale is not enough. The experiment was conducted at the Crop Production department of the Agronomy Faculty Eliseu Maciel, Capão do Leão-RS. The propagative material was originated of native plants from countryside of Pelotas. The seeds were submitted to the following treatments: complete seed, scarified seed and seed without coat. After that, it was sown in expanded polystyrene trays filled with commercial seedling (Plantmax®) and sand (1:1) and in screen house conditions, with intermittent mist system. The variables analyzed were: percentage of emerged seedlings and emergency speed index (ESI) of the seeds. The emergency speed of surinam cherry seedling is higher for big seeds. The mechanical methods of overcoming seed

dormancy used in this study didn't altered the emergency speed index, but reduced the germinative capacity (germination percentage) of big seeds. The involuntary loss of tegument or its removal maintain the germination capacity of *Eugenia uniflora*, independently of its size, may producing regular seedlings for the propagation of this specie.

Keywords: *Eugenia uniflora*, germinative capacity, propagation, dormancy, without coat, emergency speed index

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P-047

Erger and Calcium Nitrate Concentration for Budbreak Induction in Apple Trees

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Apple tree grown in low chilling rest and break the dormancy later than those grown in colder areas. Low chilling shows up symptoms such as low budbreak, which directly influences potential yield. Budbreak inductors are commercially used to overcome cold deficiency. Their effectiveness increases when at least 50% of the chilling requirement of a specific species or variety is naturally supplied. The lower chilling greater the concentration required for good budbreak and blooming. Too high concentrations may injure branches and fruiting organs. Erger, an inorganic nitrogen compound, has recently been introduced as an option for breaking apple dormancy. This work had the purpose of evaluating the effects of Erger and calcium nitrate concentrations on budbreak induction of 'Imperial Gala' and 'Suprema' (Fuji's mutation). The experiments were carried out in Caçador – SC, Brazil (Lat. 26° 46' 31" S), in a RCB design, and 5 treatments with 6 replicates of one tree per plot. The treatments were check, standard (mineral oil 3% + dormex 0.7%), and Erger + calcium nitrate at concentrations of 3, 5, and 7%. The variables evaluated were phenological data, axillary and terminal budbreak, fruit set, and mean fruit weight. The concentration of Erger + calcium nitrate had no effect on full bloom date, but these treatments anticipated it 24 days for 'Imperial Gala' and 7 days for 'Suprema'. Budbreak in axillary and terminal buds of the check was lower than in the other treatments up to 60 days after application. Budbreak did not differ between products and concentrations sprayed. Fruit set was not affected by Erger + calcium nitrate concentration. Sprayed trees with Erger + calcium nitrate had better fruit set than the check trees of 'Imperial Gala', while 'Suprema' showed inconsistent results. The mean fruit weight was greater in all treated trees than in the check treatment. Erger 7% + calcium nitrate 7% showed up phytotoxicity symptoms, but they were more intensive in Imperial Gala than in Suprema apple varieties.

Keywords: *Malus domestica* Borkh.; budbreak induction; budbreak inductors.

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P-048

Effects of Controlled Atmosphere Cold Storage on Woolliness and Pectolytic Enzyme Activity in "Douradão" Peaches

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The high incidence of woolliness is one of the main causes that reduce "Douradão" peaches quality, during long term cold storage. Experiments were performed to study the effects of controlled atmosphere (CA) cold storage ($1\pm 1^{\circ}\text{C}$ e $90\pm 5\%\text{UR}$) on the postharvest preservation, the occurrence

of woolliness and the activities of associated enzymes. The following CA conditions were: AC1- 3,0%CO₂ + 1,5%O₂; AC2- 5,0%CO₂ + 1,5%O₂; AC3- 10,0%CO₂ + 1,5%O₂; AR- 0,03%CO₂ + 21,0%O₂ (control treatment). The experiment design was entirely randomized with 3 replications of 10 fruits. After 14, 21 and 28 days of cold storage peaches were withdrawn from CA and kept in air at 25±1°C for 2, 4 and 6 days, being evaluated for weight loss, soluble solids content (SSC), titratable acidity (TA), exo-polygalacturonase (exo-PG), endo-polygalacturonase (endo-PG) and pectin methylesterase (PME). The results showed that CA reduced weight loss and had a little effect on SS and TA. The CA modified the activities of the three enzymes. The induction of exo-PG and endo-PG activity and the repression of PME activity reduced the occurrence of woolliness. The fruits from AC2 treatment maintained good quality for 4 weeks; PME activity was reduced and the activities of exo-PG and endo-PG, which were low after cold storage, effectively increased at the 4th day post-storage ripening. In regular atmosphere (AR), the period of good fruit quality was less than 14 days.

Keywords: *Prunus persica*, chilling injury, quality.

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P-049

Dormancy Release of 'Gala' Mutations Apple Trees With Garlic Extract and Mineral Oil

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This study aimed to examine the effects of garlic extract and mineral oil on the budbreak of 'Gala' mutations apple trees. In the first trial, 'Mondial Gala' apple trees were sprayed to "drip point" at dormant bud stage using an air blast, with the following treatments: 1) control (untreated); 2) H₂CN₂ 0.25% + 4% MO (mineral oil); 3) 0.5% GE (garlic extract) + 3% MO; 4) 1.0% GE + 3% MO; 5) 1.5% GE + 3% MO. In the second trial in a 'Royal Gala' commercial orchard, the following treatments were sprayed, using a hand driven sprayer: 1) control (untreated); 2) 3% MO (mineral oil); 3) 0.5% GE (garlic extract) + 3% MO; 4) 1.0% GE + 3% MO; 5) 1.5% GE + 3% MO. The same experiment was carried out using natural extract garlic obtained from cold-pressing of garlic cloves and filtering. The use of garlic extract 0.5% and mineral oil 3% was effective in bud dormancy release of 'Mondial Gala' and it was analogous to the standard treatment with hydrogen cyanamid. In 'Royal Gala' apple trees all treatments showed a very poor sprouting, basically due to an atypical warm winter in this region. But, any way, the treatment 0.5% GE + 3% MO advanced bud sprouting when using the commercial product Bioalho®, although no differences was verified at 56 DAT. When it was used natural garlic extract, no differences were observed between treatments.

Keywords: *Malus*, sprouting, budbreak, chilling.

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P-050

Leaf Spray Fertilization of Boron and Zinc on Productivity and Fruit Quality of Japanese Pear Tree

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The cultivation of fruit plants from temperate climate in tropical or subtropical regions can be a good income alternative for the producer. However, due to the little existent information about cultivation of those fruit plants, the producers use imported techniques of other producing areas, or even an association of practices used for other fruit plants, pointing out the leaf spray fertilization of

micronutrients without appropriate scientific base. In this context, the objective of this study was to verify the effect of the leaf spray fertilization of B and Zn on productivity and fruit quality of Japanese Pear tree. The experiment was conducted from 2004 to 2005, in Ilha Solteira, in northwestern São Paulo State-Brazil. The climate is, according to Köppen Classification, tropical wet and dry (Aw). The Okusankichi cultivar, grafted on *pyrus communis* rootstock was used as well as doses of 110 g.ha⁻¹ of B and 250 g.ha⁻¹ of Zn in each application. The treatments were: T1. water, T2. boric acid, T3. zinc sulfate, T4. T2 + T3, T5. boric acid + urea + citric acid + EDTA, T6. zinc sulfate + urea + citric acid + EDTA, T7. T5 + T6, T8. boric acid + urea + citric acid + EDTA + sodium molybdate + sulfur + calcium chloride, T9. zinc sulfate + citric acid + EDTA + Fe sulfate + Mn sulfate + Mg sulfate and, T10. T8+T9. A randomized blocks design was used and the averages were compared by Tukey test. In the first crop the mixture of boric acid with quelating agents were efficient to supply B to the plants and zinc sulfate plus quelating agents were efficient to increase Zn leaf content. However, the productivity and the fruit quality were not influenced by the leaf spray of B and Zn. In the second crop the leaf content of B and Zn and the productivity were not influenced by the leaf spray; the boric acid and the zinc sulfate with or without quelating agents increased the contents of total soluble solids and, the boric acid with or without quelating agents increased the contents of total titratable acidity.

Keywords: *Pyrus pyrifolia* var. culta, quelate, micronutrient

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P-051

Plant Growth and Graft Union of Some European Pear Cultivars on Quince Rootstocks

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Some high quality fruit european pear cultivars have been cultivated in southern Brazil. The most recommended cultivars are William's, Red Bartlett, and Pakham's Triumph. Some quince cultivars have been used as pear rootstock. However, the cultivars William's and Red Bartlett grafted on quince show incompatibility symptoms such as high desuniformity on their growth and production, vigorous plants, and dwarf plants. The desuniformity is continuous or non continuous, which leads to assume that the incompatibility cause is due to virus or similar organisms, but not by physiological cause. If the incompatibility had physiological origin, the symptoms would occur in all the orchard. It was observed vigorous plants of cv. William's grafted on quince rootstocks, when kept in the nursery. However, when these plants were transferred to the orchard, it was observed that they had normal growth rate during the first year, but they started to have variation in the growth rate in plant size since the second year, reaching the highest variation in plant size at full production stage. Applying mechanical force to the union between scion and rootstock at plenty vegetation phase (South-Hemisphere: december and january), occurs graft union breakage, turning possible to see dark spots (black-brown) in the separated faces of the graft union, emphasizing the incompatibility signs. The following stem, interstem and rootstocks combinations were evaluated: cv William's on quinces Adam's (two locals), C and A; cv William's on interstems Conference, Abate Fetel, and Beurré Hardy, on quince Adam's; Red Bartlett/Adam's; Clapp's Favorite on quinces A, C, and Adam's; cv. Carrick/Adam's; and cv. Packam's Triumph/Adam's. The cv. Red Bartlett, followed by cv. William's, both on quinces rootstocks, had the most severe problems of incompatibility, whereas the cv. Clapp's Favorite had less severe problems of incompatibility than those two cultivars. However, when used interstems of cvs. Conference, Abate Fetel or Beurré Hardy on quinces rootstocks, the cv. William's plants did not show any incompatibility symptoms. Therefore, the cv. Williams should not be grafted directly on quince rootstocks, but should be used interstem of pear cultivars which are compatible with quinces, avoiding this way, incompatibility problems.

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P-052

Fruit Set of Pear Fruits Cultivar Garber in the Different Fruiting Organs Regarding to the Quadrant, Pruning, Girdling, Bending and Chemical Treatments

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The low fruiting is one of the main problems related to the pear production in Brazil. Following this context, this work aimed to determine the fruit set of pear fruits cultivar Garber in the different fruiting organs regarding to the North, South, West and East quadrant by using physical and chemical treatments. The research was carried out at the experimental field of Centro Agropecuário da Palma, FAEM/UFPEL – Capão do Leão/RS. The sixteen year old trees were conducted at spacing of 6 x 8 m. The experimental design utilized was a randomized complete block with three replications of one tree each (3x4x8 factorial design). The treatments were: 1) control; 2) summer short pruning; 3) branches bending + summer long pruning; 4) winter branches bending; 5) winter pruning; 6) girdling; 7) 560ml.100L⁻¹ of H₂O of Promalina® (benzyladenine + gibberellins AG₄+AG₇) or 8) 200ml.100L⁻¹ of H₂O of Biozyme*TF. After 55 days, it was counted the fruits fixed in the different fruiting organs as lamburde, brindille, brindille couronnee and bourse. The girdling treatment done in the winter time showed the highest effective fruit set rates independent of fruiting organs. The use of Promalina® and winter bending were not efficient to the pear tree 'Garber' in this experiment conditions. The effective fruit set was similar at all the orientation quadrants (North, South, East and West) in the region of Pelotas-RS. The fruiting organs of the pear trees 'Garber' that showed the highest effective fruit set rates were brindille couronnee and bourses. Lamburde was the fruiting organ with the lowest effective fruit set rates independent of treatment.

Key words: *Pyrus communis*, bioregulators, cultural practices

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P-053

Evaluation of Overcoming the Endodormancy in Apple Trees in Distinct Regions of Santa Catarina State

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During the winter season, the apple trees show no growth due the bud dormancy. When the chilling is not sufficient to provide the natural bud break of apples, it is necessary to use chemical products to induce the growth of these plants. The goal of the present study was to evaluate the effect of different chemical products on overcoming the endodormancy in three cultivars with different chilling requirement and two distinct regions of Santa Catarina State. The cuttings used were from the cultivars Gala Standard, Fuji Suprema and Condessa. They were submitted to climatic simulations seemed with the cities of Chapecó – Santa Catarina State (27°05'S, 52°37'W), altitude of 675m and São Joaquim – Santa Catarina State (28°17'S, 49°56'W), altitude of 1350m. The experimental design was conducted in a randomized block design. The products used in the treatments were Dormex® plus mineral oil; Erger® plus calcium nitrate plus mineral oil; Acordex®, Kymon Plus® plus mineral oil and the control was treated only with water. The data found indicated that the cv. Condessa presented uniform budding in all the treatments, the use of chemical products to induce the overcoming of endodormancy is not necessary for the situation of São Joaquim. Dormex® plus mineral oil had better results on overcoming the endodormancy in Fuji Suprema for both conditions. Dormex® plus mineral oil followed for Erger® plus calcium nitrate plus mineral oil had better results for cv. Gala Standard in both conditions studied. For the condition of São Joaquim the treatments didn't present difference for cv. Condessa. In the condition of Chapecó Acordex®, Kymon Plus® plus mineral oil had better results on overcoming the endodormancy in Condessa, the others treatments didn't

present difference.

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P-054

Initial Development of Pear Seedling under Saline Conditions

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The salinity affects 7% of the world land area which corresponds 930 million hectares. In Brazil, approximately nine million hectares are affected by salt presence in the soils, mainly in locals of low precipitation and high evapotranspiration. The saline stress is one of the main factors that limit the culture growth and production. The saline condition induces morphological, structural and metabolic modifications in the superior plants. Therefore, the work aimed to evaluate the salinity influence on initial development of pear seedlings (*Pyrus communis*). The experiment was carried out at the Seeds Analysis Laboratory belonging to the Department of Phytotechny of the Federal University of Pelotas. In the work execution, it was applied four aqueous solutions of NaCl (0, 2, 4 or 6 g) diluted in 100 ml of distilled water. The seeds were distributed into Gerbox® boxes lined with germitest paper moistened with 100 mL of the solutions and set in germinator at constant temperature of 25°C. The experiment was a complete random design, being each treatment represented by three replications of 32 seeds each. The seedlings were assessed fifty days after sowing using the following parameters: seedling height (cm); roots length (cm) and roots number. The obtained results were submitted to variance analyses and the means compared by Tukey test at the level 5%. For the variable seedling height the control (0 g NaCl) treatment was the one that showed the highest means. However, the seedling height decreased as NaCl concentrations increased without significative difference between concentrations 2 and 4 g. Regarding to root length the better results were obtained using the solution of 4g NaCl. The lack of NaCl resulted statistically in roots with similar length to those seedlings submitted to 2g NaCl. The concentration of 4g NaCl provided the growth of roots hairs. The aqueous solution of 6g NaCl showed the highest roots number, but thinner. The NaCl presence affects the growth of seedling height. The salt presence seems to develop the root system, but the seedlings were visually deformed.

Keywords: *Pyrus communis*, NaCl, seedling.

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P-055

The Relation of Endogenous Abscisic Acid and Indole Acetic Acid to Vigor of Selected Dwarf Mahaleb (*Prunus Mahaleb* L.) Genotypes

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Vigor reduction of cherry varieties by dwarfing rootstocks is well known, but the mechanism by which a rootstock induces dwarfing is not well understood. This study was conducted at Khorasan Natural Resources and Agricultural Research Center on 10 selected mahaleb genotypes possessing different degrees of vigor to determine, the relation between vigor, endogenous abscisic acid and

indole acetic acid. The concentration of IAA and ABA in bark samples were identified using the method of Ergun with some modifications. Differences in abscisic acid concentrations in shoot bark were highly significant. The mean ABA content decreased as invigoration capacity of mahaleb genotypes increased. ABA: IAA ratio in shoot bark decreased with increasing genotype vigor. The concentration of ABA in rootstock shoot bark showed a good relationship with rootstock vigor, thus the content of this phytohormone in shoot bark could be a useful marker of dwarfing character in mahaleb rootstock selections.

Keywords: Mahaleb; Dwarf rootstock; IAA- Indole acetic acid; ABA - Abscisic acid

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P-056

Micropropagation of Four Dwarf Selected Mahaleb (*Prunus Mahaleb* L.) Genotypes

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Prunus mahaleb L. is the principal rootstocks used in Iran for sweet and sour cherries. This study was conducted with the main purpose of Micropropagation four dwarf selected mahaleb (*Prunus mahaleb* L.) genotypes. The influence of different hormone concentrations and media on bud explants of mahaleb has been studied. The statistical design was factorial adopted completely randomized design with 5 replicate. The plant materials were taken in end of winter. For disinfection, plant material were dipped into 70% for 30 s followed by immersion in 0.1, 0.2 and 0.3% of mercuric chloride for 2 and 4 minute. Application of 0.2% mercuric chloride solution for 2 minute was the most effective way for the surface sterilization of the explants. Satisfactory stabilization of aseptic culture was achieved in 40-60 days. After three subcultures of each 21 days, on different proliferating media. The best results were obtained with MS supplemented with 1mgL⁻¹ BAP and 1mgL⁻¹ GA3 during proliferation. Proliferation was greatly influenced by genotypes. The best results were obtained in MS supplements with 0.8mgL⁻¹ IBA during rooting. The rooting percentages of four dwarf selected mahaleb ranged from 1.5 to 43.2%, depending on genotype and IBA concentration in the rooting media.

Keywords: Mahaleb, Dwarf rootstock, Micropropagation, Sweet cherry

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P-057

Gas exchange characterization on cultivated peach (*Prunus persica* (L.) Batsch) in two distinct localities of São Paulo State.

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In São Paulo State the peach production are destined to 'in natura' consume and this consume increase since the 90 decade, due to the adaptation of hybrids to warm climate, this fact cause the advance of this culture to diverse regions of the State. The aim of this work was evaluate gas exchange in plants of cultivated peach in two distinct places and describe the influence of external factors (irradiancy) and internal (stomatic conductance) in gas exchange and the chlorophyll content in leaves. The

experiment was developed in peach plants of the cultivars Marli and Dourado. The experimental fields are located in UNESP, in the cities of Botucatu and São Manuel. The plants are grafted in rootstock 'Okinawa'. In these plants were analyzed three adult leaves, of the first insertion of the primary branch, analyzing the fourth leaf from the branch apex. The determinations of gas exchanges were carried out with a portable system closed of photosynthesis, IRGA, model LI-6400, in the middle of completely expanded leaves. They were carried out determinations of CO₂ liquid assimilation, stomatic conductance and transpiration. The chlorophyll determinations were made with a portable meter of chlorophyll SPAD-502. The soil and climate conditions influenced the photosynthetic results in cultivar Marli in the two localities evaluated. In São Manuel the photosynthesis rate (CO₂ liquid assimilation of) was approximately 12 m² s⁻¹, while in Botucatu to same rate was of approximately 18,5 m² s⁻¹. The parameter CO₂ liquid assimilation the cultivar Marli presented better results in Botucatu, however its CO₂ concentration was minor for the same locality. The water and CO₂ flux of entrance and exit through the stomata not vary for the two localities. The rate of transpiration in the leaves was superior in Botucatu for both cultivars, such fact can be related to the environmental conditions. However, the efficiency of water use for the locality of São Manuel was bigger, losing less water. The SPAD index was superior for the cultivar Marli in two localities.

Keywords: photosynthesis, characterization, chlorophyll

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P-058

Effects of Preharvest Gibberellic Acid Sprays on Fruit Quality at Harvest and Postharvest of two Sweet Cherry Cultivars

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During 2005-2006, trials with the bioregulator gibberellic acid (GA₃) were conducted at Bioforsk Ullensvang in western Norway on mature sweet cherry trees. In 2005, unsprayed control trees of the cultivars 'Van' and 'Lapins' were compared with trees treated with one single application of 10, 20 and 30 ppm GA₃ at the straw-yellow stage of fruit development. The same program was conducted the following year but included one extra application with 40 ppm GA₃ to the cultivar 'Lapins'. Fruits were harvested when non-treated control fruits were mature, and again three times with 3 days intervals. At each harvest date a sub-sample of fruits was stored 3, 7, 10 and 14 days at 4°C. Average fruit weight, fruit firmness, total soluble solids, fruit surface color were determined for sub-samples of fruits at harvest dates and after storage. Fruit size was increased by near 1g per fruit for both cultivars after GA₃ application. Fruit firmness at harvest was not increased for the cultivar 'Van' but responded linearly with increasing dosage of GA₃ for the cultivar 'Lapins'. The maturity was delayed with half a week for 'Van' and about one week for 'Lapins' for all GA₃ treated trees. The content of soluble solids was in general high and independent of the different treatments. Fruit size, firmness or soluble solid content were not influenced after storage and had market quality still after 10 days in cold store.

Keywords: *Prunus avium* L., fruit size, fruit firmness, soluble solids, post harvest quality

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P-059

Use of SPAD-502 Meter in Diagnosis of Nitrogen Leaf Content in Peach Trees of Rich Lady Cultivar

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The present work used SPAD-502 meter as an easy method to estimate nitrogen leaf content in peach trees of Rich Lady cultivar from peach orchards located in the Beira Interior region, Portugal. The aim of this work was to obtain a curve of correlation between SPAD values and nitrogen leaf content, in June, to reach an early diagnosis in order to allow an efficient nitrogen fertilisation in early cultivars. We collected 25 leaves per tree of 45 tree from three peach orchards, in June 2006 and 25 leaves per tree from 24 trees of a nitrogen trial (0, 50, 100 and 200 kg N/ha) in June 2006 and June 2007. Before leaf analysis, for each sample, the average of SPAD-502 was calculated based on one measurement in the middle part of each leaf. SPAD values were significantly correlated to N and Mg leaf content. However, SPAD value was better to predict Mg foliar content than to predict N foliar content.

Keywords: SPAD-502; peach tree; Rich Lady cultivar; plant nutrition; nitrogen leaf content; magnesium leaf content.

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P-060

Yield Productivity of the Fig Trees as a Function of Cattle Manure Fertilization

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The fig orchards in the São Paulo state of Brazil is concentrated at the Valinhos and Campinas region, although in the other regions of the state there is interest in the figs crops. The Botucatu city is situated at 22°52'47" S, 48°25'12" W and could be favorable and interesting to cultivate the fig. Other point is that information's on the organic fertilization is scanty in fig orchards and the fertilization with cattle manure is widely recommended for fig tree crops. The research had as purpose to evaluate the effects of the cattle manure fertilization on the yield of the fig trees with 4 years old. The fig cultivar was 'Roxo de Valinhos'. The fig cuttings were planted in the experimental orchard in July/2001. When the trees had one, two, tree and four years old received the treatments with the cattle manure at the following levels: 0; 25%; 50%; 75%; 100%; 125% and 150% of the nitrogen level necessary per plant. The experiment was at randomized blocks with 7 treatments, 5 replicates and 5 plants by experimental plots. The characteristics evaluated were number, weight and medium diameter of fruits and the yield productivity. The manure application enhanced the fruits production. The best results (5 kg of fruits per plant) were obtained with 100% of nitrogen level necessary per plant that was the same of 4 kg of cattle manure per plant.

Keywords: *Ficus carica* L., organic matter, nitrogen.

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P-061

Response Standard of Peach Tree cv. Maciel to Different Levels of Hydric Deficit

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Southern of Rio Grande do Sul responds for 90% of the national production of peach for processing. However, there is a high probability of droughts in the region, during the summer months which coincides with the critical periods for water needs of this crop. Therefore, it becomes necessary a water supplementation irrigation aiming the production of high quality fruit. The objective of this work was to assess responses standard of the peach tree cv. Maciel to different levels of water

stress. The experiment using trees cultivated into weight lysimeter at Embrapa Clima Temperado, Pelotas/RS during 2005/06 crop. The irrigation levels were based on plant transpiration. Thus, the levels in experiment were: N1 – 100% of transpired water replacement, N2 – 80%, N3 – 60 % and N4 – 40%. It was possible to observe that the soil water restriction alters the growth and the final length of the one-year-old branches of peach tree. Water restrictions above 40% of water in relation to maximum transpiration cause precocious leaves fall of peach tree. The reference evapotranspiration calculated by the simplified Penman method presents slight relation with transpiration, evidencing its potentiality for the transpiration estimation of the peach tree. The water evaporation measured with a Piche evaporimeter is not appropriate for the estimation of the maximum transpiration of the peach tree. The soil water restriction above 20% of the maximum transpiration alters the fruits growth curve and reduces final size of the peaches fruits; however it does not alter the physico-chemical qualities. (Support: FAPERGS)

Keywords: *Prunus persica*. Water. Transpiration. Growth. Development.

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P-062

Production and Quality of Peach Fruits from Cv. Chimarrita Grafted on Five Rootstocks

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The performance of peach trees is influenced by the rootstock used, which could modifying the characteristics of fruit quality and production. The objective was to verify the effect of the 'Okinawa', 'Aldrighi', 'Capdeboscq', 'GF 305' and 'Tsukuba 1' rootstocks grafted with the 'Chimarrita' cultivar, during the first two years of production. The variables evaluated were: pulp firmness, fruit average weight, fruit size (categories I, II, III with > 57; 47 to 57; <47mm, respectively), total of soluble solids (SST; °Brix) and production. In 2005, the 'Okinawa' rootstock provided larger production (1700 kg/ha), following by 'Capdeboscq' and 'Tsukuba 1' rootstocks (1300 and 1201 kg/ha, respectively). The smallest production was of 548 kg/ha and 901 kg/ha from 'Aldrighi' and 'GF 305' rootstocks, respectively. In 2006, the largest production was verified from 'Capdeboscq' (5810 kg/ha), followed by the 'Okinawa' and 'Tsukuba 1' rootstocks (4681 and 4617 kg/ha, respectively). The 'GF 305' presented some production difficulty (1870 kg/ha), with the lowest production among the other ones. It is important to point out that the plants were in growth phase that can may explain the lack of productive continuity in some rootstocks in the first years of production. In 2006, the pulp firmness, average weight and fruit size were not influenced by the different rootstocks, except for SST content that was higher in the plants grafted on 'GF 305'. The smallest SST content occurred with the 'Capdeboscq' and 'Aldrighi' rootstocks (11.03; 9.95 and 9.62, respectively). In 2006, the fruit size was 22%, 73% and 5% in the categories I, II and III, respectively. In this year, 'Capdeboscq', 'Okinawa' and 'Tsukuba 1' rootstocks induced the best productive potential in the Chimarrita cultivar, in the edafo-climatic conditions of Pelotas, without affecting quality attributes like the pulp firmness and the fruits average weight. However, care with the handling, such as thinning and green pruning are very important to improve the lighting within the cup tree, increasing the photosynthesis, the fruit size and the production.

Keywords: *Prunus persica*; rootstocks; yield.

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P-063

Fruit Yield and Quality of 'Royal Gala' and 'Fuji' Apple Orchards under Conventional and Organic Production Systems.

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Orchards under conventional (CP) and organic (OP) production systems of 10-year-old 'Royal Gala' and 'Fuji' apple tree on M.7 rootstock raised as slender spindles were used. The orchards consisted of alternate rows of each cultivar, planted in the North to South orientation, with spacing of 4m x 6m, in Urupema, Santa Catarina State, Southern Brazil. Eighteen apple trees of each cultivar and management system were randomly selected in the both orchards and then assessed for fruit yield and quality at the commercial harvest maturity along two growing seasons (2002/2003 and 2003/2004). The OP management system resulted in lower fruit yield for 'Fuji' and smaller fruits for both cultivars than the CP one. For both cultivars, fruits from the OP orchard had higher severity of russet, a more yellowish skin background color, higher percentage of blush in the fruit skin, higher density and higher flesh firmness than fruits from the CP orchard. In 'Royal Gala', fruits from OP orchard had higher total soluble solids content (TSSC) and lower titratable acidity than fruits from CP orchard. On 'Fuji', fruits from the OP orchard had higher incidence of moldy core and lower incidence of water core than fruits from CP orchard. Fruits from the CP orchard had the highest contents of N, K, and Mg, while the contents of Ca were not significantly different between orchard management systems. A non trained sensory panel ranked 'Fuji' apples from CP orchard with better taste than fruit from OP one. For 'Royal Gala' there was no significant difference for this sensorial attribute between fruits from CP and OP orchards.

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P-064

Effect of Root Pruning on Growth and Production of Pears Trees in Rio Grande do Sul State

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The growth of the roots produces several physiological effects on the tree. These alterations are mostly time unknown. Root pruning is very effective in controlling shoot growth, but root pruning stress may induce excessive tree dwarfing and thus compromise productivity and fruit quality. The experiment was conducted at the Frutirol Agrícola in the city of Vacaria (28°30'S, 55°47'W) at Rio Grande do Sul State – Brazil. The objective of the present study was to determine the influence of different levels of root pruning over the growth of shoots and production of fruits from pear trees of Abbé Fétel cv. grafted on Adams rootstock. The root pruning was made in August, 2006. The treatments were control, without pruning; root pruning only at the right side to the 20 cm of the trunk; root pruning only at the right side to the 35 cm of the trunk; root pruning only at the left side to the 20 cm of the trunk; root pruning only at the left side to the 35 cm of the trunk on the deep of 35 – 40cm. The experimental design was conducted in a randomized block design. The variables tested were diameter of the trunk, shoot length and number of fruits collected on January of year 2007. Independently of the level of root pruning tested the treatments didn't present difference for diameter of the trunk and number of fruits. The treatment of root pruning left side to the 20 cm of the trunk had the minor shoot length.

Keywords: *Pyrus communis* L., Abbé Fétel, shoot length

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P-065

Rooting of Blueberry Mini-Cuttings

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This research aimed to assess the effect of leaf area on rooting of semi-hardwood mini-cuttings of cultivar Powerblue, collected on January 2006. Four-node segments with 3.2 cm length and 2.17 mm diameter, approximately, were taken from laterals branches of irrigated plants. The treatments were divided according to leaf attached: T1 – two entire leaves; T2 – one entire leaf; T3 – two leaves cut in half; T4 – one leaf cut in half. After cuttings preparation, the mini-cuttings bases were immersed into a phytohormone solution (IBA) at 2000 mg L⁻¹ for 15 seconds. Then, they were put to root in expanded polystyrene trays (Isopor®) filled with a mix of commercial substrate (Plantmax®) and washed thick sand at 3:1 ratio. The material was kept in greenhouse equipped with an intermittent micro-sprinkler irrigation. The pH of the water was reduced approximately to 5 by using Quimifol P 30®. After planting, the cuttings were mist watered every 15 days with a fungicide solution (3 g of Captan 500 PM per L of water). The experimental design utilized was a complete randomized block with one cultivar (Powderblue) and four types of mini-cuttings, with five replications of ten mini-cuttings. At 90th days, the percentage of the mini-cuttings rooted, dead mini-cuttings with root, number of mini-cuttings showing only callus (without root), mini-cuttings without both callus and roots, number of the better-developed roots, length of the better-developed root and buds number, were assessed. Treatment 2 and 3 showed the highest percent rooting (96% and 98%, respectively) and treatment 1 showed the lowest (72%). Therefore, the use of blueberry mini-cuttings for propagation allowed higher use of propagative material. Furthermore, mini-cuttings of Powderblue with one entire leaf permitted in 90 days the formation of up to 96% of rooted mini-cuttings.

Keywords: Blueberry, propagation, cuttings, phytohormone

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P-066

Influence of Flower Structure in the Flower Production and Fruit Set in Some Apple Cultivars

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Fruitful trees have a vigorous growth and a strong alternation in the fruiting structures show a discontinuity in the production, quality and in the incomes for the producer. The fruit production is related to the quality of flowers. Several researches indicate that the characteristics of the flowering structure are fundamental in the flower development and, in consequence, the fruit development. The knowledge about the fruiting patterns in apple trees is important to lead some cultural practices like pruning and thinning. The objective of this experiment was to evaluate the possible influence of the flowering structure in the flower production and the fruit set in three apple cultivars (Gala, Fuji

and Daiane). Twenty trees of each cultivar had been selected in the Caçador Experimental Station of the Institute of Agricultural Research and Rural Extension of Santa Catarina State, Brazil (26°49'07"S 50°59'06"W). Six fruiting structures were characterized: 1- spur (<10 cm) of weak bud (<3,5mm); 2- spur of vigorous bud (> 4,5mm); 3- short twig of terminal growth (<30cm) of weak bud; 4- short twig of terminal growth of vigorous bud; 5- long twig of terminal growth (>30cm) of weak bud; 6- long twig of terminal growth of vigorous bud. Five buds of each structure were analyzed. The sprout index showed significant variation in the three cultivars. In Fuji and Gala the best results were obtained in the long twigs and the worse results in the spurs, and in Daiane there was no significant variation between the structures, except for the spur of weak bud, which showed the worse sprout index. Regarding the fruit set, the best results were obtained in the long twig of vigorous bud and the worse results in the spurs, for all cultivars. The Fuji cultivar showed a high amount of vegetative buds, especially in the spurs, and the Daiane cultivar showed a high sprout index, but not a high fruit production due to the low fruit set. According to this data, the best structure for flower and fruit production is the long twig of vigorous bud, and the worse structure, the spurs, for the three cultivars analyzed.

Keywords: apple, fruiting structures, sprout index, fruit set.

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P-067

Nitrogen and Potassium Affecting Peach Rust Intensity

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The purpose of this study was to evaluate the nitrogen and potassium fertilization effect on the rust (*Tranzschelia discolor*) severity and incidence on peach (*Prunus persica*) cv Chimarrita. The trial was conducted in a commercial peach orchard, implanted in 1999, at Lapa County – Parana State – Brazil. It was used five nitrogen annual rates (40, 80, 120, 160 and 200 kg ha⁻¹ of N) and two potassium annual rates (55 and 110 kg ha⁻¹ of K₂O), during three years. Nitrogen was applied in three periods (30 % of the annual rate in the sprouting begin, 30 % after thin out and 40 % after harvest), using urea. It was used KCl as potassium source, and applied 60 % in the sprouting begin and the remaining after thin out. It was determined severity and incidence of rust, defoliation and foliar nutritional state on peach trees. There was no interaction between potassium and nitrogen on plant disease. Potassium fertilization did not affect rust severity and incidence, as well as, in the tree defoliation. Increment on nitrogen rate provided diminishing on rust severity on third year trial. It was obtained inverse relationship between foliar nitrogen concentration and rust severity, but there was no relationship between foliar nitrogen and defoliation or rust incidence. The increase of the rust severity promoted increment on tree defoliation. Since, the nitrogen foliar concentration was low, it seems that increment of nitrogen rate can diminish rust severity on peach tree.

Keywords: *Prunus persica*, *Tranzschelia discolor*, fertilization.

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P-068

Kind of Cutting and Use of Indolebutyric Acid in the Rooting of 'Mirabolano' (*Prunus Cerasifera* Ehrn) Cuttings

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This work was carried out for to verify the influence of types of cuttings and application of indolebutyric acid (IBA) in the rooting of 'mirabolano' cuttings. The cuttings were standardized with a pair of entire leaves and 12 cm in length. The experimental design was completely randomized, and the treatments arranged in a 3 x 2 factorial comprising: types of cuttings (apical, median and basal) and different concentrations of IBA (0 and 2,000 mg L⁻¹). After the cuttings preparation they were immersed in indolebutyric acid (IBA) solution at concentrations: 0 (control treatment) and 2,000 mg L⁻¹ for 20 seconds. The cuttings were then placed in polystyrene trays containing vermiculite as substrate under intermittent mist chamber. After 90 days, the following variables were evaluated: the rooting percentage, the live cuttings percentage, and the number of sprouts per cuttings. The largest percentages of rooting, alive cuttings and number of sprouts were observed in the median cuttings treated with 2000 mg L⁻¹ of IBA.

Keywords: *Prunus*, rooting, indolebutyric acid, cutting

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P-069

Rooting of Cuttings in Three Cultivars of Plum (*Prunus* Spp.)

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This work was carried out for verifying the influence of the type of cuttings and the technique of lesion in cuttings' basis on the rooting of three plum cultivars. The cuttings were standardized with a pair of entire leaves and 12 cm in length. The experimental design was completely randomized, and the treatments arranged in a 2 x 2 x 3, factorial comprising: types of cuttings (median and basal), techniques applied in the cuttings (basis incision and treatment control), and different plum cultivars ('Kelse Paulista', 'Polinizadora da Cati' and 'Grandoure'). The basis incision of the cuttings was performed by making two cuts in their basis. Later the cuttings were immersed in indolebutyric acid (IBA) solution at of 2,000 mg L⁻¹ concentrations, for 20 seconds. The cuttings were placed in polystyrene trays containing vermiculite as substrate under intermittent mist chamber. After 90 days, the following variables were evaluated: the rooting percentage, the alive cuttings percentage, and the number of sprouts per cuttings. The largest percentages of rooting, alive cuttings and number of sprouts were observed in the median cuttings of 'Kelse Paulista'.

Keywords: plum, rooting, cutting

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P-070

Boron and Calcium Sprayed on 'Fuyu' Persimmon Tree Prevent Skin Cracks, Groove and Browning of Fruit During Cold Storage

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Flesh softening, skin browning and rotting are major problems during cold storage (CS) of Sweet 'Fuyu' Persimmon. We studied the effects of boron (B) and calcium (Ca) sprayed on the trees during three consecutive years, on the development of skin cracks; grooves and darkening in persimmon fruit under CS. In the municipality of Farroupilha, RS, Brazil (29°31' south, 51°21' west, and about 750 m altitude) a homogeneous orchard area of 0.5 ha was delimited and three sets of five plants

for each treatment, were randomly selected and marked. The persimmon trees were sprayed at 20 day interval, from 15th January until harvest, for three consecutive years, with: T1) water; T2) calcium nitrate at 0.5% (m/v); T3) calcium chloride at 0.5% (m/v); T4) boron at 0.3% (m/v). The fruit were harvest with orange-reddish color; 18-20°Brix, flesh firmness of 45 to 60N, and kept under CS at $0\pm 1^{\circ}\text{C}$ for 45 days. The fruit were evaluated immediately before CS; six hours after removal from CS; and after four days at $23\pm 2^{\circ}\text{C}$, from the end of the CS period. Both boron and calcium sprayed on the trees prevented skin cracks, grooves and darkening. Besides, when boron was sprayed on the trees, the mentioned effects were additive in the following year.

Keywords: *Diospyros kaki*, cold storage, flesh firmness, conservation.

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P-071

Green Manure on Citrus Orchard

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The use of green manures on an orchard planted with 'Pera' orange (*Citrus sinensis* Osbeck) was carried out in a farm named 'Três Irmãos'/Botucatu/SP. The soil is Oxic Quartzipsamments. Plants are budded on 'Rangpur' lime tree and were planted spaced 7 x 4 m apart, in 1996, and were seven and eight years old, respectively when the experiment was conducted. Four treatments were applied with the green manures: jack bean (FP) (*Canavalia ensiformis* DC), lab-lab (LL) (*Dolichus lablab* L.), dwarf guandu (GA) (*Cajanus cajan* L. Millsp) and brachiaria (BQ) (*Brachiaria brizantha* Hochst ex A. Rich. Stapf) as a control. They were sown, being mowed and directed to the line plants by the occasion of the full flowering. The experimental design was a randomized blocks with four treatments, six replications, and two useful plants per plot. Characteristics evaluated were: average fruits weight, number of fruits per boxes, yield, percentage of dry matter and the contents of nutrients in the green manures and control (BQ). Although there was no statistical significant differences among green manures, orange yield was superior when compared to the control (BQ); dwarf guandu (GA) showed a higher dry matter content in the first year of experimentation, differing from the other treatments. In the second year, it differed from jack bean (FP), lab-lab (LL), producing a higher quantity of biomass. It is concluded that dwarf guandu can be utilized as green manure on orange budded on lime since it has additional quality as a better relation cost/benefit when compared to other studied green manures.

Keywords: *Citrus limonia*, Osbeck, *Canavalia ensiformis*, *Dolichus lablab*, *Cajanus cajan*, *Brachiaria brizantha*

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P-072

Effects of Nitrogen Fertilization of Peach Trees an a Fertile Soil in Southern Brazil

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The Peach in Rio Grande do Sul State, Southern Brazil, covers almost 13 thousand of hectares and

the area of the Serra Gaúcha, with its 3.200 hectares, is the largest area cultivated, where mainly white flesh fruit varieties are cultivated. The Orchards are usually located in soils with medium or loamy texture and with medium or high organic matter content. Despite the high capacity of nitrogen (N) supply of these soils, N fertilization is usually applied. This fertilization can affect N content in leaves, shoot growth, yield and chemical and physical characteristics of fruits. This study aimed at understanding the effect of N fertilization in peach Orchards planted on a well endowed with organic N, carried out from 2000 to 2002. The experiment was established in a commercial Orchard of peach (*Prunus persica*, L. Batsch) trees, cv. Chimarrita (white flesh fruits), grafted on Aldrighi rootstock, located at Pinto Bandeira city (area of the Serra Gaúcha, 640 m altitude, in Rio Grande do Sul State, Southern Brazil). Peach trees were planted in 1995 with plant distance of 6.0 (between rows) x 4.0 (along the row) m. The soil was a Haplumbrept soil with clay 270 g kg⁻¹; organic matter 54 g kg⁻¹ and pH (H₂O) 6.3. The climate is subtropical and rainfall annual averages 1736 mm. Four treatments of N fertilization (0.0, 22, 44, 66 and 88 kg N ha⁻¹) were applied. Nitrogen was split 50% at the beginning of bud burst, 30% after hand thinning of fruits and 20% after fruit ripening. A randomized block experimental design was used with four replications. In all growing seasons, leaves were collected at the fourteenth week after the flowering, oven-dried and analyzed for total N, and the length of selected shoots was determined after leaf abscission. Fruits were collected when ripen and diameter, mass, yield, total N, total soluble solids, total titratable acidity and flesh firmness were determined. Nitrogen fertilization increase N content in leaves and fruits, but did not affect shoot growth, fruit diameter and mass fruits, yield, pulp total titratable acidity firmness. Nitrogen fertilization increased total soluble solids in the 2000 growing season only. The low response of peach trees to N fertilization is likely explained considering that optimal soil water content and mild temperatures favor soil organic matter mineralization and residues decomposition, thus increasing N availability for peach trees.

Keywords: Peach mineral nutrition, nitrogen, yield, fruit quality

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P-073

Antioxidant Activity, Phenolic Content, Carotenoids and Ascorbic Acid of Surinam Cherry Total (*Eugenia uniflora*), Brazilian Guava (*Psidium cateleianum*) and Myrtle (*Campomanesia xanthocarpa*), Selections

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The variation on the chemical composition and antioxidant activity was evaluated in 13 fruits, seven of them Surinam cherry (purple, red and orange varieties), five of Brazilian guava (purple and yellow varieties) and one of Myrtle. Samples were harvested in the mature stage, ready for consumption at the Southern Brazil. In all fruits, total phenolics content, antocianins, carotenoids and ascorbic acid were evaluated in triplicate. Phenolics compounds in equivalents to mg of gallic acid/100g were 67,35-242,50 (Surinam cherry), 51,09-192,55 (Brazilian guava) and 1062,03 (Myrtle). Carotenoids content expressed as mcg β -carotene/g, was 60,08-394,50 (Surinam cherry), 3,63-14,94 (Brazilian guava) and 52,26 (Myrtle). The total antocianins content expressed as mg/100g, was 8,53-76,73 (Surinam cherry), 0,71-1,25 (Brazilian guava) and 4,39 (Myrtle). The total ascorbic acid content expressed as mg/100g, was 0,84-23,61 (Surinam cherry), 0,58-3,58 (Brazilian guava) and 246,89 (Myrtle). Antioxidant activity, determined through the DPPH method, expressed as the percentage of remaining DPPH radical was 16,90-48,48 (Surinam cherry), 33,37-55,12 (Brazilian guava) and 279,15 (Myrtle). There was a strong relation (r^2) between total phenolics content, ascorbic acid and antioxidant activity of Surinam cherry, Brazilian guava, and Myrtle, $r^2=0,95$ for total phenolics and $r^2=0,91$ for ascorbic acid.

Keywords: native fruits, chemical composition, functional properties *Eugenia uniflora*; *Psidium cateleianum*; *Campomanesia xanthocarpa*.

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P-074

Effect of Different Nitrogen Fertilizer Levels on Susceptibility of Peach Trees to *Phomopsis Amygdali*

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The effects of different levels of nitrogen fertilizer on susceptibility to peach constriction canker, caused by *Phomopsis amygdali*, were studied in two potted experiments, established in April 2003 and February 2005. Spring crest cultivar was used because of its medium susceptibility. Four different nitrogen levels were used: N0 – without nitrogen, N1 – insufficient level, N2 – level considered sufficient, and N3 – excessive level. Plant inoculations with *P. amygdali* were carried out in November. The canker area around the inoculations sites was measured between January and March the following year and used as susceptibility assessment. In 2003 year growth, the average canker size was much higher than in 2005, what probably shows the effects of temperature and precipitation on canker size. The results show that there is an effect of nitrogen level fertilisation on plant vigour and constriction canker susceptibility. Both N0 and N3 increased canker area.

Keywords: peach tree; *Phomopsis amygdali*; plant nutrition; nitrogen fertilisation; Integrated Production.

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P-075

Alternative Substrate for Cutting Propagation of Olive

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It has been more than a century that the culture of olive tree instigates agriculturists in Brazil. The productive process of the shoots is based on complex technological models, what consists of an impediment to the sprouting of innovative productive projects. In this work the object was to test a practical method of propagation of the olive tree, which makes possible the facilitated attainment of shoots remaining the qualitative standard and the applicability, independently of the productive scale. Plastic cup with perforated base was used and in contact with a water blade. This was overlapped by another transparent plastic cup, creating thus a humid chamber and undoing the use of nebulization house. The tested substrates were: Plantmax[®], carbonized rind of rice, vermiculite and perlite. In each humid chamber, a cutting propagation of shoots of olive (*Olea europaea*) variety Arbequina with two pairs of top leaves was cultivated, whose base was immersed per five seconds in solution contends auxin (AIB) 3000 mg L⁻¹ to the plantation. It was used 25 repetitions with experimental delineation with casualized blocks and the means compared by Tukey test at 5% of probability. After culture per 94 days, it was verified the death of 100% of the stakes submitted to the perlite substrate, indicating not to be this substrate adjusted to the process of propagation with irrigation for capillarity. With the vermiculite substrate only 20% of rooting, followed for the carbonized substrate of rind of rice with 40% of rooting and, the best indices of rooting had been reached with the commercial substrate (48%). So it has been verified that the suggested method presents feasibility when commercial substrate or carbonized substrate of rind of rice is used.

Keywords: *Olea europaea*, physiology, rooting, cutting propagation, auxin

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P-076

Effect of Rootstocks on Growth of Peaches in the Highland of Northern Thailand

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A peach rootstock in Thailand has been relied on only 'local clones' introduced from Southern China. Local rootstocks have expressed some degree of incompatibility with peach scions in older ages. Presently, new improved rootstocks being used elsewhere could adapt to Thailand climate. The objective was to evaluate influence of local rootstocks: 'Local Khunwang', 'White Angkhang' and 'Red Angkhang' to imported rootstocks: 'Coastal Peach', 'Flordaguard', 'In Je Taur', 'Kuu Taur', 'Okinawa' and 'Premier' on growth of 'TropicBeauty', TX2293-3 and TXW1491-1 as scions. Trees were planted at Angkhang Royal Agricultural Station (N 19°50'–19°57' E 99°01'–99°06'; 1,200 m alt) in 1997. For growth evaluation, scion height, number of flower and leaf buds, pruned branch weight, trunk cross sectional area, mineral concentration (N, P, K) and yield were measured along with chemical properties of soil (pH and mineral concentration). It was found that soil was clay and mineral concentration was sufficient to peach growth. Soil pH was 4.68 – 5.94. Significant differences were observed in scion height, branch weight, trunk size, number of flower buds and yield. Scion height was the greatest on 'Coastal Peach' (2.22 m.); while, branch weight, trunk size, number of flower buds and yield were the highest on 'Okinawa' (1.45 kg, 59.56 cm², 17 buds and 7.99 kg respectively). There was no incompatibility observed among rootstock and scion varieties in early ages. In summary, 'Okinawa' had the highest growth and good scion performance as compared to other rootstocks.

Keywords: *Prunus persica* (L.) Batsch, compatibility, plant nutrition

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P-077

Preharvest Treatment with AVG and Ethylene Removal with Potassium Permanganate to Preserve Postharvest Quality of 'Gala' Apples.

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This research was carried out to study the beneficial impacts of preharvest spraying of 'Gala' apple tree with aminoethoxyvinylglycine [AVG; at 0.0, 62.5, 125.0, and 250.0 mg (a.i.) L⁻¹, one month before anticipate commercial harvest], in combination with the use of potassium permanganate sachets during conventional cold storage, on fruit ripening and quality. Fruit were harvested at four dates, with one week intervals, from two weeks before until two weeks after the beginning of commercial harvest. Fruits from each AVG dose and harvest date were packed in standard cartons boxes (for ~18

kg, containing 135 apples), lined with polyethylene film, with or without two sachets of potassium permanganate (~10g), and cold stored ($0\pm 0.5^{\circ}\text{C}/90\text{-}95\% \text{RH}$) during one month. Fruit were assessed for maturity at harvest and for ripening after one and seven days of shelf-life (at $20\pm 2^{\circ}\text{C}/60\text{-}70\% \text{RH}$) following removal from cold storage. The increment of AVG dose delayed the skin background de-greening, the increment of percentage of blush in the fruit skin, the increase of soluble solids content and starch index, and the loss of flesh firmness along the harvesting dates. Fruit without preharvest treatment with AVG but harvested in advance and stored with potassium permanganate sachets had a fine retention of firmness, titratable acidity and green background color of the skin. Latter harvesting required preharvest treatment with higher doses of AVG to delay fruit ripening during cold storage, and this was improved with the use of potassium permanganate sachets.

Keywords: *Malus domestica* Borkh, aminoethoxyvinilglycine, preharvest ethylene control, postharvest ethylene control, fruit maturity, fruit ripening.

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P-078

Intergeneric Grafting of Loquat Cultivars Using 'Japonês' Quince Tree as Rootstock

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In Brazil, some pioneer studies were developed using quince seedlings (*Cydonia oblonga* Mill.) as rootstock for loquat (*Eriobotrya japonica* Lindl.). The advantage of this intergeneric grafting is the plant size reduction. Research has indicated that the 'Japonês' (*Chaenomeles sinensis* Koehne) is an excellent rootstock for quince trees, due to the high number of seeds, high vigor of the young plants and the 'damping-off' resistance. Therefore, the objective of this work was to study grafting techniques of loquat cultivars using 'Japonês' quince tree as rootstock. The one-year old 'Japonês' quince seedlings (with around 110 cm of height and 0,85 cm of diameter at the grafting point, 15 cm from the soil), were maintained in plastic bags (30 x 18 cm, 3 liters of capacity). The seedlings were grafted by the cleft grafting and single bud grafting methods, in two different periods: in autumn (April) and winter (July). Five loquat cultivars commercially planted in Brazil were used: 'Mizuho', 'Néctar de Cristal' (IAC 866-7), 'Mizauto' (IAC 167-4), 'Mizumo' (IAC 1567-411) and 'Centenária' (IAC 1567-420). The experimental design used was completely randomized in the 2 x 2 x 5 factorial arrangement, with four replicates of ten grafts per plot. Using the single bud grafting method, there wasn't any sprouted bud when done in autumn, and just two sprouts each of 'Mizauto', 'Néctar de Cristal' and 'Centenária' when done in winter, however, with low vigor. By the cleft grafting method, higher sprout percentage and better scions developments were observed when the seedlings were grafted in winter, especially for 'Mizuho', 'Centenária' and 'Néctar de Cristal' loquat cultivars.

Keywords: *Eriobotrya japonica* Lindl., *Chaenomeles sinensis* Koehne, *Cydonia oblonga* Mill., propagation.

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P-079

Cultural Regulation of Flower Bud Formation of Ornamental Peach Seedlings –Towards the Shortening the Juvenile Period

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Seedlings of woody perennial have the juvenile period before reach the reproductive stage. Compared with many other fruit *Prunus* tree, particularly peach and nectarine, have a shorter life cycle. In case of crossbreeding, the primary objective is to acquire the next generation with superior characters. However, if the objective allele is recessive, then it takes a longer time for segregation of an inherited character. The juvenile period is a serious constraint for breeding program. Therefore, the shortening of the juvenile period could be a great importance to hasten the ornamental peach breeding progress. Increasing the growth rate of the young seedling can often shorten the juvenile period, because a minimum size must be attained to reach the adult state (Zimmerman, 1972). To hasten the breeding process, we attempted to induce ornamental peach 'Yaguchi' seedlings to flower in 1 year from germination by cultural practices, such as growth acceleration with early sowing and root growth control by root pruning. Stratified seeds of 'Yaguchi' were sown in pots at two-week intervals from late January to early March. Seedlings from the first and second sowings attained 50th to 55th node by late June, while those from the later sowings did not attain 50th node. Early sowing appeared to hasten growth of seedlings. 'Yaguchi' and 'Hokimomo' seedlings, sown in the field on mid March, exceeded 100th node in October, and exceeding the 60th node was considered as the turning point to mature stage. Taproot of 'Yaguchi' and 'Hokimomo' seedlings, which attained 60th node, was pruned at 40cm of underground depth in one-week intervals from late June to mid August. Flower bud initiation was achieved in seedlings treated before August 15 in 'Yaguchi' and before July 21 in 'Hokimomo'. Flower induction was more remarkable in the earlier pruning treatments. It was shown that the cultural practices, such as early sowing and root pruning, promoted the growth and maturity of ornamental peach seedlings.

Keywords: forced flowering, juvenile period, ornamental peach (*Prunus persica* (L.) Batsch), root pruning

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P-080

Two Experiences of Frost Damage Control in Vineyards with Selectively Extraction of Coldest Air: Alto Valle, Argentina and Napa Valley, California USA

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Temperatures below 0° C during spring is a restrictive factor for the production in temperate zone for fruit species with early budbreak. Temperatures below -2°C during the first grapevine developing leaf which results in a significant loss of yield for that season. The SIS – Selective Inverted Sink – operates during nights with radiation frosts, by selectively extracting the cold air. Due to its higher density, cold air locates in lower layers, closer to the ground and when the SIS extracts the said lower layers this allows the hottest air from the higher layers, to reach the crop. The objective of this research was to evaluate the space and time temperature distribution during radiation frost nights with and without cold air drain by the SIS. The temperature during these nights in low vineyards areas

shows the influence of SIS operation. Once the cold air started to be drain the valley temperature initiated to increase up to reach high temperature. The SIS system increased the temperature 2°C in zones with high frost risk in vineyards of the Napa Valley, California, USA and Alto Valle, Río Negro, Argentina. The modification of the crop microclimate and the agronomic significance of the increased temperatures was discussed.

Keywords: grapevines critical temperatures, frost protection, SIS.

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P-081

Influence of Rootstock and Plant Density on Yield of 'Royal Gala' Apple in Brazil

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Brazil became self-sufficient in apple production through the last 35 years. Recent data show a yearly production of about 800.000 tons of apples, with a productivity between 35-40 t/ha. This low productivity of commercial orchards may be because doesn't have good rootstocks for the Southern Brazilian climatic and soil conditions. Small trees improve light penetration inside the canopy, reducing shade between rows, and require less labor to perform the regular activities at a orchard. This makes growers looking forward a reduction in costing orchards with simultaneous high yield and a good fruit quality. Dwarf rootstocks are a helpful tool to fulfil this objective. In 1997, the experiment was set in São Joaquim – SC, Brazil, in a RCB design. The treatments, a factorial 2X3 with 4 replications, were used rootstocks M9 and M26 with 'Royal Gala' on top, and 0.5, 1.0 and 1.5 m between trees in the row and 4 m between rows, corresponding to 5,000, 2,500, and 1,666 trees per hectare, respectively. Yield increased with orchard age and tree density. Yield increased to age 6, and then decreased to age 8, when it increased again reaching a maximum on age 10 in all spacing studied. Evaluating yield, fruit size and fruit color permits to conclude that 'Royal Gala' on top of M9 or M26 performs better when trees are spaced 1.0 m in the row, with 2,500 trees per hectare.

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P-082

Effect of Pruning Intensity in Breda and Fig Productions in the South of Tenerife, Canary Islands.

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The fig, *Ficus carica* L., is a traditional fruit tree in many south Mediterranean European countries. In Spain, it has been considered a minor species due to its crop in margin lands. Fig fruits, in Canary Islands were the subsistence food for the aborigine people, before the conqueror. Fig trees are mainly grown as isolated individuals, nor in orchard as in other Mediterranean areas. The studies of this species as a valuable crop, carried out in the Canary Islands, are of great interest to evaluate the potential of this crop. Proximity to the Africa continent, volcanic origin and subtropical location in the Atlantic Ocean make of these islands a peculiar and interesting environment for the agronomic

evaluation of the fig crop. During the last few decades, the interest of this crop in the Mediterranean countries has increased and some farmers have begun to establish this species in orchards as a crop with interest not only for local consumption but also as a valuable crop. The main objective of this research was to evaluate the effect of pruning intensity on the productions of breva and fig 'De a libra' cultivar of *Ficus carica* L. The applied treatments were three pruning intensities: 60, 45 and 30 %. The study was carried out with trees of 9 years old on Fasnia, in the south part of Tenerife Island. The trees were pruned at January first fortnight. The cultural practises applied in the orchard were the conventional ones in the islands. The distribution on breva and fig productions in the different treatments and the relationship between fig production and tree architecture was also evaluated. Different pruning intensities affected both breva and fig yields. This study has been financial support by PI042005/22, RTA2006/173 and FEDER funds.

Keywords: agronomy, cultural practices, *Ficus carica* L., yield.

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P-083

Strawberry Cultivation in Highly Varying Climatic Conditions in INDIA.

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Strawberry is one of the most delicate fruits, which is mainly grown commercially in temperate climatic conditions of the world and it has commanded a premier position in the world fruit market due to its attractive fruit and distinctive flavor. But it has adapted well to highly varying climatic conditions. It is cultivated commercially under extreme temperate conditions, sub-tropical and high altitudes of tropical regions and even in the desert-like areas of Israel. Strawberry cultivation has only recently received a great impetus in India with large business houses setting up a number of agro based establishments primarily aimed at large scale production of strawberry fruits. It has occupied a premier position in urban areas. Being a shallow rooted fruit crop, it can also be grown easily in kitchen garden, roof garden, pots etc. It is regarded as a valuable food in the diet of millions of people around the globe and is in special demand by the fruit processing industries for preparing the jams, ice cream, candy, toffee and other products. A number of large fruited, high yielding varieties viz., Chandler, Pajaro, Etna, Sweet Charlie, Selva, Douglas, Confictura, Dana, Belrubi, Gorella and Addie have been introduced into the country from Europe and North America. Some of the day-neutral cultivars are Selva, Majestic, Phenomenal, Brighton, Etna, Fern, Sweet Charlie are very promising. Farmers in the vicinity of Delhi, Haryana, Uttar Pradesh and Maharashtra a sub-tropical area and Jharkhand a tropical area have been profitably cultivating strawberries during the winter months obtaining their planting materials from the hills of Himachal Pradesh / Uttaranchal. Besides, the income from strawberry fruits, growers in the hills thus can also increase by producing planting material for winter plantings in the plains. The growers in the plains can not produce their own disease free planting material as these plants do not survive in the extreme summer. Even if they do, they are prone to various diseases, particularly those transmitted by aphids or other insect pests. The use of polyethylene in commercial cultivation of strawberry can play a pivotal role in minimizing winter injury, plant mortality and increasing productivity. Covering the strawberry beds with low clear plastic tunnels induced one month early cropping, prevented bed erosion and increased total yields by 20 per cent. The black polyethylene mulched beds did not require any weeding. During summers (In hills) the polyethylene sheets of the tunnels were replaced by plastic anti-hail nets or anti- bird nets which resulted in advanced harvest, increased yield and improved fruit quality. However, with the development of day-neutral varieties, it grows profitably well throughout the year.

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P-084

Organic Matter Amendments to a Silty Loam and a Loam Soil on O'Neal Blueberry Orchards in South Uruguay

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Highbush blueberry (*Vaccinium corymbosum* L.) growth limited in South Uruguay since soils do not meet its requirements of: good drainage, low pH, and without compaction. The addition of organic matter to the soil could overcome some of these limitations. The objective of this study was to determine the effect of different organic amendments on some soil physical and chemical properties, and Highbush blueberry var. O'Neal growth. Two trials arranged in a randomized complete block design with three replications were conducted, one in a fine silty Typic Argiudoll (trial_1), and the other one in a fine loamy Typic Argiudoll (trial_2). On trial_1, treatments were rice hull, eucalyptus sawdust and rice hull mixture, eucalyptus sawdust, and pine sawdust and pine bark mixture, at rates of 31, 36, 41, and 45 Mg.ha⁻¹ of dry matter, respectively. On trial_2, treatments were, rice hull, eucalyptus sawdust, Lituianian peat, eucalyptus and pine sawdust mixture, and pine sawdust and pine bark mixture; at rates of 47, 61, 65, 67 and 70 Mg.ha⁻¹ of dry matter, respectively. A control without amendment was included in both experiments. All amendments increased soil organic carbon and particulate organic matter as compared to the nonamended control. After 10 months of amendments application there were not differences among treatments. On trial_1, bulk density was lowered by rice hull alone or mixed with eucalyptus sawdust for the first ten months. Lituianian peat resulted in lower pH values for the first six months, afterwards the effect disappeared. Contrary to the expected, pine sawdust had any acidification effect. On trial_2, all amendments improved shoot length respect to the control. Root volume exploration was almost doubled by the sawdusts mixture at 67 Mg.ha⁻¹ one year after transplanted. Eucalyptus sawdust had not allelopathic effect, being promising it uses as amendment for cultivating blueberries on mineral soils.

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P-085

Yield and Fruit Quality of Apples cv. Fuji under Hail Protection Nets

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In apple orchards, hail damage can be avoided by covering the plants with nets. However, the nets might change the amount and quality of the light supplied to the plants and, therefore, they can affect yield and quality of the fruit. This research was carried out to assess these aspects on 8-10 years old apples trees of 'Fuji'/M9 rootstock. The work was conducted along three growing seasons (2003/04 to 2005/06) in a high density orchard (at a spacing of 3.5 x 0.8m) in Vacaria, RS, Southern Brazil. The experiment followed a completely randomized block design with three treatments (uncovered/control plants, and plants covered with white and black nets) and five replications (with the plant corresponding to the experimental unit). The black net caused a more substantial reduction of photosynthetic photons flux density (PPFD) accumulated over the plants canopy along the day (24.8%) than the white net (21.2%). The inner portion of the canopy for plants covered by nets, specially for those covered by black net, received lower levels of UV, blue, green, red, and far red radiation,

and of light with a lower red:far red (r:fr) ratio, in comparison to uncovered plants. Only for plants under black net, the substantial reduction of light supply led to an increase of mean leaf area, a reduction fruit yield, and rendered fruits with a lower density and a reduced share of blush area. The white and black hail protection nets reduced the incidence of sunburn but had no effect on moldy core and bitter pit incidence, russeting severity, and number of seeds/fruit.

Keywords: *Malus domestica* Borkh, shading, light intensity, light quality, fruit skin color, sunburn.

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P-086

Quality of 'Fuji' Apple Fruit at Harvest and after Storage in Relation to Nitrogen and Potassium Fertilization

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Brazilian apple industry increased significantly. Fruit quality can be affected by fertilization and nutritional balance in the fruit. N and K experiments were carried out to evaluate their effects on pre- and post-harvest quality of 'Fuji'/Marubakaido at São Joaquim, at 1.350 m above sea level (orchards Fk, M and H), and 'Suprema'/M9 (sport mutation of 'Fuji') at Fraiburgo, at 1.100 m above sea level (orchards P and Fs), both regions in Santa Catarina State, Brazil. Annual doses of 0, 25, 50, 100 and 150 kg N ha⁻¹, and 0, 50, 100, 150 and 200 kg K₂O ha⁻¹ were superficially applied. Doses of N were split in half for early spring and post-harvest applications, while doses of K were applied in early spring only. The experiments began during 1997 in São Joaquim and 2002 in Fraiburgo. Fruits from every field plot (5 trees in São Joaquim and 10 trees in Fraiburgo) were picked at the same date in each orchard in 2005. Fruits were stored for 6.5 months in regular air at 0.5 °C, during 7 months in controlled atmosphere at 1.5% O₂ + 2.2% CO₂, using a completely randomized post-harvest experimental design with 3 replications of 25 fruits. Fruit flesh nutrient content, fruit quality and ripening were evaluated at harvest and after storage plus 7 days at 23°C. Few effects of N and K fertilization were detected at two orchards from Fraiburgo and at orchard H from São Joaquim regarding to the content of nutrient in the fruit and to fruit quality at harvest and after storage. Only two orchards (Fk and M) from São Joaquim were affected by N and K fertilization, increasing N application, increased N content, titratable acidity (TA), soluble solids total (SST), and a reduction of P and K contents in the fruit, but did not affect fruit firmness. K fertilization increased K and Mg, and reduced N contents, TA and firmness of the fruit in orchards Fk and M. In these orchards, depending on the dose of K applied, occurred an increase in the incidence and severity of superficial scald and CO₂ damage by increasing the application of N. Bitter pit increased in fruits of Fk orchard at high doses of N associated with 100 kg of K₂O ha⁻¹.

Keywords: mineral nutrients, fertilization, apple quality, storage, physiological disorders

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P-087

Production and Quality of Peaches Cvs. Jubileu and Eldorado in Trees Trained Under Different Systems: Leader Central, Y and Vase

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In natura peaches quality still not desired concerning sensorial, functional characteristics and shelf-life. The tree training system alters both productions per tree and the quality of fruits. Therefore, the research aimed to assess the production and quality of peaches 'Jubileu' and 'Eldorado' under

different training systems. The experiment was carried out at the experimental field of Palma Agricultural Center on peach orchards trained on three different training systems: Leader, Y and Vase, in 2006. The experiment was conducted in a complete random design with five replications, in three harvests of fifteen fruits each. The data assessed was total soluble solids content, flesh firmness, color, total titratable acidity, TSS/TTA relation, vitamin C, amount of antioxidants and phenolics compounds, average fruit weight, and yield per hectare. Regarding to the obtained results for the two cultivars there was not significative difference among training systems for fruit weight, pulp firmness, total soluble solids, total titratable acidity, TSS/TTA relation, color and antioxidants. The vase system showed greater yield for both cultivars, followed by leader system. The Y system was the less productive. The leader system showed fruits with significantly higher amounts of vitamin C compared to the others systems. However, vase and ypsilon systems had higher contents of phenolics compounds, both differing from leader system. Amongst the training systems, the leader presented positives characteristics for in natura fruits market as high contents of vitamin C and less contents of phenolics compounds.

Keywords: compounds phenolics; antioxidants; vitamin C;

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P-088

Preharvest Spraying of 'Laetitia' Plum Trees with AVG and GA3 Improves Postharvest Fruit Quality

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The objective of this work was to evaluate the effect of preharvest spraying in Japanese plum trees (*Prunus salicina*, cv. Laetitia) with aminoethoxyvinilglycine [AVG, sprayed 21 days before anticipate commercial harvest, at 0, 90, and 120 mg (a.i.) L⁻¹,] and giberellic acid [GA3, sprayed 37 days before anticipate commercial harvest, at 0.0 and 100 mg (a.i.) L⁻¹] on postharvest fruit quality. The experiment followed a randomized block design, with six treatments (three doses of AVG x two doses of GA3) and three replications of seven plants. Fruit quality was assessed after 22 days in cold storage (at 0.2°C/70% RH), followed by 5 days of shelf life (4°C/60-70% RH). Fruit were evaluated in terms of decay (%), flesh firmness, titratable acidity (TA), total soluble solids content (TSSC), skin background color, and texture attributes of skin and pulp tissues. There was no interaction between AVG and GA3 for all quality attributes assessed. Preharvest spraying with GA3 and AVG increased flesh firmness and flesh compression resistance, and reduced SSC. There was no significant effect of GA3 and AVG on TA, skin background color, and force for skin rupture and pulp penetration decay was reduced in fruits treated with AVG at 120.0 mg L⁻¹. The results show the beneficial effects of preharvest spraying of 'Laetitia' plum trees with AVG or GA3 to preserve postharvest fruit quality.

Keywords: *Prunus salicina*, growth regulators, postharvest, quality

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P-089

Intergrafting in the Fruit Quality and Productivity of the Peach Tree cv. Jubileu

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Researchs concerning that peach rootstocks in Brazil still haven't given response to the numerable requests for reduction of plant vigor, allowing a more condense plantation. Intergraft is a practice that can be used to supply of exceeding vigor, when rootstocks are not available to accomplish this purpose. Intending to evaluate the outcome of intergraft in the fruit quality and productivity of the peach tree, an experiment with peach trees of Jubileu cultivar, intergrafted with 5, 10, 15 and 20 cm of cultivar Granada plus a control group (no intergrafted plants), was carried on, in 2002, in Didactic Orchard at "Centro Agropecuário da Palma" in in "Universidade Federal de Pelotas" (Brazil). Capdeboscq rootstock was obtained from the gemination of its seeds; the intergraft and the cultivar crown were engrafted with the budding technique on January and July of 2001, respectively. The parameters evaluated in the harvest time of the cycle 2006 were: yield per hectare, fruit weight average, fruit firmness, total soluble solids, epidermis coloration and fruit classification. The fruit weight average and fruit classification were not meaningly influenced by the different intergraft lengths. The yield per hectare, fruit firmness and total soluble solids were influenced by the different intergraft lengths been, 20 cm intergraft length the less yield per hectare. Plants intergrafted with 20 cm produced higher fruit firmness and total soluble solids. Both parameters could be represented by exponential functions: the fruit firmness had a minimum point at 7 cm and total soluble solids had a minimum point at 9.3 cm of intergraft length. The yield per hectare could be represented by a linear curve decreasing. The intergraft technique is positive for quality fruits to "Jubileu" plants, without downside outcomes in the productivity and classification fruit.

Keywords: yield per hectare, fruit firmness, classification peach, reduction plant vigor

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P-090

Micropropagation of 'Tsukuba 1' Rootstock: Effect of Bap Concentrations and Saline Composition of the Culture Media

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This work aimed studying the influence of the BAP concentration and the saline composition of the culture medium, during the multiplication and elongation phase of the formed shoots, with the 'Tsukuba 1' peach tree rootstock. In the first experiment, five BAP concentrations were tested (0.0; 1.0; 2.0; 3.0 and 4.0 mg L⁻¹) in MS medium, with 50% reduction of the nitrogen sources, added by the MS medium vitamins, 100 mg L⁻¹ of myo-inositol, 30 g L⁻¹ of sucrose, 0.01 mg L⁻¹ of AIB, 6.0 g L⁻¹ of agar, and pH 5.9. After the explants inoculation (apical shoots with approximately 1.0cm), they were cultured in a room at 25 ±2oC, 16 hours of photoperiod and luminous flow density of 20 mol m⁻² s⁻¹. After 40 days of cultivation, the average of sprout percentage and the number of sprouts per explant was evaluated. The salts composition in the medium was evaluated in two phases: the new shoots formation and the shoots elongation. For studying the new shoots formation (first phase), an experiment was performed using the MS (½ from the nitrogen sources), WPM, QL and QL/MS (with macronutrients from QL and micronutrients from the MS medium), with the BAP concentration settled in 2.0 mg L⁻¹. Other media ingredients and the cultivation conditions were the same from the previous experiment. After 40 days, it was analyzed the average of sprout percentage, the hyperhydricity percentage and the shoots growth, as well as the average percentage of new shoots per explant, and the average of shoots length. In the second phase of this study, the explants with the respective shoots were transferred to a medium with the same saline composition, with the BAP concentration reduced to 0.5 mg L⁻¹, which aimed at verifying the shoots growth at the 15, 30 and 45 days after transferred to that medium. The BAP addition to the MS culture medium resulted in an increase in the multiplication rate from the 'Tsukuba 1' rootstock explants, with a positive increment until 3.0 mg L⁻¹, with 54.7% of explants sprouted. Until 2.87 mg L⁻¹ of BAP the number of shoots per explant

increased to 2.0. Regarding the effect of the saline media composition, explants cultivated in QL/MS medium presented the best results in the multiplication phase and in the growth phase. The most elongated shoots were obtained after 45 days of culture, with an average of 2.25 cm of height.

Keywords: *Prunus*, in vitro, multiplication, cytokinin, minerals salts.

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P-091

Organic Strawberry Production under Protected Ambient

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Strawberry culture has an important significance to the state of Rio Grande do Sul, as well as to rural growers, as an alternative of viable income. The work aimed to evaluate the organic strawberry production using different cultivars under protected ambient. The experiment was carried out at Embrapa Uva e Vinho – Vacaria-RS, Brazil during 2002-2004. The sowing beds were prepared at the size of 1.00 m x 30.0 m and 0.20 m height in a high tunnel. The seedlings were supplied by certificated nursery and planted at plant spacing of 0.30 m x 0.30 m in October 2002. The experimental design was a complete randomized block with six treatments and three replications. The treatments were: treated cultivar treated Camarosa (T1), control 'Camarosa' (T2), treated 'Oso Grande' (T3), control 'Oso Grande' (T4), treated 'Seascape' (T5) and control 'Seascape' (T6). It was used applications of biofertilizers 5 %; *Gliocladium roseum* (50 g/L); lime sulphur 0.5% and neem oil 1.5 ml/L for the treated cultivars. It was assessed the fruit number, weight and size; totals soluble solids; rot incidence; powdery mildew; insect and caterpillar damage. There was no significative difference to yield per plant, average fruit weight, powdery mildew presence and others. The number of fruits in T1 was higher (76) whether compared to T3 (42); however, it showed high percentage of rot fruits (7 %). The insect damages were higher, varying from 15 % (T1) to 28 % (T5) of fruits. T5 and T6 showed higher amounts of medium and small fruits. Nevertheless, T5 presented the highest totals soluble solid value (7.55% °Brix), more than T1 and T2. According to the results of this experiment it is possible to produce organic strawberry under protected ambient, being the phytosanitary aspect as the major limitation.

Keywords: *Fragaria x ananassa*, greenhouse, quality, small fruit, yield.

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P-092

Evaluation of Overcoming the Endodormancy in the Application of Chemical Products in Apple Tree Interstocked

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The region of Vacaria, in Rio Grande do Sul state, had particular climatic characteristics, it presents a good potential for productions of temperate fruit trees, because this, apple culture has been explored. The objective of this work was to evaluate the effect of different chemicals products in the blooming, budding and production of apple tree, Imperial Gala cv. interstocked with EM-9 on the

rootstock Marubakaido. The experiment was conducted in a commercial orchard of Randon Agro Silvo Pastoril S.A. (RASIP) in 2006. The products used in the treatments were Dormex®, mineral oil, Acordex®, Erger®, calcium nitrate and Kymon Plus, sprayed in five lines with different interstock lengths: 10, 15, 20, 25, 30 cm, respectively. For the evaluation was used five randomize branches for each plant, totalizing ten branches for treatments. In this experiment were observed the bud break percentage, based in all buds, vegetative and flower buds. Full bloom was evaluated through the numbers of inflorescence, and the fruit set, were computed in 43 and 64 days after the applications of products, respectively. The best results of the overcoming the endodomarncy were found with the application of Erger® + calcium nitrate, Dormex® + mineral oil and mineral oil. It was verified that the lengths of the interstock 10, 20 and 30 cm had presented superior values of budding and there were no significant differences on blooming and on fruit set between the interstock. The treatment with Erger® showed the worse averages for blooming and fruit set.

Keywords: dormancy, fruit set, whiner

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P-093

Effect of 1-MCP and interstem length in the post harvest quality of Imperial Gala apples

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The effect of apple trees interstem length in fruit post harvested quality is not well-known. The major practices utilized to prolong the apple fruit post harvest life consist in reducing the ethylene effects with 1- MCP (Methylcyclopropene) application. The objective of this study was evaluated the post harvest conservation of Imperial Gala apple fruits originated from trees with five different interstem lengths, treated with 1-MCP and stored in conventional atmosphere. The experiment was conducted in Vacaria city, located at Rio Grande do Sul State, at commercial orchard of RASIP Company. The treatments consisted in apples originated from trees with 10, 15, 20, 25 and 30 cm interstem length, on Marubakaido rootstock. The apples were treated with 1 – MCP, and the control was in fruits without treatment. After the treatment, the apples were stored in conventional atmosphere during 90 days, with mensal evaluations. The analyses were done in the NUTA Laboratory (FoodTechnology Nucleus), of the Centro de Ciências Agroveterinárias from Santa Catarina State University and also in the RASIP Laboratory. Were evaluated flesh firmness, soluble solid content (SST), titratable acidity, weight, category and caliber from the apples. The interstem length influenced the fruit category, flesh firmness and SST, and the best results were obtained with 10 cm interstem. The fruit weight, acidity and caliber was not influenced by the interstem length. The 1-MCP treatment delayed the maturation of fruits in all interstem lengths.

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P-094

Performance of new peach and nectarine selections under meadow orchard system in subtropical region of São Paulo State, Brazil

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This paper reports results obtained at the Instituto Agronômico (IAC) with new peach and nectarine selections grown under the meadow orchard system. This system, characterized by maximum space reduction between plants and rows and by canopy control, presents increase in yields, precocity

of bearing and reduction in labor input. The experimental area was located in Monte Alegre do Sul (22°41'S; 46°43'W and 40 hours below 7°C) a subtropical region of São Paulo State, Brazil. Twenty IAC selections were evaluated under biennial drastic pruning and at a row spacing of 4m x 1.5m, corresponding to a density of 1.667 plants per hectare. Seven phenological traits were recorded: bud density based on the average number of buds per meter of branch, flower and leaf buds per node, fruit set, fruit development period, fruit weight and harvest season. The best vegetative and reproductive development was observed in Aurora-1, Aurora-2, IAC 680-178, IAC 680-13, Tropical and Flordaprince, presenting the following values: above 40 nodes per meter, 2.50 flower and leaf buds per node and 40% of fruit set. The earliest ripening cultivars: Flordaprince, Tropical and IAC 282-24 ripened from late September to early October between 80 and 85 days after full bloom. Fruit weight was higher in Douradão, above 120 g for the three planting densities. All the peaches and nectarines adapted very well to the meadow orchard system, under biennial drastic pruning.

Keywords: stone fruits, *Prunus persica*, phenology, peach meadow, drastic pruning

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P-095

The Assessment of Different Rootstocks to the Pear Tree Cultivar Carrick

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Low fruiting is the main problem related to the pear production in Brazil, this make the country one of the major pear importers. This research aimed to evaluate different rootstocks to Carrick cultivar pear tree to be used in commercial orchards. The experiment was carried out in Pelotas/RS, located at latitude 31° 52' 00" S, longitude 52° 21' 24" W Greenwich and altitude of 13.24 m. The orchard was set up in 2002 with a density of 2000 trees.ha⁻¹. The trees were conducted in slender spindler system trained on three-wire support with a dripping irrigation system. The treatments assessed were 13 quince rootstocks (*Cydonia oblonga*) cultivars Adams, Alaranjado, BA 29, Bereczcki, Champion, Du Lot, D'Vranja, EMC, Inta 267, Lageado, Melliforme, PineApple e Portugal and one *Pyrus calleryana*. The experimental design utilized was a complete randomized block with 3 replications of 5 trees each. The variables assessed were rootstock/scion trunk diameter, tree height, canopy volume, pruning weight, productivity and productivity efficiency. 'D'Vranja' rootstock provided the highest vigor to the tree, whereas the rootstocks cultivars Du Lot, Lageado and Bereczcki the lesser vigor, however no differing from most of the rootstocks in study. The highest productivity was verified by using of the rootstock 'Portugal' (1.12 t.ha⁻¹), followed by 'EMC' that did not differ from 'D'Vranja' and 'BA 29'. D'Vranja cvs showed the highest vigor also had the highest productivity efficiency (9.53), but did not differ from 'BA 29'. Although 'D'Vranja' provided more vigor to the tree, and still a good rootstock alternative to the pear cultivar Carrick.

Keywords: Pomacea, *Cydonia oblonga*, *Pyrus calleryana*, plant development,

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P-096

The effect of hormone, stratification period and cultivar on seeds germination of Blueberry

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This work aimed to evaluate hormones, stratification periods and cultivars on seed germination of blueberry. The experiment was carried out at the company Frutplan Mudás Ltda in Pelotas/RS from December 2005 to July 2006. Was used seeds from fruits of three open pollinated cultivars Bluegen, Powderblue and Bluebelle. After extraction the seeds were immersed into solutions with gibberellins and promalin hormones (0, 100, 200 or 300 mg/L) in different stratification periods (0, 30, 60 or 90 days). Percentage of emerged and dead seedlings and the emergence velocity index (EVI) were weekly measured from the emergence of the first seedling until the establishment of the stand. There was interaction between treatments. The seeds from fruits of 'Bluebelle' showed the higher percentages of dead seedlings (7.10%). Regarding to the hormones, the higher percentage of germination was provided by 200 mg/L of gibberellin, while the poor results with 200 and 100 mg/L of Promalin. Promalin, in these concentrations, also affected in higher percentages of dead seedlings (16.34% and 10.51%, respectively). The better period of stratification for seeds germination and dead seedlings percentage was zero day (65.25% and 8.71%, respectively). For EVI, the utilization of 100 mg/L of Promalin and 200 mg/L of gibberellin showed the better results. Similar results were verified for IVE with inverse effect to stratification period, where the increase of stratification period decreased the IVE. Therefore, seeds from fruits of 'Bluebelle' showed high germination percentage. Higher IVE is not a good indicative for presenting following higher percentage of dead seedlings.

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P-097

Controlled Atmosphere Storage of Peaches Cultivar Eldorado Grown in Conventional and Organic System

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Organic fruit market has been boosted by the consumers exigency for health products and the use of less aggressive techniques to environmental. However, researches on the quality of organic product are elemental when compared to conventional cultivation. In Brazil, more used system to conserve peaches in natura is the cold storage (CS). Therefore, in this system may be occur loss of both firmness and fruit quality. An alternative to prolong the storage period of peaches maintaining the good quality is using the controlled atmosphere (CA). Objective of this work was to evaluate, during the storage period, conditions effect of controlled atmosphere on physico-chemical and sensorial quality of peaches 'Eldorado' grown in conventional or organic system. Fruits were stored during 15, 30 or 45 days at 1.5°C and 90 a 95% of relative humidity (RH) under CS (control) or CA in gas concentrations of 2%O₂ and 5%CO₂; 2%O₂ and 10%CO₂ or 2%O₂ and 15%CO₂. The evaluations were assessed at harvest time and after each storage period. It was measured: Vitamin C (VC), Anthocyanins (AN), flesh Firmness (PF), Weight Loss (WL), Color and Sensorial Analysis with the attributes appearance, taste and texture. Peaches of both systems submitted to CA at all concentrations showed lower WL, greener ground color, higher PF and AN content, and intense characteristic taste when compared to peaches at CS. During storage the peaches grown in organic system with low: PF, WL and color uniformity. The rots appeared from the fifteenth day of conservation in both systems, but in organic system it reached 100% on the 45th days. During the firsts fifteen days of storage at CA in all concentrations, the peaches of both production systems presented a high sensorial quality. Up to 30 days of storage the gas concentration 2% O₂ and 15% CO₂ presented higher uniformity and intense characteristic taste. At the 45th of storage the fruits were of inferior quality and high rots percentage. The results allow to conclude that CA was efficient on quality preservations of fruits stored up to 30 days to conventional system and up to 15 days to organic system in peaches 'Eldorado'.

Keywords: Quality; Sensory; Concentrations; Rots.

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P-098

Rootstock of Nursery Lemon Tree in Substrate of Pinus Bark and Vermiculite with Hydrogel Super Absorbent

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The experiment was conducted in a greenhouse conditions, using containers with capacity of five liters, with Pinus (*Pinus* spp.) bark substrates and vermiculite with one lemon "Cravo" (*Citrus limonia*) plant. Nursery tree was transplanted two months after sowing, with a delineation randomized of four treatments, respectively 0.0; 0.5; 1.0 and 1.5 kg/m³ of hydrogel in the substratum. The results showed a quadratic effect in hydrogel levels on the height of the nursery lemon "Cravo", reaching the maximum estimated height of 74cm for a great level of 0.57kg/m³ of hydrogel in the substratum while the stem's diameter of nursery lemon "Cravo" reached 5.6mm with treatment of 1.1kg/m³ of hydrogel in the substratum. Analyzing estimated levels of 0.95 and 0.25kg/m³ of hydrogel in the substratum, the plants accumulate respectively 16.1g of the canopy and 11.0g of roots system dry weight. A decreasing linear response was observed of root: canopy ratio in result of hydrogel levels in substratum. The maximum estimated relation of 0.804 occurred in the absence of hydrogel in substratum and the minimum 0.561. Occurred an accumulation of nitrogen and calcium in the nursery lemon "Cravo" leaf in replanting to the increase of hydrogel in substratum, however for the others macros and micronutrients, the hydrogel presence didn't modify the leaves contents. Nursery lemon "Cravo" plants started to demonstrate water stress from the eighth day without irrigation, delaying for 3.6 days per Kg m⁻³ of hydrogel in the substratum.

Keywords: nursery tree, hydrogel, substratum, water stress and fertilization.

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P-099

Gas Exchanges in Three Cultivars of Peach (*Prunus persica* (L.) Batsch) in São Manuel – São Paulo - Brazil

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Presents productivity of peach in Brazil decrease, estimating in 200 thousand tons destined to consume 'in natura' and industrial processing for fruit in syrup. In the São Paulo state, the mainly purpose is consume 'in natura', and the production are increasing since the 90 decade, due to the hybrids adaptation to warm climate, expanding the production to diverse regions of State. The aim of this work was to evaluate gas exchange of three peach cultivars and describe the influence of external factors (irradiance) and internal (stomatal conductance) about the gas exchange and leaves' chlorophyll content. The experiment was developed in three cultivars of peach cvs., Marli, Dourado and Aurora, grafted in rootstock 'Okinawa'. In these plants were analyzed three adult leaves, in the first insertion of the primary branch, analyzing the fourth leaf from the apex of the branch. The determinations of gas exchange were done with a portable closed system of photosynthesis, IRGA, model LICOR-6400, in leaf's medium region, completely expanded. They were determined liquid assimilation of CO₂, stomatal conductance and transpiration. The determinations of chlorophyll levels

were deeds with a portable meter of chlorophyll SPAD-502. The rates of transpiration and stomatal conductance evaluated in three peach cultivars did not present statistical difference, however had significant differences for the parameter photosynthesis in cultivar Dourado, suggesting that the fall of the rate of photosynthesis is related with the partial locking of stomata for other two cultivars. The efficiency of use the water expressed by the reason A/E, showed similar values for the three cultivars. Stomatal conductance was superior in Dourado comparing the other ranges. The CO₂ concentration presented similar standards for the three cultivars. The SPAD index for the cultivar Dourado has statistical difference for the other cultivars. With these results it's possible to conclude that there is similarity between photosynthesis and SPAD index in the cultivar Dourado.

Keywords: photosynthesis, characterization, chlorophyll

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P-100

Determinants of Organic Certification on Cashew Nuts Producers in the Mossoró/RN and Serra do Mel/RN Regions

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Organic certification forbids the utilization of agrotocics and demands the conservation of natural resources and adequate working conditions in the field. In order to safeguard and guarantee quality, standards must be met by cashew nuts producers. The objective of this paper was to identify the role of the organic certification and to detect the differences among the 3 groups of producers. Data were obtained from 85 interviews applied to small cashew nuts producers with and without organic certification as well as with those which received support from SEBRAE in the Mossoró/RN and Serra do Mel/RN regions. Some descriptive showed that the cashew nuts production is based on the familiar regime where 100% of the producers live in rural areas, and has been led by the owner of the household with 95% of the cases. His level of education is on average 5 years of schooling. Moreover, 70% of the producers do not see any disadvantage of having certification. On the other hand, 48% of do not know about the benefits of having it. The main organization or institution which had been demanded certification is the cooperative (22.4%) being the food safety the main reason (26.8%).

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P-101

Technical Subsidies to Contingency Plan Elaboration on the Agent of the Fireblight, *Erwinia amylovora*

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International trade is playing an important role in introducing organisms into new habitats either non-intentionally or by inadvertence. Many of these introductions can cause injuries to important crops in agroecosystems or to plants in natural environments leading to economic and environmental impact. In order to protect trade, international plant protection organizations produced guidelines aiming to bring together common principles linking biological, other scientific and economic information. It would result in evaluation of risks such as pest categorization, assessment of the probability of introduction and spread and assessment of potential economic consequences, including environmental impacts. Fire blight caused by *Erwinia amylovora* is one of the most destructive disease of fruit trees in the North Hemisphere. The bacterium has never been reported

to Brazil, and it has been included in the quarantine pest list of the Ministry of Agriculture, Livestock and Food Supply (MAPA). Several outbreaks have been registered in the Middle East, Europe and Mediterranean Regions. The economic importance of the disease is increasing due to its spreading into new apple and pear growing areas. Although the bacterium and the disease has been studied more than a century, many studies are being highlighted about some strategies of control, classical genetic resistance and engineering, risk assessment systems and nursery and orchard management practices. Chemical control presents some drawbacks, and streptomycin, the unique antibiotic registered that can effectively control the disease, is responsible for the development of resistant strains. In Brazil, the increasing trade of plants is the concerning of the National Plant Protection Organization (NPPO). Contingency plan is an important tool in plant protection activities, especially when there are eminent threats of quarantine pests or invasive alien species. Pest Risk Analysis (PRA) should be considered as guidance in order to determine if the pest has potential to be introduced and established in the new environment. The pest risk potential for *E. amylovora* was evaluated as high. Prevention of introduction and dispersal are very important measures for the apple production regulation in the country. Technical subsidies to contingency plan elaboration are here presented to collaborate with the actions of the Department of Plant Sanitary (DSV/MAPA) to prevent or eradicate in case of the introduction of the pathogen.

Keywords: Fireblight, bacterial blight disease, apple, pear, pomaceae.

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P-102

Intergeneric Grafting of Apple Cultivars in the 'Japonês' Quince Tree

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Researches developed by the Agronomic Institute (IAC) and EPAMIG, in Brazil, determined the 'Japonês' quince (*Chaenomeles sinensis* Koehne) as a rootstock for quince plants, in reason of its high seeds number per fruits (above 180), high germination and emergence, and high grafting ability. New researches have been carried out, in attempt to make possible the use of 'Japanese' quince for other pomeoideae plants, as the loquat and the pear tree, concerning the nanism promoted by this intergeneric graft, that culminate in the plant size reduction and cultural management facilities. The objective of the present experiment was to evaluate the 'Japanese' quince used as a rootstock for apple tree. The nursery trees used has 90 centimeters length and diameter of eight millimeters (in the graft point), they where produced in plastic bags with capacity of three liters of substrate. In the first experiment the apple trees 'Anna', 'Imperial', 'Centenaria', 'Einshemer' and 'Michal' were used, and they were grafted by the cleft method in the hibernal period (July). In the second experiment the apple trees used were 'Eva', 'Ohio', 'Soberana', 'Rainha' and 'Dulcina' and they were grafted by bud method, in the vegetation phase (summer – January). After 60 days of the grafting, were evaluated after 90 and 150 days of plants development the bud-sprouting percentage, length and graft average diameter. Cleft graft provided better results, with sprouting indices superiors of 86%. Were obtained best results using the cleft grafting method with 'Einshemer' and 'Michal' apple trees, and with 'Eva' and 'Soberana' apple trees grafted by the bud method.

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P-103

Evaluation of the productive and vegetative aspects of the cultivar Imperial Gala apple tree with EM-9 interstem in different lengths

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The obtain of a compact plant, with less vigor and high productivity, equivalent to a conventional plant, constitutes a strong tendency in the current horticulture, aiming at a raising on the fruit production at the same planted area. One of the techniques that have had success nowadays is the interstem use. This study was developed in a commercial orchard of Randon Agro Silvo Pastoril S.A. (RASIP), located in the Rio Grande do Sul state, Brazil. The purpose of this work was evaluate the vegetative and productive development of apple tree on the Imperial Gala cultivar with different lengths of EM-9 interstem. The treatments consisted of five interstem lengths: 10, 15, 20, 25, 30 cm. In the seventh year of implantation the following parameters were evaluated: the height of the plant, the diameter of the Imperial Gala 5 cm above the second graft point, the volume of the tree-head (height, width and length), the number of bud per branch, and the number of fruits per lineal centimeter of branch. Through this study it could be concluded that the greater interstem (30 cm) presented better indices with relation of vigor control. However the number of fruits per lineal centimeter of branch the interstem of 10 cm offered only significant superiority, when compared with the interstem of 30 cm. Using interstem technique allows to gathering the benefits of the rootstock Marubakaido and the control excessive vigour with the interstem EM-9.

Keywords: *Mallus domestica*, Interstem, EM-9

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P-104

Intergeneric Quince Tree by Bud Grafting Using 'Japonês' and 'Taiwan Nashi-C' Rootstock

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The quince tree has always been commercially propagated by cuttings. Due to low vigor of the young plants, mainly in the first years of the orchard, a series of works was developed in Brazil in order to make possible the use of the 'Japonês' quince (*Chaenomeles japonica* Koehne) as a rootstock. The results were satisfactory but the lack of other options of other highly vigorous rootstocks for quince tree and due to the observations in nursery and field of the high vigor of the pear rootstocks 'Taiwan Nashi-C' (*Pyrus calleryana* Dcne). This work was developed to verify the performance of quince cultivars grafted on these rootstocks by bud grafting. The 'Japonês', 'Mendoza Inta-37', 'Portugal', 'Smyrna' and 'Provence' quinces were grafted by the cleft grafting method onto 'Taiwan Nashi-C' and 'Japonês' seedlings and maintained in plastic bags (3 L of capacity of substrate) in January. The scion sticks used had three buds each and were collected from the mother plants at the Agronomic Institute (IAC). The young plants were maintained in the nursery and evaluated after 60 days for the percentage of sprouted grafts. At the length and diameter of the grafts were measured 90 and 150 days after grafting. Although the sprout percentage have reached the maximum of 25%, there was no statistics difference between the two rootstocks; however, for the stocks that had sprouted, there was an excellent development in the sprouting, mainly for the quince trees grafted on 'Taiwan Nashi-C', the exception occurred with the 'Japonês' quince, that can only be grafted in rootstocks of the same species.

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Vitamin C Retention in Light and Conventional Blackberry jellies

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Blackberry is a rich source of natural antioxidant as phenols, anthocyanins and ascorbic acid. Due to the fragile structure and high breathing activity, the blackberry post harvest conservation is relatively short; therefore, the fruits can be used for pulps, juices and jellies production. The study aimed at to evaluate the vitamin C retention in light and conventional jellies of blackberry during 4 months storage. It was used the fruit of cultivate Tupy for the jellies processing, that were elaborated starting from the formulation of pulp:sugar 1.0:0.7 for conventional (68°B) and 1.0:0.35 for the light (43°B) jelly with substitution of 50% of the sugar content. The fruit and the jellies were analyzed for the vitamin C content soon after processing and at the 2 and 4 months of storage by liquid chromatography analysis. The fruit presented the vitamin content of 2.58 mg/100g; the conventional and light jellies at the 0,2 and 4 months of storage presented respectively: 0,29 and 1,15; 0,17 and 0,13; 0,01 and 0,22 mg/100g. It was concluded that the vitamin C is sensitive to the storage, presenting significant losses and that the light jellies keeps in a more expressive way this vitamin in the processing conditions and storage time.

Keywords: vitamin c, jellies, retention

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Production of loquat trees grafted on 'Portugal' quince tree cultivar

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The Instituto Agronômico (IAC), Campinas-SP, Brazil, developed and released many loquat cultivars that are planted commercially in the country. Along with the divulgation works of their own loquat cultivars, there was an intense experimentation on the search of the viability of intensive cultivation, grafting the plants on dwarfing rootstocks, such as quince seedlings. The advantage of the use of this intergeneric combination, like the pear cultivars grafted in quince seedlings, is to obtain loquat plants with desirable dwarfing characteristics that can be better economically explored under reduced spacing and including humid soils that are not indicated when loquat cultivars are used as rootstocks. Therefore, the objective of this work was to verify the performance of five loquat selections grafted on quince seedlings. It was used the following 'Instituto Agronômico' selections: IAC 966-23, IAC 265-66, IAC 1467-25, 'Mizauto' (IAC 167-4) and 'Mizumo' (IAC 1567-411), grafted in rooted cuttings of 'Portugal' quince cultivar (planted in field with 4.0 x 2.0 meters, with the density of 1250 plants.ha-1) and in loquat seedlings (planted in field with 7.0 x 4.0 meters, with the density of 357 plants.ha-1). The experiments were carried in the IAC farm, located in Jundiá-SP, Brazil, with four replications of three plants per plot. Three years after planted, the production (Kgm.plant-1) and average number of fruits, average fruit weight (gm) and productivity (ton.ha-1) were measured during four harvests. After the last harvest, the average of all harvests was calculated. The 'IAC 265-66' selection presented the best performance when grafted on quince and loquat rootstocks. Despite the lower production, there wasn't a statistic difference in production between quince and loquat as rootstocks. Therefore, the use of quince as rootstock is an excellent option for loquat cultivation, mainly due to the plant size reduction and consequently, the easier orchard handling.

Keywords: *Eriobotrya japonica* Lindl., *Cydonia oblonga* Mill. and fruit quality.

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Effect of Fruit Bagging on the Appearance of Apple cv. Condessa

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The objective of this study was to verify the effect of fruit bagging of apples cv. Condessa (*Malus domestica* Borkh.) in terms of skin color and skin finish. The treatments used consisted of fruits bagged with brown-kraft paper bags, polypropylene micro punched plastic bags, white paper bags, red paraffin paper bags and brown-yellowish paraffin paper bags. As control was used fruits not bagged. The results showed that the bagging affected the skin finish of the fruits, independently of the type of bags. The polypropylene micro punched plastic bags and the white paper bags did not affect the distribution of reddish surface of the fruit skin. Only the brown-yellowish paraffin paper bags stimulated the development of russeting at the stalk cavity of fruits. The bagging affected differently the saturation, the brightness and the nuance of the reddish color of fruits. However, the saturation of ground color of fruits was not affected. Both the white and the brown-yellowish paraffin paper bags and the brown-kraft paper bags reduced the color of fruits for commercial purposes. The skin finish of fruits was enhanced by bagging the fruits with polypropylene micro punched bags and also anticipated the fruit ripening of Condessa cv.

Keywords: *Malus domestica*, fruit quality, skin color

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Phenological Stages of Pears Grafted on Quince 'CP' Rootstock in Brazil

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Despite of the increased consumption in the last years, pear production still incipient in Brazil, supplying only 12% of the internal demand, mostly because the lack of crop technology, especially regarding to climatic adaptation in different regions. For this reason, a field experiment has been carried out since 2004, aiming to study the behavior of some pears cultivars grafted on quince 'CP' dwarfing rootstock, in Paraná State, Southern of Brazil. The pear trees were spaced 1.0 x 4.0 m and trained to a slender spindle. Trial was laid out using a randomized block design with five treatments, five replications and five-plant plots. In this paper was presented the data of phenological stages and their respective accumulated heat units (base temperature = 7.2°C) in the first crop. For 'Cascatense', 'Tenra', 'Hosui', 'Packham's Triumph' and 'Williams' pear trees the accumulated degree-days were respectively, from bud burst to full bloom: 96, 212, 466, 833 and 994, and from full bloom to harvest: 1109, 1525, 1271, 1472 and 1477. The number of days following full bloom (DFFB) were 102, 113, 93, 104 and 104; corresponding to the harvest dates in December 16th in 2005, January 16th and 21th, March 2th and 10th in 2006 for the 'Cascatense', 'Tenra', 'Hosui', 'Packham's Triumph' and 'Williams' pear trees, respectively.

Keywords: *Pyrus*, flowering, sprouting, degree-days.

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P-109

Evaluation of the Growth of Micropropagated Apple Seedlings Rootstocks through the Microbiolization with *Pantoea agglomerans*

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The propagation methods in vitro are quite efficient in the multiplication of temperate zone fruits, however, rooting and acclimatization are critical points and, in some cases, able to limit the process. Aiming to revert that inconvenience, the use of bacterium *Pantoea agglomerans* to promote growth, can be the alternative for apple rootstocks micropropagated which present this limitation. The bacterium was multiplied in culture media 523 of Kado & Heskett and 24 hours later the bacterial suspension was prepared in NaCl 0.85% and adjusted in OD₅₅₀=0.5, for control only saline solution was used. Apple rootstocks micropropagated were microbiolized for 1 hour and transplanted in polystyrene trays containing a Plantmax[®] substratum mixture and vegetable ash in the relationship 1:1 (v/v), plus 0.5 mL of bacterial suspension applied in the soil for each seedling. The trays remained at 25°C and photoperiod of 16 hours. After thirty days an increase of 29.61% was observed in the survival of microbiolized seedlings, and an increment of 50% in the height compared to control. The same parameters when compared to the 15 days evaluation after the transfer to the substratum didn't differ statistical. Regarding the fresh and dry weight of the aerial part, the bacterium provided an increase of 53.09% and 52.94% respectively, superior to control and an increment of 103.28% and 66% respectively, for fresh and dry weight of root system when evaluated 30 days after the transfer to the substratum. It was verified that *Pantoea agglomerans* presents potential for acclimatization and to promote the growth of micropropagated apple rootstock seedlings.

Keywords: micropropagation, in vitro culture, bacterium growth promoter.

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Evaluation of the Cutting Time and Use of Growth Regulators in the production of Fig tree

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Fig culture (*Ficus carica* L.) present a good prospect of expansion, demanding efficient propagation techniques. The most feasible propagation method is the cutting. Its association with the use of auxins can increase the cuttings rooting percentage and reduce the necessary time for both rooting and seedling formation. The objective of this work was to study the propagation of the fig trees, using herbaceous cuttings in intermittent mist system, using the indolbutyric acid at different concentrations combined with different seedling preparation times. The propagative material was taken from a plantation of 5 years old 'Roxo de Valinhos' fig cv, located at the FCA/UNESP/Botucatu orchard, using the branches removed during the hibernal pruning, in the end of the months of August, September and October. The cuttings were treated with AIB in fast immersion (5 seconds), at the following concentrations: 0 (control), 2500, 5000, 7500 and 10000 mg L⁻¹. Later they were placed to root in polypropylene trays, having vermiculite as substrate and under intermittent mist for 70 days. After this period, the rooting cuttings percentage, the length of the biggest root (cm) and the

dry mass of the roots (g) were evaluated. The experimental design was completely randomized, in a factorial 3x5. It was observed that cuttings proceeding from the control treatment and from the August pruning, presented lower rooting percentage (20%), shorter root length and lighter root dry mass, requiring treatment with AIB at 2500mgL⁻¹ concentration to increase significantly this percentage to 90%. Cuttings originated from the September and October pruning did not required treatment with AIB to obtain a high rooting number. The most feasible for the collection of fig trees cuttings was in september, since it had the highest rooting percentage (95-100%). The cuttings treatment with 7500 and 10000mgL⁻¹ AIB presented the low rooting percentage, the short length and the lightest root dry mass in the months of August and September.

Keywords: *Ficus carica* L., rooting, auxins.

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Influence of Red Light Filter on Chemical and Physical Characteristics of Japanese Persimmons Taubaté cv.

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The Japanese persimmon cultivated in China, Japan and South Korea, was introduced in Brazil in 1890, approximately, in São Paulo, and expanded in 1920 with the Japanese immigration. Factors like the short time for harvesting and the lack of divulgation of the specie contribute to the steadiness on the consumption. Technologies that improve the quality may contribute to change this context. The utilization of colored light filters changes the transmittance and absorbance of direct light, it has been effect at the photosynthesis rate of the plants. The quantity of lightness incidence over the plant is directly linked to the photosynthesis which, is related to the carbohydrates concentration of the vegetal structure. The overconcentration of sugars at the fruit may be associated to a fast deterioration and fermentation, which reduces the overall lifetime. Otherwise, sweetest fruits have better acceptance at in natura consumption and when industrialized present a better yield. In the experiment were used persimmons trees, cv Taubaté, existent on the Learning Orchard of Agronomy Faculty Eliseu Maciel - Universidade Federal de Pelotas, at a orchard with 5 years old. The plants selected were submitted to total shadowing with colored light filter at red color and, the control (without shadowing). Were used mature fruits to determine the color, total soluble solids content (TSSC), total titrable acidity (TTA) and potentiometric pH. The statistical delineation used was completely casualized, with three repetitions, being each repetition composed by five fruits. The results obtained were submitted to variation analysis and the means compared by the Duncan test with 5% of margin error. Comparing the plants submitted to total shadowing with colored light filter at red color, with plants without shadowing, it could be verified that statistically, there was no significant difference for color, total soluble solids, total titrable acidity and pH. In relation to TSS and TTA, it could be evidenced that the better result was obtained when the plants were not shadowed. It can be concluded therefore, that the utilization of red light colored filter doesn't change the chemical and physical characteristics of persimmons Cv. "Taubaté".

Keywords: maturation, TSSC, *Diospyrus kaki* L.

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The Influence of Different Training Systems in Peach Trees

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The change in peach tree architecture alters yield, quality and practical management for each cultivar. The objective of this work was to assess the yield performance and the fruit quality on peach trees cultivar Maciel by using either training system central leader or ypsilon shape. The evaluations were carried out in four years investigation (2003-2006) on orchard trained in high density (1333 trees/ha) in the region of Pelotas – RS, Brazil. It was measured yield, total soluble solid content (TSS), pulp firmness and fruit size. The fruit size was determined by the following categories: I (>57mm), II (47 to 57mm) and III (<47mm). According to the results, the yield in this period was higher in the ypsilon shape averaging 10.8 ton/ha and being superior during the three firsts years of evaluation (12.1, 14.3 and 11.0 tons/ha, respectively). There was also an increase in fruits of category I. Although the ypsilon shape has showed the highest yield in comparison to central leader, the central leader showed less alternate bearing, with a minimum of 8.6 and maximum of 10.6 tons/ha, while the ypsilon varied from 5.5 to 14.3 tons/ha. In 2005 and 2006 crops, the total soluble solids were higher in the central leader shape system whereas pulp firmness fluctuated between years. Regarding to fruit size only the category I and II showed significative differences between training systems, 92.6% and 89.8% for I and 6.6% and 9.4% for II, for central leader and ypsilon shape respectively. These observations allowed to conclude that the parameters yield, total soluble solids, pulp firmness and fruit size were affected by either training system used and by different years. Even though the central leader training system yielded better it may result in management difficulties due to tree height, so the ypsilon shape is the more indicated system for the region of Pelotas, RS.

Keywords: Peach, fruit quality, plant management, tree architecture.

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Current state of temperate fruits growing in Colombia (South America)

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In Colombia, temperate zone fruits (apple, peach, pear, plum, and strawberry) are grown between 1,700 and 2,800 m a.s.l. commercially. The main production lies between latitude 1 and 8°N where on elevational sites with unimodal rainy patterns one (rest breaking technique) or two (rest avoidance technique) cycles of crop per year, respectively, are achieved. Only grape production is classified in two altitudinal sites: between 800 and 1,200 m a.s.l., where the production of table grapes in the region of La Union (Valle del Cauca department) is located, and between 2,200 and 2,600 m a.s.l. in the Boyacá department with the production of wine grapes. The high solar radiation at elevated sites allows high sugar accumulation in fruits, especially grapes, enforcing high wine quality, whereas zones with mists and overcast skies are prevalent in unimodal rainy pattern zones (zone of Nuevo Colon) during the dormant season (May to August) allowing a good pome and stone fruit production. Due to the fact that most regions of deciduous fruit production in Colombia are situated in the bimodal rainy pattern, rest avoidance technique is very common using a chronological sequence of techniques, beginning after harvest, suppressing vegetative growth through withholding irrigation for one month, then defoliating, pruning, irrigation and, finally, treating with a rest-avoiding chemical (e.g. hydrogen cyanamide). In small fruit farms, in many cases, only defoliation is applied because of high product

prices of the chemical dormancy breaker. For such a production in Colombia, varieties with a low chilling requirement and a short fruit development period such as 'Anna' (120 days) in apple and *Prunus salicina* cultivars in plums are suitable. Problems to resolve are especially in diseases (e.g. *Venturia* in pome fruits), short postharvest duration and quality, lacking farmer extension, among others. Taking into account that Colombia is importing fruits from temperate zones in a value of more than 60 millions US\$ per year (70% of the total fruit import; mainly from Chile and USA), the existing approximated 5,500 ha of temperate zone fruit species are not sufficient to cover the demand and, furthermore, production per hectare is too low making governmental and research programs very important to increase fruit production and quality.

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Study on Cultural Control (*Pruning Severity*) Of Peach Twig Borer *Anarsia Lineatella* on Common Peach and Flat Peach In Qazvin Region

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This study, as an attempt to achieve the goals including: 1) possibility of non- chemical method application (Cultural practice- pruning) in order to control of *Anarsia lineatella*, 2) Assessment of pruning intensity and its effect on pest control and quantitative and qualitative traits of peach, 3) Recommendation for suitable pruning intensity on peach trees in Qazvin region. This experiment was carried out during 2001-2002 in Feizabad research station in complete block design with 3 replications. Treatments including, pruning at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ shoot length that was carried out before blossoming. The factors involved in assessing, consisted of the fruit weight, fruit volume, number of damaged shoots and number of damaged fruits. Results showed that, pruning effected on peach twig borer control and fruit quality and quantity increase. Increasing of pruning intensity was related to reducing of pest damage and better fruit characteristics. The lowest pest damage was correlated with the highest fruit weight and volume in $\frac{3}{4}$ and $\frac{1}{2}$ pruning intensity.

Key words: peach twig borer- *Anarsia lineatella*- Peach – flat peach- pruning

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The Temperate Fruit Tree Industry in Afghanistan: Its Economic and Food Security Importance as a Sustainable Alternative Livelihood

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Twenty years ago the horticultural sector was one of the pillars of the Afghan economy, contributing over 40 percent of total export earnings due to the production of dry fruits mainly, and also quality fresh ones. This sector utilized only 6 percent of the total cultivated land and about 12 percent of the permanently irrigated crops. The war and civil strife, and in the last three years, the drought have contributed to the decline of the sector due to the destruction of most of the irrigation systems, infrastructures and orchards, as well as nurseries. The Afghan environment is very suitable for the cultivation of a wide range of horticultural species. The agro-economic importance of this produce is related to Afghanistan land tenure, characterized by kitchen gardens and small-sized farms, particularly in the peri-urban areas. The cultivation of deciduous and subtropical fruit species has also been traditionally grown. However, with the exception of grapes, the production of most of the fruit crops

is characterized by poor quality and low yield, resulting in uncompetitive produce in the international market. Raisins are economically the largest part of the horticultural crop in Afghanistan and are also its primary export commodity. During the 1960s and 1970s, export of raisins from Afghanistan accounted for 60 percent of the world market. Vegetables with short-cycle generate an immediate cash flow, and are an essential part of the diet due to their high content of vitamins and minerals. Therefore, they are considered of great importance in peri-urban and rural areas. In Afghanistan over 50 percent of children, under five, are estimated to be chronically malnourished. However, acute malnutrition appears to be primarily a seasonal problem during the summer and is related to diarrheal diseases rather than food shortage. Low levels of acute malnutrition have been interpreted as suggesting highly equitable distribution of food within the household. High rates of micronutrient malnutrition (and scurvy) highlight the importance of dietary habits, and possibly food preservation and post-harvest practices. There is very little consumption of fruits and vegetables during the winter months. Up to now the programs of food security were related to distribution of wheat and vegetable seeds, and initiatives for fruit and vegetable production to promote income generation, rather than consumption. Few post-harvest and food processing projects address seasonal micronutrient deficiencies. However, to reduce hunger in the country the current operational programming has been focused on increasing cereal production through the distribution of improved wheat seeds and to rehabilitate the cereal seed industry. During the last four years, and in the future years, the cultivated irrigated areas have increased to the benefit of poppy and cereals favored by farmers' needs of short-term cash and guaranteeing secure food for their families. This will continue unless a comprehensive specific program on the restore of horticulture sector is soon prepared.

Keywords: horticultural sector, agro-economy, cultivation of deciduous and subtropical fruit, micronutrient malnutrition

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Efficiency Of Entomopathogenic Nematodes (Rhabditida: Steinernematidae E Heterorhabditidae) In The Control Of *Anastrepha Fraterculus* (Diptera: Tephritidae).

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The South American fruit fly *Anastrepha fraterculus* (Wied., 1830) is the species with the highest economic importance in its genus, considered the key-pest of the apple and pear trees in the producing regions of Rio Grande do Sul (RS) and Santa Catarina (SC) states causing losses of up to 100%. Integrated Pest Management Programs in fruit culture have been motivating the use of various methods and control tactics, especially the biological control. In this context, entomopathogenic nematodes (EPNs) of the families Heterorhabditidae and Steinernematida present themselves as potential and effective agents of in the control of several pest-insects. This paper aimed to evaluate the pathogenicity of isolates native in RS, of the larvae *A. fraterculus*. Larvae of third instar of *A.*

fraterculus were distributed in plates in 24 cells containing sterilized sand in the proportion of 1:1 (larva/cell) and inoculated with 100 JIs of 11 EPNs isolates native of different regions of RS. After being kept for seven days in climatized chambers at $25 \pm 1^\circ\text{C}$, $\text{RH } 70 \pm 10\%$ and photo phase of 12 hours the dead larvae were transferred to Petri plates and dissected in order to observe the presence of the nematodes. The mortality of the larvae of *A. fraterculus* without the presence of infective juveniles (IJs) after the dissection was higher after they were exposed to the isolates of *Heterorhabditis* sp. "Sample" 17 (84,32%), *Steinernema* sp. "Canguçu P4" (82,7%), *Heterorhabditis* sp. "Nema 24" (79,58%) and *Steinernema* sp. "Lagoa Vermelha" (79,51%). Despite the low mortality of *A. fraterculus* the isolate *Heterorhabditis* sp. Arroio Grande city was the one that presented the highest percentage (16,6%) of dead larvae with the presence of IJs, followed by *Steinernema* sp. "Lagoa Vermelha" and *Heterorhabditis* sp. "Nema 24", both with 12,49% of larvae containing IJs. Besides, *Heterorhabditis* sp. "Nema 24" and *Steinernema* sp. "Lagoa Vermelha" were the isolates that caused higher total mortality (with and without the presence of IJs) of larvae of *A. fraterculus* with 92,0 and 92,07%, respectively. According to the results presented, the isolates *Heterorhabditis* sp. "Nema 24", *Steinernema* sp. *Heterorhabditis* sp. "Lagoa Vermelha" and *Heterorhabditis* sp. "Samples 17" showed themselves as efficient candidates for the control of larvae of *A. fraterculus* and deserve further studies concerning their efficiency in the field.

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First Studies on the Epidemiology and Management of Sooty Blotch and Flyspeck of Apples in Southern Brazil

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Sooty blotch and flyspeck (SBFS) is an important fungal complex that causes blemishes on the apple fruit surface. A 19-year-old Fuji orchard, located in Vacaria, RS, Brazil, was selected to assess the disease and evaluate control strategies in the 2006-2007 season. Fungicide treatments, beginning 10 days after petal fall, were timed as follows: 1) captan at 14-day interval or after rain (>50 mm); 2) IPM-based grower's decisions focused on control of fruit rot diseases; 3) U.S. SBFS alert system whose threshold for the first fungicide (thiophanate-methyl + captan) application is 175 hours of cumulative wetness duration, starting 10 days after petal fall; and 4) unsprayed treatment. The alert system used was modified so that subsequent sprays after the first threshold-timed spray also were triggered by 175 hours of wetness since the previous spray. The effect of summer pruning on performance of the SBFS warning system was also evaluated. SBFS incidence (% apples with signs) was assessed at 7-day interval from disease onset to harvest. In the unsprayed treatment, SBFS incidence reached 87,8% by the last evaluation. SB fungi had incidence as high as 85,7%, whereas the highest incidence of FS fungi was 2.1%. The first signs of SBFS were observed 120 days after petal fall, when incidence was 50%. Thirty days later, incidence had increased an additional 39%. Five mycelial types in the complex were discerned based on colony morphology; the "punctate" mycelial type was most prevalent (45% of colonies examined). Most SBFS colonies clustered at the peduncle region. All fungicide treatments were equally effective in reducing SBFS incidence by 50% compared to the check. However, 5 sprays were needed following the alert system or grower's decisions, whereas 11 sprays were used in the preventative treatment. No significant effect of summer pruning was observed in improving disease control.

Keywords: disease; control strategies; disease survey

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Colletotrichum acutatum is the Causal Agent of Anthracnose on Blueberry Fruits (*Vaccinium* Spp.) at Rio Grande do Sul State

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Colletotrichum sp. can cause diseases in several plants, especially in tropical and subtropical areas, where the weather is wet and hot. In blueberries it causes lesions on fruits, compromising the commercialization. Studies aiming the identification and control of this pathogen are very important. This work aimed to characterize a monosporic culture of *Colletotrichum* isolated from blueberries of the Embrapa Clima Temperado Gene Bank, localized in Pelotas, RS. The following characters were evaluated: conidia and apressorium morphology, micelial color and growing rate, presence of setae, presence of teleomorphic state, sensitivity to carbendazim fungicide and PCR amplification using taxon-specific primers. The morphocultural characterizations followed the protocol from Sutton (1992). The isolate presented a salmon color, with the presence of aerial mycelium in BDA medium. Carbendazim was not able to inhibit the micelial growth in any of the concentrations tested, and no protease was produced. The formation of setae was observed. The conidia length varied from 6 to 13.2 μm , with average of 8.4 μm and the width varied from 2.4 and 4.8 μm , with average of 3 μm . The conidia were classified as fusiform, with tapered ends and apressorium from smooth to lobed. Beyond blueberry fruit, the isolate was also pathogenic against other hosts (apple, papaya, sweet pepper and red pepper). Sporulation on inoculated fruits was higher in blueberries, in comparison to other hosts. In PCR reactions, bands were amplified with three species-specific primers for *C. acutatum*, but no amplification was observed with the two species-specific primers for *C. gloeosporioides*. The results revealed that *C. acutatum* is the causal agent of anthracnose in blueberries.

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Ecological Zoning and Simulation of Increasing the Generation Number of *Grapholita Molesta* (Lepidoptera: Tortricidae) by Global Warming

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Grapholita molesta (Busck, 1916) is considered one of the most important pest of the peach culture, and the last decades it also became a pest for the apple culture. The global climate changes can affect their biology as well as the geographic distribution of insects. This work aimed to obtain an ecological zoning of *G. molesta*, by determining its generation number based on the actual temperature in Rio Grande do Sul State and on simulations of increasing the minimum temperature in 1, 3 and 5.8°C. Climatic data, were based on the historical data from Fepagro. The lower temperature development thresholds of 8.99°C was used in order to calculate the somation of growing degree-day, for the development of the egg-adult period of *G. molesta*. The results showed that considering the actual termic conditions, between 5 and 10 generations per year can occur, depending on the geographic region in the State. In 86% of the areas, 6 to 8 generations can develop. By increasing 1°C in the minimum temperature *G. molesta* can have from 5 to 10 generations/year, with 8 to 9 generations occurring in 84% of the State. If the temperature is increasing in 3°C, *G. molesta* can have from 7 to 12 generations/year, and increasing 5.8°C, from 10 to 14 generations/year can occur. These results demonstrate the importance of temperature increase on *G. molesta*.

Keywords: Peach, global warming, oriental fruit moth

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P-120

Quantification of Antioxidant Capacity with DPPH Methodology Using Methanol, Ethanol and Acetone As Diluents

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Several human pathologies are originated from free radicals that induce oxidative damage to biomolecules. The antioxidants can be powerful compounds to preventing against free radicals. One of the most common methodologies to quantify antioxidant activity in vitro uses 1,1-diphenyl-2-picrylhydrazyl (DPPH⁺) and 6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid (trolox), both diluted in methanol. The main question that guided this paper was to evaluate the substitution of methanol for ethanol for diluting the DPPH reagent and methanol for acetone 75% and ethanol to dilute trolox. These substitutions can give analytical cost advantage and reduce analytical toxicity. Besides it has been showed that acetone 75% is better to extract polyphenol and antioxidant molecules of both pulp and skin of the fruits. Thirteen concentrations varying from 416.67 M to 81.42 ?M were used to construct the calibration curve. The results were comparated with the original methodology, using methanol as diluent. The results showed that the coefficients of the linear equations using methanol/methanol (Abs = -0.0011(trolox) + 1.2124, r²=0.9905), ethanol/ethanol (Abs = -0.0011trolox) + 1.2073, r²=0.9903) and ethanol/acetone 75% (Abs = -0.0012(trolox) + 1.1733, r²=0.9925) were similar. Samples of BSR Rúbea grape juice were used to compare the original methodology, using methanol as the only solvent to dilute the DPPH reagent and the trolox standard, with the modified method, using ethanol to dilute the DPPH reagent and acetone 75% to dilute the trolox standard. The results obtained were 18,89 mM and 21.08 mM for the original and for modified methodologies, respectively. The statistical analysis showed that this diference was highy significant (P<0.01). The results obtained suggest that the quantification of antioxidant capacity using acetone 75% and ethanol as diluents of trolox and DPPH, respectively, besides the health and safety at work, can present analytical advantages.

Keywords: trolox, grape juice, polyphenol, free radical, oxidative damage.

P-121

Effect of Time and Place of Girdling on Quality and Yield of Grape and Raisin of *Vitis Vinifera* Sefid Bidaneh Cv. in Takestan Region

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In order to study on the effect of times and places of girdling on quality and yield of grape and raisin, an experiment was conducted on non-grafted vines of *Vitis vinifera* Sefid Bidaneh cv. (6-year old) in Takestan region. Grapevines was treated by cane, trunk and arm girdling alone or a combination of them at berry growth (FB+3 week) and veraison (berry softening or color break) stages. 19 treatment combinations of vine girdling tested in vineyard of 6-year-old ungrafted vines of Sultana cultivar on clay-loam soil at Takestan Grapevine Research Station. The effects of trunk, cane, arms or combination of these treatments were varied on increasing of yield/vine, cluster weight, cluster length, average weight of 100 berry and also after girdling TSS, TA, TSS/TA and pH content were different, significantly. All of treatments had effect on TSS, TA and TSS/TA and also on yields/plant. The combination of trunk and cane girdling at berry growth and veraison stages increased yield and quality of fruits than other treatments, significantly (P>1%). Results showed trunk and cane girdling at veraison stage increased TSS than other treatments (at least 2.5 mg/L). Also, trunk, cane and arm girdling at berry growth

stage caused increase berry weight and size, cluster weight and total yield.

Key words: girdling, sultana, grapevine, quality, veraison.

P-122

Collection and Preliminary Evaluation of Grapevine Cultivars of the Qazvin Province

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Genetic resources are one of the most valuable resources of any country. Many attempts have done in order to protection and identification of them in different countries at past years. The present research was carried out during 2000-2002 to collect and assess grape genotypes in Qazvin state from different aspects such as: cold tolerance, fruit quality, cluster marketability, cluster density, berry quality and size; and in order to achievement to the best cultivars in the state. During which, superior and healthy genotypes were identified and labeled at different orchards. At final, 19 genotypes which were known as 'Mesghali', 'Mollaei', 'Fakhri', 'Shahani-e-Qazvin', 'Yaghouti', 'Yazdan-Daei', 'Asgari', 'Shast-e-Arous', 'Shani-Gerd' ('Shahani-e-Siah'), 'Kare-Royeh-e-Sefid', 'Shahroodi', 'Mish-Pestan', 'Sefid-e-Bidaneh', 'Talaiei', 'Siah-e-Qazvin', 'Ghermez-e-Bidaneh', 'Shahani-e-Sefid' and 'Rish-Baba' locally, are identified. During 2001-2002, measuring and recording their characteristics and different phenological stages are conducted based on the descriptor on the labeled stock plants. During March 2001, 20 cuttings are prepared from the stock plants, and cultured at the Esmaeil-Abad Research Station nursery for rooting. During 2002, needed cares are carried out on the rooted cuttings. Then, in the second phase of the design, 9 plants from any genotypes will transplant to the collection place, at the Takistan Grape Research Station. Measured characteristics, showed wide variation between genotypes. So that, between them genotypes of early ripening to late ripening, seedless and seeded, low to high yield, very small to large fruit, early to late flowering, low to high sugar, different vegetative characteristic, weak to power vigor, and other was observed.

Keywords: Grape, Identification, Genetic resources, Genotype, Collection

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P-123

Determination of the Best Harvesting Date of Grape Cv. Sultana to Produce Favorable Raisin in Takestan Region

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A qualitative and quantitative aspect of Iranian raisin, as a significant exporting material, has been declined because of several reasons in recent years. There are many factors affecting traits of raisin. Fruit harvesting date is one of these factors which are highly effective on quantitative and qualitative traits of raisin through alternating fruit characteristics and even plant yield. Therefore, this investigation was carried out to determine the best time of Sultana grape harvesting in Qazvin for obtaining a raisin uniform in color and size with suitable taste and tissue and highest in yield. For this purpose, harvesting dates with 10-day intervals including 22th August, 1, 11, 21th September and 2th October were used in a RCBD with four replications in one of orchards of Takestan region. In each treatment, four plants were considered and harvesting was done from two middle plants.

In each harvesting date, tried such as content of soluble solid materials (TSS), bunch length, bunch weight, volume and weight of berry, grape yield, and after production of raisin, traits such as color, size, 50-seed weight, marketing value and amount of recoverable raisin were measured. Results showed that late harvests (21th September and 2th October) by having about 23% TSS, weight of 18 grams for 50-seed of raisins and the best ratio of grape to raisin (3.5 kg grape for production of one kg golden yellow raisin) are the most suitable harvesting date for raisin production in Takestan region.). Also higher %TSS was together with significant increasing in quality, color, and 50-seed weight and raisin production efficiency. %21 is recommendable minimum percentage of TSS, for producing favorable raisin with high efficiency.

Keywords: Best harvesting date, Sultana grape, raisin, TSS, producing raisin efficiency

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Study on the Effective Condition and Factors for Decreasing Losses of Grape Through the Harvesting Time, Storage and Supply to the Market

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Grape fruit use in large amounts and in different types (fresh, raisin, vinegar, juicy, and wine). Every year, amounts of grape preserve to supply out of season. But, traditional methods of grape preservation decrease quality and crop weight, largely. The present research was conducted to study different factors which affects on shelf-life of grape, and to achieve to more information on optimum conditions and requirements for preserving of quality of fruit after harvest in order to increase its shelf-life in cold-room, and to minimize rate of qualitative and quantitative losses when it supply out of season. For this, two Fakhri and Shast-e-Arous cultivars (late-ripen with high preservation ability, and main cultivars in Qazvin) were selected. The grapes fruits were affected by treatments including: disinfection using fungicide solutions pre- or post-harvest, SO₂ gas before transferring to cold-room, and interaction between them. Then they placed in boxes contented 3 and 6 kg, for 30, 60 and 90 days under 0-1°C in cold-room. Before placing of boxes in cold-room, variables such as fresh weight and TSS of each treatment were noted, and after existence of boxes from cold-room other factors such as weight reduction (%), infected fruits to disease (%) and healthy fruits (%) were measured. The experiment was conducted as factorial based on CRD with 3 replications. Comparison of the means was carried out using Duncan's multiple range test (DMRT). The results showed that: Shast-e-Arous cultivar had storable properties better than Fakhri. Fumigation using SO₂ was more effective in control of fungi growth. Boxes 3 kg due to having higher percent of healthy fruits were more suitable than 6 kg. However, rate of weight reduction was higher in 3 kg boxes than 6 kg. With increase of preservation time, decreased quality and quantity of fruits.

Keywords: Grape, Shelf-life, Cold-room, Disinfection, Cultivars, Boxes contented, SO₂, Infected to disease.

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P-125

Spatial Dynamics of Grapes Production in Brazil Between 1975 and 2003

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Viticulture is an activity which creates employment and is adequate to provide economic and social sustainability to small family-based farms. For these reasons, it has been used in several regions of Brazil. More than 50% of grapes is consumed in natura; the remaining is processed to produce juices and table wines. The present work evaluates the spatial dynamics of grapes production in Brazil, between 1975 and 2003, using measures of asymmetry, and distance, and showing the center of gravity, for the years 1975, 1985, 1995 and 2003. The work used data from the Brazilian Statistical Service (IBGE), at the micro-regional level. It was found that grapes production is concentrated in a few micro-regions. Theil's concentration index (standardized to a maximum of 1) changed very little during the period, from 0,879 in 1975 to 0,842 in 2003. Throughout the period, only one micro-region was sufficient to reach 25% of grapes production, and between one and three to reach 50%. In order to reach 75% of total production, between 5 and 9 micro-regions were sufficient. Of the six micro-regions which were sufficient to reach 75% in 1975, four remained in 2003, while two left and were replaced by five new ones. These spatial changes were reflected in a persistence index (Jaccard's coefficient) of 0,3636 and a transvariation distance of 0,4091. The national center of gravity, which may not fall into a grapes producing micro-region, moved in the North direction. In 1975, it was in the Rio do Sul micro-region, in the state of Santa Catarina, while in 2003 it was in Avaré, in the state of São Paulo, with a terrestrial distance of 464 kilometers between these two points.

Keywords: agricultural dynamics, concentration measures, distance measures, center of gravity.

P-126

Hibernal Behavior of Different Grapevine Cultivars under Climatic Conditions of Bento Gonçalves-RS, Brazil.

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Chilling requirement and budburst prediction are important factors in deciding the pruning date and needs of chemical sprays for breaking dormancy in grapevines. However, there is lack of knowledge about these factors in the climatic conditions of southern Brazil, which usually show great daily thermal amplitude during the hibernal period. This work defines the chilling requirement and extension of dormancy period in grapevine, using a 10 year meteorological and phenological data series (1984-1993) of *Vitis vinifera* (Cabernet Sauvignon and Chardonnay) and *Vitis labrusca* (Concord) cultivars, in Bento Gonçalves, Brazil (29°09'44"S, 51°11'02"W, 640 m). These cultivars were selected due to the contrast in budburst date. Based on that data series (from April 1st to the budburst date in each year, for each cultivar), chilling hours (CH-10, 10°C as basis temperature) and chilling units (CU) were calculated, according to the Utah (UM), North Carolina modified by Ebert et al (1982), (NCM) and Erez Dynamic models (EDM). The results show that chilling requirements of C. Sauvignon and Chardonnay were, respectively, 955 and 836,6 CH-10, which correspond to 435.9 and 432.9 CU by UM; 479.7 and 462.15 CU by NCM; and 46.99 and 40.35 CU by EDM. Regarding to Concord, the chilling demand was approximately 922.9 CH-10, and the CU was respectively 430.45 by UM; 477.65 by NCM; and 45.26 by EDM. According to these results, the cultivars were classified as having high (C. Sauvignon), medium (Concord) and low (Chardonnay) chilling requirement, with hibernal periods of 171, 163, 157 and 146, respectively. Furthermore, the EDM was also the best fit model, correlated to CH-10 data and budburst date of grapevine cultivars, and could be useful in the prediction of budburst date.

Keywords: temperature, budburst, dormancy, chilling unit, mild winter.

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The Effect of Hydrogen Cyanamide on Breaking Bud Dormancy in cv. Niágara Rosada after previous Ethephon Application

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Since the decade of 1980, the grapevine Niágara Rosada *Vitis labrusca* has been cultivated in tropical climate regions. The vines are conducted in the arbor system and grafted on vigorous rootstock which are adapted to these conditions. Achieving a satisfactory bud dormancy breakage and a good development of sprouts in periods with minimum temperatures below 17°C constitutes a challenge. The application of 2,160 ppm ethephon before pruning induces senescence of the leaves and stimulates budburst. However, since these events occur in a non-uniform manner, the application of hydrogen cyanamide (HC) might become necessary. In periods with minimum temperatures above 18 °C the effect of ethephon is stronger which makes it possible to reduce the concentration of HC. The objective of this study was to determine the most appropriate HC concentration to induce budburst in grapevines that have been treated with 2,160 ppm ethephon approximately 12 to 18 days before pruning. The experiment was designed as a factorial 3 x 4, distributed at random in five blocks, being the first factor composed of tree pruning periods in fall, while the second consisted of four HC concentrations (0; 1.22; 2.45; e 3.67 %). Pruning was performed when the plants were defoliated to more than 95 % and were in stage 2 of Eichorn & Lorenz (1997). On the same day the pruning was performed, HC was applied on the last four buds, where the evaluations were carried out. In the hottest period, the 1.22 % HC afforded budburst indices over 70 %, which resulted in at least 1.2 sprouts per bud.

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The Location of the Removed Leaf in the Green Pruning Interfere in the Quality of the Grapes

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The removal of the leaves near the brunch is a recommended practice in viticulture, because it balance the relation between leaves and brunches, permit a bigger light penetration and bigger ventilation of brunches. Little is known about the nutritional and metabolic alterations provoked by defoliation. Another difficulty about the defoliation is the theory of source-drain, where removal of the leaf opposite to the brunch provokes negative influence on the quantity and quality of the fruit, it demands selective and manual defoliation, making it even more expensive. The objective of this research was verify the possible interferences that the location of the removed leaf presents on the quantity and quality of the fruit in grapes variety Niagara Branca and Concord, both *Vitis labrusca*, harvest 2007, at a vineyard located in Eldorado do Sul, Rio Grande do Sul. The treatments without defoliation (T1), the removal from the opposite leaf of the brunch (T2), removal of all leaves localized under the brunch (T3), removal of the opposite and under leaves the brunch (T4) and, removal of the leaves above the brunch (T5) were applied to the verasion. There were used six repetitions with experimental delineation based on casualized blocks and two plants each portion, and the means compared by Tukey test at 5% of probability. The weight of hundred berries was not influenced by the treatments, as well as total acidity, being °Brix on lower T5 in relation to the rest of treatments in both varieties. Niagara Branca presented higher pH in T5, but Concord presented inverse correlation

to the severity defoliation for the variable pH. Generally it can be observed that the defoliation until the brunch was not negative for variable analyzed on the grapes. The results refer to only a harvest, there for they need a continuation of evaluation to verify the real tendency obtained.

Keywords: *Vitis labrusca*, viticulture, physiology, defoliation

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Characterization of Physical-Chemistry Changes of Cabernet Sauvignon Grapes in Function of Cluster Thinning Per Plant

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The market competition has stimulated the winery to improve the management of vineyards and consequently the enological quality of grapes. In this scenario, winery from Serra Gaúcha Region have recently been recommended the used of clusters thinning. However, do not exist any criteria, according to cultivar and region conditions, that could refer the best level of cluster thinning to improve the enological quality and economic benefits. To verify the effect of this practical, was conducted an experiment in Bento Gonçalves-RS, cycle 2004/2005, using a vineyard of Cabernet Sauvignon, 8 year old, grafted onto the Paulsen 1103 rootstock, 1,5 x 3m spaced and trained in a head system with mixed pruning method (spur and cane). The treatments of thinning grapes were handily performed at the beginning of maturation (50% of the color change), leaving 5, 10, 20 and 30 clusters per plant and following the block-type delineation with 5 repetitions of 6 plants. With the reduction of cluster number per plant, a significant increase in the weight of clusters was promoted (+42.4%), but without changes in the skin/pulp relation and diameter and weight of berries. In the chemical analyses of berries, the thinning treatments favored the increase of pH and °Brix of must. In general way, although the reduction reached 83,3% in the number of clusters/plant, the maximum increase observed in the enological parameters of the grapes was only 3,4% in °Brix. Thus, this isolated practical of manage, based on trellis system, cultivar, and thinning levels used, we can concluded that it does not provide great improve in the enological quality of the grapes.

keywords: *Vitis vinifera*, management, enological quality.

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The Role of Defoliation on the Quality of Wine Grapes in Serra Gaúcha

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Defoliation is a common technique performed in grapevines to provide a better insulation and ventilation on grapes, as well to make easier the harvest procedure. The position in that the leaf is removed, however, has influence over the sap supply necessary for grape development. Consideretip, this study aimed to analyze the interference of the removed leaf position in terms of grapes quantity and quality. Such experiment was performed using Cabernet sauvignon e Merlot, both *Vitis vinifera* varieties cultivated in Veranópolis county (Rio Grande do Sul, Brazil). A Randomized Block Design

consisting of 3 repetitions and 4 treatments was performed, as follows: T1 (placebo – no defoliation), T2 (leaves closed to grapes were removed), T3 (shoot leaves under the grapes were removed) and T4 (shoot leaves under and in opposite position in relation to grapes were removed). Treatments were conducted during the color changing phase. After the harvest, 100 grapes were analyzed in terms of weight, total solid solubility, acidity and pH. No significance was verified in any of these variables for both grape varieties, indicating that defoliation procedure can influence grape color and ventilation, but it does not interfere in the internal characteristics of the grapes.

Keywords: defoliation, grape, *Vitis vinifera*, vegetal physiology, quality

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Maturation monitoring of variety Cabernet Sauvignon in São Joaquim, SC, Brazil

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The Brazilian wine grape growers have searched to improve the quality of their wines, looking forward to increase national consumption and the access of new international markets. The expansion to new productive regions and the increase of planted area with fine varieties stimulated the sector growth. Amongst these regions figures the Planalto Serrano Catarinense, especially São Joaquim town (1,293 meters of altitude), a reference by its excellent wines. The aim of this work was to monitor the maturation of the Cabernet Sauvignon variety cultivated in São Joaquim during the 2006/2007 season, in vertical trellising system. The space between rows and plants is 3 meters and 0.75 m, respectively, planted in December 2002. To monitor the maturation, 200 berries had been randomly collected each 7 days in different positions of the clusters. The soluble solid content, total acidity and pH had been evaluated for 12 weeks, from the beginning of the veraison - 31/01/07 - until the harvest - 17/04/2007. The total soluble solid content measure started at 12.9°Brix, until 21.2°Brix during the harvest. The total acidity varied from 350.0 to 111.3 meq/l during this period. The measures of pH increased from 2.67 to 3.31. The maturation index presents an adequate maturation degree to produce high quality wines. Exceptionally, the precipitation in the end of the cycle affected the grapes quality during the maturation period. However, the variety Cabernet Sauvignon presents good adaptation and a great potential for wines elaboration in the regions of high altitude of Santa Catarina, southern Brazil.

Keywords: *Vitis vinifera*, total soluble solid, total acidity, pH, fruit composition, fruit quality

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Characterization of Cabernet Sauvignon Wine Made With Grapes from Campanha Region - RS

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The Campanha region in the State of Rio Grande do Sul (Brazil) has gained focus on the topic of grape production specifically 'Cabernet Sauvignon', 'Merlot' and 'Tannat'. Due to the edafoclimatic peculiarities as sandy soil, good thermal amplitude and sunshine and low rainfall during the ripening period it is supposed that the wine of this region, in especially Bagé city, might have particular typicity. However, as being a recent activity in the region the data referred to grape ripening and wine quality are little. Following this context, at 2004 and 2007 vintages it was aimed to characterize the Cabernet Sauvignon wine made in this region. As reference parameters it was also vinified

grapes of the same cultivar from vineyards of Serra do Sudeste and Serra do Nordeste of the state of Rio Grande do Sul. The grape of each vineyard was harvested and submitted to microvinification. In one of the vineyards in 2007 (Bagé - RS) was measured the late harvesting of grapes on wine quality. In general, the Bagé wines results from the 2004 vintage pointed to good alcohol content and dry extract, but no efficiency on intensity and shade of color. This is probably due to the decrease of acidity during vinification reducing the stability of anthocyanic compounds. The over-ripeness of Carbenet Sauvignon grape during 2007 vintage is an alternative of color and alcohol increment in the wines of Bagé - RS. There was no effect on total acidity whether compared to conventional harvesting or industrially recommended. The high levels of K detected might be one of the factors that contributed for the low total acidity, high pH and color destabilization.

Keywords: *Vitis vinifera*, grape quality, color, ripening

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Effects of Different Levels of Summer Pruning on Quality of Merlot Grapevines Cultivated in Mountain Regions of Santa Catarina State

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The production of grapevines in mountain regions of southern Brazil is pioneer and there is little information about the correct management decision on the vineyards. Scientific data indicates that an adjusted summer pruning can increase total soluble solids (TSS) and pH. The experiment was conducted at the Villa Francioni Vineyards in the city of São Joaquim (28°17'S, 49°56'W), at altitude of 1360 meters, with cv. Merlot grafted on Couderc 3309 rootstock. The objective of the present study was to determine the influence of different levels of summer pruning on the quality of the grapes. The treatments were T1 – without pruning the main shoot and removal all the axillary shoots keeping a leaf area of 2,5m²; T2 – summer pruning of the main shoot keeping a leaf area of 2,6m²; T3 – control, without summer pruning and without removal of axillary shoots keeping a leaf area of 4,4m²; T4 – summer pruning of the main shoot and removal of all the axillary shoots keeping a leaf area of 1,5m². The variables tested were diameter of berries, weight of 25 berries, pH, ° Brix, acidity, anthocyanin and phenolic contents. The experimental design was conducted in a randomized block design, with 4 replicates. The data found indicated that T1 had better results for acidity and anthocyanin contents. T2 had better results for phenolic contents. T4 had the worse result for ° Brix, the other treatments didn't present difference for that variable. T4 and T2 were better for weight of 25 berries. The treatments did not present difference for diameter of berries and pH.

Keywords: *Vitis vinifera* L., canopy management, anthocyanin contents, phenolic compounds

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Fertility of buds and their location on canes of grapevines in mountain regions of southern Brazil

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The viticulture in mountain regions of Santa Catarina State is expanding; however, little information is available referring about the morphologic behavior of the cultivars for the highlands regions conditions. The objective of the present study was to determine the behavior and the location of fertile buds on canes of grapevines, which could aid correct pruning management on the vineyards.

The experiment was conducted at the Villa Francioni Vineyards in the city of São Joaquim (28°17'S, 49°56'W), at altitude of 1360 meters in the season 2006/2007, with the Sangiovese, Nebbiolo, Syrah and Sauvignon Blanc cultivars grafted on Paulsen 1103 root stock. The vineyard was four-year-old and trained in a horizontal bilateral cordon, planted in a 3.0 m x 1.2 m spacing. The bud fertility was defined verifying the presence of floral primordium and its location on the cane was defined according the position, since the first bud (next the cordon), until tenth bud of the cane from each cultivar. For the altitude conditions the cv. Nebbiolo presented low bud fertility potencial on spur-pruning. It was verified a large variation on the position of fertile buds on the cane. The fertility increased from the second bud to the top of the cane.

Keywords: *Vitis Vinifera*, Vitiviniculture, Floral buds.

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Plastic Cover Effect on Grapevine Yield

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The POC (Plastic overhead cover) has been considered an alternative to minimize the physical and biological damages in South of Brazil, because of benefits of the cover in microclimate, restricting the free water on leaves and fruits, which is the primary factor for fungal infections. The aim of this work was to evaluate the POC effect on the yield of grapevines. The experiment was conducted in 2005/2006 and 2006/2007 seasons, in Flores da Cunha, Rio Grande do Sul, Brazil, in a vineyard of 'Moscato Giallo', trained in "Y", and covered with an impermeable plastic cloth (2.65m x 160im), in 12 rows with 35m, being left five rows without covering (control). The plants were grafted onto the Kobber 5BB rootstock planted in a density of 3703 plants/ha (3.0 x 0.9m). In both areas, the microclimate was evaluated in presence of free water (visual register), temperature (T), relative humidity (RH) of the air, photosynthetically active radiation (PAR), wind speed (WS) above the canopy and close to the cluster. The yield components were evaluated in ten plants at random selected in each area, measuring: production per vine, cluster per vine, weight, and length of clusters, diameter and weight of berries and skin/pulp ratio. The POC increased the diurnal temperature at the canopy, but not influenced the relative humidity, decreased the PAR and WS and drastically the free water on the leaves and clusters. In the first season was not observed differences in yield between areas. However, in the second season the POC promoted a significant increase in the number of clusters per plant and, in the yield consequently. Results suggest that the plastic overhead cover did not affect the yield components and can be a tool to increase it in adverse conditions.

Keywords: microclimate, grape, physiology, budburst, production, plasticulture.

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Phenological Characterization and Thermal Requirement in Grapevines under Overhead Plastic Cover

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The plastic overhead cover (POC) of grapes is increasing in Brazilian vineyards aiming to reduce

physical and biological damages. The work aims at evaluating the POC effect on phenology behavior and thermal requirement of grapevines. The experiment was installed in 2005/2006, in Flores da Cunha, Rio Grande do Sul, Brazil, in a vineyard of 'Moscatto Giallo', trained in "Y" and covered with an impermeable plastic cloth (2.65m x 160im), in 12 rows with 35m, being left 5 rows without covering (control). The plants were grafted onto the Kobber 5BB rootstock and planted in a density of 3703 plants/ha (3.0 x 0.9m). In both areas, the microclimate was evaluated in presence of free water (visual register), temperature (T), relative humidity (RH) of the air, photosynthetically active radiation (PAR) and wind speed (WS) above the canopy and close to the cluster. The phenology had been followed weekly visually since the winter pruning until the leaves fall of 10 plants in each system (POC and control). The degree-days (GD°C) were calculated using 10°C as base temperature. The POC increased the temperature at the canopy and clusters levels, but did not have influence upon the RH. This system also reduced the PAR and wind speed as well as restricted drastically the free water on the leaves. Anticipation was observed on the beginning of budburst and veraison due to the largest GD°C proportionated by the POC. However, plants in POC had a delay in the evolution of maturation, which could be related to restriction of PAR on the clusters (-55%). To the total cycle was necessary 2079 GD°C in the covered area and 1847 GD°C in the control. The POC alters microclimate and vine physiology, which must be considered in the management of vineyard.

Keywords: microclimate, grape, phenologic behavior, budburst, plasticulture

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Grape Juice Characterization by its Free Amino Acid Composition

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Grape juice is an important segment of the Brazilian vitiviniculture, which production is concentrated in the Serra Gaúcha region, State of Rio Grande do Sul, Brazil. In average, over than 100 million kilograms are crushed each year for this purpose. Considering the economic and social importance of grape juice industry, an experiment was carried out with the objective to characterize Brazilian grape juice by its free amino acid composition. Four commercial grape juices made from American/hybrid varieties 'White Niagara', 'Isabella', 'Concord' and 'Ives' + 'Jaquez' (50% each one) were analyzed according to their free amino acid composition. Replicates of 1 ml samples of each juice were lyophilized and reconstituted by adding 0.5 ml of a sodium citrate buffering solution with norleucine as internal standard. Analyses were performed on an amino acid autoanalyzer. Sixteen amino acids were detected and considered, i.e., lysine, histidine, arginine, aspartic acid, threonine, serine, glutamic acid, proline, glycine, alpha-alanine, valine, methionine, isoleucine, leucine, tyrosine and phenylalanine. Besides the individual amino acids, three relationships were taken in account, i.e., alpha-alanine/arginine, alpha-alanine/proline and proline/arginine. The data were submitted to the principal component analysis. Results show that most variables had strong correlation mainly with factors 1 and 2. Indeed, factor 1 represented 46.37%, factor 2 36.39% and factor 3 17.24% of the total variation. 'White Niagara' grape juice was characterized by phenylalanine, tyrosine, isoleucine, leucine, proline, valine, glycine and the proline/arginine ratio. 'Isabella', by arginine, histidine and aspartic acid. 'Concord', by alpha-alanine and alpha-alanine/arginine and alpha-alanine/proline ratios. 'Ives' + 'Jaquez', by threonine, glutamic acid and lysine. This work is an important contribution to the characterization of the Brazilian grape juice made from American/hybrid varieties.

Keywords: Vitis, American varieties, 'Isabella', 'Concord', 'White Niagara', 'Ives', 'Jaquez'

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Towards the Developing of Well Adapted Grapes for Tropical Regions

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The association between proper pruning and irrigation practices has been made possible growing grapes (*Vitis* spp.) in tropical regions. Under these conditions, however, the physiological and sanitary behavior of most commercial varieties introduced from traditional temperate regions can be quite different. As a general rule, vegetative growing and yields are not stable. Besides, production costs are also higher as a result of the adoption of an intensive program of chemical interventions. Breeding program maintained by Embrapa Grape and Wine has been using *Vitis* genetic variability to contribute to the solution of problems resulting from lack of adaptation of traditional grape varieties. About 3.000 hybrids from crossings between several *Vitis* species, including wild tropical ones, are evaluated every year. Selected individuals are multiplied and evaluated on selection fields for 3-4 years. To be sure about these results, promising selections are propagated and a greater plot is evaluated for more 3-4 years. Depending on the purpose, this step can include sensorial analysis of table grapes, juice or microvinifications. Advanced selections are then tested on real yield conditions or commercial fields, for about 2 years. New cultivars are released only when this decision is also supported by growers. Usually, grape selection prerequisites are quality for processing or table, resistance to main diseases, particularly downy mildew (*Plasmopara viticola*) and powdery mildew (*Uncinula necator*), and bud fertility. Grape breeding program is using biotechnology tools as tissue culture, especially embryo rescue to the developing of seedless table grapes, and molecular markers also. In last years, five processing cultivars (Moscato Embrapa, BRS Lorena, BRS Rúbea, BRS Cora and BRS Violeta) and three seedless table cultivars (BRS Morena, BRS Clara, and BRS Linda) released by the program are presenting good performance in tropical conditions. Currently, about 200 table and processing advanced selections are under evaluation.

Keywords: *Vitis*, breeding, germplasm

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Effect of Summer Pruning, Cluster Thinning, Gibberellin and Fungicide Application on Bunch Rot Disease of Grapevine Cv. Thompson Seedless

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Two field trials with 15 years old grapevines cv. Thompson Seedless (highly susceptible cultivar) were conducted at Sadat City, Menofya governorate, Egypt. In these trials, treatments consisted of summer pruning (leaf removal , shoot removal , topping , the treatment with (leaf removal +shoot removal + topping) and the control vines (without summer pruning). An additional trial , compared the cluster thinning treatment with the control (without cluster thinning). All plots were established in a split -plot design with or without fungicides or gibberellin application . The above mentioned treatments were applied during the growing season starting at full bloom till veraison stage (the beginning of ripening) in order to control grapevine bunch rot disease . The obtained results showed that the disease incidence and severity of bunch rot were best reduced by using any of the used gibberellin treatments compared to that of untreated vines. The greatest reduction in disease incidence and severity was occurred in the treatments with three sprays of gibberellin when the flower cluster was 10 cm³ long, Full Bloom and 6mm in berries diameter stage which summer pruning is done. In additional trial, cluster thinning also reduced disease incidence and severity in nonsprayed control compared to the nonsprayed control (without cluster thinning). The greatest reduction in disease

incidence and severity was recorded from the treatments with three sprays of the fungicide (Euparen M) at bloom, pre-close and veraison. Also, the produced fruit yield from treated vines was significantly higher during the first and the second seasons in comparison with that of untreated vines

Keywords: bunch rot, disease incidence, disease severity, gibberellin

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Characterization of Fine Table Grapes Produced

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The fine grapes culture, in the South half of the Rio Grande do Sul, State, has great importance concerning the production of fine wines. However, its potencial for in natura consumption remains under exploited. Thus, an experiment in a vineyard protected by plastic covering, was carried out, in Canguçu city, in the South Region of the Rio Grande do Sul, in the 2006/2007 seasons. The objective was to characterize the production of table grape cultivars Italy, Benitaka and Elegante Lady, under protected environment. The experiment was conducted randomly, with 10 replications (clusters). The studied factors were: varieties (Italy, Benitaka and Elegante Lady) and insertional position of the berries in the cluster (shoulder, medium and basal). The clusters were randomly harvested (01 of March of 2007) in the orchard, and were taken to the genetic breeding laboratory of Embrapa Clima Temperado. The following character evaluated: weight of cluster, berries and peduncle, length and diameter of cluster and berry, soluble solids contents (°Brix) and berries colour. The results showed that, Italy (26.1 mm) and Bentitaka (25.88 mm) have larger berries than Elegant Lady (24.19 mm); Italy (17.47° Brix) and Elegant Lady (17.42° Brix) have superior soluble solids contents than Bentitaka (14° Brix); Elegant Lady (1.517 g) have higher cluster weight than Italy (1.266 g) and Bentitaka (906.1 g); and higher cluster length were observed for Italy, Elegant Lady, compared to Benitaka (30.2 cm, 29.62 cm and 26.27 cm, respectively).

Keywords: Viticulture, Italia, Benitaka, Elegante Lady, protected environment

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Rest Completion and Growth of 'Thompson Seedless' Grapes as a Function of Temperatures

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A research was carried out over three seasons from 2000 to 2003 in order to establish the effect of temperature on phenological development of 'Thompson Seedless' grapevine in the Aconcagua Valley, Chile (32°45 S, 600 m.a.s.l.). Winter chilling requirement to break dormancy was determined by different models, which were compared according to Ashcroft et al. methodology (1977). Grapevine development since dormancy breaking was characterized based on growing degree-hours (GDH) and degree-days (DD). It was concluded that Utah model was the least variable model for rest estimation, with 430 chilling units up to dormancy break, which would have occurred between June 6 and June 17 for years between 2000 and 2003. Heat requirement from rest completion up to full bloom were 9,451 GDH, 451 DD and 45 days, and 28,532 GDH, 713 DD or 76 days were required from 4 mm berry up to harvest. In order to validate heat requirements for berry growth, phenological stages were estimated for season 2003-2004, the more accurate estimation was obtained when GDH were used.

Keywords: *Vitis vinifera*, chilling models, dormancy, heat requirements.

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Morpho-Anatomical Observations During Bud Break in *Vitis Vinifera* L.

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The widespread distribution of grapevine is due to their large genetic variability, as well as the relative low chilling requirement of buds to overcome winter dormancy (50-400 h at < 7°C). Irregular bud break, reported when grapevine don't receive sufficient winter chilling, can cause poor uniformity of fruit development, while, has been showed that grapevine budbreak usually improve with increased exposure to chilling temperatures (Dokoozlian, 1999). The Baggioolini phenological scale (1952) was the first proposed for grapevine, characterised by simple descriptions of stages between budburst and setting. Following more specific scales has been realised: Eichhorn and Lorenz (1977) and BBCH (ZADOKS et al., 1974, Rack et al., 1992) systems with transitional stages. Among the dormant and 'woolly' bud, occur important weak changes corresponding to some sub-phases, that aren't correctly studied and that could be the early signal for bud break dormancy. The 'greentip' bud stage (07) is generally considered indicative of 'budbreak', but is a stage of difficulty identification, because its length can be very short (Lavee, 1997). The aim of this study was to explore the first phases of bud sprouting from a morphological point of view, to better define the phenological bud changes and to find the sub-phase as clear indicator of budbreak under the climatic conditions of the Tuscan coastal area (Pisa, Italy-lat. 43,02 N, long. 10,36E). Plant material was constituted by two diffused cultivars of *Vitis vinifera*: 'Cabernet Sauvignon' and 'Sangiovese'. After the 1250 Chilling Units (CU) cumulated, the dormancy breaking was evaluated on two-node segments, by forcing method (18 days at 25°C, 60-70% relative humidity, 12/12 h photoperiod). The evolution of bud opening was observed by noting the phenological stages (BBCH scale) reached in two-to four-day intervals, under forcing and field conditions. Morpho-anatomical evolution of bud tissue was made on fresh material under stereomicroscope. During the observation the heat requirement (GDH) was calculated. The two cultivars showed a different GDH requirement. In both genotypes the first stages of bud evolution were distinguished. In relation to the morphological characteristics, the stage 03 (bud scales opening) could be a possible early indicator of bud break in *Vitis vinifera*.

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Leaf Spray Fertilization of Boron and Zinc on Productivity and Fruit Quality of Grape Niagara Rosada cv.

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The leaf spray fertilization has been the form more used to apply micronutrients. Commonly the salts, oxides and quelates are used as sources. However, the micronutrients have low mobility or are almost immobile in the phloem. The B and Zn application must be more studied because they are elements which deficiencies appear in larger frequency in the crops and they are responsible to the formation and quality of the fruits. In this context, the objective of this study was to verify the effect of the leaf spray fertilization of B and Zn on the productivity and fruit quality of the grape Niagara Rosada cv.. The experiment was conducted in Brazilian savannah area, in the Experimental Farm of 'Universidade Estadual Paulista', from 2004 to 2006, in Selvíria-MS, in southeastern Mato Grosso

do Sul State-Brazil. The climate is according to Köppen Classification, tropical wet and dry (Aw). Grape (*Vitis labrusca* L.) Niagara Rosada cv., grafted on IAC 572 'Jales' rootstock was used as well as doses of 110 g.ha⁻¹ of B and 250 g.ha⁻¹ of Zn in each application. The treatments were: T1. water, T2. boric acid, T3. zinc sulfate, T4. T2 + T3, T5. boric acid + urea + citric acid + EDTA, T6. zinc sulfate + urea + citric acid + EDTA, T7. T5 + T6, T8. boric acid + urea + citric acid + EDTA + sodium molybdate + sulfur + calcium chloride, T9. zinc sulfate + citric acid + EDTA + Fe sulfate + Mn sulfate + Mg sulfate and, T10. T8+T9. A randomized blocks design was used and the averages were compared by Tukey test. The boron sources used were not efficient to supply B to the plants; the zinc sulfate and the products with quelating agents plus zinc were efficient to supply Zn to the plants; the productivity of grape was not influenced by the leaf spray of B and Zn, the leaf spray fertilization of boric acid plus quelating agents in the second crop increased the berries diameter and did not influence the other components of the fruit quality.

Keywords: grape, *Vitis labrusca* L., quelate, micronutrient

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Behavior of Seedless Grape Cultivars under Tropical Conditions in Brazil

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Most table grapes grown in Brazil, especially 'Niágara Rosada' (rose mutant of "Niagara"), the cultivar Italia and its mutants Rubi, Benitaka and Brasil, have seeds. This study aims at evaluating the yield potential of the seedless cultivars Thompson Seedless, Flame Seedless, Ruby Seedless, Marroo Seedless, Loose Perlette, Pasiga, Imperatriz e Emerald Seedless, grafted on rootstock 'IAC 572', under tropical conditions in the Northeast of the state of São Paulo. The vineyard used, conducted in the bower system with 3.00 x 5.00 m field spacing, was submitted to two cycles a year, one for shoot formation (pruning being performed on spurs), the other one for production (pruning performed on canes with 18 buds per cane). In the first cycle of spur pruning initiated in the rainy mid-summer, the growth of 6 shoots per plant on three plants per cultivar was observed through weekly measuring of their length and counting of the nodes. In the third cycle, the second with long pruning, initiated at the end of winter, the pruning weight and the real fertility (FR) for each bud position after budburst were evaluated. All cultivars showed excess of vigor, with elevated growth rates of the shoots up to the 12th week after budburst, elevated pruning weight (over 4.60 kg plant⁻¹) resulting in low FR, except for 'Marroo Seedless, whose average value was 0.60 despite the high pruning weight of 4.65 kg plant⁻¹. The cultivars with medium FR were: Flame Seedless (0.22), Ruby Seedless (0.22), and Loose Perlette (0.27). The cv. Thompson Seedless achieved a medium growth rate of 4.00 cm day⁻¹ until approximately 120 days after pruning. The medium pruning weight was 5.20 kg plant⁻¹ and the medium fertility was 0.17 between the 5th and the 18th bud.

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Control of Rot Diseases in Cabernet Sauvignon by the Use of Plastic Cover of Vineyard

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During the grape maturation period in the Serra Gaúcha region, Brazil, the high frequency of precipitation usually promote the incidence of rot diseases, which have poor chemical control. This problem tends to be stronger in *Vitis vinifera* cultivars promoting losses in production and quality. The plastic cover could be a useful technology to avoid these problems and with this idea the present experiment was conducted in Bento Gonçalves-RS, cycle 2007, using a 10 year old vineyard of Cabernet Sauvignon/Paulsen 1103, 1.5 x 3m spaced and trained in a head system with mixed pruning method (spur and cane). The treatments were rows without (control) and with plastic cover, employing plastic of low density polyethylene (200 microns, 2.6m x 30m, placed during the pruning). The design was a randomly block-type, with four blocks. The fungicide sprays were performed only in the control areas according to the needs. The evaluations were done during the harvest, determining the severity (percentage of damaged clusters in regard to the total grapes by cluster) of Ripe rot (*Glomerella cingulata*). Furthermore, was also observed the incidence (percentage of infested cluster in relation to the total clusters per plant) of Botrytis (*Botrytis cinerea*) and Sour rot (bacteria and fungal). The plastic cover treatment reduced drastically the severity of Ripe rot in clusters of C. Sauvignon (94,5% in control area and 10,9% in covered area). The same effect was also observed with the incidence of Sour rot (from 13,7% to 1,6%) and Botrytis (from 1,87% to 0%). In general, the results show that the plastic cover can be a useful technology to rot disease control and also to reduce the needs of chemical sprays in the vineyards.

keywords: *Vitis vinifera*, Fungal disease, Plasticulture.

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Evaluation of Alternative Products for Breaking Dormancy in Grapevine.

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Nowadays to improve the budbreak in grapevine hydrogen cyanamid has been used frequently as a guarantee for good production and quality. Although it is an effective product, its use has been questioned because of its high toxicity degree. In search of a sustainable in the sector, the goal of this work was an analysis of an organomineral fertilizing and extract of garlic as alternative products for budbreak in grapevine. The experiment was conducted in Bento Gonçalves - RS, using 95 plants of cv. Chardonnay, at 12 years old, graft on Paulsen 1103 rootstock, trained in a Lira system. The treatments were applied in February 2007, at random design with 5 repetitions (plants), simulating the management and the dormancy that happen in tropical conditions. The plants were previously treated with Ethrel (1.5%) and after 15 days each plant was pruned in 8 cane with 10 buds each. These buds were submitted to the following treatments: 1) negative control (water); 2) positive control (hydrogen cyanamide-Dormex®) in doses of 2.5%, 5% and 7%; 3) fertilizing organomineral (Erger G®) in doses of 5%, 7% and 10% in mix with or without calcium nitrate in 10% or 20%, and 4) extract of garlic (Bioalho®) in the doses of 5%, 10% and 20% in a mix with or without mineral oil 2%. After the applications, the budbreak (green tip) was monitored every 3 days. The results point out that the organomineral fertilizer and the extract of garlic, with or without mineral oil, have positive effect on budbreak, comparing to the negative control. These products also promoted the same maximum levels of budbreak comparing to the positive control, being Erger G®5% + NCa 10% and Bioalho®

10% + OM 2% the best dosages of this alternative products. However, both the products had a delay of 12 days to get the maximum budbreak as observed with hydrogen cyanamid.

Keywords: *Vitis* sp., hydrogen cyanamide, extract of garlic, fertilizing organomineral.

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Developing Subtropical Stone Fruits in Taiwan

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Taiwan, situated on the western edge of the Pacific Ocean, is transversed by the Tropic of Cancer and has a summer rainy season in a subtropical climate with a warm winter - the limiting factor for producing traditional temperate zone deciduous fruits. Local stone fruits (peach, plum and mume) varieties in Taiwan originated from genotypes brought by immigrants from southeast China about 1600 to 1700 AD. These stone fruits may not have the fruit quality (size, skin color, aroma and brix, etc.) to compete in the modern fruit market, but these germplasm have good adaptation, 50-100 chill units (cu), to Taiwan winters and tolerance to the hot and humid summer climate and can be grown with mango, papaya and banana in the subtropical lowlands. For developing low-chill, high quality stone fruits, more than 350 peach and plum cultivars were introduced from Brazil, Japan, South Africa, and the United States (Florida) in the last 20 years and crossed with Taiwan local varieties. The characteristics of new selections including subacid peach, nectarine, peento, sweet skin plum are discussed in this paper. Tree and fruit characteristics of 17 native mume varieties are reported also.

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Elicitors of Decay Resistance Reduce Postharvest Losses in 'Fuji' Apples

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Two experiments were carried out to evaluate the effects of fruit treatment with elicitors of decay resistance on ripening and rot incidence of 'Fuji' apples. In the first experiment, to assess the effect of elicitors of decay resistance on fruit ripening, apples were treated by immersion (2 minutes) in water (control), in a complex of organic acids and bioflavonoids (at 2mL L⁻¹), or in a mannaoligosaccharid derivative of the leavening wall (at 2 and 5mL L⁻¹). In the second experiment, to assess the effect of elicitors of decay resistance on the rot incidence, fruit were needle punctured (two equidistant lesions) at the equator region (2mm in diameter and 2mm deep) and then treated by immersion (2 minutes) in water (control), in a complex of organic acids and bioflavonoids (at 2mL L⁻¹), in a mannaoligosaccharid derivative of the leavening wall (at 2 and 5mL L⁻¹), or in potassium phosphite (at 2mL L⁻¹). Twenty four hours latter, fruits lesions from all treatments were inoculated with 10L of spores suspension. The elicitors of decay resistance did not affect fruit ripening, but reduced diameter of lesions and the incidence of the rots, especially in fruit treated with mannaoligosaccharid derivative of the leavening wall at 5mL L⁻¹. The results show that elicitors of decay resistance might reduce postharvest disease by other means than that related to ripening delay in 'Fuji' apples.

Keywords: *Malus domestica* Borkh., fruit, postharvest, ripening, disease.

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Epidemiology of Glomerella Leaf Spot: The Main Apple Disease in Brazil

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The Glomerella Leaf Spot (GLS) was related for the first time in Brazil in the Parana State in 1983, and later, the disease disseminated to others apple production regions in Brazil. In the Santa Catarina State orchards, three species of *Colletotrichum* are related to GLS. After the establishment of the GLS in the decade of 1980, the number of fungicide sprays increased a lot. So, the greenhouse, in vitro and field trials were carried out in order to develop a GLS prediction model aimed to reduce the use of fungicides. In the growth chamber assays was observed that 16°C is the temperature limit to disease establishment that is in agreement with field assessment, where the disease symptom appeared after three consecutive rainy days with temperature over than 15°C. At 16°C and 12 h of leaf wetness period (LWP), the symptoms was absent or light (1-2 lesions/leaf), and at 20°C the disease severity varied from light (5-25%) to severe (>50%). In another trial, small specks was observed in inoculated plants maintained at least 72 h in a mist chamber at 12°C. Temperatures ranging from 12o to 16oC during one LWP is frequent in the highlands (>1.300 m of altitude) of Santa Catarina State. On other hand, temperatures during LWP varying from 20o to 24oC are usual in regions with altitudes below 1.100 m. These results were used to elaborate a prediction model for GLS and a model was tested in the Lapa County, Paraná State, during the season of 2005/06. The agrometeorological data were processed to calculate the daily severity value of GLS. When the sum of this value in the last 3 days was 2.5 was considered an infection period, and then the fungicide was applied. The disease incidence in the leaves after 15 sprays (from September, 26 to December, 28) was 6,6%, similar to 4,5% of the apple grower system using more fungicides. Besides of the efficiency of this disease prediction model, there was an operational difficulty because the short incubation period of GLS and lack of curative fungicides to control this disease. The conclusion was that is necessary to integrate the weather forecasting with the disease prediction model to optimize the control.

Keywords: Glomerella leaf spot, Epidemiology of Glomerella leaf spot, Apple disease

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Patogenicity of *Colletotrichum* spp. Isolates from Several Hosts on Peach Fruits Cv. Aurora Artificially Inoculated by Wounding

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Rio Grande do Sul State is the most important peach producer in Brazil. However, the yield (6.4 t/ha) is low if compared to other States. Among other reasons, diseases account for that reduction. Anthracnose, caused by *Colletotrichum* spp., can cause lesions on fruits and shoots of this species, raising considerable losses, especially if the weather conditions are favorable. For this reason, cross inoculation studies related to pathogenicity of isolates from different hosts are very important to investigate rather an isolate can cause disease in other hosts. The objective of this work was to evaluate the pathogenicity of 64 isolates of *Colletotrichum* spp. on peach fruits 'Aurora' cv. The *Colletotrichum* species, *C. acutatum* and *C. gloeosporioides* were isolated from erva mate (1 isolate), guava (2), feijoa (2), orange (2), apple (1), papaya (2), mango (2), passion fruit (2), blueberry (1), strawberry (6), peach (5), red pepper (27), sweet pepper (4), pitanga (2) and grape (1). The inoculation was carried out using mycelium discs (5 mm) of the fungi cultivated on BDA medium, which were placed over the peach fruits. The evaluations were done by measurement of the lesion diameter every two days after inoculation, until the sixth day. The inoculated fruits were incubated at 25°C and maintained in humid boxes. All the peach isolates were pathogenic to peach fruits, but the isolate 23 showed

a small lesion when compared to the other isolates. The isolates showed variable pathogenicity. Some isolates from other hosts developed bigger lesions than that caused by peach isolates. The results suggest the non-specificity from this genus, when peach fruits were artificially inoculated by wounding.

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Control of the Oriental Fruit Moth, *Grapholita Molesta* (Lepidoptera: Tortricidae), Using Entomopathogenic Nematodes (Rhabditidae: Steinernematidae and Heterorhabditidae).

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The oriental fruit moth *Grapholita molesta* (Busck, 1916) is considered one of the major pests in the temperate climate fruit culture standing out as the most important pest in the cultivation of the peach and apple trees. This pest causes production loss from three to five percent, in the late cultivars, during harvest or implantation of the orchards, when it affects the growth of the plants. The Biological Control using entomopathogenic nematodes (EPNs) as control agents is considered a viable alternative as they present a vast array of hosts, search behavior high virulence, and safety to vertebrate and plants. This paper aimed to evaluate the susceptibility of isolates native of EPNs coming from different regions of the Rio Grande do Sul State, on Pupae of *G. molesta*. Pupae were distributed in plates in 24 cells containing sterilized sand at a proportion of 1:1 (larvae/cell), inoculated in concentrations of 100, 500 and 1.000 IJs of six isolated natives EPNs and underwent the control treatment using the sumithion 500 EC (150 mL/100 L water). After being kept in climatized chambers during different times (24, 48 and 72 hours) at 25°C, RH 70 ± 10% and photo phase of 14 hours, the mortality of the larvae was checked by the entomopathogens. The highest larvae mortality occurred with the use of the insecticide sumithion 500 EC (91, 6%), considered as control treatment. The isolated that presented higher mortality of *G. molesta* pupae were: *Steinernema* sp. Nema 8, *Heterorhabditis* sp. Sample 16, and *Heterorhabditis* sp. Sample 17, with 71, 5, 64, 2 and 56%, respectively. There was no significant difference among the concentrations tested and the highest mortality of larvae took place 96 hours after the treatments. However, these isolates can be considered an alternative of biologic control of this plague, and can be used in MIP programs along with other control methods. New experiments must be carried out in order to optimize the efficiency of these entomopathogens in future field use.

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Soluble and Insoluble Sugar Foliar Contents in Grapevines Syrah and Moscato Canelli Submitted to Different Rootstock and Irrigation Strategies During two Production Cycles at São Francisco Valley, Bra

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One of the main difficulties of grapevine cropping is to maintain an ideal balance of sugar distribution within the plants, that is related to their vigor, which is influenced by environment and cultural practices. Among the practices that control the excessive grapevine vigor, less vigorous rootstocks and controlled

deficit irrigation are the most applied. The carbohydrate metabolism in grapevine leaves is influenced by a wide range of internal and external factors, such as environmental and hormonal stimuli, as well as, phenological stages. The objective of this work was to evaluate the influence of two irrigation strategies and two rootstocks on the leaves sugar metabolism of wine grapevines (Moscato Canelli and Syrah) during two production growing seasons. The essays were conducted during the second semesters of 2005 and 2006, at Embrapa Tropical Semi-Arid, at Petrolina, State of Pernambuco, Brazil. The experimental design was randomized blocks in a 2x2 factorial squeme, with five replication. The factors were irrigation strategies (PRD, partial rootzone drying; RDI, regulated deficit irrigation) and rootstocks (IAC 572 and 1103P). In the PRD treatment, there were two irrigation tubes per row with two emitters per vine (one in each side of the trunk), while in RDI vines there was one tube per row with three emitters per vine. Consequently, to apply the same amount of water to both treatments, the irrigation time was different. Seasonal and diurnal variations were evaluated for leaf contet of total soluble sugars, reducing sugars and starch at the beginign and at the end of cluster maturation and at different hours of the day (6, 13 and 18 hours). For both cultivars during the two growing seasons, the sugar metabolism in leaves was more affected by rootstock than irrigation strategies.

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