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Winter 1979

Blueberry Progress Reports

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D. E. YARBOROUGH

BLUEBERRY PROGRESS REPORTS

MAINE LIFE SCIENCES AND AGRICULTURE EXPERIMENT STATION
and
MAINE COOPERATIVE EXTENSION SERVICE

Prepared for

THE MAINE BLUEBERRY COMMISSION
and the
UNIVERSITY OF MAINE BLUEBERRY ADVISORY COMMITTEE

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Weed Control in Blueberry Fields

Personnel:

Amr A. Ismail

Mission of Project:

To improve blueberry production and facilitate harvesting by developing new or improved methods of controlling weeds in blueberry fields.

Specific Objectives:

1. Evaluate herbicides for the control of grasses, sedges and flowering herbaceous weeds.
2. Evaluate herbicides for the control of woody weeds (lambkill, barrenberry, poplar, etc.), with emphasis on barrenberry control.
3. Develop equipment and methods for application of herbicides for selective or general control of various weed species in blueberry fields.

Status of Current Research:

1. The duration of effectiveness of terbacil (Sinbar) and terbacil/diuron (Karmox) in controlling grasses, sedges and certain flowering herbaceous weeds is being evaluated. The effect of these treatments on blueberry growth is also being determined. Plots are located in several fields in four counties.
2. Aerial application of terbacil, terbacil/diuron, and terbacil/princep (Simazine) is being studied at five locations in Hancock County. The effect of these treatments on herbaceous weeds and blueberry growth is being determined. Comparison between air and ground methods of application of these herbicides is in progress to identify practical and economical application methods that are adaptable to the topography and conditions common in lowbush blueberry fields.
3. In progress are studies to determine the effectiveness of 2,4-D and glyphosate (Round up) applied at different rates and on different dates for lambkill control in blueberry fields. The effect of these treatments on blueberry plant stand, growth and yield are also being determined. Plots are located in Township 19MD.

Significant Research Accomplishments:

1. Pursuing leads that were earlier identified by M. F. Trevett the present research (extending over 5 years and 30 locations) confirmed that terbacil and a mixture of terbacil and diuron were effective in controlling grasses, sedges and certain flowering herbaceous weeds in blueberry fields under a wide range of field soil and moisture conditions. This was accompanied by significant increase in yield and ease of harvesting. Yields of 8,000(+) pounds per acre were obtained from some treated plots. Findings from this research and other available information indicate that obtaining yields of 6,000-10,000 pounds per acre is quite possible from existing native lowbush blueberry fields with the adoption of certain cultural practices. Some growers who adopted grass control in their fields harvested yields up to 5,000-6,000 pounds per acre. In 1978, which had a dry summer, fields treated with terbacil (in 1977) out yielded adjacent nontreated fields.

2. Terbacil and terbacil/diuron treatments were found to result in increases of the number of fruit buds of unbranched blueberry stems, number of branches on branched stems, number of fruit buds per branch, the fruit bud ratio of unbranched and branched stems and the total number of fruit buds per blueberry stem. These increases could be responsible for the significant increase in blueberry yield noted in fields treated with terbacil and terbacil and diuron for grass control.
3. Terbacil/diuron and terbacil/princep treatments suppressed the growth of golden and silver rods. Goldenrod became a conspicuous problem in fields treated with terbacil alone. The problem was greatly aggravated with the application of nitrogen fertilizer. Terbacil/princep showed more suppression of goldenrod than terbacil/diuron.
4. Registration status for terbacil and diuron:
 - a. Terbacil; ground application - was registered in 1977.
 - b. Terbacil; air application - label approval is expected in April, 1979.
 - c. Terbacil/diuron tank mix; ground and air application - label approval is expected in April, 1979.
5. Development of a spraying and marking system that is adapted for the special conditions (irregular terrain, no rows, etc.) encountered in lowbush blueberry fields. Because of practicality, strength and simplicity, the spraying equipment was well received and quickly duplicated by blueberry growers.
6. A segmented weed roller, for selective application of herbicides on weeds taller than blueberries was developed, evaluated and proven effective. Eight large segmented weed rollers were constructed for use by blueberry growers in controlling the numerous woody weeds present in their fields.
7. A small self-propelled weed roller, for selective application of herbicides on weeds taller than blueberries was developed for use by growers with small acreage. The roller was tested and found to be effective. Twelve small self-propelled weed rollers were constructed by interested blueberry growers.
8. A system for barrenberry control in blueberry fields was proposed, tested and proven to be practical. The system utilizes the application of nitrogen fertilizer to stimulate the growth of barrenberry causing differential height between barrenberry and blueberry stems. Herbicides could then be selectively applied to the taller barrenberry plants using the improved segmented roller.
9. Both glyphosate and 2,4-D, when applied selectively to tall barrenberry plants using the aforementioned roller and system, were found to be effective in controlling barrenberry plants without adversely affecting blueberry plant stand, vigor or yield.
10. Both glyphosate and ~~OF EO~~ were found to effectively reduce lambkill plant stand without adversely effecting blueberry plant stand, vigor or yield. These findings confirm earlier reports and recommendations relevant to the use of 2,4-D for lambkill control and have identified a second herbicide (glyphosate) for possible use in controlling lambkill in blueberry fields. Additional studies are needed, however, before the use of glyphosate in blueberry fields for weed control is recommended.

Impact of Research:

This research provides essential information on the ability of certain herbicides to control specific weeds, and the effect of their application on blueberry plant growth and yield.

Blueberry growers will benefit by being able to control certain weeds in blueberry fields and improve their productivity, increase ease of harvesting, reduce costs, and improve the quality of the blueberry pack.

Research Plans for 1979:

1. Continue evaluation of the effectiveness of aerial application of terbacil, terbacil/diuron and terbacil/princep in controlling herbaceous weeds in blueberry fields. Initiate more aerial application plots using these herbicides to provide needed additional data on goldenrod suppression under different field conditions (soil type, weed population, moisture, blueberry plant stand, etc.).
2. Continue to evaluate plots to determine effectiveness of 2,4-D and glyphosate for lambkill control in blueberry fields.
3. Initiate studies to evaluate new herbicide materials for controlling weeds in blueberry fields:

VELPAR (a Dupont product)
KRENITE (a Dupont product)
ASULOX ← *Selective*

Pruning of Blueberries

Personnel: Amr A. Ismail

Mission of Project:

To improve blueberry production, reduce energy consumption and pruning cost.

Specific Objectives:

1. Evaluate the effectiveness of various pruning methods (mechanical, thermal, etc.) and time of pruning (fall and spring).
2. Determine the optimum method and frequency of pruning under various fertility and weed control treatments.

Status of Current Research:

Underway are active studies to:

1. Determine and compare the effectiveness of burning and mowing in the fall and spring, in combination with herbicide and fertility treatments, on the growth and yield of blueberries and on accumulation of soil organic matter. This study is expected to be of a long duration (6-8 years).
2. Develop mowing equipment that could be used for pruning blueberries with consideration given to lowbush blueberry growing habits and prevalent irregular field topography.
3. Develop and evaluate better burning equipment and method in order to reduce fuel consumption and conserve organic matter on the surface of the soil.

Significant Research Accomplishment:

1. Identified the feasibility of mowing as a pruning method for blueberries.
2. Blueberries pruned mechanically (mowed with a flail mower) yielded as much as those pruned by fire (oil or straw burn).
3. Determined that a "segmented system" consisting of several narrow mowers is more practical and efficient for pruning, under most field conditions, than a single large rotary mower.

Impact of Research:

Burning with fuel oil is currently the most practical method of pruning blueberries but is costly and destructive of the organic material on the surface of the soil. Fuel oil is a nonrenewable resource that is rapidly increasing in cost and becoming less readily available.

This research provides information on the effectiveness and practicality of different pruning methods and equipment. With improvements in weed control practices and fertility management, it may become possible to reduce the frequency of burning (possibly every 3 or 4 years) or substitute mowing for burning as a pruning method. The development of a more efficient burner would help reduce production cost and conserve energy.

Research Plans for 1979:

1. Continue the existing experiments to compare mowing vs. burning using flail mowers and an oil burner. Determine the effect of pruning method on blueberry plant growth and vigor and certain soil components. Plots are located in Pinio field on the barrens in Deblois.
2. Continue development and evaluation of mowing equipment, with emphasis on the development of a "segmented" flail mowing system.
3. Develop and evaluate a burning system with emphasis on the construction of an efficient burning head.

Integrated Management of Blueberry Fields

Personnel:

Amr A. Ismail

Mission of Project:

Develop and demonstrate an integrated management program that combines various cultural practices to achieve maximum yield of blueberries with decreased production and harvesting cost per pound.

Specific Objectives:

1. To evaluate the effects of various combinations of weed control and fertility practices along with irrigation, the use of honey bees for pollination, and pest management on the blueberry plants as well as other present plant species. The goal is to identify and demonstrate compatible and beneficial cultural practices and increase first crop production and possibly to produce an economical second year crop.
2. To identify plant growth habits and establish field conditions that will facilitate ease of mechanical harvesting.

Status of Current Research:

Plots have been established during the past four years. Several years are needed to evaluate and determine the most desirable combinations of cultural treatments and practices under different field conditions (weather, fields, soils, plants, etc.).

Significant Research Accomplishments:

Certain benefits as well as pitfalls of application of herbicides and fertilizer (at various levels) have been identified under commercial growing conditions. Production problems that need further attention or research by this project as well as others have been identified. Effective weed control has been shown to be essential before a progressive fertility program may be adopted.

Impact of Research:

If a combination of weed control, improved fertility and other compatible cultural practices can be combined in an effective field management program, there should be a substantial increase in the yield per acre and a decrease in the cost per pound for producing and harvesting blueberries.

Research Plans for 1979:

1. Maintain and evaluate existing management areas (5-20 acres at several locations in several counties) where herbaceous and woody weeds have been controlled, fertilizer applied and insects and diseases managed according to the latest research findings.
2. Establish new integrated management areas, as mentioned above, in additional locations. Establish irrigation treatment on new burn areas in addition to the various recommended cultural practices. Mowing as a pruning method will be practiced in some of these integrated management areas.

FACTORS REGULATING RHIZOME INITIATION AND
DEVELOPMENT IN THE LOWBUSH BLUEBERRY

Personnel:

Project Leader: - Dr. John M. Smagula
Cooperators: - Dr. Stewart Goltz, Dr. Paul Hepler, Dr. Alan Langille

Mission of Project:

To develop an effective method of accelerating rhizome initiation and growth that will permit more intensive management and increased yields from natural and cultivated blueberry fields.

Specific Objectives:

- a) To develop a method for in vitro culturing of lowbush blueberry tissue.
- b) To investigate the role of growth regulators in rhizome initiation and development.
- c) To study nutritional responses of the lowbush blueberry related to growth habit, particularly rhizome production.
- d) To study the effect of Promalin (a growth regulator formulation) on fruit set and yield of lowbush blueberries.
- e) To evaluate the influence of different bark mulches on growth and spread of the lowbush blueberry.

Status of Current Research:

- a) Tissue culture propagation of the lowbush blueberry using shoot tip culture is being investigated. The effect of physiological age of vegetative buds on tissue culture shoot regeneration will be studied by (1) identifying the characteristics of the "juvenility" stage of lowbush blueberry growth; (2) investigating methods of inducing juvenility in mature plants; and (3) evaluating the response of vegetative buds from juvenile and adult shoots to various tissue culture media.
- b) The effect of N fertilization on rate of clonal spread is being studied on Mr. Frank McGinley's farm in Eddington. Urea was applied at 0, 40, and 80 lb. N/A to treatment plots within each of 5 clones. Plots were treated with a combination of terbacil and diuron. Clonal spread, plant stand and concentration of nutrients within leaves will be measured during successive production cycles.
- c) Methods of introducing selected plant material into existing fields is being investigated. In a preliminary study, seedlings and cuttings were planted into tilled vs non-tilled blueberry soil, with or without a surface bark mulch. Plant survival will be assessed in the spring, 1979.
- d) Under greenhouse conditions, Promalin (GA₄ + GA₇ + Benzyl Adenine) at 12.5, 25, 50, 100 or 200 ppm stimulated lowbush blueberry blossoms to development into blueberry fruit in the absence of pollination.

The control plants produced no fruit. The number of fruit per plant, total fruit weight per plant and individual berry weight increased with increasing concentration of promalin. The seedless fruit which developed were small and did not have a uniform blue coloration.

In a field experiment conducted on Dick Merrill's land in Hancock, Promalin at concentrations from 12.5 to 200 ppm had no effect on the yield of 5 clones. However, pollination weather was ideal and the activity of honeybees brought into the field was excellent. Concentrations above 200 ppm will be tested during the 1979 season in areas of low bee activity and under conditions where bee activity is excluded using screened cages.

- e) The effect of duration of a 1000 ppm Gibberellic Acid (GA₃) treatment on germination of lowbush blueberry seed germination was studied in 1977. GA₃ treatment stimulated early seed germination compared to the controls. However, there was no significant differences due to treatment durations of 1/2 hour, 1, 3, 6, 10 or 15 days.

An experiment is currently in progress to determine the effect of a 24 hour treatment with GA₃ or GA₄ + GA₇ at concentrations of 1,000, 2,000, 3,000 or 4,000 ppm.

- f) An experiment was initiated in 1977 to compare urea (45% N), Peter's Acid Special (27-7-7), Osmocote (18-6-12) and Osmocote (14-14-14) for use during propagation of four lowbush blueberry clones by softwood cuttings. All fertilizer sources were applied at the rate of 72 lb. N/A. Water soluble urea and Peter's Acid Special were applied as a split application 6 and 8 weeks after sticking, while the slow release Osmocote sources were surface applied at the time of sticking the cuttings.

No significant differences were found among fertilizer treatments in respect to percent rooting, total number of branches per rooted cutting, dry weight of aerial portions of rooted cuttings, or percent N in aerial portions of rooted cuttings.

- g) The influence of four types of bark mulches on growth and spread of lowbush blueberry cuttings is being studied. The mulch treatments were bark, bark amended with nitrogen, composted sludge and composted sludge amended with sulfur; and their pH's at the time of application (June, 1977) were 6.8, 9.2, 7.9 and 7.2, respectively. The pH of all mulches decreased with time, and by October, 1978, the pH of the bark, bark + nitrogen and composted sludge + sulfur ranged from 5.3 to 5.9 and were not significantly different. The unamended composted sludge had a pH of 6.8 which was significantly different from the other mulches.

Neither the presence nor type of bark mulch had any significant effect on plant survival. However, the clones differed greatly in their survival; only 43% of Clone A (Augusta) survived compared to 93% of Clone B (randomly selected).

Significant Research Accomplishments:

- a) Application of fertilizer to cuttings during rooting has stimulated branching, increased the N status of plants and resulted in greater rhizome production under field conditions. Studies on timing of fertilizer application and types of fertilizer have led to the standard practice of applying urea at the rate of 36-72 lbs. N/A as a split application 6 and 8 weeks after sticking the cuttings.

- b) Treatment of lowbush blueberry seeds with Gibberellic Acid (GA₃) for 24 hours has been shown to stimulate germination under normal greenhouse conditions.
- c) Promalin stimulated the development of parthenocarpic (seedless) blueberry fruit.

Impact of Research:

- a) The development of a method to stimulate rhizome production will have a significant influence on existing fields and newly planted fields. The slow spread of the lowbush blueberry is a major hurdle in the establishment of fields of high yielding clonal material.
- b) The practice of fertilizing lowbush blueberry cuttings during rooting has been shown to produce a significantly better plant for increasing plant cover in existing fields and for establishing new fields.
- c) Gibberellic Acid (GA₃) treatment may be beneficial to a large scale seeding operation by stimulating early and more uniform germination.
- d) Tissue culture propagation of the lowbush blueberry would provide a practical means of rapidly increasing selected plant material. This method of propagation would be especially useful when only a limited supply of a particular clone were available.

Research Plans for 1979:

The following studies will be conducted during 1979:

- a) Tissue culture propagation of lowbush blueberries using shoot tip culture.
- b) The influence of bark mulch treatments on lowbush blueberry growth and spread.
- c) The effect of Promalin on fruit set and yield of the lowbush blueberry.
- d) The effect of GA₃ and GA₄ + GA₇ on lowbush blueberry seed germination.
- e) The effect of N fertilization on clonal spread.

Effect of Plant-Water Stress on "Lowbush"
Blueberry Growth Yield and Quality

Personnel:

G. R. Benoit, W. J. Grant, and Amr A. Ismail

Mission of Project:

To develop a water management system that will maximize blueberry production and reduce year-to-year fluctuations in yield.

Specific Objectives:

1. To determine the effect of duration and magnitude of plant-water stress on lowbush blueberry plant growth, fruit bud development, fruit set, yield and quality.
2. To determine the amount and timing of water required for optimum blueberry growth and yield under various soil and climatic conditions.

Status of Current Research:

Greenhouse Study:

The original set of blueberry plants used in the greenhouse had developed an abnormal morphology because of forced growth cycling. In addition, plant treatments had resulted in great size differences. These features would make future data collection difficult and analysis questionable. We discarded these plants and a replacement set of 32 plants (clone 4161) were planted in the same pots during early summer of 1978. These plants will be used to check initial findings and for investigation of interaction effects that may exist between plant-water stress and fertilizer levels. Establishment difficulties did develop as a result of extremely high summer greenhouse temperatures and from a rust infection. However, the plants were established in the pots and are now in cold storage. The plants will be moved into the greenhouse, pruned, and have the fertilizer and plant-water stress treatments set up during early April.

Field Study:

Eight clones located in a Deblois, Maine blueberry field were selected and subdivided with wooden barriers during the summer of 1977. These clones were burned and treatments established in the spring of 1978. Treatments consisted of three levels of soil-water maintenance (Soil-water levels of .2 and .6 bars of tension and no added water) and three levels of fertilizer (45, 90 and 135 lbs of Nitrogen per A. in a 5-10-5 fertilizer). Soil-water level was monitored with an electronic tensiometer that automatically allowed additions of water from a storage barrel at specified soil-water levels. Plant growth measurements (number of stems and stem lengths) were determined throughout the season. These data are now being analyzed. Number of flowers per plant will be determined at flowering in the spring.

Impact of Research:

Research will establish water requirements for each phase of the blueberries growth cycle and will establish the fertilizer requirements of blueberries grown under more intensive water management systems. Results will increase the ability to maximize and smooth out blueberry yields.

Research Plans for 1979:

Fertilizer - water interaction effects will be evaluated on rooted cuttings grown in the greenhouse. Emphasis will be placed on effects through the flowering phase of growth. The field study will be continued to obtain the effects of similar interactions on flower development and on final yields.

BLOSSOM BLIGHT OF BLUEBERRIES

Personnel:

M.G. Zuck and D.C. McGee*

Mission of Project:

To improve methods of control of blossom blight of blueberries.

Specific Objectives:

1. To test the efficacy of new fungicides in control of blossom blight of blueberries

Status of Current Research:

Fungicide trials were located at sites in Centerville and Jonsboro in 1978. Due to hot, dry conditions during blossom period, blossom blight infection was not severe enough to allow any estimate of disease.

Significant Research Accomplishment:

Previous work suggests that fungicides such as Benlate and Captan are more effective in controlling blossom blight than fungicides recommended in the past.

Impact of Research:

Improved methods of fungicidal control of blossom blight will become available.

Research Plans for 1979:

Due to a change in personnel, research plans are not fully formulated at this time.

*Present address: Dept. of Botany/Plant Path., Iowa State University,
Ames, IA 50011

BOTRYTIS BLOSSOM BLIGHT OF
LOWBUSH BLUEBERRIES

Personnel:

Steven B. Johnson, Dr. Simeon S. Leach

Mission of Project:

1. Identify initial inoculum source of Botrytis cinerea.
2. Establish inoculum potential of Botrytis cinerea.
3. Determine timing for application of fungicides.

Status of Current Research:

The 1978 field work including: fungicide screening for control of Botrytis blossom and stem blight as well as Botrytis fruit rot, air sampling with rotorod spore samplers, soil analysis of the fungicide screening sites, and a noncrop year field survey for Botrytis cinerea presence, was completed. Laboratory work on benomyl tolerance of Botrytis cinerea field isolates was also completed. Currently in progress is a continuation of controlled environment chamber studies initiated in 1978. Timing of fungicide application for Botrytis blossom and stem blight, as well as effect of relative humidity on the incubation period is being investigated. Development of the pathogen in the buds and open flowers is also being investigated.

Significant Research Accomplishments:

1. The primary inoculum for Botrytis cinerea originating in the blueberry field was established.
2. The infection period previously thought to be four to five days was shown to be less than 12 hours.
3. The green bud stage as well as the fully opened blueberry blossom was shown to be susceptible to Botrytis cinerea.
4. Fungicide trials were evaluated for effectiveness and no chemical was found superior.

Impact of Research:

1. With establishment of the source of primary inoculum, control measures can be more effectively directed.
2. With the infection period better understood, timing of control measures for maximum effectiveness is possible.
3. Improved fungicidal control of Botrytis blossom and stem blight is possible.

Research Planned for 1979:

1. Controlled environment chamber studies focusing upon:
 - a) Effect of relative humidity on infection and disease severity.

- b) Timing of fungicide application.
 - c) Concentration of application.
 - d) Development of the pathogen in the buds and open flowers.
2. Field work includes:
- a) Rotorod sampling of the air for presence of Botrytis cinerea.
 - b) Fungicide trials for reduction of the primary inoculum source in noncrop year vegetation.

INSECTS AFFECTING THE BLUEBERRY

Personnel:

Howard Y. Forsythe, Jr.

Mission of Project:

Protect blueberry crop from loss due to insects.

Specific Objectives:

- (a) To find more effective and less hazardous insecticides which are less damaging to the environment.
- (b) To determine the feasibility of utilizing trapping methods to monitor for blueberry maggot fly activity.
- (c) To study biology, ecology, and behavior of blueberry pests as necessary for development of control measures.

Status of Current Research:

Insecticide tests for control of blueberry maggot and blueberry thrips were conducted in 1978 and control data were obtained. Fields with adequate infestations of thrips, but declining populations of maggots were used. One of these fields will be reclaimed for commercial production by the grower. One field to be used in 1979 was "seeded" with infested berries, through the cooperation of the inspectors. Except for one new insecticide, no others seemed to hold much potential for maggot control.

Maggot fly trapping studies reduced the number of variables affecting trap efficacy. With the cooperation of growers, traps were used in some commercial fields with 0, 1, and 2 sprays. A preliminary relationship was found between numbers of flies trapped and the numbers of maggots in the berries.

No "minor-pest" infestations were observed or reported in 1978.

Significant Research Accomplishment:

Malathion looks most promising for control of blueberry thrips and was tested on a commercial scale. Thrips pressure was light, but control with malathion dust appears to compare favorably with dieldrin.

Trithion dust and Mesurol (bird repellent) at 0.75 active ingredient per acre for ground application showed good control for blueberry maggot. At present, only Dylox appears to be worthy of further aerial spraying testing; low maggot populations in 1978 did not provide conclusive testing conditions.

Maggot fly trapping studies showed that a sticky yellow cardboard trap hung horizontally to the ground was most effective. There is some preliminary evidence to indicate that if less than 3 flies/trap/season are recorded, less than 5 maggots per quart will be found.

Impact of Research:

Control of insect damage is essential for the commercial production of blueberries. A more effective and less costly insecticide is necessary to control blueberry thrips. An environmentally less hazardous insecticide would be desirable for the control of the blueberry maggot by air. Because of the current tenuous position of registered insecticides, alternative insecticide choices are becoming more important. Initial registrations are also vital for the control of "minor" pests in the situations where serious commercial blueberry injury might occur. Before new insecticides can be registered for use, the materials must be tested for application method, rate and time of application, control effectiveness, residue and environmental hazards, and effect on production and quality.

Maggot fly trapping research can lead to a commercial use of a trap in determining the timing and necessity of a maggot insecticide spray, thus potentially reducing the use and cost of insecticides. The feasibility of this pest management method can only be determined by repeated and expanded testing.

Research Plans:

None. However, some traps will be set up at or near Blueberry Hill Farm to monitor for appearance of blueberry maggot flies.

TREATMENT OF BLUEBERRIES WITH POTASSIUM SORBATE
TO REDUCE SPOILAGE DURING TEMPORARY STORAGE

Personnel:

Gordon E. Ramsdell and Cynthia L. Kahrman

Mission of Project:

To evaluate the use of potassium sorbate for reducing blueberry spoilage during temporary storage.

Specific Objectives:

1. To determine concentration of preservative and treatment to reduce spoilage of blueberries during temporary storage.
2. To observe condition of blueberries as a result of treatment.

Status of Current Research:

Two concentrations of potassium sorbate were used in conjunction with two storage temperatures and two methods of application.

Significant Research Accomplishments:

1. The major problem at 70-75^oF temperature is with yeast development.
2. Time of harvest has some influence on initial yeast and mold contamination.
3. All treatments benefited from storage at refrigeration temperature.
4. Immersion of blueberries resulted in no yeast and mold growth.
5. Blueberries immersed and temperature maintained at 40^oF resulted in firm berries with practically no bleeding.

Impact of Research:

This establishes some guidelines for blueberry preservation during temporary storage. Further, it establishes that blueberry quality and weight could be improved by immersion of berries during transport and preprocessing storage.

Research Plans for 1979:

No further studies contemplated at this time.

1978-79 Blueberry Extension Program Progress Report*
Maine Cooperative Extension Service
University of Maine at Orono

Prepared for the University Blueberry Advisory Committee
Spring Meeting, March 16, 1979

Amr A. Ismail
Extension Blueberry Specialist

Progress Made in 1978 and Activities of Blueberry Extension Program

Highlights of the 1978 Blueberry Educational Program were as follows:

Field Demonstration Plots: A significant activity in the program was the continuation of state-wide "Weed Control and Fertility Demonstration Plots". Field demonstration plots that illustrate the practices, benefits and pitfalls of fertilizing and controlling certain weeds in several blueberry fields were evaluated. As in previous years, growers were involved in the planning, application and evaluation of the effects and practicality of treatments. Several growers were able to make decisions relevant to the management of their blueberry fields based on their observations and experience with these demonstration plots. As a result, approximately 5,000 acres of blueberry fields in Maine (representing 20% of possible treatable acres) were treated in 1978 with an herbicide for controlling grasses and sedges. Growers also became more aware of the need to control woody weeds in their fields and have initiated better woody weed control practices on several thousand acres. Growers who adopted grass and sedge control practices in 1977 reported increases, ranging between 50-100%, in yields in their 1978 blueberry crop. At 52¢ per pound (field price in 1978) the increase in yield represented a significant addition to their income.

As a result of an educational effort that presented and demonstrated the use of equipment for application of herbicides for the control of woody weeds, several growers took action by constructing or purchasing similar equipment and adopting this cultural practice in their fields. Eight large tractor drawn segmented weed rollers and twelve small self propelled rollers were built and put to use in blueberry fields in 1978.

Cultural and variety evaluation trials utilizing lowbush and highbush blueberries have been maintained in Deblois, Jonesboro and Ellsworth.

Spring Growers Meetings: Four growers meetings were held during the spring 1978 in East Machias, Ellsworth, Rockland and Norway. Growers' participation in the meetings was excellent. The program included reports on "Grass Control in Your Blueberry Field", "Controlling Woody Weeds and the New Weed Roller", "Increasing Plant Stand in Your Blueberry Field", and "Burning Blueberry Fields".

*Summary of major Blueberry Extension activities from March 1, 1978 to March 31, 1979.

Recertification of Restricted Use Pesticide Applicators: In cooperation with other Extension Specialists and the State Board of Pesticide Control forty meetings for recertification of applicators of restricted use pesticides were scheduled during January and February of 1979. Attendance at these meetings was excellent. Efforts were also expended in providing educational material for growers who have never been certified and desire to be certified for use of restricted use pesticides.

Educational information on various aspects of production practices, marketing and utilization of blueberries and relevant State and Federal regulations were also disseminated to commercial blueberry growers and other segments of the blueberry industry through correspondence, the blueberry newsletter (Blueberry News), timely newspaper articles, farm and packing plant calls, and radio and TV spots.

Close cooperation and contacts were maintained with principle investigators of various research projects at the University of Maine and other universities, Federal agencies, and Canadian research and Extension agencies to learn of changes and acquire information for the blueberry educational program. Participated in an agriculture training session for County Agents to update their knowledge and sharpen their skills about growing blueberries. An educational booth was set up and manned in cooperation with Maine Department of Agriculture, at the 1979 Agriculture Trade Show in Augusta. It provided an excellent opportunity to answer questions and provide educational material for many people, most of whom were home gardeners with interest in growing highbush blueberries.

Plans for 1979 Blueberry Extension Program:

Emphasis in the 1979 Blueberry Extension Program will be placed on educating growers in the areas of: weed control, pollination, increasing plant stand and efficient use of energy resources especially when burning blueberry fields.

Blueberry School: A survey of blueberry growers indicated considerable interest in having the Extension Service schedule a "Blueberry School: and also identified the topics of most importance and interest to the growers. In response to this need a school has been scheduled to be held in March, 1979. The school will be offered at three locations: Ellsworth, Machias and Union with meetings being held once a week for four consecutive weeks. A copy of the school announcement and topics to be discussed is attached to this report. More than one hundred growers indicated that they plan to attend the school. Other growers' meetings will be scheduled as the need arises.

Field Demonstration Plots: Emphasis will continue to be placed on working with growers to establish and maintain field demonstration plots where the use of various cultural practices (weed control, fertilizing, and insect and disease control) will be demonstrated. Plots will be located in different parts of the State to allow for the involvement of as many growers as possible.

Certification and Recertification of Pesticide Applicators: Educational material will be disseminated upon request to growers wishing to meet the requirements for certification or recertification for use of restricted use pesticides.

Direct Contact: Farm calls will be limited to field demonstration and field day activities and to respond to special problems or needs. This would provide more efficient use of time and resources. Personal correspondence, assistance in formulating specific management programs as well as other means of personal contacts are planned. Organize and man a Blueberry Information Booth at the Agriculture Trade Show in January 1980. Assist County Agents in horticulture type courses by teaching segments dealing with management and culture of blueberries.

Mass Information System: Continue to disseminate pertinent information to blueberry growers, packers, marketing concerns, other segments of the blueberry industry and consumers through the Blueberry Newsletter, newspaper articles and radio interviews.

Information Sheets: Continue to work on the introduction of new "Information Sheets" and revision of outdated ones on various aspects of blueberry production. Specific topics for 1979 are: Introduction to Growing Blueberries in Maine; Bees for Blueberry Pollination; Woody Weed Control in Blueberry Fields; Pruning-Burning; Blueberry Insects; Blueberry Diseases; and 1979 Blueberry Pesticide Review.

Cooperate with University researchers in planning for, and conducting blueberry research. Demonstrate and communicate their research findings to blueberry producers, packers and the consumer.