TRADE MARKET OF VEGETABLE SEEDLINGS, CURRENT AND FUTURE PERSPECTIVE IN ROMANIA

PIAȚA COMERCIALĂ DE RĂSADURI DE LEGUME, PERSPECTIVA ACTUALĂ ȘI VIITOARE ÎN ROMÂNIA

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Abstract. *It is presented current situation in Romania of vegetables cultivation, disease and pest keys in protected and field vegetable crops, using of pesticides and adjacent national and European regulations at farm and national level. In Romania, vegetable production technology based on grafted vegetable seedlings was introduced in 2009. The market today has grafted seedlings of eggplant, tomatoes, peppers, cucumbers, watermelons and melons, but tomato seedlings grafted on two arms are the most common and popular. It is discussed trade market of vegetable seedlings, current and future perspective in Romaniawith a special reference on the market addressed to farmers which are using grafted vegetables from Greece, Turkey and Hungary. It is discussed the advantages of using grafted vegetable plants in conditions when over 80% of the farmers do not receive subsidies on product support even on the surface (EU standards 0.3 hectares), grafting can be regarded as an important link in obtaining biological or ecological vegetables. It is discussed trade case for vegetable seedlings of the firm Agris S.A from Salonic, the experience with most well-known Romanian greenhouses.*
Key words: *evolution of vegetable seedlings trade market, Romania*

Rezumat. *Este prezentată situația actuală în România privind cultivarea legumelor, bolile și dăunătorii cheile în culturile de legume în spații protejate și câmp, folosirea pesticidelor și reglementările naționale și europene adiacente la nivel de fermă și la nivel național. În România, tehnologia de producție de legume pe bază de răsaduri altoite a fost introdusă în 2009.Pe piață astăzi există răsaduri altoite de vinete, roșii, ardei, castraveți, pepeni verzi și galbeni, dar răsadurile de roșii altoite pe două brațe sunt cele mai comune și populare. Este discutată piața comercială de material săditor de legume, perspectiva actuală și viitoare în România, cu o referire specială pieței adresată fermierilor care utilizează legume altoite din Grecia, Turcia și Ungaria. Sunt discutate avantajele utilizării legumelor altoite în condițiile în care peste 80% dintre agricultorii nu primesc subvenții pe produs sau pe suprafață (standardele UE 0,3 hectare), altoirea poate fi privită ca o verigă importantă în obținerea legumelor biologice sau ecologice. Se discută cazul comerțului pentru răsaduri de legume ale firmei Agris SA din Salonic, experiența sa cu cele mai cunoscute sere românești.*
Cuvinte cheie: *Evoluția pieței comerciale de răsaduri de legume, România*

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INTRODUCTION

In China, the earliest literature about vegetable grafting was recorded in an ancient "Book of Fan Shengzhi shu jing shi" in 32-37 B.C., an agriculturistic book of China written by Fan Shengzhi translated and commented upon by Shi Shenghan (1959). Due to intensive horticultural practice and limited land, grafting of vegetable seedlings is more and more spreaded as new technology, even this was applied from late 20th century in Eastern Asia, beeing most suitable for trade market of vegetable seedlings.The grafted varietyes on to a rootstock brings qualities to the plant that the vegetable does not possess, avoid the situation where the soil is infested by diseases and pests, for this reason this method was spreaded and applied with success. In Eastern Asia watermelons were grafted to prevent root rot and now is possible to sell grafted vegetable of rootstocks. After Kubota (2008), the first record of interspecific, herbaceous grafting as a yield increase and pest/disease control strategy was for watermelon *Citrullus lanatus* (Thunb.) Matsum. & Nakai, using a squash rootstock (*Cucurbita moschata* Duch.), reportedly developed by a watermelon farmer in Japan (Tateishi, 1927). Grow vegetables in the same soil year after determined increasing of freqvency of soil-borne diseases whih decrease quantity and quality of vegetable, in this respect rootstock most often used for grafted vegetables is resistant to some soil-borne diseases. Grafted plants have earlier and higher crop, seems to be resistant to cultivation in the same place year after year, at lower temperatures of soil and field overwatering. However, commercial application began in 1970^{s} and increased with the rapid development of protected cultivation. The main purposes of grafted vegetable production are to overcome soil borne diseases and increase resistance against abiotic stress (Williamson, 1998; Cohen *et al.,* 2000: Igarashi *et al.,* 2001; Ioannou, 2001; Cao *et al.,* 2005; Sigüenza *et al.,* 2005). Due to resistance through grafting to the pathogens and even some pests, part from very expensive chemical treatments difficult to apply were reduced.

MATERIAL AND METHOD

Based on own experience it is presented results of Agris S.A. in selling seedlings in Romania. It is discussed trade case for vegetable seedlings of the firm, the experience with most well-known Romanian greenhouses [Pipera, IVAs (Constanta), Leoser (Popesti Leordeni and Constanta), Chirana (Slobozia), Interagro (Zimnicea), Rovina (Deva), Topsemconsult (Iasi), Aroneanu (Iasi), Agromir (Hateg), Agros Braila, Cernavoda] regarding influence of grafting on soil diseases and nematode's attack, were the observation were done twice on month after seedling planting. Based of local experience were synthetized using of pesticide in vegetable cultivation.

RESULTS AND DISCUSSIONS

Disease and arthropod pests are a continual problem for field and greenhouse vegetable production. These problems range from minor infestations to major disease

or arthropod pest outbreaks that can destroy an entire crop. In Romania, in the past, the major management strategy was pesticide control. Pesticides registered in Romania for watermelons and melons with active ingredient clorotalonil; fosetil + propamocarb; triadimenol + folpet; sulphur; thiophanate-methyl. For tomatoes,fungicides, *seed treatment,* metalaxil-M; mefenoxam, *treatment in vegetation,* dimethomorph 9% + mancozeb; copper; metallic copper; metallic cooperfrom copperoxychloride;propineb; metalaxyl + copper oxychloride with metallic cooper; clorotalonil; piraclostrobin + metiram; mancozeb; cymoxanil + famoxadone; folpet; iprovalicarb +copper oxychloride; cymoxanil + copper; tebuconazole; azoxystrobin; mandipropamid + mancozeb; metiram; fosetil + propamocarb; mefenoxam + mancozeb; mefenoxam + metallic cooper; difenoconazole difenoconazole; triadimenol + folpet; boscalid + pyraclostrobin; fludioxonil + cyprodinil; fenhexamid; thiophanate-methyl; fosetyl aluminum + fenamidone, insecticides, emamectin benzoate; thiamethoxam; alfa-cipermetrin; cipermetrin; pyriproxyfen; spinosad; lufenuron; tau-fluvalinate; spirotetramat; dimetoat; imidacloprid (in field after flowering); cipermetrin + clorpirifos; gamma cihalotrin; abamectin abamectin; abamectin + chlorantraniliprole; oxamyl, molluscocides and nematicides, methiocarb; fostiazat, soil disinfectants, dazomet; metam-sodiu. For pepper, fungicides, *treatment in vegetation,* copper from*copper* oxychloride + fosetyl aluminum + myclobutanil; azoxystrobin; sulfur; penconazole; thiophanate-methyl; insecticides, emamectin benzoate; alfa-cipermetrin alfa-cipermetrin; cipermetrin; pyriproxyfen; acetamiprid; flonicamid; oxamyl acaricides, hexythiazox; abamectin; *soil disinfectants*, metam-sodiu. For cucumber, fungicides, *treatment in vegetation,* dimethomorph + mancozeb; metallic copper; fosetyl aluminum; propineb; clorotalonil; popiconazole; metallic cooper from copperoxychloride; copper hydroxide + metallic cooper; mancozeb; folpet; fluopicolide + propamocarb; meptyldinocap; cooper from copperoxychloride+ fosetyl aluminum; mancozeb + myclobutanil + fosetyl aluminum; improvalicarb + cooper as copperoxychloride; tebuconazole; mandipropamid + mancozeb; metiram; fosetyl + propamocarb; mefenoxam + mancozeb; clorotalonil; triadimenol + folpet; sulfur; myclobutanil; fenhexamid; sulfur; penconazole; thiophanate-methyl; fosetyl aluminum + fenamidone, insecticides, thiamethoxam; alfa-cipermetrin; cipermetrin; pyriproxyfen; spinosad; tau-fluvalinate; acetamiprid; imidacloprid; oxamyl, acaricides, milbemectin; hexythiazox; abamectin, nematicides, fostiazat, *soil disinfectants*, metam-sodiu. For eggplant, fungicides, *treatment in vegetation,* thiophanate-methyl, insecticides, thiamethoxam, deltametrin, alfa-cipermetrin; pyriproxyfen; lambda-cihalotrin; oxamyl, acaricides, abamectin; *soil disinfectants*, metam-sodiu.

However, many plant pathogen, insect and mite pests are resistant to registered pesticides and few new pesticides are being developed. Nowadays, there is a global attempt to minimize the use of harmful substances, particularly pesticides in agriculture, in order to reduce the actual levels of pollution in the environment. In addition, customers worldwide demand produce for consumption that is free of

pesticide residues. It is for this reason that non-chemical methods are welcome in the context of the agricultural production as one of the ways to reduce the use of substances of different levels of toxicity. Alternative control strategies exist or are being developed for most major pests and diseases.

Introducing grafted vegetables into usual cultivation system determined increasing sales in the next years with 5-10% per year at tomatoes, cucumbers, eggplant and other vegetables, especially where the farmers have problems with difficult conditions connected with infestation of soils by pesticides and pests and diseases. It is the case of Agris S.A. company as is presented (Table 1). It is the large number of seedlings demand on market for large-scale greenhouses and open-fields, of course part of this involve grafted seedling, for it is necessary a lot of hand work or semi or fully automated grafting robots. In case of Agris S.A. company the main market for seedlings is for eggplant (increase with 1731% in 2015 versus 2014), melon (increase with 162% in 2015 versus 2014), watermelon (increase with 26% in 2015 versus 2014), (Table 2).

Table 1

Evolution of Agris S.A. company's sales of in Romania

PRODUCT GROUP SEEDLINGS	2015	2014	2013	2012	2011
watermelon	1.558.374	1.222.050	989.645	436.246	362.314
greenhouse tomato	482.408	459.041	449.858	40.467	39.665
melon	59.668	37.947	28.106	33.803	18.357
eggplant	18.165	152.478	7.700	8.741	2.998
pepper	41.558	161.717	24.416	10.088	1.686
open field tomato	19.993	12.725	6.243	1.914	0
short cucumber	999	1.529	392	546	588
lettuce		5.580	4.215	1.881	1.080
broccoli		0	3.069	3.447	0
long cucumber	276	482	1.809	38.299	0
cauliflower		1.245	12.045	9.465	1.125
cabbage		0	53.760	123.231	486
TOTAL	2.181.441	2.054.794	1.581.258	708.128	428.299

Many seedling nursery companies, institutes and universities carry out studies on the seedling production, rootstock breeding, facilities development, plant physiology and molecular biology in relation to vegetable grafting. At least 40 cultivars of rootstock for the vegetable grafting have been bred and released, a series of grafting robots have been developed, and some scientific results have been published in international journals. Grafting may increase resistance to stress factors such as temperature and water and pathogen attack (key diseases *Pythium*, *Rhizoctonia*, *Phytophthora*, *Fusarium*, etc.), grafted crops yield and the use of organic chemical fertilizers as well as water is higher than the check culture. Price of grafted seedlings for fresh market is higher than classical seedling (excluding seed costs), it is the result of intensive labour input for propagation, a longer production period, and

the additional costs of the rootstock. Those expenses often discourage potential users of grafted seedlings. Not often acknowledged is that growers may be compensated for the greater initial cost of buying grafted seedlings by additional benefits of increased yield and reduced cost of control measures for soil borne pests.

Table 2

Sales of Agris S.A. company in Romania

general category	product group	category	Value sales in 2015 versus targets value %	Values sales in 2015 versus sales in 2014 %
grafted plants	watermelon	grafted	-2%	26%
	greenhouse tomato	grodan	-21%	-6%
		grafted	-98%	-98%
	melon	grafted	102%	162%
	eggplant	grafted	1331%	1731%
	long cucumber	grafted		
total - grafted plants			***-11%***	***12%***
regular plants	greenhouse tomato	ungrafted	-96%	5%
		grodan	-100%	-100%
	pepper	ungrafted	-95%	-94%
	open field tomato	ungrafted	-45%	-29%
	eggplant	ungrafted	-99%	-99%
	melon	ungrafted	-78%	-72%
	short cucumber	ungrafted		66%
	watermelon	ungrafted	-100%	-100%
	long cucumber	ungrafted		
total - regular plants			***-96%***	***-90%***
vegetable seeds	rootstock	seeds	-59%	27%
	various vegetables	seeds	-31%	142%
	greenhouse tomato	seeds	-52%	4%
	squash	seeds		
	carrot	seeds	-88%	-36%
	open field tomato	seeds	-93%	-58%
	onion	seeds		
	processing tomato	seeds	-100%	
	pepper	seeds		
	melon	seeds		
total - vegetable			***-63%***	***35%***
general total			***-29%***	***0%***

In generally it was an decreasing of nemathodes and soil born diseases from 0-5,5%, in average 3.7%, for all Romanian greenhouses were firm's seedling were sold.

CONCLUSIONS

1. In Romania, in the past, the major management strategy was pesticide control,however, many plant pathogen, insect and mite pests are resistant to registered pesticides and few new pesticides are being developed.

2. Introducing grafted vegetables into usual cultivation system determined increasing sales, in case of Agris S.A. company the main market for seedlings is for eggplant (increase with 1731% in 2015 versus 2014), melon (increase with 162% in 2015 versus 2014), watermelon (increase with 26% in 2015 versus 2014).

3. In generally it was an decreasing of nemathodes and soil born diseases from 0-5,5%, in average 3.7%, for all Romanian greenhouses were firm's seedling were sold.

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