Effect of Grafting Eggplant (*Solanum melongena* L.) on its Selected Useful Characters

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Abstract

The grafting eggplants cultivars onto rootstocks that are resistant to the soil-borne pathogens and nematodes is a method known for many years, but which has improved and spread quickly in the last years. The objective of these experiments was to evaluate the influence of some rootstocks on the crop of grafted eggplant. The Romanian eggplant "Andra F1" and Dutch hybrid "Sharapova", were grafted onto the rootstocks "King Kong, Emperador, Hikyaku, KA-312, Torvum vigor and Espina". It was determined the influence of the eggplants rootstock on the marketable yield, early harvest, fruits quality and nutritional value. There were calculated the disease incidence (I %), disease severity (S %) and attack degree (AD%) at the experimental variants for soil pathogens Verticillium dahliae, respectively Fusarium oxysporum f. sp. melongenae and nematodes Meloidogyne spp. The resulted values were used to calculate the attack degree (as an expression of extending attack seriousness) on the following formula: AD% =(S% x I %) /100, where AD% represents attack degree. Presence of root galls induced by nematodes, were visually assessed at the end of the trials on 50% of the plants harvested from the middle of the plots. The rootstocks which led to the increase of yield and tolerance to the lower soil temperatures as well as to a earliness character of the yield were "Emperador, King Kong and Hikyaku". The percent of first class fruits were higher to the grafted eggplants than to the non-grafted plants. It not were registered significant differences between rootstocks concerning the influence of rootstock on the nutritional value of the eggplants fruits. The frequency of damage to the plants of eggplants by the soil-born pathogen and nematodes attack was significantly reduced by grafting eggplant scions onto resistant rootstocks. The rootstocks "Emperador, King Kong and Hikyaku" led to increased marketable yield, fruits quality, early harvest and nutritional value. "Emperador F1" rootstocks reduced the frequency and severity of infection with the soil-borne pathogens and the nematodes attack.

Keywords: *nematodes, quality, rootstock, scion, soil-borne pathogens.*

INTRODUCTION

The biotic and abiotic environmental factors offer optimum breeding conditions for numerous species of pathogenic agents causing great production damage; *Fusarium oxysporum f.sp. melongenae, Verticillium dahliae* and nematodes are very destructive in eggplants crops and one of the most limiting factors to farmer's income (Bletsos *et al*., 2003). Since crop rotation is rarely adopted, the reduction of yield, both in quantity and quality, progressively affects the crops, thus making necessary the adoption of soil disinfestations practices or other methods (Gullino *et al.,* 2003). Soil-borne pathogens such as *Verticillium dahliae and Fusarium oxysporum* f.sp. *melongenae* may cause yield losses that exceed 60% in affected production areas (Bletsos *et al*., 2003).

Growing vegetables without soil fumigants has remained a challenge, in part because commercially acceptable eggplant cultivars produced through conventional breeding lack resistance to many soil borne plant pathogens(Bausher and Chellemi, 2010).

One possible method to reduce production losses is the use of grafted plants. Productive

eggplant cultivars grafted onto rootstocks that are resistant to soil pests and diseases, were achieved some time ago and have spread quickly. It is extremely important during the grafting process to ensure the vascular fusion between the scion and rootstock by using a cut that maximizes the contact surface and creating the proper conditions for close contact between those two plants (Assenza, 2004). Joining a suitable cultivar scion to a wild-type rootstock which has a robust root system and strong resistance to soil pests and diseases induce the tolerance features to less favourable conditions of soil and environment (Edelstein and Ben-Hur, 2015; Oda,1993).The main result of the grafting process is the increase of the resistance against soil diseases such as *Fusarium, Verticillium* or nematodes (Bogoescu, 2007).

The objective of the researches was to evaluate the performance of the eggplants grafting on some rootstocks, in greenhouse conditions, in Romania.

MATERIALS AND METHODS

The reserach was done in the pilot greenhouse of the Horting Institute. The Romanian eggplant hybrid "Andra F1" and Holland hybrid "Sharapova F1", used as scions, were grafted onto the rootstocks "King Kong", "Emperador", "Hikyaku", "KA-312", "Torvum vigor" and "Espina".

The main features of the used rootstocks are:

King Kong is a rootstock developed by Rijk Zvaan, Netherlands. It has a high production potential. It leads to a very good balance of culture, leading to a good fruiting and quality. It is a rootstock that does not negatively affect early maturation. It induces graft tolerance to low temperatures. It shows resistance or tolerance to *Fusarium oxysporum var. lycopersici race, 0.1, Verticillium albo-atrum, Verticillium dahliae* and *Meloidogine ingognita*.

Emperador F1 belongs to hybrid rootstocks resistant category KVF (*Pyrenochaeta lycopersici, Dydimella lycopersici, Verticilium spp. şi Fusarium spp*.), resulted from crossing between *Lycopersicon esculentum* and *L. hirsutum* produced by Rijk Zwaan, Netherlands. It is a generative rootstock, very vigorous which conducts to obtaining big fruits and increasing production. It has a good tolerance to low temperatures. It is compatible with lots of cultivars of tomatoes and eggplant. It shows a high level of resistance to nematodes.

Hikyaku F1(*Solanum melongela*) is a rootstock for grafting eggplants created by Kaneko Seeds Co., Japan, which has resistance to: *Fusarium oxysporum var. lycopersici race, 0.1, Fusarium oxysporum lycopersici race radicis - 0.1, Verticillium albo-atrum, Verticillium dahliae, Meloidogine ingognita*. This rootstock is recommended to be used especially in fields infested with vascular disease; it confers rusticity and force to the graft; it has a vigorous growth even under low temperatures conditions, being recommended for cooler areas or to be planted in early spring.

KA-312 is an rootstock for eggplants created by Kaneko Seeds Co.,Japan, which is resistant to *Fusarium oxysporum var. lycopersici race, 0.1, Verticillium albo-atrum, Verticillium dahliae, Meloidogine ingognita*. It does not affect the organoleptic qualities of the fruit.

Torvum vigor derives from *Solanum torvum* and it is produced by Kaneko Seeds Co., Japan; it is a very vigorous cultivar which can be used only as rootstock for eggplants; it shows resistance to *Pseudomonas solanacearum, Verticillium spp., Fusarium spp.* and nematodes. It can be cultivated and gives good results in prolonged cycle eggplants culture and confers resistance to high temperatures.

Espina is a special selection of *Solanum torvum* with high resilience and force, designated for eggplants grafting. It has good tolerance to weather cooling; therefore its root shave high absorption efficiency even at low temperatures. The harvest is consistently high throughout all harvesting period. It does not affect the organoleptic qualities of the fruit. It determine significant increases in production. It has a high resistance to *Fusarium oxysporum f.sp melongenae* and middle resistance to *Meloidogine incognita,Pseudomonas solanacearum, Pyrenochaeta lycopersici.*

The main features of the two cultivars we used are the following:

Andra F1: semi early hybrid, obtained at the Research and Development Institute for Vegetables and Flowers Vidra, recommended for growing in the field and under covers. The plants are high; the bushes there are tight and semi lax. The fruits are ovoid, elongated, of 300 grams on average of dark purple color, with a length of 19-22cm and 6-7cm diameter. They have a potential of 45-50t/ha from which over 85% of first quality.

It has tolerance to *Verticillium dahliae*, and it is *Phytophthora* resistant.

Sharapova F1 is an early and vigorous hybrid product by Rijk Zwaan, for protected and field cultures, which has shiny dark black and uniform fruits, with dense white pulp, with pleasant taste, no spikes, cylindrical-oval, weighting 350-400grams, high production potential, resistant to thermal stress, and with resistance to phytopathogens.

The researches refer to the behavior of (rootstock x scion) combinations in terms of average production recorded, earliness grade (average yield per plant, harvested in the first 30 days of harvest), commercial quality and nutritional value of eggplant fruit.

Experimental variants were organized in randomized blocks each consisting of three repetitions. Each of the three areas of one variant was of $10m^2$; resulting a total area of $4320m^2$.The eggplants were planted on May 03rd, 2014 and cleared on October 27th, 2014.

Comparative analysis of (rootstock x scion) combinations has been performed using a culture of non-grafted eggplants with a density of 24000 plants/ha and one of grafted eggplants with a density of 20 000plants /ha.

Observations on the phytosanitary status were made under natural infection conditions. Soil samples were taken to determine the load with soil pathogens and nematodes. Isolation of fungi in culture substrate was made by the method of successive dilutions. Two culture selective mediums were used for growth: Martin and Waksman, to avoid bacterial growth. Weekly observations were made on the emergence and evolution of pathogens and pests. Data obtained from combinations graft/rootstock were compared with data registered in non-grafted plants (control variant).

For identified pathogens there were calculated the disease incidence (I %), disease severity (S %) and attack degree (AD%) in the experimental variants.

I% (disease incidence) = N x 100/Nt, where: N = number of attacked plants and Nt = total plants analyzed; S % (disease severity) = $\sum$x (I x f)/n, where: i = % index; f = number of plants with an index; n = total number of attacked plants analyzed; AD % (attack degree) = (S% x I %) /100.

Observations on identifying nematodes and plant roots galls on demonstration plots were carried out when clearing eggplants culture according to the method described by Di Vito and Lamberti (1971), in scoring scale (0-5):

0 = no galls;
1 = slight infection, presence of 1-5 galls located only on few roots;
2 = slight infection, widespread galls, presence of no more than 20 galls well spread on root system;
3 = infection with widespread galls, more than 20 galls evident and well spread on root system;
4 = strong infection, root system cut down and deformed due to the presence of big galls on the main roots;
5 = very strong infection, root system cut down and totally deformed due to the presence of big galls, absence capillary roots.

Determination of nematode species from genus *Meloidogyne* was made directly by placing nematodes in microscopic samples. Nematodes were collected by the extraction method.

Concluding observations were done in the fourth decade of October, during the clearing of experimental plots. Statistical analysis was performed by Duncan's test.

RESULTS AND DISCUSSION

Analysis of the results obtained (Tab.1) refers to the influence of grafting eggplants on average productions, the degree of earliness (amount harvest in the first 30days) and the sum of degrees of temperature at first harvest, depending on the soil temperature at 10-15cm depth, when plants were seed; the soil temperature when planting eggplants should not be less than 17°C. Regarding this aspect, eggplants planting was done at two moments, respectively 12 and 17°C, at a depth of 10-15cm in soil.

The mean yield of grafted eggplant fruits has been 122.4 t/ha while at the non-grafted eggplants was registered only an yield of 98.8 t/ha. Regarding the (rootstock x scion) combinations, the best results were recorded for grafting (Emperador x Sharapova), where there was an average production per plant of 7.77kg, respectively (Hikyaku x Sharapova) where there was an average production per plant of 7.32kg.

Rootstocks that have led to high productions were Emperador (an average of 7.04kg/plant), King Kong and K-312(an average of 5.81kg/plant). Tolerance to low soil temperatures was given by

the rootstocks Emperador (an average of 5.64kg/ plant), followed by King Kong and Hikyaku with 4.65 and respectively 4.51kg/plant.

A higher degree of earliness was recorded in combinations between (Sharapova x Emperador) with an average of 2.44kg per plant harvested in the first 30 days of harvest and (Hikyaku x Sharapova) with an average of 1.67kg per plant.

The rootstock that showed earliness features were Emperador (an average of 1.97kg per plant harvested), Hikyaku (1.62kg /plant) and King Kong (1.31kg /plant).

The above results in general agree with other research who found that yield and qualitative characteristics of the eggplants fruits were not affected by grafting process, on the contrary(Bletsos *et al*.,2003; Khah, 2011; Romano and Paratore, 2001).

The warm requirements, expressed as the sum of degrees of temperature until the first harvest, was between 3333°C (Espina) and 3621°C(KA-312) versus average of non-grafted eggplants which was less high, respective 3323°C. A slight tardiness was confirmed, the additional amount of the sum of degrees of temperature for grafted plants ranging between 48 and 188°C due to grafting, representing 2 to 8 days, depending on the rootstock, scion and environmental conditions.

Grafting eggplants led to improving their quality (Tab.2). Fruits quality was assessed in accordance with quality standard for fresh fruits and vegetables SR1423/2003 - eggplants. Non

Tab.1. Effect of grafting two cultivars of eggplant on various rootstocks on their production and earliness when growing in 2 different soil temperatures

Rootstock	Cultivar grafted	12°C		17°C		Σ °C
		Production (kg/ha)	Earliness (kg/ha)	Production (kg/ha)	Earliness (kg/ha)	
King Kong	AndraF1	3.84	0.46	4.80	1.16	3514
	SharapovaF1	5.45	0.58	6.81	1.46	3337
Average		4.65 ab*	0.52ab	5.81ab	1.31ab	3425
Emperador	AndraF1	5.05	0.61	6.31	1.50	3514
	SharapovaF1	6.22	0.98	7.77	2.44	3337
Average		5.64 a	0.79a	7.04 a	1.97a	3425
Hikyaku	AndraF1	3.90	0.62	5.57	1.56	3526
	SharapovaF1	5.12	0.67	7.32	1.67	3349
Average		4.51ab	0.64a	5.57 b	1.62 a	3437
KA-312	AndraF1	3.76	0.28	5.38	0.71	3710
	SharapovaF1	4.37	0.31	6,24	0.81	3533
Average		4.06 b	0.30b	5.81ab	0.76 b	3621
Torvum vigor	AndraF1	3.26	0.39	4.67	0.97	3365
	SharapovaF1	4.40	0.32	6.29	0.83	3365
Average		3.83 b	0.36b	5.48 b	0.90 b	3365
Espina	AndraF1	3.39	0.55	4.84	1.38	3297
	SharapovaF1	4.42	0.39	6.31	0.98	3369
Average		3.90 b	0.47b	5.58 b	1.18 b	3333
Non grafted eggplants	AndraF1	2.75	0.14	4.04	1.71	3323
	SharapovaF1	3.18	0.24	6.26	1.99	3323
Average non grafted eggplants		2.97c	0.19c	5.15 b	1.85 a	3323
Average grafted eggplants		4.43	0.51	5.88	1.29	3434.33

*In each column, the mean values noted with the same letters do not present significant difference after the Duncan test, for p = 5%

– grafted eggplants produced 81% fruits of Extra and First quality, while grafted eggplants produced 94.08%. When planted in unfavorable environmental conditions, grafted eggplants as well as non-grafted recorded an over 12% decrease of the fruits amount of Extra and First quality.

The rootstocks which led to a special quality of fruit were in order: KA - 312 (97%), Torvum vigor (95.5% eggplants of Extra quality and First), Hikyaku(95%), Emperador and Espina(92.5%) and King Kong(92%).

The nutritional value of eggplants expressed as soluble dry matter content and total carbohydrates have not undergone significant changes in the process of grafting.

When soil temperature was 17°C, the soluble substance content was 5.3% for non-grafted eggplants and 5.18% for grafted eggplants. Total carbohydrates content was 2.77% for non-grafted eggplants and 2.07% for grafted plants. By planting the eggplants in a soil with temperature of 12°C, the values of the biochemical quality indicators had a slight decrease, with values ranging between 0.35-0.83%(soluble substance content) and 0.17-0.23%(total carbohydrates) .

Good nutritional qualities were conferred by Hikyaku eggplant rootstock, with a soluble dry matter content of 5.8% and total carbohydrates of

Tab.2. Effect of grafting two cultivars of eggplant on various rootstocks on their regarding commercial quality and nutritional value when growing in two different soil temperatures

Rootstock	Cultivar grafted	12°C			17°C		
		Quality (E + I) %	Nutritional value		Quality** (E + I)%	Nutritional value	
			SDM (^{0}R)	total carbohy-drates(%		SDM (^{0}R)	total carbohy-drates (%)
King Kong	AndraF1	84	4.5	2.01	90	4.7	2.02
	SharapovaF1	89	4.3	1.32	94	4.5	1.43
Average		86.5a*	4.4a	1.66a	92a	4.6a	1.73a
Emperador	AndraF1	78	4.6	1.63	90	5.1	1.73
	SharapovaF1	81	5.1	1.98	95	5.3	2.23
Average		79.5a	4.85a	1.81a	92.5a	5.2a	1.98a
Hikyaku	AndraF1	77	5.1	2.14	92	5.5	2.54
	SharapovaF1	82	5.8	2.12	98	6.1	2.32
Average		79.5a	5.45a	2.13a	95a	5.8a	2.43a
KA-312	AndraF1	81	5.0	1.98	96	5.4	2.01
	SharapovaF1	83	5.2	1.61	98	5.4	1.91
Average		82a	5.1a	1.80a	97a	5.4a	1.96a
Torvum vigor	AndraF1	84	5.1	2.07	94	5.3	2.22
	SharapovaF1	86	4.3	2.00	97	4.9	2.05
Average		85a	4.7a	1.79a	95.5a	5.1a	2.14a
Espina	AndraF1	78	4.6	2.51	91	4.9	2.66
	SharapovaF1	81	4.9	1.67	94	5.0	1.74
Average		79.5a	4.75a	2.09a	92.5a	4.95a	2.2a
Ungrafted eggplants	AndraF1	64	4.6	2.39	79	5.3	2.57
	SharapovaF1	72	4.8	2.69	83	5.3	2.97
Average non-grafted plants		68b	4.72a	2.54a	81b	5.3a	2.77a
Average grafted plants		82.00	4.88	1.92	94.08	5.18	2.07

*In each column, the mean values noted with the same letter do not present significant difference after the Duncan test, for p = 5%; **E = Extra quality; I = First quality.

2.43%. In the case of the experimental plot from the unheated greenhouses of Horting Institute – where soil has not been disinfected from 2005 – the experimental plots were labeled based on the obtained results, depending on the level of soil infestation with pathogens *Verticillium dahlia,* respectively *Fusarium oxysporum f. sp. melongenae*, in second class (medium infestation), and depending on the level of infestation of the soil with *Meloidogyne spp.*, in third class (high infestation).

In the circumstances of a natural level of soil infection with *Verticillium dahlia* and *Fusarium oxysporum f.sp. melongenae*, the eggplants grafting resulted in a pronounced reduction in the frequency of symptoms on plants and a consistent decrease of the attack intensity and attack degree: disease incidence (I %), disease severity (S %) and attack degree (AD %) (Tab. 3).

The obtained results showed a high degree of tolerance of the grafted eggplants. Thus, the frequency of plants attacked by *Verticillium dahlia* was 4.3 – 7.5% in the case of non-grafted eggplants and 0.12% for grafted plants. The degree of attack was between 0.00% for grafted plants up to and 0.58% for non-grafted eggplants.

Similar results were recorded in the case of pathogen *Fusarium oxysporum f agent. sp. melongena.* The disease incidence was in the range 2.4% Sharapova F1 and 4.15% Andra F1. For grafted eggplants the disease incidence was of 0,00%. The disease severity was 5.3 - 8.9% for non-grafted eggplants and 0.00% for grafted eggplants. Also, the attack degree was 0.00% for

Tab. 3. Effect of grafting two cultivars of eggplant on various rootstocks and various soil pathogens, on a soil with a medium natural level of infection, when growing in two different soil temperatures.

Rootstock	Cultivar grafted	Verticillium dahlia (%)			Fusarium oxysporum f. sp. melongenea (%)		
		I**	S	AD	I	S	AD
King Kong	AndraF1	0	0	0	0	0	0
	SharapovaF1	0	0	0	0	0	0
Average		0a	0	0	0a	0	0
Emperador	AndraF1	0	0	0	0	0	0
	SharapovaF1	0	0	0	0	0	0
Average		0a	0	0	0a	0	0
Hikyaku	AndraF1	0	0	0	0	0	0
	SharapovaF1	0	0	0	0	0	0
Average		0a	0	0	0a	0	0
KA-312	AndraF1	0,7	1.1	0.00	0	0	0
	SharapovaF1	0	0	0	0	0	0
Average		0.35a	0.55	0	0a	0	0
Torvum vigor	AndraF1	0	0	0	0	0	0
	SharapovaF1	0	0	0	0	0	0
Average		0a	0	0	0a	0	0
Espina	AndraF1	0.7	1.1	0	0	0	0
	SharapovaF1	0	0	0	0	0	0
Average		0.35a	0.55	0	0a	0	0
Ungrafted eggplants	AndraF1	7.5	11.3	0.84	5.9	8.9	0.52
	SharapovaF1	4.3	7.4	0.32	2.4	5.3	0.12
Average non-grafted eggplants		5.9b	9.35	0.58	4.15b	7.10	0.32
Average grafted eggplants		0.12	0.18	0.00	0.00	0.00	0.00

*In each column,the mean values noted with the same letter do not present significant difference after the Duncan test, for p = 5%

grafted eggplants and 0.32% for non-grafted plants.

The results regarding the presence and severity of galls produced by nematodes attack on the roots of the eggplants, determined and recorded at the end of the production cycle and clearing the eggplant culture are shown in Tab. 4.

Grafting eggplants led to a significant reduction in attack frequency produced by *Meloidogyne spp.* on plant's roots. While in the case of non-grafted eggplants there was an disease incidence pest of 18.85%, when plants were grafted the frequency of nematode attack had not exceeded the value of 2.11%. Besides, the variation range recorded for all combinations (rootstock x scion) was quite tight: from 0.9%(Emperador x Sharapova) to 4.0%(Espina x AndraF1). The data regarding the severity of nematodes attack on the eggplants roots eggplants, roots expressed by the index, determined by Di Vito and Lamberti (1971), the grading scale(0-5) whose value expresses the number of galls from the roots, their spread and size, showed a high tolerance of the grafted plants to nematodes attack. Practically, in the case of grafted plants, the nematodes galls index on the roots of eggplants was between 0.8(Emperador x Sharapova) and 2.3(Espina x AndraF1) representing a level of infestation very weak to weak, with a number of galls between 3 and 8, isolated spread on root system and respectively 2.9(AndraF1) on non-grafted plants, representing a medium level of infestation to strong, with over 20 galls with spread throughout all the root system, including main roots. The obtained results are consistent with those presented by Oda, 1993

Tab. 4. Effect of grafting two cultivars of eggplant on various rootstocks and various soil pathogens, against nematode attack on a soil with high degree of natural infection, when growing in two different soil temperatures

Rootstock	Cultivar grafted	Disease incidence (% attacked plants)	Galls on roots (index 0-5)
King Kong	AndraF1	2.1	1.4
	SharapovaF1	1.3	1.1
Average		1.7a	1.25a
Emperador	AndraF1	1.9	1.4
	SharapovaF1	0.9	0.8
Average		1.4a	1.1a
Hikyaku	AndraF1	2.4	1.3
	SharapovaF1	1.4	1.1
Average		1.9a	1.2a
KA-312	AndraF1	3.1	2.1
	SharapovaF1	2.9	1.9
Average		3.0a	2.0ab
Torvum vigor	AndraF1	2.2	1.6
	SharapovaF1	1.4	1.3
Average		1.8a	1.45a
Espina	AndraF1	4.0	2.3
	SharapovaF1	1.7	1.7
Average		2.85a	2.0ab
Ungrafted eggplants	AndraF1	24.3	2.9
	SharapovaF1	13.4	1.4
Average non grafted eggplants		18.85b	2.15b
Average grafted eggplants		2.11	1.50

*In each column, the mean values noted with the same letter do not present significant difference after the Duncan test, for p = 5%

Tab. 5. Elements of economic effectiveness regarding eggplants culture(grafted plants vs. non-grafted plants)*

Culture type	Average production (t/ha)	Quality E+ I (%)	Average price (Euro/t)	Incomes (Euro**)	Total expenses (Euro)	Financial results (Euro)	
						+	-
Non-grafted eggplants	98.8	73	84.93	8391.9	3827.16	4564.74	-
Grafted eggplants	122.4	88	93.08	11393.77	4716.05	6677.72	-

*The source of prices and costs: financial data - accounting, own, of the institute
** 1Euro = 4.5 lei

and confirm the tolerance effect of grafted plants against nematodes (Meloidogyne sp.)

In order to determine the effectiveness of using the method of grafting eggplants some elements of economic effectiveness were analyzed. According to the data presented(Tab. 5), the use of grafted plants increases profits.

Average production/ha in the case of non-grafted eggplants – based on the obtained results - can reach 98.8 tone/ha, while a grafted eggplant crop could achieve a production of 122.4tone/ha; also, in terms of commercial quality, there was an average of Extra quality and First quality fruits in the case of non-grafted eggplants of 73% and 88% in the case of grafted plants. Considering an average price of 84.93 Euro for non-grafted plants and 93.08 Euro for grafted eggplants (due to the superior quality with over 15%), the potential revenues are 8391.9 Euro in the case of a hectare of non-grafted eggplants crop and, respectively 11393.77 Euro in case of a hectare of grafted eggplants.

Total expenses (seeds and seedlings, pesticides, fertilizers, auxiliary materials, labor, water, energy, etc.) represent 3827.16 Euro for a non-grafted culture and 4716.05 Euro for grafted eggplants (there are additional costs for obtaining the seedlings). The estimated financial results are positive and could be worth 4564.74 Euro for non-grafted eggplants and with 46.29% higher, respectively 6677.72 Euro, for grafted eggplants.

The better results recorded at the eggplants grafted (referring to marketable yield, quality, etc.) seems to be mainly due to the root system of the plants. It is known as the root system of the plants affects the vegetative growth and yield. As a result it is obvious that the differences in the root system of the grafted and non-grafted plants, leads to the efficiency water and nutrient uptake of by the roots.

The differences in quality, yield and earliness could be attributed to the different growth characteristics of the cultivars and to their different affinity to grafting and compatibility with the rootstock. Thus, (Suzuki & Morishita, 2002; Sebahattin *et al*.,2009) showed that Solanum torvum is a vigorous rootstock, and a graft combination of a vigorous cultivar with an equally vigorous rootstock reduces the amount of fertilizer required for the same yield. Earliness could also be associated with the high vigour of the rootstock. Gisbert *et al.* (2011) have mentioned that the earliness was observed mainly in the interspecific hybrids, respective between S. melongena and S. aethiopicum or S. incanum.

CONCLUSIONS

The obtained results highlight the positive effect of grafting eggplants on the average production. The best results were recorded in the grafting where has been used the rootstock Emperador, Hikyaku and King Kong. In the circumstances of a natural medium level of soil infection with *Verticillium dahlia* and *Fusarium oxysporum f.sp. melongenae*, eggplants grafting led to a significant decrease of the frequency of symptoms on plants and a consistent reduction of the disease incidence, disease severity and attack degree. Eggplants grafting led to a significant reduction of the frequency of *Meloidogyne sp.* attack on eggplants roots. Using grafted plants increased the final profit.

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