

RESEARCH REGARDING THE BEHAVIOUR OF GRAFTED EGGPLANTS TO BIOTIC AND ABIOTIC FACTORS IN CROPS IN GREENHOUSE

CERCETĂRI PRIVIND COMPORTAREA UNOR CULTIVARURI DE VINETE ALTOITE FAȚĂ DE FACTORII BIOTICI ȘI ABIOTICI, LA CULTURILE DIN SPAȚII PROTEJATE

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Abstract. Areas cultivated with eggplants occupy a very large surface in greenhouses and greenhouses, after tomatoes, peppers and cucumbers. The rootstocks assure to the eggplants high productivity, high quality of fruits and resistance/ tolerance to diseases and pests. The biological material was represented by eggplant cultivars Luiza and Aragon F1 and rootstock Torvum vigor. The purpose of the experience was to study the rootstock's influence on the growth, fructification and resistance to pathogens and pests of grafted eggplants. Eggplant plants grafted on Torvum vigor had a 19.8% higher vigor than Luiza and 25.2% Aragon F1 non-grafted. The yield was higher in grafted plants with 18.5% to Luiza cultivar and 17.8% to Aragon F1 compared with non-grafted variant. The Torvum vigor rootstock gives to grafted plants a high resistance to the attack of soil pathogens *Verticillium dahliae* and *Fusarium oxysporum f.sp. melongenae*.

Key words: eggplant, grafting, soil pathogen

Rezumat. Suprafețele cultivate cu vinete ocupă o pondere foarte mare în spații protejate, după tomate, ardei și castraveți. Portaltoiul utilizat pentru altoire asigură plantelor de vinete o productivitate ridicată, o calitate bună a fructelor și rezistență/ toleranță la patogeni și dăunători. Materialul biologic a fost reprezentat de două cultivaruri Luiza și Aragon F1 și de portaltoiul Torvum vigor. Scopul experienței a fost de a studia influența portaltoiului asupra creșterii, fructificării și rezistenței la patogeni și dăunători a vinetelor altoite. Plantele de vinete altoite pe portaltoiul Torvum vigor au avut o vigoare mai mare cu 19,8 % față de Luiza nealtoit și de 25,2% față de Aragon F1 nealtoit. Sporul de producție a fost mai mare la plantele altoite cu 18,5% la soiul Luiza și 17,8% la Aragon F1 față de cele nealtoite. Portaltoiul Torvum vigor conferă plantelor altoite o rezistență ridicată față de atacul agenților patogeni de sol *Verticillium dahliae* și *Fusarium oxysporum f.sp. melongenae*.

Cuvinte cheie: patlagele vinete, altoire, patogeni de sol

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INTRODUCTION

The vegetable grafting has been used since the early decades of the XIX century in the countries from the Far East and it is considered to be an ecological way to reduce the attack of pathogens and pests of soil (fungi, bacteria and nematodes) which, particularly in intensive culture conditions, produce considerable production loss and abandonment of some cultures. This planting material is a biological alternative for replacing polluting chemicals used to disinfection of the soil (Echevarria *et al.*, 2004).

The grafted seedlings print quality, productivity, resistance to diseases (*Fusarium* spp., *Verticillium* spp.) and pests (nematodes) of soil (Bogoescu *et al.*, 2008).

The grafting print resistance to pathogens and pests of soil, tolerance to abiotic stress factors, improves absorption about water and nutrients, increase vigor to scion (King *et al.*, 2010).

The use of rootstocks resistant to soil problems seems to be one alternative with future possibilities in places where growing cultivars, which has no resistance to nematodes, is still advantageous and where weather conditions make it difficult to introduce soil-less culture (Lee, 1994).

Çürük *et al.*, 2009 had investigated the grafting influence on eggplants, noting that the fruit average weight is significantly influenced by grafting. The results concerning the grafting influence on vegetable crops require more researches in this domain for to highlight the grafting effect on some aspects concerning production of grafted vegetables.

Some researchers believe that the results concerning the fruit quality obtained from grafted plants are contradictory (Davis *et al.*, 2008).

MATERIAL AND METHOD

The biological material used in the experiment was represented by grafted and non-grafted eggplant seedlings from ICDIMPH-Horting. The experimental variants were: V1. Luiza x Torvum vigor, V2. Luiza, non-grafted, V3. Aragon F1 x Torvum vigor and V4. Aragon F1, non-grafted.

Planting was done on May 20, 2013 in bands of two rows, 26.600 plants / ha. Before planting, the soil was mulched with black polyethylene foil.

During the vegetation period, there were made observations and determinations regarding the height of the plants, the obtained yield and the behavior of some soil pathogens and pests with economic importance.

Verticillium dahliae and *Fusarium oxysporum* f. sp. *melongenae* are two soil pathogens that attack the eggplant crops in greenhouses and fields and produce verticillium wilt and fusarium wilt.

Verticillium dahliae growing best in the soils when the temperatures are between 20 and 23 °C (optimally 22 °C), the nitrogen are in excess and the infestation with nematodes.

Optimal temperature for the production of infections with *Fusarium oxysporum* f. sp. *melongenae* is 28 °C. Symptoms of the disease do not occur at temperatures

below 20 °C or above 34 °C. Soil moisture that favors succulent plant growth causes rapid and severe disease development.

The occurrence and evolution of the attack of pathogens and pests is closely correlated with the environmental factors in the greenhouses, a very important role having the temperature and humidity in the soil and in the air.

The registration of the climatic factors in the greenhouse was done using an electronic thermohygrometer (Testo 172 - H2; tab. 1). Soil temperature was recorded using soil thermometers. Soil temperature in June and July was between 20 °C and 25 °C. In the next period, the soil temperature decreased, from 24 - 25 °C in August to 14-15 °C at the end of September.

Table 1

Greenhouse climatic data

Month	Atmospheric temperature (°C)			Atmospheric humidity (%)		
	Minimum	Average	Maximum	Minimum	Average	Maximum
June	16.9	23.9	34.3	49.2	65.1	86.5
July	17.4	24.9	34.3	40.6	64.5	85.2
August	16.7	24.2	32.6	41.3	64.4	86.9
September	13.3	19.9	29.7	44.8	63.1	85.6

RESULTS AND DISCUSSIONS

The eggplant plants grafted on *Torvum vigor* were more vigorous than the non-grafted, regardless of cultivar (tab. 2, figs 1 and 2). On September 25, the grafted plant Luiza were 126.6cm high, and the non-grafted plants had a lower height (101.5cm). The Argon F1 hybrid had more vigorous plants at the grafted variant (147.9cm) compared to the non-grafted variant (110.6cm).



Fig. 1 Luiza cultivar (1. grafted on *Torvum vigor*; 2. non-grafted)



Fig. 2 Aragon F1 hybrid (3. grafted on *Torvum vigor*; 4. non-grafted)

Table 2

The dynamics of the growth of eggplant plants in greenhouse

Cultivar	Variant	Plant height (cm)			
		25.06	25.07	25.08	25.09
Luiza	V ₁ Luiza x <i>Torvum vigor</i>	45.1	104.6	108.6	126.6
	V ₂ Non-grafted Luiza	44.1	83.9	90.3	101.5
Aragon F1	V ₃ Aragon F1 x <i>Torvum vigor</i>	39.6	110.9	130.1	147.9
	V ₄ Non-grafted Aragon F1	41.3	91.0	101.2	110.6

Plants grafted on *Torvum vigor* formed a more number of fruits per plant (4.8 Luiza and 6.1 Aragon F1), fruits with higher weight (462.3g Luiza and 572.2g Aragon F1) compared to non-grafted plants. The highest yield was obtained at grafted Aragon F1 (9.28kg / sqm) and non – grafted Aragon F1 (7.63kg / sqm, tab. 3, fig. 3).

Table 3

Eggplant yielding

Cultivar	Variant	Number of fruits/plant	Fruits weight (g)	Yield /plant (kg)	Yield /sqm (kg)
Luiza	V ₁ Luiza x <i>Torvum vigor</i>	4.8	462.3	2.22	5.90 ⁰⁰⁰
	V ₂ Non-grafted Luiza	4.2	432.1	1.81	4.81 ⁰⁰⁰
Aragon F1	V ₃ Aragon F1 x <i>Torvum.vigor</i>	6.1	572.2	3.49	9.28***
	V ₄ Non-grafted Aragon F1	5.4	531.3	2.87	7.63***
Average		5.1	499.5	2.59	6.90
DL 5%					0.32
DL 1%					0.46
DL 0.1%					0.67

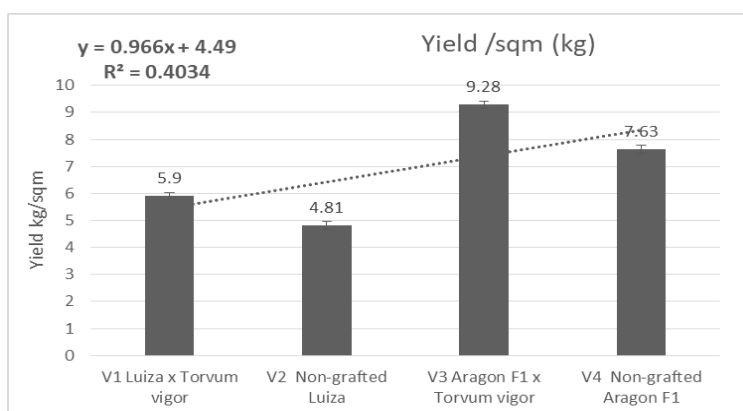


Fig. 3 Eggplants yield

In the Luiza cultivar, the yield was higher with 10.9 t / ha at the grafted variant with *Torvum vigor* compared to the non-grafted Luiza. In Aragon F1, the

yield difference between the non-grafted and the grafted variant is 16.5 t / ha in favor of the grafted variant.

Among the soil pathogens, *Verticillium dahliae* had a higher frequency than *Fusarium oxysporum*. The attack was manifested only in the non-grafted plants.

At the beginning of June, the first symptoms of *Verticillium dahliae* attack appeared on the basal leaves of the non-grafted plants, regardless of cultivar. Thus, the frequency of the attack was 17.8% in the non-grafted Luiza cultivar and 21.4% in the non-grafted Aragon F1 hybrid (tab. 4).

In mid-July, the first symptoms of the pathogen *Fusarium oxysporum* appeared in the non-grafted Luiza cultivar, which finally the frequency of the attack was 3.5%.

In the mulched soil with black foil the temperature was maintained at 18 - 25°C, favorable for the attack of the pathogen *Verticillium dahliae*.

Table 4

Frequency of *Fusarium oxysporum* and *Verticillium dahliae* attack on eggplant in greenhouse

Cultivar	Variant	Attack frequency (%)	
		<i>Fusarium oxysporum</i>	<i>Verticillium dahliae</i>
Luiza	V ₁ Luiza x T.vigor	0	0
	V ₂ Non-grafted Luiza	3.5	17.8
Aragon F1	V ₃ Aragon F1 x T.vigor	0	0
	V ₄ non-grafted Aragon F1	0	21.4

The grafted plants had a longer vegetation period with two weeks than the non-grafted ones. Thus, around September 15, the plants of the two non-grafted cultivars no longer had fruits that could be marketed, while the grafted plants also had fruits around October 1.

CONCLUSIONS

1. The eggplant plants grafted on the *Torvum vigor* rootstock had a greater vigor with 19.8% higher compared to Luiza non-grafted and 25.2% compared to Aragon F1 non-grafted.

2. The weight of the fruits from the plants grafted on *Torvum vigor* was higher with 6.5% compared to the fruits from the Luiza non-grafted and with 5.1% compared to the fruits from Aragon F1 non-grafted.

3. The yield was higher on the grafted plants with 18.5% in the Luiza grafted and 9.7% in Aragon F1 grafted compared to the non-grafted ones.

4. *Torvum vigor* rootstock gives to the grafted plants a high resistance against the attack of soil pathogens *Verticillium dahliae* and *Fusarium oxysporum* f.sp. *melongenae*. On the non-grafted plants, the attack frequency of *Verticillium dahliae* was 17.8% at Luiza cultivar and 21.4% in Aragon F1 hybrid. Attack of *Fusarium oxysporum* f.sp. *melongenae* was only found in the Luiza variety, with a frequency of 3.5%.

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