Evaluation of Rootstock Resistance to Fusarium Wilt and Gummy Stem Blight and Effect on Yield and Quality of a Grafted ‘Inodorus’ Melon

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Abstract. Grafting represents an effective tool for controlling the race 1,2 of *Fusarium oxysporum* f. sp. *melonis* (FOM) and *Didymella bryoniae* in melon (*Cucumis melo* L.). Although not considered a soilborne pathogen, *D. bryoniae* survives on plant remains in the soil. The lack of effective resistant commercial hybrids and the gradual reduced use of soil fumigation with methyl bromide increase the risk of damages by both these pathogens. We determined the effectiveness of eight commercial rootstocks, ‘RS 841’, ‘P 360’, ‘ES 99-13’, ‘Elsi’ (*Cucurbita maxima* Duchesne × *Cucurbita moschata* Duchesne), and ‘Belimo’, ‘Energia’, ‘Griffin’, ‘ES liscio’ (*Cucumis melo* genotypes), for their resistance to FOM and *D. bryoniae*. During 2003 and 2004 growing seasons, the *inodorus* F₁ hybrid Incas was grafted onto each of these commercial rootstocks and then evaluated, under greenhouse conditions, in terms of productivity and fruit quality. *Cucurbita* rootstocks (‘RS 841’, ‘P 360’, ‘ES 99-13’, ‘Elsi’) were highly resistant both to the race 1,2 of FOM (100% survival) and to *D. bryoniae* (almost absent crown lesions and low leaf disease index); this reaction clearly differed from that of both the *C. melo* rootstocks (‘Belimo’, ‘Energia’, ‘Griffin’, ‘ES liscio’) and the control Incas. In both years, the highest yield was recorded in the graft combination Incas/‘RS 841’ with 5.6 and 8.1 kg·m⁻² during 2003 and 2004, respectively. The *Cucurbita* rootstock ‘RS 841’ produced yields higher than *C. melo* rootstocks (‘Belimo’, ‘Energia’, ‘Griffin’, ‘ES liscio’) and the control Incas. Fruit dry matter, titratable acidity, total soluble solid contents, fruit firmness, and Hunter color [L* (brightness), a* (redness), and b* (yellowness) parameters] of grafted melons were similar to those of the plants grown on their own roots.

Melon (*Cucumis melo* L.) is one of the most economically important and widely cultivated vegetable crops in the Mediterranean region. In Italy, 26,615 ha are annually cultivated (ISTAT, 2005) with 23,157 ha

(87%) in open-field and 3458 ha (13%) under protected cultivation (greenhouses, plastic houses, and tunnels). In the last 30 years, melon cultivation in the greenhouse has become increasingly dependent on methyl bromide (MB) fumigation. This is attributable to the continuous cropping and, consequently, to the increasing soil contamination by pests and pathogens as *Fusarium oxysporum* f. sp. *melonis* (FOM) and *Didymella bryoniae* (causal agent of gummy stem blight). Although not a soilborne pathogen, this last fungus causes crown rot at or near the soil level, and inoculum potential represented by plant-infected remains can represent a serious danger for the future cultivations of *Cucurbitaceae* (Davi et al., 1988).

However, MB has a number of disadvantages: 1) it is considered toxic to humans and animals during its application and dissipation

periods (Ristaino and Thomas, 1997); 2) it is detected in groundwater (Wheeler and Kwar, 1997); 3) it is dissipated in the air, thus reducing the ozone layer (Montzaka et al., 1996) and increases skin cancer in humans (Diffey, 2004). For these reasons, 168 countries, including Italy, have agreed to gradually reduce the use of MB. Alternatives to MB for soil fumigation are represented by use of other chemicals (e.g., metham sodium, formalin, chloropicrin, and so on), crop rotation, solarization, and use of resistant cultivars. Crop rotation appears to be ineffective because the chlamydospores of FOM are able to survive for many years in the soil (Armstrong and Armstrong, 1978). Solarization has been used with good results against soilborne diseases of melon (Katan et al., 1976; Tjamos and Makriniakis, 1990), but it is not widespread because when the temperature is high enough for the application of this method, melon cultivation in the greenhouse is already in progress. Disease-resistant cultivars were developed to limit damages incited by soilborne fungi (McCreight et al., 1993). However, no commercial hybrids completely resistant to the race 1,2 of FOM and to *D. bryoniae* are available; in both cases, only sources of partially effective quantitative resistances have been until now reported (Frantz and Jahn, 2004; Perchepped and Pitrat, 2004; Perchepped et al., 2005). High levels of resistance have been found in different genotypes of *Cucurbitaceae* spp. (Lhotsky et al., 1991; Trionfetti Nisini et al., 1999, 2000), but they are incompatible with the cultivated melon.

Grafting plants onto resistant rootstocks is a quick method that may enable the susceptible scion to control soilborne diseases and increase yield (Lee, 1994; Lee and Oda, 2003; Oda, 1995). Melon is a vegetable species in which grafting is performed intensively to control soilborne diseases (Bletsos, 2005; Cohen et al., 2002, 2005; Edelstein et al., 1999; Lee, 1994; Trionfetti Nisini et al., 2002) and improve yield and tolerance to environmental stresses (Colla et al., 2006; Rivero et al., 2003). Generally, melons are grafted onto the same species (*C. melo* L.) and very rarely onto pumpkin (*Cucurbita* spp., *Cucurbita moschata* × *Cucurbita maxima* hybrids) and white gourd (*Benincasa hispida*) rootstocks. However, in these cases, the taste and the fruit shape may be often negatively affected by grafting, indicating that metabolites associated with fruit quality are translocated to the scion through the xylem. This decrease in fruit quality does not represent a general phenomenon but depends on the specific scion–rootstock interaction and on the particular combination of growing conditions, including the response to diseases (Cohen et al., 2002).

This work aims 1) at verifying the level of resistance to the race 1,2 of FOM and *D. bryoniae* of commercial *Cucurbita* and *Cucumis* rootstocks and 2) at determining the influence of the rootstocks on yield and fruit quality when used in graft combinations with the melon hybrid Incas under greenhouse conditions.

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Materials and Methods

Characteristics of rootstocks used. Name, definition, and source of rootstocks are given in Table 1. These rootstocks were chosen for their good level of resistance to the race 1,2 *F. oxysporum* f. sp. *melonis* (Trionfetti Nisini et al., 2002) and to *D. bryoniae* (Trionfetti Nisini et al., 2000). The F₁ hybrid Incas (Clause Tézier, Italia Spa, Venaria Reale, Torino, Italy) was used as control in the inoculation tests with both *FOM* and *D. bryoniae*. 'Incas' belongs to the *inodorus* group of *C. melo* and is known as winter melon. This is a late-maturing melon characterized by a firm and sweet flesh, usually white or green, a cucumber-like aroma, and a long shelf life. Traditionally, 'Incas' is grown for local consumption or long-distance transport during the fall–winter period. In our work, it was chosen for its tolerance to powdery mildew, which is a disease seriously threatening several Italian greenhouse cultivations of melon.

Inoculation tests. For the race 1,2 of *FOM*, artificial inoculations were performed under controlled conditions (24 ± 1 °C; 16 h light/8 h dark) on 15 plantlets per genotype at the first-true-leaf stage. Plants were arranged in a completely randomized design with nine treatments (eight commercial rootstocks and one scion) and three replications of 15 plants for each treatment. The inoculum was represented by the fungal suspension containing 10⁶ conidia/mL⁻¹ collected from 20-day old potato dextrose agar cultures of an Italian highly aggressive isolate (ISPaVe No. 1018, VCG 0134) of the race 1,2w. Inoculations were performed during transplanting of plantlets into sterile soil. Roots were washed with tap water, pruned to ≈1.0 to 1.5 cm, and then dipped for 10 min into 5 mL of the fungal suspension. To facilitate inoculum absorption into the plant, the seedling trays were kept at 24 ± 1 °C and watered, for the first time, only the day after inoculation. The percentages of healthy, symptomatic (progressive wilting on leaves) and dead plants per genotype were recorded 40 d after inoculation.

The isolate CP 1799 of *D. bryoniae*, supplied by the Royal Veterinary and Agricultural University of Copenhagen, Denmark, was cultured for 14 d at 24 ± 1 °C and 12 h light on malt agar (Oxoid, Basingstoke, UK) to induce sporulation (Keinath et al., 1995). Six of the commercial rootstocks tested for resistance to the race 1,2 of *FOM* ('RS 841', 'P360', 'ES 99-13', 'Elsi', 'Belimo', 'Energia') and 'Incas' were also tested for resistance to *D. bryoniae*. Plants were arranged in a completely randomized design with seven treatments (six commercial rootstocks and one scion) and three replications of 15 plants for each treatment. Plantlets with three or four fully expanded true leaves, grown in the greenhouse at 24 ± 2 °C, were sprayed with a fungal suspension containing 5 × 10⁵ spores/mL⁻¹ of the pathogen according to the procedure described by Trionfetti Nisini et al. (2000). Damage severity both on leaf and stem was scored 21 d after inoculation using the 1 to 5 scale (for leaves: 1

= 0% of leaf area affected, 5 = 75% to 100%; for stems: 1 = no damage, 5 = seedling dead) described by Zhang et al. (1997).

Greenhouse conditions. Two experiments were conducted, one in 2003 (Expt. 1) and one in 2004 (Expt. 2) in a 250-m² unheated polyethylene greenhouse situated on the Santa Croce Camerina Farm, Ragusa, South Italy (Expt. 1) and on the Pachino Farm,

Siracusa, South Italy. Plants were grown under natural light conditions. The maximum and minimum air temperatures inside the greenhouse, during the experimental period, was recorded on a data log and saved on a personal computer. Seeds of the hybrid Incas were sowed 4 d later (26 Mar. 2003 and 3 Apr. 2004) and 7 d earlier (22 Mar. 2003 and 31 Mar. 2004) than the *C. melo* and the

Table 1. Name, definition, and source of melon rootstocks.

Rootstocks	Definition	Source
RS 841	<i>Cucurbita maxima</i> × <i>Cucurbita moschata</i>	Royal Sluis Spa, Mirandola (Modena), Italy
P 360	<i>Cucurbita maxima</i> × <i>Cucurbita moschata</i>	SAIS Sementi S.p.A., Cesena (Forlì e Cesena), Italy
ES 99-13	<i>Cucurbita maxima</i> × <i>Cucurbita moschata</i>	Esasem Spa, Casaleone (Verona), Italy
Elsi	<i>Cucurbita maxima</i> × <i>Cucurbita moschata</i>	Vilmorin Italia srl, Funo (Bologna), Italy
Belimo	<i>Cucumis melo</i>	Nunhems Sementi srl, S. Agata Bolognese (Bologna), Italy
Energia	<i>Cucumis melo</i>	SEMINIS Vegetable Seeds Italia Srl, Parma, Italy
Griffin	<i>Cucumis melo</i>	PEOTEC Seeds srl, Sissa (Parma), Italy
ES liscio	<i>Cucumis melo</i>	Esasem Spa, Casaleone (Verona), Italy

Fig. 1. Daily maximum and minimum air temperatures (°C) recorded inside the greenhouse during Expt. 1 (29 Apr. to 2 Aug. 1003) and Expt. 2 (29 Apr. to 30 July 2004).

Cucurbita rootstocks seeds, respectively. The tongue approach was used for grafting the scion Incas onto the commercial rootstocks (Table 1) according to the procedure described by Lee (1994). In both experiments, a randomized complete block design with three replications was used. Each experimental unit consisted of six plants. Grafted and ungrafted melon plants were transplanted on 29 Apr. 2003 (Expt. 1) and on 29 Apr. 2004 (Expt. 2). The soil was a sandy loam with a pH of 8.2. Plants were grown in single rows (2 m × 0.96 m) at a plant density of 0.52 plants/m². Drip irrigation tape was installed on the soil surface at 20-cm distance from the plant row. The irrigation tape (T-tape; T-systems International, San Diego) had outlets for watering at 30-cm intervals and with a flow rate of 4 L·h⁻¹ per emitter.

In both experiments, preplant broadcast N-P-K fertilizer (12N-15P-18K) was applied at a dose of 400 kg·ha⁻¹ to all plots. Additional N at 100 kg·ha⁻¹, K at 130 kg·ha⁻¹, and Ca at 66 kg·ha⁻¹ were applied as potassium nitrate (13N, 44K), calcium nitrate (15.5N, 19 Ca), and ammonium nitrate (34N) through the drip irrigation system in four equal proportions at 10-d intervals starting 2 weeks after transplanting. Plants were kept free from weeds, insects, and diseases using greenhouse standard management procedures. The experiments were concluded on 2 Aug. 2003 (96 d after transplanting, Expt. 1) and on 30 July 2004 (93 d after transplanting, Expt. 2).

Measurements and analysis. Nine mature fruits per treatment (three fruits per replication) were harvested on 2 Aug. 2003 (Expt. 1) and on 30 July 2004 (Expt. 2). The numbers of fruits (no./m²), the mean fruit weights (kg), and the total yield (kg·m⁻²) were determined on six plants per plot. Immediately after harvest, Hunter color values [parameters L* (brightness), a* (redness), and b* (yellowness)] were measured on the surface of the external pulp with a Minolta colorimeter Model CR-300 (Minolta, Osaka, Japan). Pulp fruit firmness (N/cm²) was determined by a penetrometer (Texture Analyzer, Milano, Italy) fitted with a 4-mm diameter round-head probe on three discs of the skin surface from the fruit equatorial area. From the liquid extract obtained by liquefying in a blender (Moulinex, Milano, Italy) and then filtering all mesocarp of each fruit, total soluble solids (TSS) content in juice was determined by an Atago N1 refractometer (Atago Co. Ltd., Tokyo) and expressed as °Brix at 20 °C. Acidity was determined by potentiometric titration with 0.1 M NaOH up to pH 8.1 using 15 mL of juice. Results were expressed as percentage of citric acid in the juice. In both years, the fruits were dried in a forced-air oven at 80 °C for 72 h and weighed to determine the fruit dry matter (DM).

Statistical analysis. All data were statistically analyzed by analysis of variance using the SPSS software package (SPSS 10 for Windows, 2001). Duncan's multiple range test was performed at *P* = 0.05 on each of the variables measured.

Results

Climatic data. Differences between the two growing seasons in maximum (*T*_{max}) and minimum (*T*_{min}) air temperatures were observed (Fig. 1). During the 2003 growing season, the daily *T*_{max} and *T*_{min} ranged from 23.0 to 40.2 °C and from 9.1 to 23.7 °C, respectively, whereas for the 2004 growing season, the daily *T*_{max} and *T*_{min} varied from 17.0 to 34.6 °C and from 7.7 to 23.9 °C, respectively. Furthermore, the average daily *T*_{max} of the first 30 d after transplanting, in the 2003 growing season, was higher than in the 2004 growing season (27.6 °C versus 19.0 °C).

Fusarium and Didymella resistance. Mean values of inoculations tests with the race 1,2w of *FOM* indicated that the commercial *Cucurbita* rootstocks ('RS 841', 'P 360', 'ES 99-13', 'Elsi') had 100% plant survival, which clearly differed from that of both the *C. melo* rootstocks (average 38%) and the control (Fig. 2). Among *C. melo* rootstocks, reactions of 'Belimo' and 'Griffin' to the fungus resulted in higher levels of survival. Finally, the susceptible control Incas was completely wilted by the fungus with only a 2% survival.

The results of *D. bryoniae* resistance tests are reported in Figure 3. Among the genotypes tested, *Cucurbita* rootstocks ('RS 841', 'P 360', 'ES 99-13', 'Elsi') showed a high degree of resistance to *D. bryoniae* both on leaves and stems. Among *C. melo* rootstocks, 'Belimo' displayed a moderate severity of fungal attack, whereas 'Energia' was completely susceptible as the control Incas. Combining the results of inoculations both with the race 1,2w of *FOM* and *D. bryoniae*, the genotypes 'RS 841', 'P 360', 'ES 99-13', and 'Elsi' have shown the

highest levels of control of both pathogens. The *Cucumis* rootstocks showed moderate reactions to the fungi that were significantly different in respect to *Cucurbita* rootstocks; in some cases (e.g., 'Energia' in the inoculations with *D. bryoniae*), they reacted similarly to the susceptible control Incas.

Yield and fruit quality. In both experiments, yield and mean fruit mass of grafted melons were highly influenced by the rootstock, whereas no significant differences among genotypes were observed for fruit number (Table 2). In Expt. 1 (2003), the graft combination Incas/RS 841 yielded 36% more than ungrafted plants. The *Cucurbita* rootstock RS 841 produced also yields 74% higher than *C. melo* rootstocks ('Belimo', 'Energia', 'Griffin', 'ES liscio'). Plants grafted onto *Cucurbita* rootstocks, especially on 'RS 841', produced fruit weight larger than control and plants grafted onto *C. melo* rootstocks. The largest fruit weight was obtained by the same combination Incas/RS 841, with 2.74 kg, whereas the ungrafted control weighed 2.21 kg. A similar trend was also observed in the Expt. 2, in which the *Cucurbita* rootstock 'RS 841' yielded 16% and 22% more than both the *C. melo* rootstocks ('Belimo', 'Energia', 'Griffin', 'ES liscio') and the control, respectively (Table 2). The highest yield recorded on the graft combination Incas/RS 841 with respect to the *C. melo* rootstocks and the control, was attributable to an increasing in the mean fruit mass and not to the number of fruit. Finally, total yield was generally lower in 2003 than in 2004 cropping season (Table 2).

In terms of fruit quality, no significant differences among rootstocks were observed for TSS contents (average 11.5 °Brix and

Fig. 2. Plant survival (%) of eight commercial rootstocks and melon hybrid Incas recorded 40 d after inoculation with *F. oxysporum* f. sp. *melonis*, race 1,2w. Different letters indicate significant differences according to Duncan's test (*P* = 0.05).

Fig. 3. Leaf (A) and stem (B) disease index of six commercial rootstocks and the melon hybrid Incas recorded 21 d after inoculation with *D. bryoniae*. (for leaves: 1 = 0% of leaf area affected, 5 = 75% to 100%; for stems: 1 = no damage, 5 = seedling dead). Different letters indicate significant differences according to Duncan's test ($P = 0.05$).

Table 2. Total yield, mean fruit mass, and number of fruit of melon hybrid Incas when grafted on eight rootstocks and grown under greenhouse conditions in 2003 and 2004.

Grafting combination	Yield (kg·m ⁻²)		Mean fruit mass (kg)		Fruit number (no./m ²)	
	2003	2004	2003	2004	2003	2004
Incas (ungrafted)	4.13 bc ^z	7.05 b	2.21 bc	1.88 ab	1.88 a	3.74 a
Incas/RS 841	5.60 a	8.14 a	2.74 a	2.08 a	2.05 a	3.92 a
Incas/P 360	3.71 bc	7.35 ab	2.57 ab	2.13 a	1.47 a	3.47 a
Incas/ES 99-13	4.55 ab	7.34 ab	2.43 abc	1.95 ab	1.88 a	3.78 a
Incas/Elsi	4.11 bc	7.65 ab	2.45 abc	2.03 a	1.68 a	3.78 a
Incas/Belimo	3.45 bc	6.41 b	2.25 bc	1.74 b	1.53 a	3.71 a
Incas/Energia	2.93 c	6.90 b	2.25 bc	1.88 ab	1.30 a	3.71 a
Incas/Griffin	3.36 bc	7.02 b	2.06 c	1.87 ab	1.62 a	3.74 a
Incas/ES liscio	3.13 bc	6.42 b	2.11 c	1.92 ab	1.56 a	3.36 a
Significance	**	*	*	*	NS	NS

Means within columns separated using Duncan's multiple range test ($P = 0.05$).

ns,*,** Indicates nonsignificant or significant at $P \leq 0.05$ and 0.01 , respectively.

10.9 °Brix in 2003 and 2004, respectively), fruit DM (average 11.3% and 11.1% in 2003 and 2004, respectively), titratable acidity (average 0.15% and 0.13% in 2003 and 2004, respectively), firmness (average 20.5

and 20.1 N/cm in 2003 and 2004, respectively), and pulp color represented by L* (average 65.3 and 62.9 in 2003 and 2004, respectively) and by the a*/b* ratio (average -0.09 and -0.47 in 2003 and 2004, respectively) (Table 3).

Discussion

Considering the results of both inoculations with the race 1,2w of *FOM* and with *D. bryoniae*, the *Cucurbita* genotypes 'RS 841', 'P 360', 'ES 99-13', and 'Elsi' have shown the highest levels of resistance to both pathogens and can be considered as rootstocks for melon cultivation under greenhouse conditions in infected soil by both these pathogens. Their use is of great interest mainly to overcome the diffusion of the race 1,2 of the pathogen *FOM*, already causing severe damage in South Italy (Belisario et al., 2000).

It was demonstrated that grafting per se affects directly plant yield (Nielsen and Kappel, 1996; Rivero et al., 2003). Its influence can be exerted by the interaction of some or all of the following processes such as an increase of water and nutrient uptake resulting from the rootstock's vigorous root system (Lee, 1994; Ruiz et al., 1997), an enhanced production of endogenous hormones (Zijlstra et al., 1994), and an enhancement of scion vigor (Leoni et al., 1990). The joint action of some or all of these processes could explain the highest yield of melon plants grafted, especially on *Cucurbita*-resistant rootstocks as observed in the current study on 'RS 841'. The highest yield of melon, observed in this study from grafted plants, has been earlier reported also on watermelon (Yetisir and Sari, 2003), tomato (Fernandez-Garcia et al., 2004), eggplant (Khah, 2005), and melon (Ruiz and Romero, 1999). According to Ruiz and Romero (1999), the efficiency of grafting was significantly evident for fruit yield, in which fruit weight per plant was two times higher in the majority of grafted plants than in their controls. The highest yields recorded in the current experiment were not observed on all *Cucurbita* rootstocks suggesting that an accurate agronomic evaluation of the rootstock-scion combination is still necessary before using them on a commercial scale.

Exposure to higher-than-optimal temperatures reduces yield and impairs the quality of many crops, including vegetable crops (Erickson and Markhart, 2001; Firon et al., 2006). The highest air temperature recorded at the fruit set stage in 2003 with respect to the 2004 growing season was presumably responsible for the reduction in fruit set and productivity. Chronic heat stress, even at a mild degree, has been shown to disrupt the normal development of the gametes and thereby fruit set (Levy et al., 1978). Another interesting point observed in our study was that the rootstock 'RS 841' was found to be tolerant when grown under high-temperature conditions as observed in the 2003 growing season. There is general evidence that certain *Cucurbita* rootstocks may cause deterioration in fruit quality (Lee, 1994; Lee and Oda, 2003). In the present study, nutritional qualities such as fruit DM, titratable acidity, TSS content, and physical quality such as fruit firmness and Hunter color (L* and a*/b*) of grafted melons were similar to those of plants grown on their own roots (control). Therefore, the use of grafted melons under greenhouse

Table 3. Fruit dry matter (DM), total soluble solids (TSS) contents, titratable acidity (TA), firmness, and hunter color values (L*, a*/b*) of melon hybrid Incas when grafted on eight rootstocks and grown under greenhouse conditions in 2003 and 2004.

Grafting combination	DM (%)		TSS (°Brix)		TA (%)		Firmness (N/cm ²)		L*		a*/b*	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
Incas (ungrafted)	11.2	10.7	11.5	11.0	0.15	0.12	20.8	19.7	65.5	63.2	-0.05	-0.43
Incas/RS 841	12.0	10.5	12.1	11.6	0.16	0.12	21.1	21.0	63.8	64.4	-0.12	-0.52
Incas/P 360	11.9	10.4	11.7	10.8	0.19	0.12	18.5	18.3	65.2	62.0	-0.09	-0.49
Incas/ES 99-13	11.7	10.6	11.6	10.9	0.15	0.11	17.4	20.8	65.4	63.2	-0.12	-0.50
Incas/Elsi	10.5	11.3	10.8	11.1	0.16	0.13	21.6	18.4	65.3	62.6	-0.06	-0.47
Incas/Belimo	12.1	11.0	11.8	10.6	0.15	0.12	20.8	18.6	64.6	63.4	-0.06	-0.43
Incas/Energia	11.7	12.1	12.0	11.0	0.17	0.12	21.1	18.9	63.5	60.7	-0.10	-0.47
Incas/Griffin	9.8	12.3	10.3	10.5	0.14	0.11	22.8	19.2	67.6	64.1	-0.16	-0.46
Incas/ES liscio	10.9	10.9	11.8	10.4	0.16	0.10	21.8	18.6	66.9	62.2	-0.12	-0.43
Significance	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Means within columns are separated by Duncan's multiple range test ($P = 0.05$).

^{NS}Nonsignificant.

conditions would represent a potential strategy to increase total yield without having remarkable deterioration in the taste of melons.

In conclusion, the rootstock 'RS 841' was resistant to the race 1,2w of *FOM* and to *D. bryoniae* and was also the best genotype capable of significantly improving the productivity without a detrimental effect on fruit quality of the hybrid Incas used as a scion. 'RS 841' can be considered the most interesting rootstock among those tested for melon cultivation under greenhouse conditions.

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