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Determination of *Verticillium* and *Fusarium* wilt resistance levels of different interspecific hybrid eggplant lines

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Abstract: This study was conducted to investigate the resistance of 4 wild eggplant species (*Solanum aethiopium* group Aculeatum, *S. incanum*, *S. macrocarpon*, *S. linnaeanum*), 3 cultivated eggplant varieties ('Anamur F1', 'Pala', 'Yamula'), 1 eggplant rootstock (Köksal F_1) and 34 interspecific hybrids to *Verticillium dahliae* Kleb. and *Fusarium oxysporum* f.sp. *melongenae*. Disease resistance of eggplant genotypes was determined by the pathogenicity test. The disease severity values varied between 0–80% for *Verticillium* and between 0–100% for *Fusarium*. Among the 42 genotypes, 18 genotypes were found to be moderately resistant and 1 genotype was found to be highly resistant to *Verticillium*. At the same time, 2 of the 42 genotypes were found to be moderately resistant and 22 of the 42 genotypes were found to be highly resistant to *Fusarium*. All hybrids with *S. integrifollium, Solanum aethiopicum* group Gilo as father were found to be highly resistant to *Fusarium oxysporum* f.sp. *melongenae*. *Solanum linnaeanum* did not exhibit any disease symptoms and was found to be highly resistant to both disease agents. Present interspecific hybrid eggplant genotypes with known resistance to *Verticillium* and *Fusarium* wilt are expected to have significant contributions in developing new eggplant rootstocks and hybrid eggplant cultivars in the future.

Keywords: hybrid line; soil-borne pathogen; symptoms; resistant; wild eggplant

Eggplant (*Solanum melongena* L.) is an economically valuable vegetable and is widely produced in tropical and subtropical regions. It ranks 6th among the mostly produced vegetables after tomato, watermelon, onion, cucumber and cabbage (FAO 2019). In case of ideal ecological conditions, there are some other factors with serious negative effects on yield and quality of eggplant. The most important factor limiting eggplant production is its susceptibility to soil-borne diseases. *Fusarium* and *Verticillium* wilt are among the most serious ones of these soil-borne diseases (Rotino et al. 2004). *Fusarium oxysporum melongenae* causes vascular wilt disease in eggplant and generates serious yield losses, especially in Asian countries. This disease is also commonly encountered in both greenhouse and open-field cultivations of Mediterranean basin and European countries including Turkey (Altinok 2005). Since *Verticillium* can develop worldwide and has a wide host area, it causes serious yield and quality losses. Such a loss in *Verticillium*-infested soils was reported be around 78% (Bletsos et al. 2003). For instance, *Verticillium dahliae* causes damage on about 660 plant species. Among them, there are important products such as eggplant, cotton, tomato, potato and sunflower (Bowden et al. 1990). Lack of an effective control method against these diseases and absence of resistance genes

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against *Verticillium* and *Fusarium* wilt in *Solanum melongena* germplasm make eggplant cultivation difficult. Some wild *Solanum* species, such as *S. linnaeanum*, *S. sisymbriifolium*, *S. aethiopicum*, *S. incanum*, *S. macrocarpon* and *S. torvum*, which are close relatives of eggplant (*Solanum melongena*), have resistance genes against *Verticillium* and *Fusarium* wilt (Daunay 2008; Liu et al. 2014). Therefore, transferring resistance genes found in wild eggplant species to cultivated eggplant constitute a significant tool for developing resistance to *Verticillium* and *Fusarium* wilt in eggplant. Several studies have been carried out to transfer the resistance in wild forms to cultivated plants, but success has not been achieved due to incompatibility problem encountered in interspecies hybridizations (Monma et al. 1997; Rotino et al. 2001; Okada et al. 2002; Rizza et al. 2002). Except for cultivars used as rootstock, resistance has not yet been reported in commercial eggplant varieties (Boyacı 2007; Türktaş, Koral 2018). This study was conducted to identify resistance level of some wild eggplant species and interspecific hybrids to *Verticillium dahliae* and *Fusarium oxysporum* f.sp. *melongenae*.

MATERIAL AND METHODS

Plant material. In this study, a total of forty-two genotypes, including thirty-four interspecific hybrid lines, four wild eggplant species, three cultivated eggplant cultivars and one eggplant rootstock obtained in an interspecies eggplant hybridization study carried out in Tokat Gaziosmanpaşa University in 2019, were used as the plant material (Table 1). Seeds of present genotypes were sown (840 seeds/genotypes) in peat medium (Klasman) of multiple pots and left to develop under controlled greenhouse conditions (25 ± 2 °C, 60–70% of relative humidity and a 12-h photoperiod).

Fungal material. The Vd-14 and Fomg10 fungal isolates used in pathogenicity tests to determine the reactions of resultant hybrid lines to *Verticillium dahliae* Kleb. and *Fusarium oxysporum* f.sp. *melongenae* pathogens causing wilt in eggplant were supplied from the stocks of Mycology laboratory of Phytopathology Department of Tokat Gaziosmanpaşa University Agricultural Faculty.

Preparation of spore suspensions. Spore suspensions used in pathogenicity tests were prepared from 3–4-week-old fungal cultures developed in Potato Dextrose Agar (PDA, Sigma) medium at 25 °C. Fungal spores were scraped from the medium with the aid of a sterile scalpel and taken into 250 mL Erlenmeyer flasks. The flasks were then supplemented with sterile distilled water (1 000 mL) containing 0.1% Tween 80 in a controlled manner as to have a dense suspension.

Homogenized fungal suspensions were filtered through 3 layers of tulle to remove agar and mycelium fragments and taken into new Erlenmeyer flasks. Spore density of resultant suspension was determined by microscope counting with the use of a hemocytometer. Spore concentration was adjusted as 3×10^6 conidia/mL for *V. dahliae* and as 1×10^6 conidia/mL for *F. oxysporum* f.sp. *melongenae* (Korolev et al. 2008; Altınok, Can 2010).

Pathogenicity tests. Root dipping method was used for inoculation of fungal solutions into the plants. The seedlings with 5–6 leaves were removed from their environment and their roots were washed under water. The washed root tips were shaved and scar tissue formation was achieved. Then, each hybrid plant group was immersed into the spore suspensions in a beaker and kept there for 15 minutes. The control group was immersed in sterile distilled water with the same method and for the same duration. Following inoculation, plants were transplanted into plastic pots containing a mixture of sterilized soil, peat, and perlite (2 : 1 : 1). The experiment was conducted with 5 pots for each eggplant genotype with a completely randomized design. The *V. dahliae*-induced disease symptoms were evaluated 2.5 months after inoculation and disease severity was determined with the use of a 0–4 scale of Korolev et al. (2008) (0 = no symptoms, 1 = less than 25% wilt of leaves, 2 = 25–50% wilt, 3 = 50–75% wilt, 4 = 75–100% wilt, dead plant).

The *F. oxysporum* f.sp. *melongenae*-induced disease symptoms were evaluated 4 weeks after inoculation and disease severity was determined with the use of 0–4 scale of Altınok and Can (2010) (0 = no symptoms, 1 = onset of wilting, lightening of thin veins on lower leaves, 2 = half of the plant wilt, growth recession, chlorosis and necrosis, 3 = general wilt, drying of leaves, shedding and dieback from the tips, 4 = drying and death).

With the use of scale values, the percent (%) disease severity of hybrid lines was calculated by using Tawsend-Heuberger equation (Altınok, Can 2010):

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Table 1. Source of wild eggplant species used in hybridization study

No.	Species	Accession code	Origin
21	*S. incanum*	PI 381155	USDA
15	*S. integrifollium*	MM 134	INRA
28	*S. macrocarpon*	PI 441915	USDA
37	*S. linnaeanum*	PI 420415	USDA
31	*S. aethiopicum*	PI 441848	USDA
10	*S .linnaeanum*	PI 388847	USDA
60	*S. insanum*	TS02880	AVRDC
43	*S. aethiopicum* (Shum group)	TS02780	AVRDC
26	*S. aethiopicum* (Gilo group)	VI050355	AVRDC
11	*S. aethiopicum* (Aculeatum group)	VI 038290	AVRDC
29	*S .anguivi*	PI 194789	USDA
51	*S. anguivi*	PI 179745	USDA
3	*S. lichtensteini*	PI 645685	USDA

USDA – United States Department of Agriculture; AVRDC – The World Vegetable Center; INRA – Institut National de la Recherche Agronomique

$$\text{Disease severity (\%)}: \sum \frac{n \times v}{V \times N} \times 100$$

where: n – number of samples with the same value; v – scale value; V – the greatest scale value; N – total number of samples.

Resistance level groupings of hybrid lines were made based on disease severity values (Kehr et al. 1972). 1 (0–10%): highly resistant (HR), 2 (11–40%): moderately resistant (MR), 3 (41–70%): slight resistance (SR), 4 (71–100%): susceptible (S).

Data analysis. The Kruskal-Wallis H test was used for statistical analysis of the resistance of 42 different eggplant breeding lines to *V. dahliae* Kleb. and *Fusarium oxysporum* f.sp. *melongenae*. Differences between the groups were evaluated with Tamhane's T2 test.

RESULTS AND DISCUSSION

Thirty-four interspecific hybrid eggplant lines, four wild eggplant species, three cultivated eggplant cultivars and one eggplant rootstock were tested by classical testing to determine resistance level to *Foxysporum* f.sp. *melongenae* and *V. dahliae* Kleb wilt. Test results revealed that in terms of resistance to both disease agents, differences between the groups were found to be significant ($P < 0.05$).

Effects of *V. dahliae* Kleb. on eggplant genotypes. Effects of *V. dahliae* Kleb. on different eggplant genotypes were evaluated through observations made 2.5 months after inoculation. In disease assessments, yellowing and wilting symptoms were monitored, disease susceptibilities were determined on a scale and disease percentages were compared. Disease severity values varied between 0–80% (Table 2). While 5 of 42 lines were found to be susceptible to *V. dahliae*, 18 of them were found to be slightly resistant, 18 of them moderately resistant and 1 of them highly resistant. In a previous study, in which resistance of eggplant genotypes to *Verticillium dahliae* were assessed, disease severity of *Solanum incanum*, *Solanum linnaeanum*, *Solanum aethiopicum* varied between 7.98–9.87% (Colak Ateş 2020). In the present study, the disease severity of *Solanum incanum* hybrids varied between 25–75%, while the disease severity of *Solanum incanum* was found to be 35%. The disease severity of *Solanum aethiopicum* (Aculeatum group) was 50% and the disease severity of hybrids varied between 50–65%. Disease symptoms were not encountered in *S. linnaeanum*. It has been reported that the backcross progeny of *S. linnaeanum* and a cultivated eggplant have a resistance of about 60% to *V. dahliae* (Acciarri et al. 2001; Sunseri et al. 2003).

Effects of *Fusarium oxysporum* f.sp. *melongenae* on eggplant genotypes. In present observations made 4 weeks after inoculation, significant findings were achieved for the development of interspecific hybrid eggplant lines resistant to *F. oxysporum* f.sp. *melongenae*. Disease severity values varied between 0–100% (Table 3). Among the 34 interspecific hybrid eggplant genotypes used

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Table 2. Response of eggplant genotypes to *Verticillium dahlia*

Genotype	Disease severity scores of *V. dahliae* on eggplant $\bar{X} \pm S_{\bar{x}}$ (med: min–max)	Disease severity (%)	Degree of resistance
S. aethiopicum (11) × *S. incanum* (21)	2 ± 0 (0: 2–2)^{cde}	50	SR
S. aethiopicum (11) × *S. anguivi (29)*	2.6 ± 0.24 (3: 2–3)^{efgh}	65	SR
S. integrifollium × *S. incanum* (21)	2 ± 0 (2: 2–2)^{cde}	50	SR
S. integrifollium × *S .anguivi* (29)	2.6 ± 0.24 (3: 2–3)^{efgh}	65	SR
S. integrifollium × *S. macrocarpon* (28)	2.6 ± 0.24 (3: 2–3)^{efgh}	65	SR
S. integrifollium × Pala	2.8 ± 0.2 (3: 2–3)^{fgh}	70	SR
S. integrifollium × Anamur F_2	3.2 ± 0.2 (3: 3–4)^{h}	80	S
S. integrifollium × Anamur F_4	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
S. integrifollium × Yamula	1.6 ± 0.24 (2: 1–2)^{bcd}	40	MR
S. aethiopicum (31) × Anamur F_4	1.6 ± 0.24 (2: 1–2)^{bcd}	40	MR
S. aethiopicum (31) × *Yamula*	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
S. aethiopicum (31) × *Pala*	1.6 ± 0.24 (2: 1–2)^{bcd}	40	MR
S. aethiopicum (31) × *S. incanum* (21)	1 ± 0 (1: 1–1)^{b}	25	MR
S. aethiopicum (31) × Anamur F_4	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
S. incanum (21) × Anamur F_4	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
S. incanum (21) × *S. anguivi* (51)	1 ± 0 (1: 1–1)^{b}	25	MR
S. incanum (21) × Pala	2 ± 0 (2: 2–2)^{cde}	50	SR
S. incanum (21) × Yamula	3 ± 0 (3: 3–3)^{gh}	75	S
S. incanum (21) × Anamur F_2	3 ± 0 (3: 3–3)^{gh}	75	S
S. incanum(21) ×*S. anguivi* (29)	2.2 ± 0.2 (2: 2–3)^{def}	55	SR
S. anguivi (29) × Yamula	2.6 ± 0.24 (3: 2–3)^{efgh}	65	SR
S. anguivi (29) × *S. incanum* (21)	2.6 ± 0.24 (3: 2–3)^{efg}	65	SR
S. anguivi (29) × Anamur F_2	3 ± 0 (3: 3–3)^{gh}	75	S
Köksal F_1 × *S.insanum* (60)	1.2 ± 0.2 (1: 1–2)^{b}	30	MR
Anamur F_2 × *S.aethiopicum* group Gilo(26)	2 ± 0 (2: 2–2)^{cde}	50	SR
Anamur F_2 × *S. insanum* (60)	2 ± 0 (2: 2–2)^{cde}	50	SR
Anamur F_2 × *S. lichtensteini*(3)	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
Anamur F_2 × *S. integrifollium*	1.6 ± 0.24 (2: 1–2)^{bcd}	40	MR
Anamur F_2 × *S. incanum*(21)	2 ± 0 (2: 2–2)^{cde}	50	SR
Anamur F_4 × *S. anguivi (29)*	2.6 ± 0.24 (3: 2–3)^{efgh}	65	SR
Anamur F_4 × *S. incanum*(21)	2.4 ± 0.24 (2: 2–3)^{efg}	60	SR
Anamur F_4 × *S. macrocarpon* (28)	1.2 ± 0.2 (1: 1–2)^{b}	30	MR
Pala × *S. aethiopicum* group Gilo (26)	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
Yamula × *S. insanum* (60)	2.4 ± 0.24 (2: 2–3)^{efg}	60	SR
S. aethiopicum (11)	2 ± 0 (2: 2–2)^{cde}	50	SR
S. incanum (21)	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
S. macrocarpon (28)	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
S. linnaeanum (10)	0 ± 0 (0: 0–0)^{a}	0	HR
Köksal F_1	1.5 ± 0.5 (1.5: 1–2)^{bc}	37.5	MR
Anamur	3 ± 0 (3: 3–3)^{gh}	75	S
Pala	2.6 ± 0.24 (3: 2–3)^{efgh}	65	SR
Yamula	1.4 ± 0.24 (1: 1–2)^{bc}	35	MR
Significance	0.000 ($P < 0.05$)		

HR – highly resistant (disease severity 0–10%); MR – moderately resistant (disease severity 11–40%); SR – slight resistance (disease severity 41–70%); S –susceptible (disease severity 71–100%); the Kruskal-Wallis H test was used for statistical analysis of resistance to *V. dahlia* Kleb. and *Fusarium oxysporum* f.sp. *Melongenae*; data followed by different lowercase letters show statistically significant differences at $P < 0.05$ according to Tamhane's T2 test

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Table 3. Response of eggplant genotypes to *Fusarium oxysporum* f.sp. *melongenae*

Genotype	Disease severity scores of *F. oxysporum* f.sp. *melongenea* on eggplant $\overline{X} \pm S_{\overline{x}}$ (med: min–max)	Disease severity (%)	Degree of resistance
S. aethiopicum group Aculeatum (11) × *S. incanum* (21)	0 ± 0 (0: 0–0)^{a}	0	HR
S. aethiopicum group Aculeatum (11) × *S. anguivi* (29)	0.2 ± 0.2 (0: 0–1)^{a}	5	HR
S. integrifollium × *S. incanum* (21)	0 ± 0 (0: 0–0)^{a}	0	HR
S. integrifollium × *S. anguivi* (29)	0.2 ± 0.2 (0: 0–1)^{a}	5	HR
S. integrifollium × *S. macrocarpon* (28)	0 ± 0 (0: 0–0)^{a}	0	HR
S. integrifollium × Pala	0 ± 0 (0: 0–0)^{a}	0	HR
S. integrifollium × Anamur F_2	0 ± 0 (0: 0–0)^{a}	0	HR
S. integrifollium × Anamur F_4	0 ± 0 (0: 0–0)^{a}	0	HR
S. integrifollium × Yamula	0 ± 0 (0: 0–0)^{a}	0	HR
S. aethiopicum (31) × Anamur F_4	0 ± 0 (0: 0–0)^{a}	0	HR
S. aethiopicum (31) × Yamula	0 ± 0 (0: 0–0)^{a}	0	HR
S. aethiopicum (31) × Pala	0.2 ± 0.2 (0: 0–1)^{a}	5	HR
S. aethiopicum (31) × *S. incanum* (21)	0 ± 0 (0: 0–0)^{a}	0	HR
S. aethiopicum (31) × Anamur F4	0 ± 0 (0: 0–0)^{a}	0	HR
S. incanum(21) × Anamur F4	3 ± 0.63 (4: 1–4)^{fghi}	75	S
S. incanum (21) × *S. anguivi* (51)	0.8 ± 0.49 (0: 0–2)^{ab}	20	MR
S. incanum(21) × Pala	2.4 ± 0.68 (2: 1–4)^{cdef}	60	SR
S. incanum(21) × Yamula	2.8 ± 0.37 (3: 2–4)^{efgh}	70	SR
S. incanum(21) × Anamur F_2	3.4 ± 0.4 (4:2–4)^{ghij}	85	S
S. incanum(21) × *S. anguivi* (29)	2 ± 0 (2: 2–2)^{cdef}	50	SR
S. anguivi (29) × Yamula	2.6 ± 0.24 (3: 2–3)^{defg}	65	SR
S. anguivi (29) × *S. incanum* (21)	1.6 ± 0.51 (2: 0–3)^{bc}	40	MR
S. anguivi (29) × Anamur F_2	3.4 ± 0.4 (4: 2–4)^{ghij}	85	S
Köksal F_1 × *S. insanum* (60)	0 ± 0 (0: 0–0)^{a}	0	HR
Anamur F_2 × *S. aethiopicum* group Gilo (26)	0 ± 0 (0: 0–0)^{a}	0	HR
Anamur F_2 × *S. insanum* (60)	1.8 ± 0.2 (2: 1–2)^{cd}	45	SR
Anamur F_2 × *S. lichtensteini*(3)	3.8 ± 0.2 (4: 3–4)^{ij}	90	S
Anamur F_2 × *S. integrifollium*	3.6 ± 0.24 (4: 3–4)^{hij}	90	S
Anamur F_2 × *S. incanum*(21)	3.6 ± 0.4 (4: 2–4)^{hij}	90	S
Anamur F_4 × *S. anguivi* (29)	2.6 ± 0.51 (3: 1–4)^{defg}	65	SR
Anamur F_4 × *S. incanum* (21)	3.2 ± 0.49 (4: 2–4)^{fghij}	80	S
Anamur F_4 × *S. macrocarpon* (28)	0 ± 0 (0: 0–0)^{a}	0	HR
Pala × *S. aethiopicum* group Gilo (26)	0 ± 0 (0: 0–0)^{a}	0	HR
Yamula × *S. insanum* (60)	2.6 ± 0.4 (2: 2–4)^{defg}	65	SR
Aculeatum	0 ± 0 (0: 0–0)^{a}	0	HR
S. incanum (21)	1.6 ± 0.24 (2: 1–2)^{bc}	40	MR
S. macrocarpon (28)	0 ± 0 (0: 0–0)^{a}	0	HR
S. linnaeanum (10)	0.4 ± 0.24 (0: 0–1)^{a}	10	HR
Köksal F_1	0 ± 0 (0: 0–0)^{a}	0	HR
Anamur F_1	4 ± 0 (4: 4–4)^{j}	100	S
Pala	4 ± 0 (4: 4–4)^{j}	100	S
Yamula	3.8 ± 0.2 (4: 3–4)^{ij}	95	S
Significance	0.000 ($P < 0.05$)		

HR – highly resistant (disease severity 0–10%); MR – moderately resistant (disease severity 11–40%); SR – slight resistance (disease severity 41–70%); S –susceptible (disease severity 71–100%); the Kruskal-Wallis H test was used for statistical analysis of resistance to *V. dahlia* Kleb. and *Fusarium oxysporum* f.sp. *Melongenae*; data followed by different lowercase letters show statistically significant differences at $P < 0.05$ according to Tamhane's T2 test

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in this study, 18 genotypes were found to be highly resistant to *Fusarium oxysporum* f.sp. *melongenae*, 2 genotypes were moderately resistant, 7 genotypes were slightly resistant, and 7 genotypes were susceptible. All genotypes ('Anamur', 'Pala', 'Yamula') of *Solanum melongena* used in the study were found to be susceptible to *F. oxysporum* f.sp. *melongenae*.

S. linnaeanum line exhibited high resistance against both *V. dahliae* and *F. oxysporum* f. sp. *melongenea* agents. The resistance of 12 wild species, which are close relatives of eggplant, to *Fusarium* wilt was investigated and *Solanum incanum* and *Solanum linnaeanum* species were reported to be susceptible (Stravato, Capelli 2000). However, in the present study, *S. linneanum* was found to be highly resistant to Fomg-10 and *Solanum incanum* was found to be moderately resistant. Sakai (1984), investigated potential use of *S. integrifolium* and *S. melongena* cv. Dingaras Multiple Purple hybrids as rootstock and indicated that interspecies F_1 hybrid exhibited better resistance to *Fusarium* than *S. integrifolium*. In the present study, all hybrids of *S. integrifolium* were found to be resistant. In another study, the resistance of *Solanum aethiopicum* group Gilo and *Solanum melongena* somatic hybrids to *Fusarium oxysporum* f.sp. *melongenae* was investigated and it was reported that 34 of 41 dihaploids did not have any symptoms (Rizza et al. 2002). In the present study, 5 hybrids of *Solanum aethiopicum* group Gilo and *Solanum melongena* were tested and all were found to be highly resistant.

CONCLUSION

Wilt disease caused by soil-borne pathogens affects both the quantity and quality of crops, thus resulting in significant yield losses. Cultivated eggplant (*Solanum melongena*) is susceptible to soil-borne pathogens such as *Verticillium* and *Fusarium*. On the other hand, wild eggplant species constitute a rich source of genes for resistance to pests and diseases. In interspecies hybridization, hybrid seed production is greatly restricted by certain fertilization barriers. Therefore, in the present study, different from the previous ones, to obtain intermediate hybrids, species such as *Solanum incanum*, which can easily be hybridized with *Solanum melongena*, were hybridized with the other species and the resistance levels of resultant hybrids to *Verticillium* and *Fusarium* were investigated. This study is unique in this sense and prospective outcomes are expected to provide significant contributions to further studies. In the present study, *S. aethiopicum* (11) × *S. incanum*, *S. aethiopicum*(11) × *S. anguivi* (29), *S. integrifollium* × *S. incanum*, Anamur F_2 × *S. aethiopicum* (*gilo* group), *S. aethiopicum* (31) × Anamur F_4, Pala × *S. Aethiopicum* (26), *S. integrifollium* × *S. anguivi* (29), *S. integrifollium* × *S. macrocarpon*, *S. integrifollium* × Pala, *S. integrifollium* × Anamur F_2, *S. aethiopicum* (31) × Yamula, *S. integrifollium* × Anamur F_4, Köksal F_1 × *S. insanum*, Anamur F_4 × *S. macrocarpon*, *S. aethiopicum* (31) × *S. incanum*, *S. integrifollium* × Yamula, *S. aethiopicum* (31) × Anamur F_4, *S. macrocarpon*, *S. linnaeanum*, *S. aethiopicum* (11) and Köksal F_1 were found to be highly resistant to *Fusarium oxysporum* f.sp. *melongenae*. *S. anguivi* (29) × Anamur F_2 hybrid and all hybrids with Anamur F_2 lines as the father were found to be susceptible to *Verticillium* disease agent. Therefore, it was thought that the use of these two genotypes in cultivar development studies will fail in terms of resistance to diseases. On the other hand, *S. linnaeanum* line with high resistance to both disease agents has a promising potential in both cultivar and rootstock development studies.

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