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SCREENING OF TOMATO VARIETIES FOR RESISTANCE TO MAJOR FUNGAL DISEASES AND BACTERIAL WILT

*The resistance of local and introduced tomato varieties to early blight (*Alternaria solani* Sorauer) and late blight (*Phytophthora infestans* (Mont.) de Bary) were evaluated in the field and to bacterial wilt (*Ralstonia solanacearum*) were tested under artificial infection in greenhouse conditions. Three varieties (De-brao krasnii, De-brao Rozovii and Sultan F1) showed the moderate resistance to early blight, while the only two varieties (De-brao krasnii and De-brao Rozovii) were moderate resistant to late blight. The remaining samples showed susceptibility to disease.*

The tested varieties showed a different degree of resistance to the bacterial wilt. Four varieties: Rozovii Gigant, Krachodarskii Krasnii, Tarasenko and Lagidnii appeared to be resistant; Two varieties: Fakel and Polbig showed the moderate resistance and the rest ten varieties were susceptible to the disease.

tomato, *Ralstonia solanacearum*, early blight, late blight, resistance

The cultivated tomato (*Solanum lycopersicum*) is one of the most popular and widely used foods in Georgia. It was introduced in the second half of the XVIII century in Georgia and now it is grown in all regions up to 1700 meters above sea level. Of the several major diseases infecting tomato, late blight (caused by *Phytophthora infestans*) and early blight (caused by *Alternaria solani* Sorauer) are prevalent and severe diseases, reducing yields significantly. Average yield losses of a tomato crop caused by these pathogens are 40–50%, but during severe outbreaks of diseases, the affected foliage area reached 70–100% [1, 2].

Very harmful, restricted distributed quarantine disease of tomato is bacterial wilt (caused by *Ralstonia solanacearum*). In tomato, bacterial wilt was identified for the first time in 2011 in Chkhorotsku and Kutaisi regions (west Georgia). Where it caused up to 100% plant loss in greenhouse- and

field-grown crops [3]. Since then, several cases of this disease have been documented on potato in home gardens [4]. Natural climatic conditions of Georgia are favorable for development tomato diseases, however, the level of damage depends on the varieties, on the infection time and severity, crop grown season climate, etc.

Chemical control of the disease has commonly been used in Georgia, but it is expensive and despite their usefulness, pesticides could pose potential risks to food safety and the environment. Adoption of disease resistant varieties/hybrids is the most environmentally friendly practical way to solve this problem, especially to control *Ralstonia solanacearum*.

Successful production of tomato depends on the choice of resistant varieties adapted to a concrete location. The purpose of this study was to evaluate the level of resistance of tomato varieties introduced recently in Georgia to above mentioned diseases.

Material and methods. Two Georgian: Choportula, Kedis vardisferi and fourteen introduced tomato varieties: Cheri, Rozovii gigant, Grusha Rozavaya, Biche Sertse, Mikado Rozovi, Belii Naliv, De-Bravo Krasni, De-bravo rozovi, Polbig, Volgogradskii nizkii, Krasnodarski krasnii, Taracenko, Lagidni, Sultan F1 were evaluated in the field conditions under natural infection on the trial of Institute's plot (Kobuleti).

Plots with three times replication were 1 m wide $\times$ 3 m long. Intra-row spacing was 50 cm and inter-row spacing — 70 cm. Late blight and Early blight severity was evaluated weekly on the basis of the percent leaf area infected using unified scale of resistance of vegetable plants (Table 1) [5].

The tomato varieties were also tested to *Ralstonia solanacearum* under artificial infection in greenhouse conditions with temperature 26—28°C, humidity — 60—80%. The tested plants were grown in plastic pots contained sterilized mixture of peat, moss and soil (1:1:1). As an inoculum, a mixture of strains of *Ralstonia solanacearum* spread in Georgia was used. The strains of

1. Unified scale of resistance of vegetable

Disease severity, %	Type of reaction		Description of symptoms
0.0	9	Highly resistant(HR)	healthy
0.1—15.0	7	Resistant(R)	first foliar symptoms present and no defoliation
15.1—35.0	5	Moderately resistant(MR)	up to 25% de-foliation plus foliar blight
35.1—50.0	3	Susceptible (S)	up to 50% defoliation plus foliar blight
50.1—100	1	Highly susceptible (HS)	up to 75% defoliation plus foliar blight

pathogen were subcultured and multiplied on the Casamino Acid-Peptide-Glucose (CPG) media. Plants in the phase of three to four leaves were inoculated with a suspension (10^9 cfu/ml) of 24 hours cultivation cultures of *Ralstonia solanacearum* by injection into the plants stem. Control plants were inoculated with sterile water. The experiments were carried out in three replicates with 10 plants in each replication. After the first visible disease symptoms tested cultivars were observed weekly. Disease severity was recorded at an interval of 7 days after inoculation according to 0–5 scale developed by [6], where RT (reaction type), 0 — means no symptom, 1 — one leaf wilted, 2 — two or three leaves wilted, 3 — the majority of leaves wilted except the top two or three leaves, 4 — all leaves wilted, and 5 — plant dead. Also, disease severity has been calculated using the following formula:

$$DI = [(\sum N_i x_i) / (N \times 5)] \times 100\%,$$

where DI-diseases index, N_i = number of infected plants with a scale, I — RT's from 0 to 5, N =total plant tested. On the base of disease index, the level of resistance of cultivar was determined as follows: when DI is less than 10% the cultivar considered as resistant (R), when $DI = 10$ –20%, cultivar is moderately resistant(MR), $DI = 21$ –40%, cultivar shows moderately susceptibility — MS and when DI is more than 40%, cultivar is susceptible — S.

RESULTS

In accordance with results of the field trials only two varieties: de-bravo krasnii, de-bravo rozovi were moderate resistant to late blight and three varieties (de-bravo krasnii, de-bravo rozovi, sulthan F1) showed moderate resistance to early blight. The most of tested tomato cultivars were susceptible to both diseases (Table 2).

The results from greenhouse experiments indicated that potato varieties

2. The level of resistance of tomato varieties to Early Blight and Late Blight

№	Tomato varieties	Reaction types to diseases	
		Early blight	Late Blight
1	Cheri	S	S
2	Rozovi gigant	S	S
3	Grusha Rozavaia	S	S
4	Biche Sertse	S	S
5	Mikado Rozovi	S	S
6	Belii Naliv	S	S

№	Tomato varieties	Reaction types to diseases	
		Early blight	Late Blight
8	De-bravo rozovi	MR	MR
9	Kedis vardisferi	S	S
10	Polbig	S	S
11	Volgogradskii nizkii	S	S
12	Choportula	S	S
13	Krasnodarski krasnii	S	S
14	Tarasenکو	S	S
15	Lagidni	S	S
16	Sultan F1	MR	S

Volgogradskii nizkii, Taracenکو, Lagidni, Rozovii gigant were resistant to *Ralstonia solanacearum*. Varieties Polbig and Fakel showed moderate resistance to pathogen and the left varieties (Kedis vardisferi, Choportula, Cheri, Grusha Rozavaia, Biche Sertse, Mikado Rozovi, Belii Naliv, De-Bravo Krasni, De-bravo rozovi, Krasndarski krasnii, Sultan F1 were susceptible and their severity ranged from 33% to 90% (Table 3).

3. The resistance of local and introduced tomato varieties to *Ralstonia solanacearum*

N	Tomato varieties	Disease severity, %	Type of reaction
1	Cheri	50	MS
2	Rozovii gigant	13	R
3	Belii Naliv	33	MS
4	Biche Sertse	42	MS
5	De-Bravo Krasni	86	S
6	De-bravo rozovi	53	MS
7	Kedis vardisferi	86	S
8	Volgogradskii hizkii	84	S
9	Choportula	90	S
10	Fakel	35	MR
11	Grusha Rozavaia	50	MS
12	Mikado Rozovy	60	MS

N	Tomato varieties	Disease severity, %	Type of reaction
13	Polbig	26	MR
14	Khasnodarskii krasnii	0	R
15	Tarasenko	6	R
16	Lagidnii	0	R

CONCLUSIONS

Field and greenhouse experiments have shown that tomato varieties Rozovi gigant, Krasnodarski krasni, Tarasenko, Lagidny and Polbig and Torch were resistant and moderate resistant to bacterial wilt, respectively. Three varieties (De-brao krasnii, De-brao Rozovii and Sultan F1) showed the moderate resistance to early blight, while the only two varieties (De-brao krasnii and De-brao Rozovii) were moderate resistant to late blight.

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**Цецхладзе Ц.М., Сихарулдзе З.В., Мурадашвілі М.Т.,
Сихарулдзе К.Т. Скринінг сортів томата щодо стійкості проти
основних грибних захворювань і бактеріального в'янення**

*В результаті оцінки стійкості шістнадцяти місцевих та інтродукованих сортів томатів проти альтернاریозу (*Alternaria solani* Sorauer)*

і фітофторозу (*Phytophthora infestans* (Mont.) De Bary) в польових умовах на природному інфекційному фоні помірно стійкість проти альтернаріозу показали три сорти томатів — Де-брао червоний, Де-брао рожевий і Султан F1, а проти фітофторозу — тільки два сорти: Де-брао червоний і Де-брао рожевий. Інші зразки проявили сприйнятливість до хвороб.

Згідно з результатами оцінки стійкості тих же сортів томата проти бактеріального в'янення (*Ralstonia solanacearum*) на штучному інфекційному фоні в теплиці чотири сорти Рожевий гігант, Краснодарський червоний, Тарасенко і Лагідний були стійкими, два сорти — Полбіг і Факел — помірно стійкими. Десять сортів проявили сприйнятливість до захворювання.

**Цецхладзе Ц.М., Сихарулідзе З.В., Мурадашвили М.Т.,
Сихарулідзе К.Т. Скрининг сортів томата на устійчивість
против основных грибных заболеваний и бактериального увядания**

В результате оценки устойчивости шестнадцати местных и интродуцированных сортов томата против *Alternaria solani* Sorauer и *Phytophthora infestans* (Mont.) De Bary в полевых условиях на природном инфекционном фоне умеренную устойчивость против альтернариоза показали три сорта томата — Де-брао красный, Де-брао розовый и Султан F1, а против фитофтороза — только два сорта: Де-брао красный и Де-брао розовый. Остальные образцы проявили восприимчивость к болезням.

Согласно с результатами оценки устойчивости тех же сортов томата против бактериального увядания (*Ralstonia solanacearum*) на искусственном инфекционном фоне в теплице четыре сорта Розовый гигант, Краснодарский красный, Тарасенко и Лагідный были устойчивыми, два сорта — Полбіг и Факел — умеренно устойчивыми. Десять сортов проявили восприимчивость к заболеванию.