



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 119-122
© 2023 TPI
www.thepharmajournal.com
Received: 23-08-2023
Accepted: 29-09-2023

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Screening of tomato varieties/cultivars against *Fusarium oxysporum* f. sp. *lycopersici* causing wilt of tomato

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Abstract

Tomato (*Solanum lycopersicum* L.) cultivars were evaluated to identify the source of resistance against wilt caused by *Fusarium oxysporum* f. sp. *lycopersici*. The eleven varieties were screened for relative resistance or susceptibility to *Fusarium oxysporum* f. sp. *lycopersici* under cage house condition. Tomato eleven varieties namely, Pusa ruby, Tycon, Sulabh, Sarathi, Shakti, To-1057, NHT-1813, MAHY-302, Emrol, Arka samrat, KSP-1154 are observed of larger variation in respect of disease expression. Among the different varieties with incidence ranging from 10.03-85.00 percent mortality recorded. The variety of tomato Arka samrat (10.03 percent) showed highly resistant and Tycon (27.50 percent) showed moderately resistant while Emrol (85.00 percent) and Sarathi (75.02 percent) were highly susceptible reaction against FOL of tomato. In this screening no variety was immune.

Keywords: Tomato, *Solanum lycopersicum* L., *Fusarium oxysporum* f. sp. *lycopersici*, screening, Cultivars

Introduction

Tomato (*Solanum lycopersicum* L.) is widely cultivated vegetable crop in the world. It is a self-pollinated solanaceous vegetable crop grown in open field as well as under protected cultivation into different cropping system in tropical and temperate regions throughout the world. It is a native of Tropical America (Thompson and Kelly, 1957) ^[11] and was introduced in India by the Portuguese during 1700 (Kale and Kale, 1994) ^[5]. The wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* (Sacc) Synder and Hans is most important world wide disease of tomato, was first described in England in 1895 and has been reported from 32 countries (Srinon *et al.*, 2006) ^[9]. It is a serious constraint in the production of tomato and causes considerable yield losses up to 45 percent in India (Ramyabharathi *et al.* 2012) ^[7]. The symptoms are characterized by wilted plants, yellowed lower and younger leaves, leaflets or only one side of the petiole may be affected, initially vascular browning is seen in stem, roots became necrotic and some discoloration of vascular tissues resulted in minimal or no crop yield (Asha *et al.*, 2011) ^[2]. The pathogen is highly destructive in both green house and field grown tomatoes. It is soil-borne in nature and produces three types of asexual spore microconidia, macroconidia and chlamydospores and survives in soil in the form of chlamydospores for decades (Haware *et al.*, 1996) ^[4]. The fungus *Fusarium* belongs to the sub division Deuteromycotina and perfect stage is *Mycosphaerella* sp. It produces white aerial mycelium with pink, orange, red, blue, violet or purple pigmentation and produces slimy clump of spores (sporodochia) with blue sclerotia in culture (Liaquat *et al.*, 2016) ^[6]. The management of wilt disease is difficult by conventional management practice using chemical fungicides. The popular resistant varieties of tomato are also not available and limited efforts have been done to develop resistant varieties (Abdel-Monaim *et al.*, 2012) ^[1].

Materials and Methods

Screening of tomato varieties against *Fusarium oxysporum* f. sp. *lycopersici*

The eleven varieties were screened for relative resistance or susceptibility to *Fusarium oxysporum* f. sp. *lycopersici* under cage house condition. Tomato varieties namely, Pusa ruby, Tycon, Sulabh, Sarathi, Shakti, To-1057, NHT-1813, MAHY-302, Emrol, Arka samrat, KSP-1154 were purchased from National Seed Corporation (NSC), Udaipur (Rajasthan). Seedlings were raised for each variety in sterilized soil separately and maintained up to transplanting.

For the experimentation pure culture of *Fusarium oxysporum* f. sp. *lycopersici* isolates were multiplied separately on corn meal-sand medium (1:3) in flasks at 28±2 °C for 15 days. The sterilized soil were filled in earthen pots and inoculated by mixing pathogen inoculum @ 50 g/kg soil and were kept in cage house condition. Four pots as four replications were maintained for each variety. All the pots were lightly irrigated immediately after inoculation to allow establishment of the

pathogen for one week, keeping four pots as four replications for each isolate. For comparison, control pots were kept without inoculation. Forty five days old five seedlings of each test variety were transplanted in sick and control pots and were irrigated at regular time interval. The wilt incidence in form of plant mortality for each variety was observed and recorded at 30 days of transplanting.

The percent plant mortality (wilting) was recorded and categorized as per the disease reaction scales

Reaction/ grade	Percentage of wilt (Plant mortality)
Immune	0%
Highly resistance	1-10%
Moderately resistance	11-30%
Moderately susceptible	31-50%
Susceptible	51-70%
Highly susceptible	71-100%

Results

Screening of tomato varieties against *Fusarium oxysporum* f. sp. *lycopersici*.

The popular tomato varieties namely, Tycon, Sulabh, Sarathi, Shakti, TO-1057, NHT-1813, MAHY-302, Emrold, Arka Samrat, KSP-1154 and Pusa ruby were screened for the resistance against *F. o. f. sp. lycopersici* in inoculated pots. The results presented in the Table-1 showed that the variety Arka Samrat was resistant (10.03%) and the variety Tycon was moderately resistant (27.50%) while, other varieties MAHY-302, Shakti and Pusa ruby were moderately susceptible. The varieties Sulabh, TO-1057, NHT1813, KSP-1154 was susceptible and Emrold and Sarathi were highly susceptible. The percent disease incidence was varied from 10.03-85.00 percent in different test varieties of tomato. The maximum wilt incidence (85.00%) was noticed in variety

Emrold followed by 75.02 percent in variety Sarathi while, minimum 10.03 percent incidence was noticed in variety Arka Samrat followed by 27.50 percent in variety Tycon. The differences in disease incidence among the test varieties were statistically significant. (Table-1, Plate-1, Fig.-1). The eleven popular tomato varieties were screened for resistance against *F. o. f. sp. lycopersici* in pots under cage house condition. The observation of larger variation in respect of disease expression among the different varieties with incidence ranging from 10.03-85.00 percent mortality recorded. The variety of tomato Arka samrat (10.03 percent) showed highly resistant and Tycon (27.50 percent) showed moderately resistant while Emrold (85.00 percent) and Sarathi (75.02 percent) were highly susceptible reaction against FOL of tomato. In this screening no variety was immune.

Table 1: Screening of tomato varieties for resistance against *Fusarium oxysporum* f. sp. *lycopersici*

S. No.	Name of variety	Percent disease incidence (Mortality %)	Reaction
1.	Tycon	27.50 (31.53)	Moderately resistant
2.	Sulabh	55.03 (47.87)	Susceptible
3.	Sarathi	75.02 (60.08)	Highly susceptible
4.	Shakti	42.50 (40.65)	Moderately susceptible
5.	TO-1057	67.54 (55.41)	Susceptible
6.	NHT-1813	67.50 (55.41)	Susceptible
7.	MAHY-302	47.50 (43.54)	Moderately susceptible
8.	Emrold	85.00 (67.47)	Highly susceptible
9.	Arka Samrat	10.03 (13.37)	Highly resistance
10.	KSP-1154	55.02 (47.86)	Susceptible
11.	Pusa ruby	50.04 (44.98)	Moderately susceptible
	SEm ±	3.237	
	CD at 5%	9.354	
	CV %	14.014	

*Mean of four replications

Figures in parentheses are arcsine percent angular transformed values

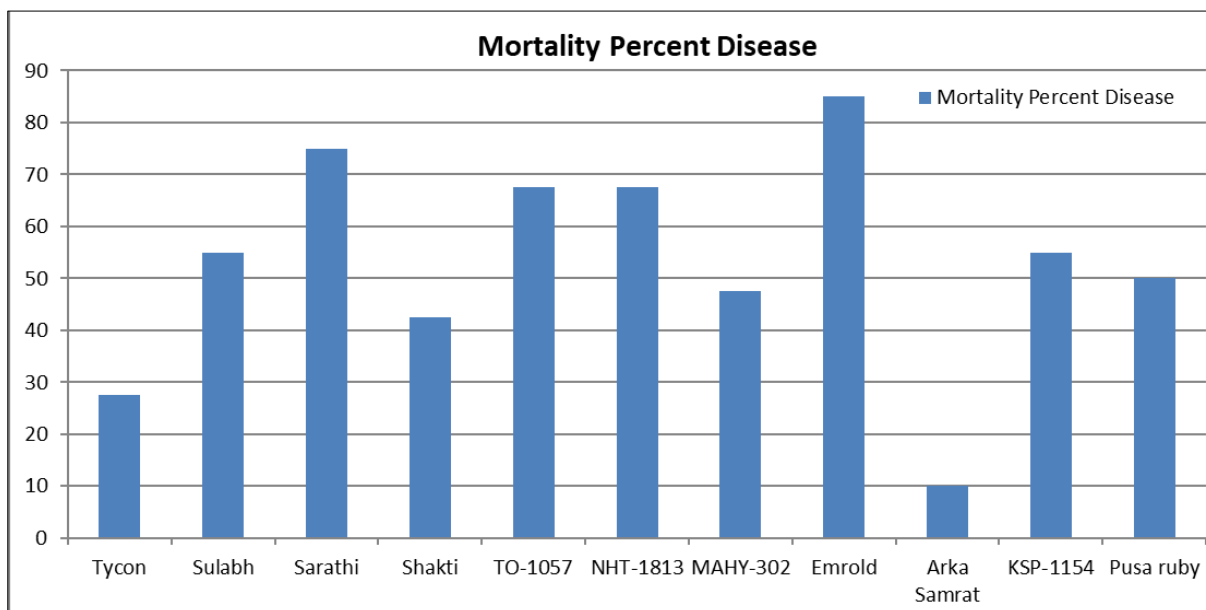


Fig 1: Screening of tomato varieties for resistance against *Fusarium oxysporum* f. sp. *lycopersici*



A. Health seeding of tomato varieties.

T₁ – tycoon, T₂- Sulabh, T₃ – Sarathi. T₄ – Shakti, T₅- TO-1057, T₆- NHT-1813, T₇- MAHY-302, T₈ - Emrold, T₉- Arka Samarat, T₁₀- KSP-1154, T₁₁ - Pusa ruby

B. Screening of tomato varieties against *Fusarium oxysporum* f. sp. *lycopersici* in pot culture condition.

T₁ – tycoon, T₂- Sulabh, T₃ – Sarathi. T₄ – Shakti, T₅- TO-1057, T₆- NHT-1813, T₇- MAHY-302, T₈ - Emrold, T₉ - Arka Samarat, T₁₀ - KSP-1154, T₁₁- Pusa ruby

Plate 1: Screening of popular tomato varieties against *Fusarium oxysporum* f. sp. *lycopersici* in pot culture condition

Discussion

The eleven popular tomato varieties namely, Tycon, Sulabh, Sarathi, Shakti, TO-1057, NHT-1813, MAHY-302, Emrold, Arka Samrat, KSP-1154 and Pusa ruby were screened for resistance against *F. o. f. sp. lycopersici* in pots under cage

house condition. The observation in respect of disease expression among different varieties with incidence ranging from 10.03-85.00 percent was recorded. The tomato varieties, Arka samrat was highly resistant (10.03 percent) and Tycon (27.50 percent) observed as moderately resistant while,

Emrold (85.00 percent) and Sarathi (75.02 percent) were highly susceptible and Sulabh (55.03 percent), TO-1057 (67.54 percent), NHT-1813 (67.50 percent), KSP-1154 (55.02 percent) were susceptible, while Shakti (42.50 percent), MAHY-302 (47.50 percent), Pusa ruby (50.04 percent) were moderately susceptible. None of the variety was immune. Similarly, Terna *et al.*, (2017) ^[10], Chopada *et al.*, (2014) ^[3] also screened tomato varieties for resistance to FOL-7 isolate in pots, and reported that the varieties NS-2535, Heamsona and GT-2 were moderately resistant with 33.33, 33.33 and 46.67 percent wilt incidence while, GT-1 (73.33 percent), Pusa early dwarf (66.67 percent), AND-1 (66.67 percent), PKM-1 (60.00 percent) and DT-11 (55.67 percent) varieties showed wilt incidence between 50.00 to 74.00 percent and were categorized as moderately susceptible.

Conclusion

Based on the experimentation it could be concluded that in eleven variety The Arka Samrat variety was found most resistant against wilt of tomato. The maximum wilt incidence (85.00%) was noticed in variety Emrold while, minimum 10.03 percent incidence was noticed in variety Arka Samrat.

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