

Original Research Article

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Field Evaluation of Fungicides, Sea Weed Biomolecules and Screening of Available Varieties/ Hybrids against Early Blight of Tomato caused by *Alternaria solani*

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ABSTRACT

An experiment on evaluation of fungicides, sea weed biomolecules and screening of fifty commercially available varieties/hybrids against early blight of tomato was conducted to study at ARS, Gunjevu during 2018-19. The result clearly indicates that the least disease severity of 14.33% was recorded in Hexaconazole 5% EC @ 0.10% which showed significantly superior over other treatments. The next least disease severity of 15.74% was recorded in Trifloxystrobin 25 + Tebuconazole 50% WG @ 0.07% and which was at par with Hexaconazole 5% EC. While, Fluxapyrad 250 + Pyraclostrobin 250 SC @ 0.05% and Difenoconazole 25% EC @ 0.10% has recorded 21.70% and 23.18% disease severity respectively and were statistically at par with each other. Among the two sea weed bio molecules evaluated 39.26% severity was recorded in Sea weed bio molecule LBD12 followed by 43.26% in Sea weed bio molecule LBD1. Among the different treatment maximum fruit yield of 57.68 t/ha was noticed in Hexaconazole 5% EC @ 0.1% followed by 57.19 t/ha was recorded in Trifloxystrobin 25 + Tebuconazole 50% WG @ 0.07%. The least fruit yield of 41.06 t/ha was recorded in untreated plots. The similar trends were observed in field experiment of 2019-20 and the Hexaconazole 5% EC @ 0.1% has recorded least disease severity of 21.22% with highest yield of 58.40 t/ha. The economics of cost benefit ratio was worked for different fungicides evaluated and it was found that the highest cost benefit ratio was obtained by Hexaconazole 5% EC (2.03) followed by Trifloxystrobin 25 + Tebuconazole 50% WG (1.88). Among the fifty commercial varieties/hybrids evaluated three varieties/ hybrids (Arka Surabh, Arka Samrat and Arka Vikas) showed moderately resistant (MR) reactions. The thirty four varieties/hybrids showed susceptible (S) reaction and the remaining thirteen varieties/hybrids recorded highly susceptible reaction (HS).

Keywords

Early blight,
Alternaria solani,
Fungicides, Sea
weed biomolecules,
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Introduction

Alternaria solani (Ellis and martin) Jones and Grout is one of the most and frequently

occurring disease on tomato and Potato in most of the parts of the world (Mathur and Shekhawat, 1986; Agrios, 2005 and Majeed *et al.*, 2014). The acid sweet taste and its flavour

make it as popular vegetable among the vegetables. In India it was estimated that it was grown in an area of 0.8 Mha and 19.00 MT and productivity of 23.75 t/ha (Anonymous, 2018). Among the different Tomato growing states Andhra Pradesh, Karnataka and Madhya Pradesh together produces 40% of the country's total production. In Karnataka it grown in an area of 0.06 M Ha with the production of 2.08 MT and productivity of 32.40 t/ha (Anonymous, 2018).

Among the different biotic and abiotic factors, diseases were considered the main production constraints which are responsible for the reduction in yield. Among the different diseases early blight caused by *Alternaria solani* (Ellis and Martin) Jones and Grout is considered as important foliar disease and pathogen is a soil inhabiting air borne pathogen responsible for blight, collar rot and fruit rot of tomato. The disease in severe cases can lead to most damaging on tomato in regions with heavy dew, rainfall, high humidity and fairly high temperatures. Sufficient early blight resistance is not known within the cultivated species of tomato (Nash and Gardner, 1988). Disease effect crop production as they cause premature defoliation and results in heavy losses in production by reducing quality and quantity of fruit (Holm *et al.*, 2003). Regarding the management of disease many workers had tried many fungicides and found that most of the Dithiocarbmates are effective in controlling the disease. Among the Dithiocarbmates Mancozeb was found effective in reducing the disease intensity and increase the yield of Pus Ruby (Kumar and Srivastava, 2013). Kumar *et al.*, 2007., reported that Hexaconazole (0.05%) and Azoxystrobin (0.2%) was very effective in managing early blight of tomato. Due to continues and discriminate use fungicides, development of resistance in fungi and also

increasing residual hazards has given a thrust to search for alternative method of management and also to evaluate new groups of fungicides and combination fungicides available in the market. So an attempt was made to evaluate new generation fungicides, derivatives of sea weed extracts and identification of resistance source against the pathogen of early blight of tomato.

Materials and Methods

Evaluation of fungicides and sea weed extracts under field condition

Field experiment was laid out in Randomized complete block design with ten treatments with three replication to study the efficacy of seven fungicides and two formulations of sea weed extracts against early blight was carried out during *Rabi*, 2018 and 2019 at ARS, Gunjevu. Twenty days old seedlings (Variety- Alnkar) were transplanted into the field with 60cm inter 40cm intra row spacing in plots measuring 4 x 3 m. All the agronomical practices and pest control measures were followed as per the recommended package of practices. The fungicides were tested as 5 sequential sprays at an interval of 10 days. The first spray was carried out as soon as the first symptom of early blight was noticed. Ten plants were randomly selected and tagged for regular observations. Observation on disease severity of foliage was recorded by using 0-9 scale as given by Mayee and Datar (1986) and per cent disease index (PDI) was worked out using formula of wheeler1969. The fruit yield in each plot was also recorded.

Screening of commercial varieties/ hybrids of tomato against *Alternaria solani*

A field experiment was conducted to find out the source of resistance against *Alternaria* blight of tomato at ARS, Gunjevu during *Rabi* 2018 under natural conditions. Fifty

commercial varieties/hybrids from different seed companies and IIHR were sown with minimum of 10-12 plants per row with the spacing of 60 x 40cm. The incidence on *Alternaria* blight under natural disease pressure was recorded.

The observations were recorded from randomly selected 5 plants in each genotypes using 0-9 scale as given by Mayee and Datar (1986). Varieties and hybrids were then grouped into five categories based on the PDI value (Mckinney, 1923) as: <1 %=immune; 1-10 %=highly resistant; 10.1-25 %= resistant; 25.1-40 %=moderately resistant; 40.1-50 %=susceptible; >50 %=highly susceptible.

Results and Discussion

Evaluation of Fungicides and Sea weed extracts under field condition

The seven fungicides and two sea weed extracts were evaluated under field condition against early blight of Tomato. It is evident from the data (Table 1) that all fungicides evaluated were reduced the incidence of the disease compared to control. However rate of decrease of disease varied from fungicide to fungicide. The range of disease intensity ranged from 14.33 to 37.92 % at 10 days after 5th treatment in comparison to control (40.22%).

The least disease severity of 14.33% was recorded in Hexaconazole 5% EC @ 0.10% which shows significantly superior over other treatments. The next least incidence of 15.74% was recorded in Trifloxystrobin 25 + Tebuconazole 50% WG @ 0.07% and which was at par with Hexaconazole 5%EC. The recent fungicides like Fluxapyrad 250 + Pyraclostrobin 250SC @ 0.05% and Difenconazole 25%EC @ 0.10% has recorded 21.70% and 23.18% disease severity respectively and was statistically at par with

each other. Among the two weed extract evaluated 35.92% disease severity was recorded in Sea weed bio molecule LBD12 followed by 37.92% severity in Sea weed biomolecule LBD1.

Among the different treatment maximum fruit yield of 57.68 t/ha was noticed in Hexaconazole 5%EC @ 0.1% followed by 57.19 t/ha was recorded in Trifloxystrobin 25 + Tebuconazole 50%WG @ 0.07%. The least fruit yield of 41.06 t/ha was recorded in untreated plots.

During the year 2019 the experiment was carried for subsequent second year and data were presented in table 2. The results clearly indicated that among the seven fungicides evaluated against the early blight the least disease severity was observed in Hexaconazole treated plots (21.22%) followed by Trifloxystrobin 25 + Tebuconazole 50%WG (22.63%) both of these fungicides were at par with each other in reducing the disease incidence. Among the other treatments tested Fluxapyrad 250 +Pyraclostrobin 250SC @ 0.05% has recorded 24.48% disease severity followed by Difenconazole25%EC @ 0.10% has recorded 26.44% disease severity.

Among the two Sea weed biomolecules evaluated Sea weed biomolecule LBD12 has showed disease severity of 41.55 % followed by Sea weed biomolecule LBD1 has recorded 48.07 % disease severity.

Among the fungicides and sea weed biomolecules evaluated the maximum fruit yield of 58.40 t/ha was noticed in Hexaconazole 5%EC @ 0.1% followed by 54.84 t/ha was recorded in Trifloxystrobin 25 + Tebuconazole 50%WG @ 0.07%. The least fruit yield of 40.73 t/ha was recorded in untreated plots.

Table.1 Field evaluation of different fungicides and sea weed extracts for the management

Treatments		Concentration (%)	Pre-treatment	Per cent Disease Index 10 days after					Yield (t/ha)	B: C
				1 st spray	2 nd spray	3 rd spray	4 th spray	5 th spray		
T1	Mancozeb 75% WP	0.25	4.81 (12.66)	9.70 (18.11)	12.81 (20.97)	16.89 (24.26)	21.25 (27.45)	27.33 (31.52)	47.87	1.67
T2	Difenoconazole 25%EC	0.10	4.88 (12.76)	8.33 (16.77)	11.48 (19.80)	13.22 (21.32)	17.48 (24.71)	23.18 (28.78)	52.30	1.74
T3	Hexaconazole 5%SC	0.10	4.84 (12.66)	5.92 (14.06)	7.77 (16.18)	8.81 (17.26)	17.48 (19.73)	14.33 (22.24)	57.68	2.02
T4	Tetraconazole 3.8%EW	0.10	4.88 (12.76)	10.40 (18.80)	14.48 (22.34)	17.29 (24.57)	11.44 (27.99)	27.25 (31.46)	47.19	1.64
T5	Thiafluzamide 24%SC	0.07	4.81 (12.66)	12.55 (20.75)	16.55 (24.00)	21.88 (27.89)	22.07 (30.70)	32.00 (34.43)	45.56	1.57
T6	Fluxapyraxad 250 + Pyraclostrobin 250 SC	0.05	4.77 (12.62)	8.77 (17.23)	11.22 (19.56)	12.55 (20.75)	17.26 (24.54)	21.70 (27.73)	52.64	1.77
T7	Trifloxystrobin 25 + Tebuconazole 50% WG	0.07	4.66 (12.46)	7.11 (15.46)	8.44 (16.81)	9.92 (18.35)	13.26 (21.34)	15.74 (23.37)	57.19	1.92
T8	Sea Weed Bio molecule LBD12	0.15	4.84 (12.71)	15.81 (23.43)	21.52 (27.64)	27.70 (31.75)	32.62 (34.83)	39.26 (38.80)	43.30	1.50
T9	Sea Weed Bio molecule LBD1	0.20	4.88 (12.76)	17.03 (24.37)	23.96 (29.30)	30.33 (33.41)	36.62 (37.24)	43.26 (41.12)	42.43	--
T10	Untreated control	--	4.88 (12.76)	21.07 (27.32)	28.29 (32.13)	35.59 (36.62)	44.29 (41.72)	57.55 (49.34)	41.06	1.45
CD @ 5%			NS	1.72	1.56	1.48	1.46	1.63	3.93	
S. Em. ±				0.58	0.52	0.49	0.49	0.54	1.31	
CV%				5.08	3.93	3.33	2.91	2.86	4.66	

* Data in the parenthesis are angular transformed values

Table.2 Field evaluation of different fungicides and sea weed extracts for the management of early blight of Tomato during 2019

Treatments		Concentration (%)	Pre-treatment	Per cent Disease Index 10 days after					Yield (t/ha)	B: C
				1 st spray	2 nd spray	3 rd spray	4 th spray	5 th spray		
T1	Mancozeb 75% WP	0.25	6.40 (14.66)	11.13 (19.43)	18.88 (25.70)	23.26 (28.80)	26.44 (30.95)	29.70 (33.01)	44.81	1.56
T2	Difenoconazole 25%EC	0.10	6.55 (14.80)	9.87 (19.68)	15.92 (23.51)	20.15 (26.67)	24.00 (29.33)	26.44 (30.95)	50.63	1.69
T3	Hexaconazole 5%SC	0.10	6.55 (14.80)	7.11 (16.74)	10.66 (19.01)	12.66 (20.84)	18.33 (25.34)	21.22 (27.43)	58.40	2.05
T4	Tetraconazole 3.8%EW	0.10	6.55 (14.80)	11.79 (21.25)	17.66 (24.83)	21.63 (27.66)	25.70 (30.43)	30.70 (33.60)	45.21	1.57
T5	Thiafluzamide 24%SC	0.07	6.55 (14.80)	13.50 (22.33)	21.18 (27.38)	25.11 (30.07)	29.33 (32.79)	36.07 (36.90)	43.23	1.49
T6	Fluxapyrad 250 + Pyraclostrobin 250 SC	0.05	6.40 (14.66)	9.79 (19.13)	15.07 (22.84)	17.77 (24.93)	21.77 (27.76)	24.48 (29.64)	50.66	1.71
T7	Trifloxystrobin 25 + Tebuconazole 50% WG	0.07	6.55 (14.83)	8.46 (18.25)	13.83 (21.39)	14.66 (22.51)	15.85 (23.46)	22.63 (28.38)	54.84	1.84
T8	Sea Weed Bio molecule LBD12	0.15	6.55 (14.80)	23.07 (28.70)	26.00 (30.65)	31.55 (34.17)	37.40 (37.70)	41.55 (40.13)	42.79	1.48
T9	Sea Weed Bio molecule LBD1	0.20	6.55 (14.80)	25.18 (30.12)	27.40 (31.56)	35.77 (36.73)	42.81 (40.87)	48.07 (43.89)	42.66	--
T10	Untreated control	--	6.55 (14.80)	25.88 (30.58)	33.44 (35.33)	42.07 (40.44)	53.70 (47.12)	62.74 (52.38)	40.73	1.43
CD @ 5%			NS	1.64	1.97	2.04	2.03	1.91	3.61	
S. Em. ±				0.55	0.66	0.68	0.68	0.64	1.21	
CV%				4.17	4.33	4.02	3.60	3.10	4.40	

* Data in the parenthesis are angular transformed values

Table.3 Field evaluation of different fungicides and sea weed extracts for the management of early blight of Tomato during 2018 & 2019 (Pooled data)

Treatments		Concentration (%)	Pre-treatment	Per cent Disease Index 10 days after					Yield (t/ha)	B:C
				1 st spray	2 nd spray	3 rd spray	4 th spray	5 th spray		
T1	Mancozeb 75% WP	0.25	5.61 (13.66)	11.13 (19.43)	15.85 (23.34)	20.07 (26.53)	23.85 (29.25)	28.51 (32.47)	46.34	1.62
T2	Difenoconazole 25%EC	0.10	5.72 (13.80)	9.87 (18.18)	13.70 (21.66)	16.68 (23.97)	20.74 (27.02)	24.81 (29.90)	51.46	1.72
T3	Hexaconazole 5%SC	0.10	5.70 (13.73)	7.11 (15.40)	9.22 (17.60)	10.73 (19.05)	14.88 (22.65)	17.79 (24.87)	58.04	2.03
T4	Tetraconazole 3.8%EW	0.10	5.72 (13.78)	11.79 (20.02)	16.07 (23.59)	19.46 (26.12)	23.89 (28.84)	28.98 (33.04)	46.20	1.61
T5	Thiafluzamide 24%SC	0.07	5.68 (13.75)	13.50 (21.54)	18.87 (25.69)	23.50 (28.98)	27.70 (31.79)	34.03 (35.70)	44.40	1.53
T6	Fluxapyraxad 250 + Pyraclostrobin 250 SC	0.05	5.59 (13.64)	9.79 (18.18)	13.14 (21.20)	15.16 (22.84)	19.52 (26.59)	23.09 (28.94)	51.65	1.74
T7	Trifloxystrobin 25 + Tebuconazole 50% WG	0.07	5.61 (13.65)	8.46 (16.86)	10.88 (19.10)	12.29 (20.43)	14.55 (22.41)	19.18 (26.17)	56.01	1.88
T8	Sea Weed Bio molecule LBD12	0.15	5.70 (13.76)	19.44 (26.06)	22.29 (29.14)	29.63 (32.96)	35.01 (36.27)	40.40 (39.47)	43.05	1.49
T9	Sea Weed Bio molecule LBD1	0.20	5.72 (13.80)	21.11 (27.25)	24.57 (30.43)	33.05 (35.07)	39.72 (39.05)	45.66 (42.51)	42.54	--
T10	Untreated control	--	5.72 (13.80)	23.48 (28.95)	27.09 (33.73)	38.83 (38.53)	49.00 (44.42)	60.14 (50.86)	40.89	1.44
CD @ 5%			NS	1.13	1.24	1.17	1.38	1.31	2.48	
S. Em. ±				0.40	0.43	0.41	0.48	0.46	0.87	
CV%				4.57	4.31	3.66	3.84	3.27	4.42	

* Data in the parenthesis are angular transformed values

Table.4 Screening of tomato varieties and hybrids against early blight caused by *Alternaria solani* under natural epiphytotic conditions

Sl. No.	Variety/ Hybrid	Per cent disease Index		Disease reaction
		Flowering stage	Fruit Harvesting stage	
1	Arka Alok	8.66	49.77	S
2	Arka Saurabh	8.88	34.44	MR
3	ArkaMeghali	8.88	48.00	S
4	Arka Samrat	8.44	37.33	MR
5	ArkaRakshak	18.66	49.33	S
6	ArkaAabha	10.44	48.44	S
7	Arka Vikas	16.88	39.55	MR
8	Emerald	9.33	40.88	S
9	NS-538	16.22	46.66	S
10	NS-501	7.77	48.88	S
11	NS-5002	8.66	41.77	S
12	Abhilash	9.33	43.11	S
13	Shivam	8.44	49.33	S
14	SYN-1057	9.55	40.88	S
15	Sampurna	9.33	48.88	S
16	Abhinav	27.55	49.77	S
17	Rishika	18.88	58.66	HS
18	Meghdout	9.77	56.44	HS
19	NS-629	19.55	45.77	S
20	JK-811	8.66	48.88	S
21	US-4722	8.00	41.77	S
22	US-1143	9.33	43.11	S
23	US-440	9.55	40.88	S
24	HMC-01	9.77	48.88	S
25	HMC-02	9.77	49.77	S
26	HMC-03	10.00	47.11	S
27	HMC-04	18.00	48.11	S
28	NCSTMH-01	18.44	48.88	S
29	NCSTMH-02	18.88	50.22	HS
30	NCSTMH-03	7.11	51.11	HS
31	NCSTMH-04	9.11	49.77	S
32	NCSTMH-05	18.44	59.11	HS
33	NCSTMH-06	19.11	60.00	HS
34	NCSTMH-07	19.55	60.88	HS
35	NCSTMH-08	18.66	48.44	S
36	NCSTMH-09	17.77	61.33	HS
37	NCSTMH-10	19.33	64.44	HS
38	NCSTMH-11	17.55	50.66	S
39	NCSTMH-12	9.11	49.77	S
40	NCSTMH-13	9.55	49.77	S
41	NCSTMH-14	10.44	48.44	S
42	NCSTMH-15	10.22	50.66	HS
43	NCSTMH-16	18.44	48.88	S
44	NCSTMH-17	18.00	49.33	S
45	NCSTMH-18	18.66	47.55	S
46	NCSTMH-19	19.11	50.22	HS
47	NCSTMH-20	19.33	51.11	HS
48	NCSTMH-21	18.88	41.11	S
49	NCSTMH-22	17.55	42.00	S
50	Alankar	20.66	62.22	HS

Table.5 Disease reaction of varieties and hybrids in terms of per cent disease index

PDI Scale	Disease reaction	Varieties/ hybrids
<1%	Immune	-
1-10%	Highly Resistant	-
10.1-25%	Resistant	-
25.1- 40%	Moderately Resistant	Arka Saurabh, Arka Samrat, Arka Vikas
40.1- 50%	Susceptible	Arka Alok, ArkaMeghali, ArkaRakshak. Arkaabha, Emerald, NS-538, NS-501, NS-5002, Abhilash, Shivam, SYN-1057, Sampurna, Abhinav, NS-629, JK-811, US-4722, US-1143,US-440,HMC-01, HMC-02,HMC-03,HMC-04, NCSTMH-01, NCSTMH-04, NCSTMH-08, NCSTMH-11, NCSTMH-12, NCSTMH-13, NCSTMH-14, NCSTMH-16, NCSTMH-17, NCSTMH-18, NCSTMH-21, NCSTMH-22
>50%	Highly susceptible	Rishika, Meghdout, NCSTMH-02, NCSTMH-03, NCSTMH-05, NCSTMH-06, NCSTMH-07, NCSTMH-09, NCSTMH-10, NCSTMH-15, NCSTMH-19, NCSTMH-20, Alnkar

Two years pooled data (2018 & 2019) was presented in Table 3 clearly revealed that among the fungicides and sea weed biomolecules evaluated all the treatments showed superiority over control in reducing the incidence of disease. Among the treatments disease intensity ranged from 17.79% to 45.66 % as against 60.14 % in untreated control. The least disease severity of 17.79% was recorded in Hexaconazole 5%EC @ 0.1% followed by 19.18% disease severity in Trifloxystrobin 25 + Tebuconazole 50%WG @ 0.07% which were at par with each other in reducing the disease severity. Among the other fungicides evaluated Fluxapyradad 250 +Pyraclostrobin 250SC @ 0.05% has showed significantly superior in reducing the disease severity and recorded 23.09 % followed by Difenconazole 25%EC @ 0.1% (24.81%)and both of these fungicides were at par with each other in reducing the disease severity. The maximum fruit yield of 58.04 t/ha was recorded in Hexaconazole 5% EC followed by 56.01 t/ha was recorded in Trifloxystrobin 25 + Tebuconazole 50% WG.

Among the different fungicides Fluxapyradad 250 + Pyraclostrobin 250 SC and Difenconazole25%EC has recorded fruit yield of 51.65 t/ha and 51.46 t/ha respectively. Economics of cost benefit ratio of pooled data clearly indicates that spraying of Hexaconazole 5%EC @ 0.1% will bring the highest returns compared to other treatments with the highest cost benefit ratio of 2.03 followed by cost benefit ratio of 1.88 was obtained in Trifloxystrobin 25 + Tebuconazole 50%WG. The present results are in conformity with the earlier workers. Palaiah *et al.*, (2020) found that Azoxystrobin 11 % + Tebuconazole 18.3% SC @1000ml /ha was most effective fungicide for controlling the early blight of tomato with maximum fruit yield of 41.83 t/ha. Arun kumar *et al.*, (2013) found that Propiconazole (0.1%) and Pyraclostrobin (0.2%) were most effective in reducing severity of the disease and increasing fruit yield over control. Bartlett *et al.*, (2002) evaluated effect of different Strobilurins fungicides like Azoxystrobin, Kresoxim methyl,

Trifloxystrobin and Pyraclostrobin on quality and yield of Barley, wheat, tomato, potato and mangoes and reported that spraying of Strobilurins influenced in increasing the yield compared to trizoles.

Screening of commercial hybrids and varieties of tomato against *Alternaria solani*

In this experiment disease observations were recorded under natural epiphytotic conditions during flowering and fruit harvesting stage. From the table 4 it is clearly shows that reactions varied with varieties / hybrids. The mean disease intensity during flowering stage ranged from 7.11% to 20.66% and during fruit harvesting stage the disease intensity was ranged from 34.44% - 64.44%. Out of fifty varieties / hybrids evaluated three varieties/ hybrids namely Arka Surabh, Arka Samrat and Arka Vikas showed moderately resistant (MR) reactions. The thirty four varieties/ hybrids viz., Arka Alok, Arka Meghali, Arka Rakshak, Arka Abha, Emerald, NS-538, NS-501, NS-5002, Abhilash, Shivam, SYN-1057, Sampurna, Abhinav, NS-629, JK-811, US-4722, US-1143, US-440, HMC-01, HMC-02, HMC-03, HMC-04, NCSTMH-01, NCSTMH-04, NCSTMH-08, NCSTMH-11, NCSTMH-12, NCSTMH-13, NCSTMH-14, NCSTMH-16, NCSTMH-17, NCSTMH-18, NCSTMH-21, NCSTMH-22 showed susceptible (S) reaction and remaining thirteen varieties and hybrids namely Rishika, Meghdout, NCSTMH-02, NCSTMH-03, NCSTMH-05, NCSTMH-06, NCSTMH-07, NCSTMH-09, NCSTMH-10, NCSTMH-15, NCSTMH-19, NCSTMH-20, Alankar has recorded highly susceptible reaction(HS). Kumar and Srivastava (2013) screened forty four genotypes and the genotype EC-521071 was found resistant fifteen genotypes (Floraded, Kashi Sharad, CO-3, Punjab Upma, TLC- 1, NDTV-60, Selection-7, BT-120, Suncherry, Swarna Naveen, Cholnak-K, T. Local, EC-521086, EC-521069 and

EC531803) showed moderately resistant and twenty genotypes (Pusa Sadabahar, DT-2, Pant T-3, H-24, H-86, N D T-3, Selection- 18, VR-20, Azad T-5, Sworn Lalima, Flawery, Feb-4, NF-315, Kajela, Angur Lata, Columbia, Grant, P.M S-1, Superbug and Shalimar-2 showed susceptible and five genotypes (PS-1, Kashi Amrit, Fla-7171, H-T-4 and DT-10) were found highly susceptible and two genotypes H-88-74-1 and EC-520061 was found highly resistant to early blight of tomato. Majeed *et al.*, 2020 conducted experiment to screen 50 genotypes under field condition. Among these Germplasms, 07 test lines viz., 2014/TODHYB-7, 2015/TODHYB-2, 2016/TODHYB-4, 2016/TODHYB-6, 2016/TODHYB-7, 2016/TODVAR-10 and 2016/TODVAR-12 exhibited complete resistant against early blight and 14 lines viz., 2014/TODHYB-1, 2014/TODVAR-3, 2014/TODVAR-1, 2014/TODVAR-4, 2014/TODVAR-6, 2015/TODVAR-1, 2016/TODVAR-3, 2016/TODVAR-4, 2016/TODVAR-6, 2016/TODVAR-7, 2016/TODVAR-8, 2015/ TOINDVAR-2, 2015/ TOINDVAR-3 and 2015/TOINDVAR-5 were found moderately resistant (Table 5).

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