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Response of onion cultivars to onion thrips, *Thrips tabaci* (Lind.) in central dry zone of Karnataka, India

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Abstract

Twenty onion cultivars were screened against thrips incidence. The results of the study revealed that all onion cultivars were infested by thrips. No single cultivar was resistant against thrips. However, fourteen cultivars were categorized as moderately resistant based on the thrips population. Among these, cultivar Arka Pragati the thrips population was minimum (29.34 thrips/pl.) which was on par with cultivars, Arka Kalyan (32.12 thrips/pl.) and Arka Niketan (34.01 thrips/pl.). Bhima Red, Agri found dark red, N-53 and Prema onion were found susceptible. In Satara Garva and Bellary red cultivars, thrips population was maximum (79.84 and 75.96 thrips/pl., respectively) and they were categorized as highly susceptible. The performance of fourteen onion cultivars is categorized as moderately resistant against thrips incidence which indicate the existence of promising source of resistance. Among the natural enemies, Lady bird beetles (coccinellid beetles) and *Chrysoperla* sp. were more abundant.

Keywords: Onion, thrips, *Thrips tabaci*, screening, natural enemies.

1. Introduction

Onion, *Allium cepa* (L.) is one of the most important bulb crops. It is grown in the world in an area of 3,971.51 thousand hectares with a total production of 75,977.21 thousand metric tonnes. India cultivates onion in 120.30 thousand hectares with production of 19401.70 metric tonnes, with an average productivity of 16.1 tonne per hectare and stands second next to China [3]. Generally, onion is cultivated repeatedly in same land, season after season, year after year and the crop suffer from water stress which might have increased the pest and disease problems in onion crop. Onion thrips, *T. tabaci* (Lind.) (Thysanoptera: Thripidae) is one of the common and the most destructive pest on onion which causes 34-43 per cent yield loss and also act as vector for Tospo virus causing Iris yellow spot virus in onion [4]. Failure in controlling the thrips timely and effectively causes considerable damage and results in immense economic losses by reducing yield up to 50 per cent. However, 90 per cent loss in yield was also reported when thrips attack onion crop in early stages of crop growth [2].

This polyphagous insect pest is distributed worldwide and infests *Allium* spp. Thrips on onion are difficult to control because insecticide spray solution does not reach the pest and also due to hiding habit of thrips in central axis near the bulb. Farmers are extensively using insecticides for controlling this pest, which leads to the endangerment of ecosystem. Further, extensive use of insecticides kills the natural enemies which causes outbreak of secondary pests. Besides, application of same group of insecticides repeatedly is not a desirable practice, so this could lead to development of resistance against insecticides and resurgence of pest [6].

In addition, direct toxicity to human beings and animals is serious concern. Therefore, integrated pest management practices can minimise the several pesticides problems. The study was conducted to screen onion cultivars against thrips incidence.

2. Materials and methods

A field experiment was conducted at Zonal Agricultural and Horticultural Research Station, Hiriyur during December 2014 to April 2015 to screen onion cultivars against thrips incidence. The cultivars of onion which were selected for the study are mentioned in table 1.

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Table 1: List of onion cultivars used for screening and source of procurement

S. No.	Cultivar	Source	S. No.	Cultivar	Source
1	Arka Kalyan	IIHR	11	Agri found White	DOGR
2	Arka Niketan	IIHR	12	Agri found light Red	DOGR
3	Arka Pragati	IIHR	13	Light Red	DOGR
4	Arka Pithambar	IIHR	14	Mahalaxmi	DOGR
5	Arka Bindu	IIHR	15	Bhima Red	DOGR
6	Bhima Super	DOGR	16	Agri found Dark Red	DOGR
7	Bhima Shakti	DOGR	17	N. 53	DOGR
8	Bhima Raj	DOGR	18	Prema	DOGR
9	Bhima Shubra	DOGR	19	Sataragarva	DOGR
10	Bhima Kiran	DOGR	20	Bellary Red	DOGR

IIHR-Indian Institute of Horticultural Research, Bengaluru.
DOGR- Directorate of Onion and Garlic Research, Nasik.

The experiment was laid out by raising 20 cultivars randomly with two replications in a plot size of 3m × 2m, all cultivation practices were followed except plant protection measures against thrips. In each cultivar, ten plants were selected and only to record the population of thrips and their natural enemies at weekly intervals. The onion cultivars were categorized as resistant, moderately resistant, susceptible and highly susceptible. The categories of onion cultivars with respect to thrips density was made by following the method of Singh and co-workers [7] (Table 2).

Table 2: Category of onion cultivars based on thrips population

Thrips Population (No. / pl.)	Category
< 25	Resistant
25.1-50	Moderately Resistant
50.1-75	Susceptible
> 75	Highly Susceptible

3. Results and Discussion

3.1 Screening of onion cultivars against onion thrips, *Thrips tabaci* (Lind.)

The population of thrips on different onion cultivars was ranged from 29.34 to 79.84 thrips per plant. Least infestation of thrips was recorded in Arka Pragati (29.34 thrips/pl.) followed by Arka Kalyan (32.12 thrips/pl.) and Arka Niketan (34.01 thrips/pl.) which are on par with each other. Whereas, high infestation of thrips was recorded in the cultivar Sataragarva (79.84 thrips/pl.) which was on par with the cultivar Bellary Red (75.96 thrips/pl. (Table 3).

3.2 Category of onion cultivars based on the population of thrips

Among twenty cultivars selected for the study, all cultivars were not complete lyresis stance against thrips (Table 3). However, among twenty cultivars, 14 cultivars were categorized as moderately resistant based on the thrips population. In this category, Arka Pragati recorded the lowest population of 29.34 thrips per plant followed by Arka Kalyan (32.12 thrips/pl.) and Arka Niketan (34.01 thrips/pl.). The highest population of (47.26 thrips/pl.) was recorded in Agri found light red. This may be due to presence of anti xenosis, antibiotic properties and presence of natural enemies over other cultivars. Among the onion cultivars, Bhima Red, Agri found dark red, N-53 and Prema were categorized as susceptible, the maximum population of (60.07 thrips/pl.) was recorded in N- 53 followed by Bhima Red (59.23 thrips/pl.). Whereas, the lowest population of thrips (54.01 thrips/pl.) was recorded in Agri found dark red. Two cultivars, Sataragarva and Bellary red were categorized as highly susceptible against thrips incidence. In Sataragarva, thrips population was 79.84 thrips per plant, whereas in Bellary red population was 75.96 thrips per plant. This may be due to extensive cultivation of the same cultivar by many farmers of Hiriyurtaluk. The performance of fourteen onion cultivars is categorized as moderately resistant against thrips incidence which indicate the existence of promising source of resistance. The present findings were in conformity with the results of Sudhir [8] who screened 18 onion cultivars against thrips. Among the cultivars screened, Arka Pragati (29.34 thrips/pl.) recorded lowest population which was moderately resistant to thrips and Nasik Red (86.94 thrips/pl.) recorded highest population of thrips which was categorized as susceptible cultivar.

Table 3: Categories of onion cultivars with respect to resistance based on thrips population and yield.

Categories	Name of Cultivars	Number of thrips per plant	Yield (t/ha)
Resistance (< 25 thrips/pl.)	Nil	Nil	Nil
	ArkaKalyan	32.12 (5.71) ^{jk}	16.05 (4.07) ^{ab}
	ArkaNiketan	34.01 (5.87) ^{jk}	15.93 (4.05) ^{ab}
Moderately Resistant (20.0-50 thrips / pl.)	ArkaPragathi	29.34 (5.46) ^k	17.15 (4.20) ^a
	ArkaPithamber	42.62 (6.57) ^{fg}	13.57 (3.75) ^{cd}
	ArkaBindu	42.52 (6.56) ^{fg}	11.86 (3.52) ^{ef}
	Bhima Super	43.75 (6.65) ^{fg}	11.57 (3.50) ^{efg}
	BhimaShakthi	40.15 (6.38) ^{gh}	12.54 (3.61) ^{cd}
	Bhima Raj	42.51 (6.56) ^{fg}	11.47 (3.46) ^{efg}
	Bhima Shubra	41.31 (6.47) ^{gh}	11.50 (3.46) ^{efg}
	BhimaKiran	43.75 (6.65) ^{fg}	15.00 (3.94) ^{bc}
	Agri Found White	36.02 (6.04) ^{ij}	11.03 (3.40) ^{fg}
	Agri Found Light Red	47.26 (6.91) ^{ef}	12.71 (3.63) ^{cd}
	Light Red	41.32 (6.47) ^{gh}	12.03 (3.54) ^{ef}
	Mahalaxmi	39.94 (6.36) ^{gh}	14.66 (3.89) ^{bc}
	Bhima Red	59.23 (7.73) ^{bc}	10.96 (3.39) ^{fg}
	Susceptible (50.1-75 thrips/plant)	Agri Found Dark Red	54.01 (7.38) ^{cd}
N. 53		60.07 (7.78) ^b	8.06 (2.93) ^b
Prema		58.00 (7.65) ^{cd}	7.85 (2.89) ^b
Sataragarva		79.84 (8.96) ^a	7.10 (2.76) ^b
Highly Susceptible (> 75 thrips/plant)	Bellary Red	75.96 (8.74) ^a	8.20 (2.95) ^b
	SEM+	0.172	0.181
CD at 5%		0.511	0.523

3.3 Population of natural enemies on onion cultivars

In the present investigation, natural enemies were recorded in all the onion cultivars. Among the natural enemies, lady bird beetles (coccinellid beetles) and *Chrysoperla* sp. were more abundant (Table 4). More population of coccinellid beetles was recorded in ArkaPragati (3.21/10 plants) whereas, the least population was recorded in Agri found white (0.21 /ten pl.). High population of *Chrysoperla* sp., 2.16 per ten plants was recorded in Bhima Raj and the least population of chrysopids was recorded in ArkaBindu (0.32/10 pl.) whereas,

spider population was found high in cultivar Agri found dark red (0.63/10 pl). The present findings may be due to non-use of insecticides, abundance of prey and favourable weather parameters. These findings are in uniformity with the findings of Mallinath and co-workers^[5] who reported that the spiders and coccinellids are the two natural enemies which feed on *T. tabaci* in onion ecosystem. Ahemedco-workers^[1] also reported that natural enemies like spiders, green lacewing and lady bird beetles were observed on onion crop against *T. tabaci*.

Table 4: Population of Predators on onion cultivars during 2014-15.

S. No.	Name of Cultivar	Mean number of lady bird beetle/10 plants	Mean number of Chrysoperia sp./10 plants	Mean number of spiders/10 plants
1	ArkaKalyan	1.36	0.73	0.21
2	ArkaNikethan	1.02	0.68	0.00
3	ArkaPragathi	3.21	0.61	0.13
4	Bhima Super	0.66	1.90	0.35
5	ArkaBindu	2.41	0.32	0.00
6	BhimaShewtha	1.30	0.63	0.00
7	BhimaShakthi	0.50	0.83	0.00
8	Bhima Raj	1.06	2.16	0.00
9	Bhima Shubra	0.73	1.40	0.32
10	BhimaKiran	1.90	1.90	0.11
11	Agri found white	0.21	1.04	0.01
12	Agri found light red	0.83	0.38	0.00
13	Light Red	1.70	0.67	0.00
14	Mahalaxmi	0.76	1.07	0.02
15	Bhima Red	0.50	1.86	0.00
16	Agri found dark red	0.63	0.47	0.63
17	N. 53	1.40	1.62	0.49
18	Prema	0.83	0.95	0.13
19	Sataragarva	1.83	1.76	0.00
20	Bellary red	1.02	1.70	0.31

4. Conclusion

Among twenty cultivars screened against thrips, *T. tabaci* (Lind.) none of the cultivars were resistant. However, the lowest population (29.34 thrips/pl.) was recorded in cultivars Arka Pragati which was moderately resistant. Whereas, highest population (79.38 thrips per plant) was recorded in cultivar Satar Garva, which was categorized as highly susceptible. Among the natural enemies, coccinellid beetles are the major predator against thrips in onion cultivar followed by Chrysopids and Spiders.

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