



International Journal of Research in Agronomy

E-ISSN: 2618-0618

P-ISSN: 2618-060X

© Agronomy

www.agronomyjournals.com

2024; 7(8): 763-766

Received: 22-06-2024

Accepted: 27-07-2024

Balachandra H

UAS, GKVK, Bangalore,
Karnataka, India

Suneetha C

UAS, GKVK, Bangalore,
Karnataka, India

Sunitha TR

College of Agriculture, Karekere,
Hassan, Karnataka, India

Kavitha TR

UAS, GKVK, Bangalore,
Karnataka, India

Krishnamma PN

UAS, GKVK, Bangalore,
Karnataka, India

Evaluation of onion (*Allium cepa* L.) genotypes for thrips resistance

Balachandra H, Suneetha C, Sunitha TR, Kavitha TR and Krishnamma PN

DOI: <https://doi.org/10.33545/2618060X.2024.v7.i8j.1377>

Abstract

Onion is an important vegetable crop belongs to the family Alliaceae. It is grown for its bulb, which can be also used as salad. Around eighteen diverse genotypes of onion were collected from different districts of Karnataka and laid out in Randomized Complete Block Design with three replications during the period of January to April 2022-23 in the Department of Horticulture, GKVK, Bengaluru and were assessed to know the performance of all the genotypes in case of thrips resistance. Counting of thrips population was done during before flowering, 50% of flowering and after flowering. The average thrips population was found higher during 50% of flowering of the crop. In case of screening for thrips resistance, Chikkamagaluru Local-1 and Gadag Local-1&3 genotypes were observed as highly resistant as these genotypes can be exploited for crop improvement programme of onion. Whereas Bidar local-6, Chitradurga Local-2 and Nagpur Local genotypes are highly susceptible to thrips infestation.

Keywords: Onion, thrips, before flowering, 50% of flowering, after flowering

Introduction

Onion (*Allium cepa* L.) is an important crop of the family Alliaceae and its chromosome number is $2n=16$. It is one of the most widely grown and popular vegetable crop in India. Onion holds the distinction of being the second most crucial vegetable crop globally, surpassed only by tomatoes. It plays an indispensable role in kitchens, serving both as vegetable and condiment, adding flavor to a wide array of dishes. Due to its versatile nature, it is often affectionately referred as 'Queen of the kitchen.' More over onions find usage in salads and pickles. Notably, the processing industry is increasingly utilizing onions for the production of dehydrated products such as onion powder and flakes (Bal *et al.*, 2020) [3]. Thus, onions have. An extensive culinary, dietary, therapeutic, trading, income and employment generation value.

Onion has a steady demand worldwide. India is the second largest onion producer in the world after China. In India, Maharashtra is the major onion producing state followed by Karnataka, Madhya Pradesh, Gujarat and Rajasthan. In India it is cultivated in a large area of 1941.12 thousand hectares with a total production of 31687.19 million tons. In Karnataka, it is grown in about 231.84 thousand hectares with a production of 2779.50 thousand tons (Anon., 2022) [2]. India ranks third in export after Netherland & Spain.

In India onion cultivation is affected directly or indirectly by both abiotic and. biotic factors. The major obstruction. In onion cultivation is the biotic. Stress including several insect pests viz., thrips, cut worms, eriophyid mites, red spider mites, diseases and competition with. Weeds. Among these, onion thrips is considered. To be the most important. Thrips infest onion throughout the crop growth period, with their population peaking from bulb initiation and persisting at high levels until bulb development and maturity. Both nymphs. And adults contribute to direct damage by piercing the leaves and extracting sap, resulting in a silvery appearance, leaf curling and ultimately diminishing bulb size and weight. Infested plants exhibit twisting and curling, leading to potential yield losses. Of up to 50 per cent. Therefore, effective pest management practice plays a pivotal role in ensuring the production of high quality, marketable onion bulbs (Yadav *et al.*, 2018) [9].

Corresponding Author:

Balachandra H

UAS, GKVK, Bangalore,
Karnataka, India

The utilization of chemical methods for pest control has become both economically unsustainable and environmentally risky. Instances of *Thrips tabaci* resistance to pyrethroids and organophosphate insecticides have been recorded. Consequently, evaluating onion genotypes for their resistance to *T. tabaci* presents a cost effective and environmentally conscious alternative (Engla *et al.*, 2014) [4].

Attaining desirable bulb quality holds significant importance for both local consumption and processing markets. In order to develop cultivars with enhanced yield, superior quality and resistance to thrips, assembling an impressive collection of genotypes is essential. To achieve the same, the study was conducted to evaluate onion genotypes for thrips resistance.

Materials and method

The field experiment was conducted in Department of Horticulture, UAS, GKVK, Bengaluru during *rabi* 2022-23 to evaluate 18 onion genotypes for thrips resistance. The soil is red sandy loam and well drained with uniform texture. Individual plots with 1 x 1m size were prepared and seedlings were transplanted with the spacing 15 x 10cm was maintained. The experiment was laid out by following RCB design with 3 replications. In this study, total 18 local onion genotypes were

taken (collected from different districts of Karnataka) with one check variety *i.e.* Bhima super (Table 1). These collected seeds of different onion genotypes were sown in pro-trays under nursery and transplanted after 6-8 weeks. Recommended doses of nitrogen (125 kg ha⁻¹), phosphorus (75 kg ha⁻¹) and potassium (125 kg ha⁻¹) were applied in each plot. The source of nutrients were for nitrogen, urea and DAP, for phosphorus DAP, for potash MOP. Half dose of nitrogen and whole doses of phosphorus and potash were applied as basal dose prior to transplanting of onion seedlings. While the rest of nitrogen was given at 45 days after transplanting of the seedlings. Population of thrips was recorded with the help of 10X magnifying lens on five randomly selected plants from each plot at 3 different stages of crop growth (Before flowering, 50% of flowering and after flowering) and for scoring against thrips resistance, all genotypes were categorized into 4 groups *i.e.* Highly resistance, resistance, Susceptible and highly susceptible (Table 2). For the grouping purpose, mean value of individual genotype ($\bar{X}_i$) was compared with mean value of all genotypes ($\bar{X}$) and standard deviation (sd) following the modified scale adopted by Kumar *et al.* (2019) [5]. The statistical analysis was carried out by using RCB design-excel sheet and R software version 4.0.5 programme.

Table 1: List of onion genotypes used in the study

Sl. No.	Treatments	Sources of collection
1.	T ₁	Bellary Local (Pattanasera)
2.	T ₂	Nagpur Local (Maharashtra)
3.	T ₃	Chitradurga Local-1 (Chitradurga)
4.	T ₄	Chikkamagaluru Local-1 (Kaduru Giriyapura)
5.	T ₅	Chikkamagaluru Local-2 (Kaduru Sahaja seeds)
6.	T ₆	Gadag Local-1 (Doni)
7.	T ₇	Gadag Local-2 (Kalsapur)
8.	T ₈	Gadag Local-3 (Gavarawad)
9.	T ₉	Gadag Local-4 (Bodhihal)
10.	T ₁₀	Vijayapura Local (Telgi)
11.	T ₁₁	Bengaluru Local (Nelemangala)
12.	T ₁₂	Bidar Local-1 (Bavagi)
13.	T ₁₃	Bidar Local-2 (Halahalli)
14.	T ₁₄	Bidar Local-3 (Hallikhet B)
15.	T ₁₅	Bidar Local-4 (Siddeswar)
16.	T ₁₆	Bidar Local-5 (Khanapur)
17.	T ₁₇	Bidar Local-6 (Tugaon)
18.	T ₁₈	Chitradurga Local-2 (Challakere)
19.	T ₁₉	Bhima super

Table 2: Pest susceptibility scale against onion thrips

Category of resistance	Scale of resistance
Highly resistant (HR)	$\bar{X}_i < (\bar{X} - sd)$
Resistant (R)	$\bar{X}_i > (\bar{X} - sd) < \bar{X}$
Susceptible (S)	$\bar{X}_i > \bar{X} < (\bar{X} + sd)$
Highly susceptible (HS)	$\bar{X}_i > (\bar{X} + sd)$

Here, $\bar{X}$ = Mean value of all genotype, $\bar{X}_i$ = Mean value of individual genotype, sd = Standard deviation and n = No. of genotypes

Results and Discussions

Counting of thrips population was done during before flowering, 50% of flowering and after flowering. The average thrips population was found higher during 50% of flowering of the crop. The results indicated significant variations among the tested cultivars with respect to infestation of thrips (Table 3). Before flowering stage of the crop was noted that, Bidar Local-5 recorded maximum number of thrips population (10.10 thrips plant⁻¹) and minimum population was observed in Gadag Local-2 (1.40 thrips plant⁻¹) and in check variety *i.e.* Bhima super was

recorded 9.90 thrips per plant. Similarly, during 50% of flowering of the crop was noted that, maximum thrips population was observed in Nagpur Local (47.90 thrips plant⁻¹) and minimum thrips infestation was observed in Gadag Local-1 (16.60 thrips plant⁻¹) and the check Bhima super was recorded 25.30 thrips per plant. At final thrips count during complete flowering was done and it was noted that, maximum thrips population was observed in Chitradurga Local-2 (15.40 thrips plant⁻¹) and minimum population was observed in Bengaluru Local (2.40 thrips plant⁻¹) and in check Bhima super (7.00 thrips

plant⁻¹). Differences in damage extent can potentially be attributed to variations in thrips infestation across different genotypes, influenced by the morphological and biochemical diversity present in plants. Genotypes displaying heightened susceptibility might attract a greater thrips population due to their characteristics such as thin leaves, reduced chlorophyll levels, and lower phenol content. Consequently, these thrips-favored genotypes could experience higher instances of leaf damage as a result of thrips feeding. (Latha and Hunumanthraya., 2018) [6]. Such variations for thrips population among the onion genotypes were reported by Tripathy *et al.* (2013) [8], Shah *et al.* (2015) [7] and Kumar *et al.* (2019) [5].

The different onion genotypes were grouped into 4 different resistance categories *i.e.* highly resistant, resistant, susceptible and highly susceptible were prepared in Table 4. The genotypes like Chikkamagaluru Local-1 and Gadag Local-1&3 were showed thrips population less than 9.11 per plant were grouped into highly resistant. Meanwhile, the genotypes like Chikkamagaluru Local-2, Gadag Local-2 & 4, Bengaluru Local, Vijayapura Local and Bidar Local-2, 3 & 5 were showed thrips population more than 9.11 but less than 12.17 per plant were grouped into resistant. Similarly, Bellary Local, Chitradurga Local-1 and Bidar Local-1 & 4 and check Bhima super genotypes were showed thrips population more than 12.17 but less than 15.23 per plant were grouped under susceptible category. While, the remaining genotypes like Bidar Local-6, Chitradurga Local-2 and Nagpur Local were showed thrips

population more than 15.23 per plant were grouped into highly susceptible.

Similarly, Kumar *et al.* (2019) [5] reported and confirm the present finding. He revealed that onion genotypes were highly susceptible to thrips population ranged from 11.73 to 17.64 thrips per plant. The genotype ON14-23 showed least population (11.73 thrips plant⁻¹) while it was the highest (15.33 thrips plant⁻¹) in the genotype ON15-01 followed by ON15-13 (12.29 thrips plant⁻¹) and ON15-45 (12.01 thrips plant⁻¹), respectively. Onion genotype ON15-11 (17.64 thrips plant⁻¹) was registered in the scale of highly susceptible *i.e.* more than 17.64 thrips population per plant.

Conclusion

The present investigation was undertaken screening of onion varieties against thrips. It was observed that, none of them was free from pest infestation. Hence, it can be concluded that Chikkamagaluru Local-1 and Gadag Local-1&3 genotypes were observed as highly resistant as these genotypes can be exploited for crop improvement programme of onion. Whereas Bidar Local-6, Chitradurga Local-2 and Nagpur Local genotypes are highly susceptible.

Acknowledgement

The authors are thankful to the Head, Department of Horticulture and other teachers for providing necessary facility and encouragement during course of present investigation.

Table 3: Reaction of onion genotypes for thrips resistance

Sl. No.	Genotypes	Population of thrips before flowering	Population of thrips 50% of flowering	Population of thrips After flowering
1.	Bellary Local	5.40 (2.29) ^{abcd}	24.90 (4.98) ^{cdef}	9.40 (3.06) ^c
2.	Nagpur Local	3.10 (1.74) ^{cde}	47.90 (6.92) ^a	9.60 (3.10) ^c
3.	Chitradurga Local-1	3.80 (1.91) ^{cde}	18.90 (4.34) ^{efgh}	15.40 (3.92) ^a
4.	Chikkamagaluru Local-1	3.70 (1.87) ^{cde}	37.00 (6.08) ^b	11.80 (3.44) ^b
5.	Chikkamagaluru Local-2	4.30 (2.07) ^{bcde}	22.60 (4.69) ^{defgh}	3.40 (1.81) ^{gh}
6.	Gadag Local-1	5.80 (2.34) ^{abcd}	16.60 (4.07) ^h	3.30 (1.80) ^{gh}
7.	Gadag Local-2	1.40 (1.17) ^e	22.10 (4.69) ^{defgh}	6.90 (2.62) ^d
8.	Gadag Local-3	2.90 (1.64) ^{cde}	18.00 (4.20) ^{efgh}	3.30 (1.81) ^{gh}
9.	Gadag Local-4	9.10 (2.98) ^{ab}	19.60 (4.42) ^{efg}	5.20 (2.28) ^{ef}
10.	Vijayapura Local	7.60 (2.55) ^{abc}	18.10 (4.25) ^{efgh}	4.30 (2.07) ^{fg}
11.	Bengaluru Local	5.40 (2.26) ^{abcd}	24.10 (4.89) ^{defg}	2.40 (1.54) ^h
12.	Bidar Local-1	2.80 (1.62) ^{cde}	29.20 (5.40) ^{bcd}	9.40 (3.09) ^c
13.	Bidar Local-2	5.30 (2.27) ^{abcd}	32.40 (5.68) ^{bc}	9.50 (3.08) ^c
14.	Bidar Local-3	4.30 (2.00) ^{bcde}	23.10 (4.78) ^{defgh}	6.70 (2.58) ^d
15.	Bidar Local-4	6.00 (2.45) ^{abc}	30.00 (5.47) ^{bcd}	4.60 (2.14) ^f
16.	Bidar Local-5	10.10 (3.18) ^a	19.20 (4.35) ^{efgh}	6.20 (2.49) ^{de}
17.	Bidar Local-6	1.80 (1.33) ^{de}	22.90 (4.78) ^{defgh}	8.80 (2.96) ^c
18.	Chitradurga Local-2	1.90 (1.33) ^{de}	17.30 (4.14) ^{gh}	2.80 (1.66) ^h
19.	Bhima super	9.90 (3.14) ^a	25.30 (5.02) ^{cde}	7.00 (2.64) ^d
F-test		*	*	*
S.E.m±		(0.30)	(0.23)	(0.09)
CD(p=0.05)		(0.88)	(0.67)	(0.25)

*Note: The figures in the parenthesis are $\sqrt{x + 0.5}$ transformed values

Table 4: Onion genotypes classified based on thrips resistance

Sl. No.	Category of resistance	Scale	Genotypes	($\bar{X}_i$)
*Based on population of thrips/plant: $\bar{X} = 12.17$ and $sd = 3.06$				
1.	Highly resistant (HR)	$\bar{X}_i < 9.11$	Chikkamagaluru Local-1	7.33
			Gadag Local-3	8.07
			Gadag Local-1	8.53
2.	Resistant (R)	$\bar{X}_i > 9.11 < 12.17$	Vijayapura Local	10.00
			Chikkamagaluru Local-2	10.10
			Gadag Local-2	10.13

			Bengaluru Local	10.63
			Bidar Local-2	11.17
			Gadag Local-4	11.30
			Bidar Local-3	11.37
			Bidar Local-5	11.83
3.	Susceptible (S)	$\bar{X}_i > 12.17 < 15.23$	Chitradurga Local-1	12.70
			Bellary Local	13.23
			Bidar Local-4	13.53
			Bidar Local-1	13.80
			Bhima super	14.07
4.	Highly susceptible (HS)	$\bar{X}_i > 15.23$	Bidar Local-6	15.73
			Chitradurga Local-2	17.50
			Nagpur Local	20.20

Reference

1. Amarananjundeswara H, Suhas YH, Kumar AJS, Gowda VR, Reddy MTB. Evaluation of onion (*Allium cepa* L.) genotypes for growth and yield parameters under the eastern dry zone of Karnataka. Int J Chem Stud. 2020;8(6):2790-2794.
2. Anonymous. Annual report of area and production of horticulture crops. Indiastatagri. 2022;1:1.
3. Bal S, Maity T, Maji A. Evaluation of onion genotypes for growth, yield and quality traits under gangetic-alluvial plains of West Bengal. Int J Chem Stud. 2020;8(4):2157-2162.
4. Engla P, Thakur AS, Thomas M, Bhowmick AK, Sharma HL. Screening of onion genotypes against *Thrips tabaci* Lind. in Central India. Int J Biodivers Conserv. 2014;6(12):806-813.
5. Kumar A, Deole S, Nirmal A, Taram SK. Evaluation of onion genotypes against *Thrips tabaci* Lindeman. Int J Chem Stud. 2019;7(1):1007-1011.
6. Latha S, Hunumanthraya L. Screening of chilli genotypes against chilli thrips (*Scirtothrips dorsalis* Hood) and yellow mite (*Polyphagotarsonemus latus* Banks). J Entomol Zool Stud. 2018;6(2):2739-2744.
7. Shah RA, Khan IA. Evaluation of onion cultivars against onion thrips, *Thrips tabaci* (Lindeman) infestation on onion crop. J Entomol Zool Stud. 2015;3(2):121-123.
8. Tripathy P, Priyadarshini A, Das SK, Sahoo BB, Dash DK. Evaluation of onion (*Allium cepa* L.) genotypes for tolerance to thrips (*Thrips tabaci* L.) and purple blotch (*Alternaria porri* [Ellis] Ciferri). Int J Bio-resour Stress Manag. 2013;4(4):561-564.
9. Yadav M, Prasad R, Kumar P, Pandey C, Kumar P, Kumar U. A review on onion thrips and their management of bulb crops. J Pharmacogn Phytochem. 2018; SP1:891-896.