Screening of onion varieties against thrips, *Thrips tabaci* L.

ABSTRACT

An investigation was undertaken to study the screening of onion varieties against thrips, *Thrips tabaci* L., on onion in the grid region of Madhya Pradesh, India. Twelve onion varieties were sown, and we observed the different incidence levels of thrips during two successive years, 2022–23 and 2023–24. It was noteworthy that none of the studied types were fully free of pest infestations. In the investigation of the screening of 12 onion varieties, 2 varieties were categorized as highly susceptible, 8 varieties as moderately susceptible and 2 varieties were less susceptible to thrips. The variety Light Red had the lowest thrips population, followed by Bhima Shweta. Among the moderately susceptible varieties, Bhima Shakti had the highest thrips population, followed by Bhima Shubhra. The highly susceptible varieties Nasik Red (N-53) and Gauran LR-241 recorded the highest thrips population.

Keywords: Onion, thrips, varieties, screening

INTRODUCTION

The onion belongs to the family Alliaceae, in the genus Allium and is known scientifically as *Allium cepa*. The onion is a biennial vegetable grown in temperate zones as an annual. Onion is one of the oldest edible food sources known to humankind, used in salads, recipes, mouth-watering gravies and curries. It has also been used in traditional medicines. Onion is considered one of the most important vegetable crop produced on a small and large scale in India [1]. It is grown for human consumption as green, immature vegetable crops as well as mature bulbs. It has occupied a key role in Indian cuisine as vegetables, salads, pickles, sauces, etc., both mature and immature bulbs of onion, are used as a condiment. One of the few adaptable vegetable crops that can safely endure the risks of physical handling, including long-distance travel and be stored for a considerable amount of time is this one. In India, the area under the crop is reported to be about 16.24 mha and production is about 266.41 million tons with a productivity of 16.4 metric tons per ha [2]. In Madhya Pradesh, onion is cultivated on 1.96 mha and with a production of 47.40 million tons and a productivity of 24.10 metric tons per hectare. The major onion-producing state is Maharashtra, followed by Karnataka and Madhya Pradesh [3]. The onion plant is attacked by several insect pests, like thrips, onion fly, cutworms, tobacco caterpillars, etc. The onion thrips (*T. tabaci* L.) (Thysanoptera: Thripidae) is a major insect pest that causes significant yield losses. In India, it is an important insect pest that affects onion yield by direct feeding as well as reducing the quality and quantity by rasping and sucking the leaves and other tissues of onion crops. To reduce the risk of pesticide application and resulting yield losses for onion. Yield loss due to onion thrips is among the insect pest complexes; *T. tabaci* L. is the most serious insect infesting up to 34–43 percent of yield [4]. For better management and reducing losses, we need to know about varietal screening against *T. tabaci* L. [5].

METHOD AND MATERIALS

Experiment at the Entomological Research Field, College of Agriculture, Gwalior, Madhya Pradesh, India. All the recommended agronomical practices were adopted for raising the crop. The susceptibility of different onion varieties to *T. tabaci* was evaluated on the basis of the number of thrips per plant recorded weekly on 12 onion varieties. spacing row to row 20 cm and plant to plant 10 cm. The observations were recorded at weekly intervals on five randomly selected tagged plants from each plot. The observations were recorded by counting the number of thrips per plant, starting from the appearance of the thrip population and were continued until crop maturity. The twelve varieties were grouped into three categories, *viz.*, less susceptible, moderately susceptible and highly susceptible, based on the number of thrips per plant rating scale as suggested [6]. For this purpose, the mean value of individual varieties ($\bar{x}$) was compared with the mean value of all varieties ($\bar{x}$) and the standard deviation (σ). The scale used for categorizing different varieties was as follows:

Table-1 Pest susceptibility scale against onion thrips.

Category of resistance	Scale for resistance
Less susceptible	$< \bar{x} - \sigma$
Moderately susceptible	$> \bar{x} - \sigma. < \bar{x} + \sigma$
Highly susceptible	$> \bar{x} + \sigma$

RESULTS
During (2022-23)

During the year 2022–23, the trial was formulated to evaluate the performance of twelve onion varieties against Thrips. The observations on thrips were recorded at a weekly interval, just after their appearance until harvesting. The data presented revealed that none of the varieties were found to be completely free from thrips attacks. The data was recorded as the mean population of thrips/ plant presented in Table 2 and Fig. 1.

On the basis of the thrips susceptibility scale against onion thrips (Table 2), out of the screening of 12 onion varieties, 2 varieties were categorized as highly susceptible, 8 varieties as moderately susceptible and 2 varieties were less susceptible against thrips. The mean number of thrips of highly resistant varieties ranged from 3.98 to 23.46 thrips /plant. The variety Light Red had the lowest number of thrips (3.98 thrips/plant), followed by Bhima Shweta (4.55 thrips/plant). Among the moderately susceptible varieties, Bhima Shakti had the highest number of thrips (21.35 thrips/plant), followed by Bhima Shubhra (18.86 thrips/plant). The highly susceptible varieties Nasik Red (N-53) (23.46 thrips/plant) and Gauran LR-241 (22.48 thrips/plant) recorded the highest number of thrip.

The mean number of thrips of less susceptible ranged from 3.98 to 4.55 thrips/ plant. The variety Light Red showed the lowest number of thrips (3.98 thrips/ plant) and Bhima Shweta (4.55 thrips/ plant).

The average number of thrips of the moderately susceptible variety ranged from 9.22 to 21.35. The variety Bhima Kiran showed the least (9.22 thrips/ plant) plant damage, followed by Bhima Dark Red (12.12 thrips/ plant), Bhima Safed (13.19 thrips/ plant), Bhima Red (14.31

thrips/ plant), Bhima Raj (16.23 thrips/ plant), Bhima Super (16.86) and Bhima Shubhra (18.86 thrips/ plant), while it was highest in the variety Bhima Shakti (21.35 thrips/ plant).

The number of thrips of the highly susceptible variety ranged from 22.48 to 23.46 thrips/ plant. The variety Gauran LR-241 showed the highest number of thrips (22.48 thrips/ plant) and Nashik Red (N-53) (23.46 thrips/ plant).

During (2023-24)

During the year 2023-24, the trial was formulated to evaluate the performance of twelve onion varieties against Thrips. The observations on Thrips were recorded at a weekly interval, just after their appearance until harvesting. The data presented revealed that none of the varieties was found to be completely free from Thrips attack. The data was recorded as the mean population of thrips/ plant presented in Table-3 and Fig. 1

On the basis of the thrips susceptibility scale against onion thrips (Table 3), out of the screening of 12 onion varieties, 2 varieties were categorized as highly susceptible, 8 varieties as moderately susceptible and 2 varieties were less susceptible against thrips. The mean number of thrips of highly resistant varieties ranged from 4.23 to 23.63 thrips/ plant. The variety Light Red had the lowest number of thrips (4.23 thrips/ plant), followed by Bhima Shweta (4.75 thrips/ plant). Among the moderately susceptible varieties, Bhima Shakti had the highest number of thrips (21.55 thrips/ plant), followed by Bhima Shubhra (19.12 thrips/ plant). The highly susceptible varieties Nasik Red (N-53) (23.63 thrips/ plant) and Gauran LR-241 (22.63 thrips/ plant) recorded the highest thrips population.

The mean thrips population score of less susceptible ranged from 4.23 to 4.75 thrips/ plant. The variety Light Red showed the lowest number of thrips (4.23 thrips/ plant) and Bhima Shweta (4.75 thrips/ plant).

The average number of thrips of the moderately susceptible variety ranged from 9.44 to 21.55. The variety Bhima Kiran showed the least (9.44 thrips/ plant) plant damage, followed by Bhima Dark Red (12.11 thrips/ plant), Bhima Safed (13.41 thrips/ plant), Bhima Red (14.41 thrips/ plant), Bhima Raj (16.35 thrips/ plant), Bhima Super (17.18) and Bhima Shubhra (19.12 thrips/ plant), while it was highest in the variety Bhima Shakti (21.55 thrips/ plant).

The number of thrips of the highly susceptible variety ranged from 22.63 to 23.63 thrips/ plant. The variety Gauran LR-241 showed the highest number of thrips (22.48 thrips/ plant) and Nashik Red (N-53) (23.46 thrips/ plant)

Discussion

The mean number of thrips of less susceptible ranged from 4.10 to 4.65 thrips/ plant. The variety Light Red showed the lowest number of thrips (4.10 thrips/ plant) and Bhima Shweta (4.65 thrips/ plant).The average number of thrips of the moderately susceptible variety ranged from 9.33 to 21.45. The variety Bhima Kiran showed the least (9.33 thrips/ plant) plant damage, followed by Bhima Dark Red (12.12 thrips/ plant), Bhima Safed (13.30 thrips per plant), Bhima Red (14.36 thrips/ plant), Bhima Raj (16.29 thrips/ plant), Bhima Super (17.02) and Bhima Shubhra (18.99 thrips/ plant), while it was highest in the variety Bhima Shakti (21.45 thrips/

plant).The number of thrips of the highly susceptible variety ranged from 22.56 to 23.55 thrips per plant. The variety Gauran LR-241 showed the highest number of thrips (22.56 thrips/ plant) and Nashik Red (N-53) (23.55 thrips / plant).

These findings are in conformity with earlier findings by Diaz-Montano *et al.*[7], who reported that among forty-nine onion cultivars, they were evaluated for resistance by counting the number of thrips larvae weekly. Among the highly resistant cultivars, Colorado-6 and NMSU-03-52-1 had the lowest numbers of *T. tabaci*, suggesting strong antibiosis and antixenosis.

In a similar, Alimousavi *et al.*[8] reported that in contrast to sensitive genotypes, the genotypes "Meshkan," "Sefid- e- Kurdistan," "Sefid e-Qom," and "Eghlid" had the lowest levels of thrips infestation, leaf infection percentage and leaf wax. Thrips could not harm genotypes with glossy leaves, but nonglossy genotypes were vulnerable to them. Findings indicated that resistant genotypes of thrips might be crossed with susceptible genotypes to create resistant crops.

Similar findings were found in another study by Tripathy *et al.*[9] that assessed how resistant various onion lines or types were to onion thrips. In Sambalpur, Odisha, India, during the 2009–10 rabi season, twenty-one varieties and advanced lines, five national checks and three replications were assessed against onion thrips under the AINRP on onion and garlic by using RBD. According to data on thrips infestation, Bhima Super, NRCWO-3, NRCRO-4, and the control, Arka Niketan, produced significantly higher total bulb yields (325.41 to 376.00 q ha-1) and had better tolerance to thrips (25.91 to 32.42 thrips plant-1). These results were obtained from the data on thrips infestation.

Similarly, at the Main Vegetable Research Station, Anand 49 Agricultural University, Anand, Gujarat, during the Rabi season of 2009–2010, Patel *et al.*[10] investigated the sensitivity of twelve onion genotypes/cultivars to thrips, Thrips tabaci. According to their findings, JRO-2000-181 was the most resistant variety, with a significantly lower thrips population (7.57 per plant) and a higher bulb yield (56.83 t/ha). Gujarat White Onion-1 and Talaja Red had the next highest thrips populations (9.61 and 49.11 t/ha) and bulb yields (48.44 and 48.44 t/ha), respectively. They found that the length and girth of the bulb, together with the plant height at 30, 60, and 90 days after transplanting, were what determined the genotypes' vulnerability or resistance.

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Table. 2.Screening of onion varieties for their susceptibility against thrips, *T. tabaci* L. during 2022-23.

Varieties	4 WAT	5 WAT	6 WAT	7 WAT	8 WAT	9 WAT	10 WAT	11 WAT	12 WAT	13 WAT	14 WAT	Over all
Bhima Super	14.70 (3.90)*	16.20 (4.09)	16.59 (4.13)	16.70 (4.15)	15.78 (4.04)	15.25 (3.97)	14.07 (3.81)	16.16 (4.08)	18.73 (4.39)	17.40 (4.47)	21.80 (4.72)	16.86 (4.17)
Bhima Red	10.12 (3.26)	12.45 (3.6)	14.87 (3.92)	14.42 (3.86)	13.62 (3.76)	13.34 (3.72)	12.48 (3.60)	14.42 (3.86)	15.32 (3.97)	19.37 (4.23)	19.03 (4.42)	14.31 (3.85)
Bhima Raj	12.78 (3.64)	14.70 (3.90)	16.44 (4.12)	16.43 (4.11)	15.67 (4.02)	14.99 (3.94)	13.70 (3.76)	16.13 (4.08)	17.65 (4.26)	12.19 (4.46)	20.65 (4.60)	16.23 (4.09)
Bhima Kiran	6.57 (2.66)	7.52 (2.83)	8.13 (2.94)	8.39 (2.98)	8.74 (3.04)	7.76 (2.87)	7.80 (2.88)	9.10 (3.10)	10.77 (3.36)	16.70 (3.56)	14.50 (3.87)	9.22 (3.12)
Bhima Safed	9.86 (3.22)	11.63 (3.48)	12.51 (3.61)	12.48 (3.60)	12.68 (3.63)	12.12 (3.55)	11.43 (3.45)	12.32 (3.58)	14.38 (3.86)	21.97 (4.15)	18.93 (4.41)	13.19 (3.7)
Bhima Shubhra	16.37 (4.11)	18.40 (4.35)	18.60 (4.37)	18.13 (4.32)	18.23 (4.33)	18.27 (4.33)	14.41 (3.86)	19.52 (4.47)	21.42 (4.68)	22.72 (4.74)	22.18 (4.76)	18.86 (4.40)
Bhima Shakti	18.32 (4.34)	20.40 (4.57)	21.67 (4.71)	21.23 (4.66)	21.77 (4.72)	21.03 (4.64)	20.75 (4.61)	21.32 (4.67)	22.17 (4.76)	6.75 (4.82)	23.50 (4.90)	21.35 (4.67)
Bhima Shweta	2.17 (1.63)	3.57 (2.01)	5.32 (2.41)	4.24 (2.18)	4.78 (2.30)	4.14 (2.15)	2.78 (1.81)	3.47 (1.99)	4.61 (2.26)	14.83 (2.69)	8.27 (2.96)	4.55 (2.25)
Bhima Dark Red	8.16 (2.94)	9.80 (3.21)	12.44 (3.60)	12.43 (3.59)	11.72 (3.49)	11.46 (3.46)	10.38 (3.29)	11.25 (3.43)	13.68 (3.77)	5.67 (3.92)	17.19 (4.20)	12.12 (3.55)
Light Red	2.09 (1.61)	3.45 (1.98)	4.57 (2.24)	4.13 (2.15)	3.73 (2.05)	3.11 (1.90)	2.70 (1.79)	3.28 (1.94)	4.57 (2.25)	25.70 (2.48)	6.47 (2.64)	3.98 (2.12)

Nasik Red (N-53)	21.17 (4.65)	21.75 (4.72)	23.77 (4.93)	23.15 (4.86)	22.83 (4.83)	22.14 (4.76)	22.12 (4.76)	23.30 (4.88)	24.71 (5.02)	24.67 (5.12)	27.46 (5.29)	23.46 (4.90)
Gauran LR-241	20.11 (4.54)	21.19 (4.66)	22.44 (4.79)	22.20 (4.76)	21.92 (4.73)	21.62 (4.70)	21.14 (4.65)	22.22 (4.76)	23.42 (4.89)	0.04 (5.02)	26.38 (5.18)	22.48 (4.79)
SEm (±)	0.04	0.05	0.06	0.05	0.05	0.03	0.08	0.06	0.06	0.04	0.05	0.02
CD at 5%	0.13	0.16	0.19	0.14	0.14	0.09	0.24	0.19	0.17	0.11	0.15	0.05

*Figures in parentheses are $\sqrt{x + 0.5}$ transformed values, WAT- Week After Transplanting

Table. 3.Screening of onion varieties for their susceptibility against thrips, *T. tabaci* L. during 2023-24.

Varieties	**4 WAT**	**5 WAT**	**6 WAT**	**7 WAT**	**8 WAT**	**9 WAT**	**10 WAT**	**11 WAT**	**12 WAT**	**13 WAT**	**14 WAT**	**Over all**
Bhima Super	15.00 (3.94)*	16.17 (4.08)	17.39 (4.23)	16.25 (4.09)	16.10 (4.07)	15.77 (4.03)	14.71 (3.81)	16.51 (4.12)	19.05 (4.42)	17.77 (4.55)	21.83 (4.73)	17.18 (4.20)
Bhima Red	10.45 (3.31)	11.90 (3.52)	14.32 (3.85)	14.37 (3.86)	13.90 (3.79)	13.83 (3.78)	12.51 (3.6)	14.79 (3.91)	15.60 (4.01)	19.71 (4.27)	19.07 (4.42)	14.41 (3.86)
Bhima Raj	12.89 (3.66)	14.71 (3.90)	16.42 (4.11)	16.02 (4.06)	15.92 (4.05)	15.47 (4.00)	13.82 (3.76)	16.13 (4.08)	18.07 (4.31)	12.56 (4.49)	20.70 (4.6)	16.35 (4.10)
Bhima Kiran	6.75 (2.69)	7.83 (2.89)	8.43 (2.99)	8.30 (2.97)	8.90 (3.06)	8.32 (2.97)	7.77 (2.88)	9.43 (3.15)	11.07 (3.40)	16.73 (3.61)	14.53 (3.88)	9.44 (3.15)
Bhima Safed	9.90 (3.22)	11.83 (3.51)	13.07 (3.68)	12.68 (3.63)	12.99 (3.67)	12.64 (3.62)	11.39 (3.45)	12.63 (3.62)	14.72 (3.90)	21.95 (4.15)	18.87 (4.40)	13.41 (3.73)
Bhima Shubhra	16.52 (4.12)	18.65 (4.37)	18.75 (4.39)	18.13 (4.32)	18.57 (4.37)	18.75 (4.39)	15.37 (3.86)	19.63 (4.49)	21.80 (4.72)	22.73 (4.74)	22.23 (4.77)	19.12 (4.43)
Bhima Shakti	18.82 (4.40)	20.57 (4.59)	21.87 (4.73)	21.22 (4.66)	21.99 (4.74)	21.50 (4.69)	20.78 (4.61)	21.58 (4.70)	22.51 (4.80)	6.78 (4.82)	23.52 (4.9)	21.55 (4.70)
Bhima Shweta	2.45 (1.72)	3.85 (2.08)	5.47 (2.44)	4.28 (2.18)	4.87 (2.31)	4.73 (2.29)	2.82 (1.81)	3.78 (2.07)	4.91 (2.33)	14.78 (2.70)	8.33 (2.97)	4.75 (2.29)

Bhima Dark Red	8.27 (2.96)	9.93 (3.23)	12.75 (3.64)	11.93 (3.53)	11.53 (3.47)	11.94 (3.52)	10.33 (3.29)	11.32 (3.44)	14.05 (3.81)	5.65 (3.91)	16.35 (4.10)	12.11 (3.55)
Light Red	2.30 (1.67)	3.82 (2.07)	5.05 (2.35)	4.17 (2.16)	4.03 (2.13)	3.68 (2.04)	2.72 (1.79)	3.63 (2.03)	4.93 (2.33)	25.68 (2.48)	6.50 (2.64)	4.23 (2.17)
Nasik Red (N-53)	21.29 (4.67)	22.58 (4.80)	23.95 (4.94)	23.16 (4.86)	22.80 (4.83)	22.30 (4.77)	22.13 (4.76)	23.60 (4.91)	24.98 (5.05)	24.62 (5.12)	27.45 (5.29)	23.63 (4.91)
Gauran LR-241	20.26 (4.56)	21.73 (4.72)	22.58 (4.80)	22.21 (4.76)	22.08 (4.75)	21.75 (4.72)	21.12 (4.65)	22.57 (4.80)	23.67 (4.91)	0.03 (5.01)	26.40 (5.19)	22.63 (4.81)
SEm (±)	0.04	0.07	0.08	0.04	0.06	0.07	0.09	0.05	0.05	0.03	0.06	0.02
CD at 5%	0.12	0.21	0.24	0.13	0.17	0.19	0.25	0.16	0.15	0.10	0.17	0.05

*Figures in parentheses are $\sqrt{x + 0.5}$ transformed values, WAT- Week after transplanting

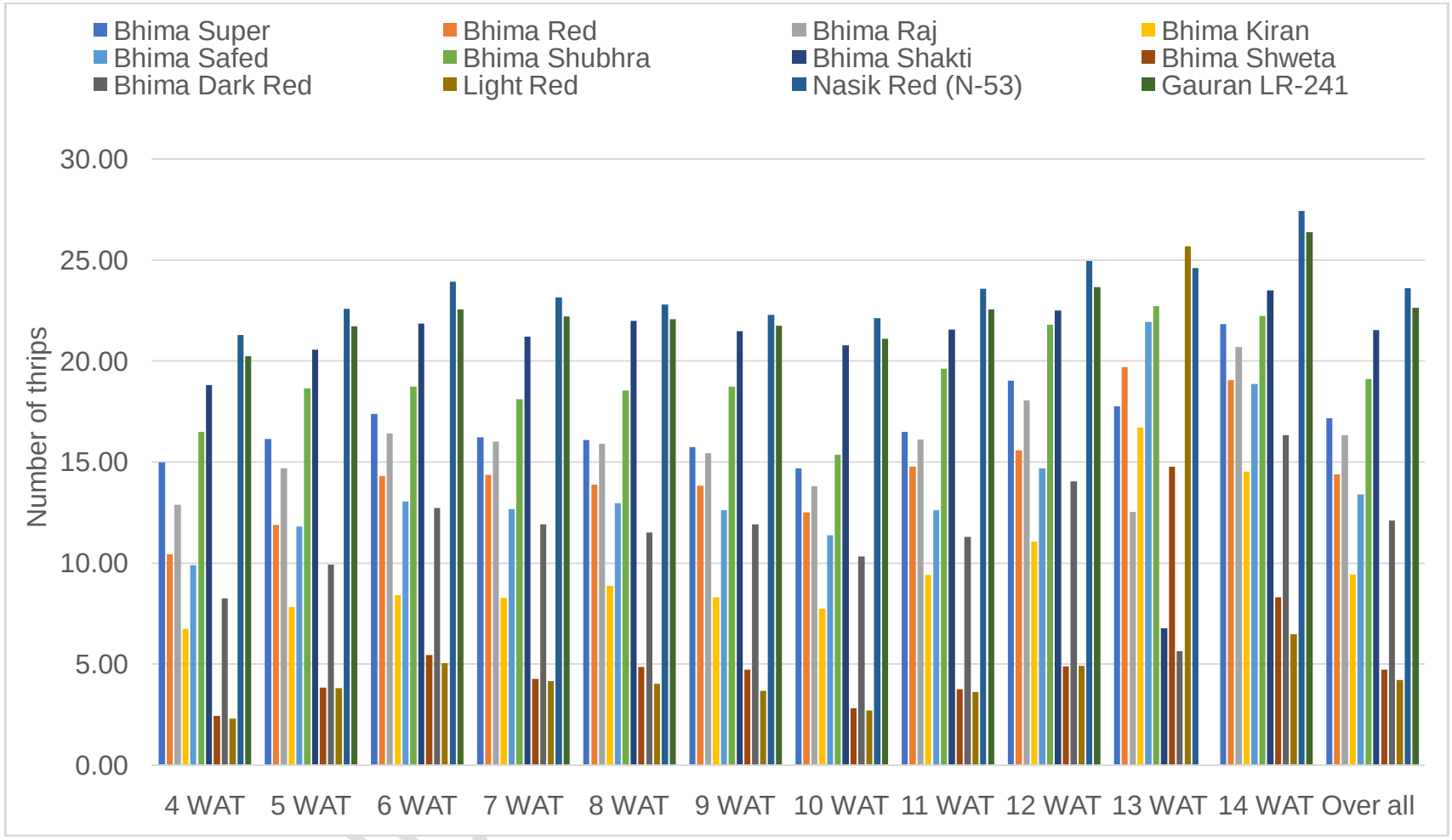

Fig. 1. Screening of onion varieties for their susceptibility against thrips, *T. tabaci* L. during 2023-24.

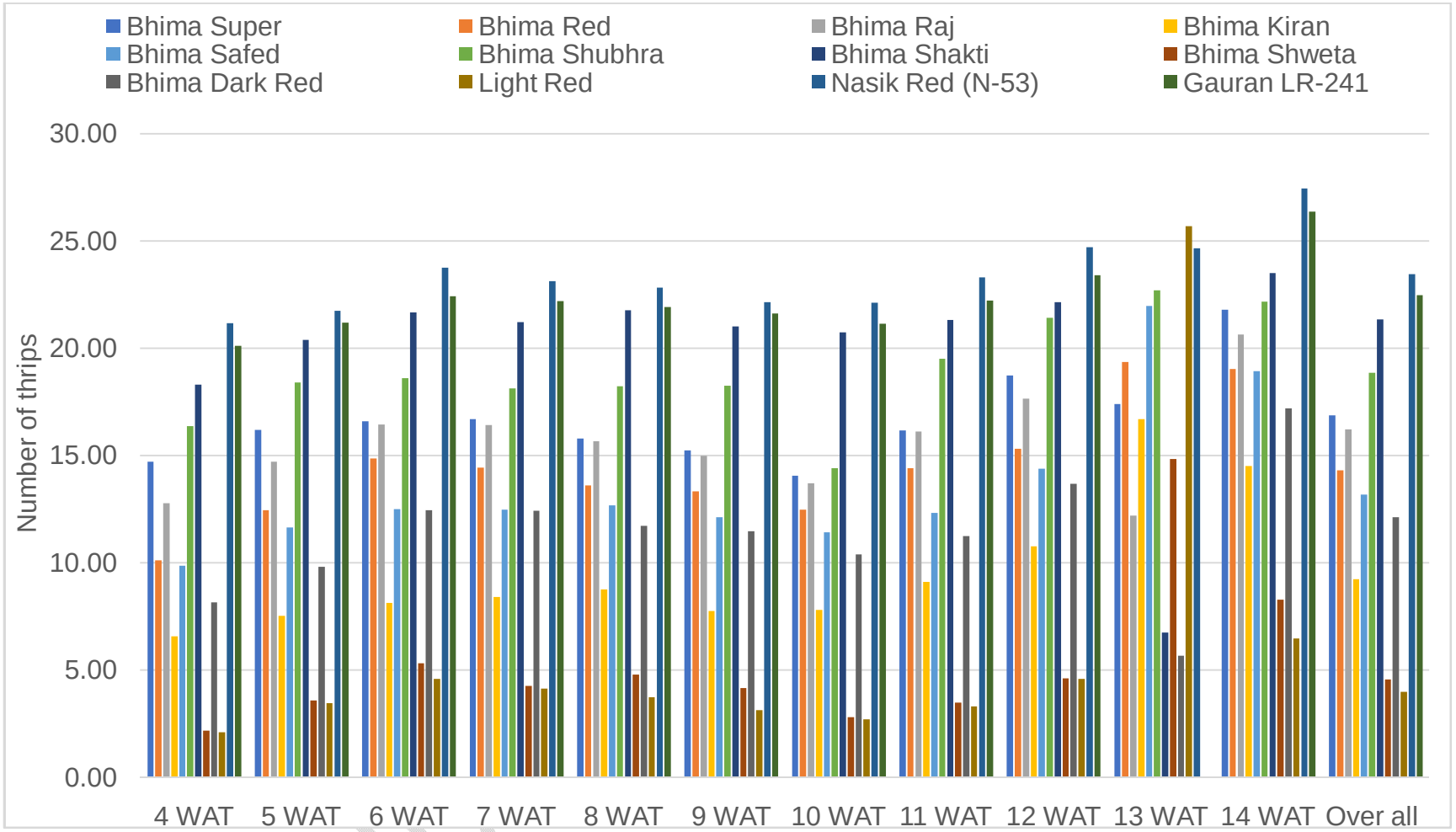

Fig. 2.Screening of onion varieties for their susceptibility against thrips, *T. tabaci* L. during 2022-23.