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Evaluation of onion genotypes against Thrips, *Thrips tabaci* Lindeman

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Abstract
The present study was conducted at Horticultural Research Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during *Kharif* season 2015-16. The results of field experiments revealed that thrips population 20.78 nymphs and adult per plant were recorded during the second week of November (46th SMW). Thereafter, the nymph and adult population gradually declined to 2.14 per plant during the Third week of December (15th SMW). In the study, 40 genotypes of onion including check variety *Agrifound dark red* as susceptible check were evaluated against incidence of thrips, *Thrips tabaci* L., out of 40 genotypes, 8 genotypes were categorized as highly resistant, 10 as resistant, 17 as susceptible and 5 as highly susceptible to onion thrips. The genotype ON14-13 (3.03 thrips/plant) was considered as highly resistant followed by OSK-1306 (3.53 thrips/plant), ON14-01 (3.63 thrips/plant), and OSK-1301 (3.90 thrips/plant) because of lowest thrips population score and were superior with check variety *Agrifound dark red*. Genotype ON15-11 (17.64 thrips/plant) was highly susceptible than the check variety *Agrifound dark red* of onion.

Keywords: onion, thrips, *Thrips tabaci*, varietal screening

Introduction
Onion belongs to the family *Alliaceae*, in the genus, *Allium* and known scientifically as *Allium cepa*. 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 as salad, recipes, mouth-watering gravies and curries. It has also been used in traditional medicines. Onion is considered as one of the most important vegetable crop produced on small and large scale in India. The major onion producing countries in world are China, India, Pakistan, Bangladesh, Indonesia, Vietnam, Russia, Myanmar, Brazil, Turkey and few other countries like Egypt, Netherlands and Iran etc. In India, onion is cultivated over an area of 1064.00 million hectares with a production of 15118.00 million tonnes. The major onion producing states in India is Maharashtra followed by Madhya Pradesh and Karnataka. Area, production and productivity of onion in Maharashtra is 468.00 thousand ha. 5867 *mt* and 14.3 tonnes/ha, respectively (Anon., 2014-15) [1]. In Chhattisgarh, onion occupies 17.95 thousand ha with a production of 269.28 thousand *mt* and productivity is about 15.00 tonnes/ha (Anon., 2014-15) [1].
The onion plant is attacked by several insect pests like thrips, onion fly, cut worms and tobacco caterpillars etc. The major insect pests onion thrips *Thrips tabaci* Lindeman (Thysanoptera: Thripidae) that cause significant yield losses. Onion thrips feeds directly on leaves, causing blotches and as well as distort the bulbs and convert them into under size causing yield loss >50% but can be even more problematic by transmitting viral disease like *Iris yellow spot virus* (IYSV). The aim of this study was to evaluation of onion genotype against onion thrips *Thrips tabaci* L.

Materials and Methods
The susceptibility of different onion varieties to *T. tabaci* was evaluated on the basis of number of thrips per plant was recorded weekly on 39 onion genotypes. Crop was transplanted on 25th August 2015 with plot size of 6 X 1.2 m and replicated three times. Five plants were selected randomly in each plot and absolute population of thrips was recorded by examining the plant. The observations were taken at weekly interval during the whole cropping season *i.e.* from August 2015 to January 2016. The method modified as according to (Ibrahim and Adesiyun, 2010, Ullah *et al.* 2010) [6, 12]. Correlation analysis was worked out as per method given by Gomez and Gomez (1985).

Categorization of varieties

The onion varieties were also grouped into four categories *viz.*, highly resistant, resistant, susceptible and highly susceptible based on number of thrips per plant. For the purpose, mean value of individual genotype (iX) was compared with mean value of all genotypes (X) and standard deviation (sd) following the modified scale adopted by the transformed data were used for computation of X, iX and sd in case of this parameter. The scale used for categorizing different genotypes was as under (Shaikh *et al.* 2014) [10].

Table 1.1: Pest susceptibility scale against onion thrips

Category of resistance	Scale for resistance
Highly Resistant	(HR) Xi < X- sd
Resistant	(R) Xi > X - sd < X
Susceptible	(S) Xi > X < (X + sd)
Highly Susceptible	(HS) Xi > (X + sd) < (X + 2 sd)

***Source*:** Shaikh *et al.* (2014) [10]

Results and discussion

A total of 39 onion genotypes and 1 check variety *Agrifound dark red* were procured from All India Network Research Project on onion and garlic at IGKV, Raipur CG. On the basis of pest susceptibility scale against onion thrips (table 1.1), it was observed that out of screening of 40 onion genotypes, 8 genotypes were categorized as highly resistant, 10 genotypes as resistant, while 17 genotypes as susceptible, 4 genotypes as highly susceptible and 1 genotype (ON15-11) was highly-highly susceptible against thrips. The mean thrips population score of highly resistant genotypes was ranged from 3.03 to 3.53 thrips per plant (Table 1.3). The genotype ON14-13 had the lowest thrips population score (3.03 thrips/plant) followed by ON14-01 (3.61 thrips/plant) and ON14-11 (3.63 thrips/plant) respectively. Among the highly resistant genotypes, the genotype ON15-48 had the highest thrips population score (4.20 thrips/plant) followed by OSK-1312 and OSK-1329 (4.03 thrips/plant). However, ON15-11 showed the highest thrips population score of 17.64 thrips per plant.

The mean thrips population score of resistant genotypes ranged from 4.66 to 7.51 thrips per plant (Table 1.3). The genotype OSK-1339 showed the least thrips population score (4.66 thrips/plant) followed ON15-16 (4.71 thrips/plant) whereas, it was highest in OSK-1327 (7.51 thrips/plant) followed by ON15-27 (6.49 thrips/plant) and OSK-1314 (7.16 thrips/plant), respectively. The average thrips population score of susceptible genotypes ranged from 7.91 to 10.56 thrips/plants. The variety AFDR showed least (7.91 thrips/plant) plant damage score followed by ON15-06 (8.03 thrips/plant), OSK-1304 and OSK-1320 (8.75 thrips/plant) and OSK-1317 (9.02 thrips/plant) while it was highest in the genotype ON15-04 (10.56 thrips/plant) followed by ON14-15 (10.49 thrips/plant), ON14-04 (10.12 thrips/plant) and ON15-29 (10.16 thrips/plant), respectively.

Onion genotypes were highly susceptible to thrips population ranged from 11.73 to 17.64 thrips per plant (Table 1.3 & fig 1). The genotype ON14-23 showed least population (11.73 thrips/plant) while it was the highest (15.33 thrips/plant) in the genotype ON15-01 followed by ON15-13 (12.29 thrips/plant) and ON15-45 (12.01 thrips/plant), respectively. Onion genotype ON15-11 (17.64 thrips/plant) was registered in the scale of highly-highly susceptible *i.e.* more than 17.64 thrips population per plant.

Similar findings were reported by Gupta (2015) [5] who evaluated 49 onion genotypes against thrips, *Thrips tabaci* L. at Horticultural instruction Farm, IGKV, Raipur during *Rabi* season. She started that out of 49 onion genotypes against thrips, *Thrips tabaci* L., 4 genotypes were as highly resistant, 21 as resistant, 20 as susceptible and 4 as highly susceptible categories, respectively. The genotype ON14-6 was found as highly resistant followed by ON14-25, OSK-1364 and ON14-17, respectively because of lowest thrips population score. Whereas, ASRO-1207 was observed on highly susceptible genotype against thrips. Engla *et al.* (2010) screened twenty-two (22) onion genotypes against *Thrips tabaci* Lind. The incidence of *T. tabaci* was observed from 45th standard metrological week (SMW) to 3rd SMW, from transplanting till harvesting in all the 22 genotypes. Shaikh, *et al.* (2012) confirm the present finding with respect to screening of onion genotypes against thrips population. He had stated that categorization for red onion varieties, Talaja Red, AGFL Red and Pilipatti. Boateng *et al.* (2014) [2] reported the similar finding and stated that the population of thrips per plant per day was 1.5, 1.4, and 1.2 for commercial cultivars, plant introductions, and OLYS05N5, respectively. Tripathy *et al.* (2013) [11] found similar results and revealed that the data on thrips infestation revealed that NRCRO-3, NRCWO-3, NRCWO-4 and VG-19 showed tolerance to thrips plant-1 and Bhima Super, NRCWO-3, NRCRO-4 and the control, Arka Niketan produced significantly high total bulb yield. Similarly, Patel *et al.* (2012) [7] reported and confirm the present finding. He revealed that onion genotype JRO-2000-181 had highly resistant and showed significantly lowest thrips population (7.57/plant) and higher bulb yield (56.83 t/ha) followed by Gujarat White Onion-1 (9.61 thrips/plant and bulb yield of 49.11 t/ha) and Talaja red (9.87 thrips/plant and bulb yield of 48.44 t/ha). They observed that plant height at 30, 60 and 90 days after transplanting as well as length and girth of bulb were responsible for providing susceptibility/ resistance of genotypes. Diaz-montano *et al*. (2011) who reported that among forty-nine onion cultivars 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 incidence of onion thrips.

Table 1.2: Screening of different onion genotypes against thrips, *Thrips tabaci* L.

	Genotype	36 SDW	37 SDW	38 SDW	39 SDW	40 SDW	41 SDW	42 SDW	43 SDW	44 SDW	45 SDW	46 SDW	47 SDW	48 SDW	49 SDW	50 SDW	51 SDW	Mean
1	ON15-01	0.00 (1.00)	0.62 (1.27)	0.57 (1.24)	1.67 (1.62)	2.75 (1.92)	3.65 (2.15)	8.19 (3.02)	14.92 (3.96)	31.57 (5.68)	34.70 (5.96)	44.80 (6.74)	36.87 (6.14)	37.06 (6.16)	16.34 (4.15)	8.82 (3.12)	2.75 (1.92)	15.33 (4.03)
2	ON15-04	0.04 (1.02)	1.20 (1.47)	1.26 (1.49)	1.70 (1.63)	2.38 (1.82)	4.63 (2.36)	9.76 (3.27)	13.35 (3.78)	25.20 (5.11)	27.08 (5.29)	29.16 (5.49)	21.25 (4.71)	17.24 (4.25)	9.17 (3.18)	4.01 (2.23)	1.58 (1.60)	10.56 (3.39)
3	ON15-06	0.02 (1.01)	1.07 (1.42)	1.61 (1.61)	2.73 (1.93)	2.84 (1.95)	1.53 (1.59)	3.51 (2.10)	6.85 (2.78)	13.17 (3.75)	17.08 (4.22)	19.63 (4.54)	13.18 (3.74)	21.10 (4.69)	14.07 (3.85)	6.77 (2.77)	3.25 (2.06)	8.03 (3.00)
4	ON15-11	0.01 (1.00)	0.76 (1.31)	1.73 (1.65)	1.93 (1.70)	1.81 (1.66)	1.76 (1.65)	4.64 (2.36)	17.67 (4.31)	39.60 (6.32)	45.08 (6.78)	49.98 (7.13)	37.95 (6.21)	39.91 (6.38)	21.87 (4.75)	12.33 (3.63)	5.29 (2.50)	17.64 (4.31)
5	ON15-13	0.05	1.32	2.13	2.00	2.87	3.57	9.20	11.35	24.33	26.41	33.26	25.59	31.05	12.41	8.17	2.87	12.29

		(1.02)	(1.52)	(1.76)	(1.73)	(1.96)	(2.13)	(3.18)	(3.49)	(4.98)	(5.19)	(5.85)	(5.11)	(5.65)	(3.65)	(3.00)	(1.96)	(3.64)
6	ON15-16	0.00 (1.00)	1.33 (1.52)	0.63 (1.25)	0.40 (1.18)	0.59 (1.25)	0.73 (1.31)	1.51 (1.57)	3.90 (2.19)	7.76 (2.95)	9.53 (3.23)	12.04 (3.61)	10.17 (3.32)	12.21 (3.61)	9.32 (3.20)	4.17 (2.26)	1.09 (1.44)	4.71 (2.38)
7	ON15-18	0.14 (1.06)	1.55 (1.59)	1.80 (1.65)	2.31 (1.80)	2.56 (1.87)	3.40 (2.09)	5.71 (2.58)	9.69 (3.26)	16.90 (4.21)	20.05 (4.58)	25.36 (5.12)	18.84 (4.44)	23.10 (4.90)	13.38 (3.77)	5.85 (2.44)	2.56 (1.87)	9.57 (3.24)
8	ON15-21	0.00 (1.00)	0.82 (1.34)	1.91 (1.70)	1.50 (1.57)	1.67 (1.62)	1.07 (1.43)	3.29 (2.05)	5.13 (2.47)	9.54 (3.23)	11.63 (3.54)	14.60 (3.91)	9.75 (3.27)	11.59 (3.54)	6.80 (2.78)	2.66 (1.90)	1.67 (1.62)	5.23 (2.49)
9	ON15-27	0.00 (1.00)	0.91 (1.37)	0.66 (1.28)	0.82 (1.34)	1.07 (1.41)	1.50 (1.57)	4.10 (2.25)	6.93 (2.80)	11.43 (3.52)	12.49 (3.66)	13.91 (3.83)	20.78 (4.66)	17.79 (4.33)	7.16 (2.83)	3.14 (2.02)	1.07 (1.41)	6.49 (2.73)
10	ON15-29	0.03 (1.01)	0.93 (1.38)	1.35 (1.52)	1.80 (1.67)	2.13 (1.76)	2.55 (1.86)	5.70 (2.58)	5.73 (2.59)	12.41 (3.65)	27.58 (5.34)	29.66 (5.52)	25.93 (5.17)	22.97 (4.87)	13.73 (3.81)	7.20 (2.86)	2.13 (1.76)	10.12 (3.33)
11	ON15-32	0.14 (1.06)	1.55 (1.59)	1.55 (1.58)	1.93 (1.71)	3.06 (2.00)	4.80 (2.40)	6.32 (2.68)	7.40 (2.88)	15.14 (4.01)	18.95 (4.40)	19.82 (4.55)	22.74 (4.87)	21.93 (4.75)	14.37 (3.90)	4.86 (2.40)	3.06 (2.00)	9.23 (3.19)
12	ON15-45	0.00 (1.00)	0.46 (1.20)	0.27 (1.11)	2.73 (1.93)	1.54 (1.58)	2.41 (1.82)	4.81 (2.40)	11.13 (3.44)	21.87 (4.76)	30.35 (5.59)	37.29 (6.16)	30.11 (5.57)	27.91 (5.37)	12.88 (3.71)	6.85 (2.78)	1.54 (1.58)	12.01 (3.60)
13	ON15-48	0.06 (1.02)	1.14 (1.46)	1.97 (1.72)	2.13 (1.76)	2.07 (1.74)	0.80 (1.34)	1.40 (1.54)	2.61 (1.87)	5.77 (2.60)	7.93 (2.98)	10.30 (3.35)	10.69 (3.40)	9.70 (3.26)	5.99 (2.62)	2.59 (1.89)	2.07 (1.74)	4.20 (2.27)
14	ON14-01	0.28 (1.12)	0.79 (1.33)	0.73 (1.30)	1.54 (1.59)	2.19 (1.76)	0.89 (1.35)	1.32 (1.52)	2.65 (1.90)	5.10 (2.46)	7.17 (2.85)	11.16 (3.47)	6.77 (2.76)	8.84 (3.10)	5.13 (2.47)	1.95 (1.71)	1.57 (1.58)	3.63 (2.14)
15	ON14-04	0.02 (1.01)	1.26 (1.50)	1.87 (1.69)	1.93 (1.71)	2.28 (1.79)	3.21 (2.04)	5.70 (2.57)	9.09 (3.16)	17.07 (4.22)	22.57 (4.84)	25.63 (5.14)	24.93 (5.03)	22.20 (4.80)	15.80 (4.06)	6.37 (2.70)	2.66 (1.90)	10.16 (3.33)
16	ON14-09	0.00 (1.00)	0.80 (1.33)	1.67 (1.63)	2.07 (1.75)	3.59 (2.11)	4.14 (2.26)	8.44 (3.04)	9.67 (3.24)	15.49 (4.04)	18.61 (4.42)	22.99 (4.88)	18.82 (4.44)	19.73 (4.54)	13.00 (3.72)	5.87 (2.60)	1.74 (1.65)	9.16 (3.18)
17	ON14-11	0.00 (1.00)	0.40 (1.17)	0.49 (1.21)	0.75 (1.31)	0.95 (1.39)	1.25 (1.49)	1.74 (1.65)	3.04 (1.99)	5.80 (2.59)	7.67 (2.91)	9.67 (3.25)	9.16 (3.17)	8.42 (3.06)	5.27 (2.49)	2.27 (1.80)	0.95 (1.39)	3.61 (2.14)
18	ON14-13	0.05 (1.02)	0.94 (1.38)	0.76 (1.32)	0.69 (1.28)	0.86 (1.36)	0.67 (1.29)	1.08 (1.44)	2.16 (1.75)	4.53 (2.34)	5.58 (2.56)	7.29 (2.85)	6.53 (2.72)	8.27 (3.02)	5.71 (2.58)	2.52 (1.85)	0.86 (1.36)	3.03 (1.99)
19	ON14-15	0.30 (1.13)	0.58 (1.25)	1.67 (1.62)	1.97 (1.71)	2.46 (1.85)	3.48 (2.10)	6.72 (2.76)	10.53 (3.34)	25.27 (5.11)	31.26 (5.66)	24.24 (4.99)	20.33 (4.60)	21.45 (4.73)	9.36 (3.21)	5.71 (2.58)	2.46 (1.85)	10.49 (3.38)
20	ON14-23	0.05 (1.02)	1.49 (1.56)	1.87 (1.69)	1.93 (1.70)	3.09 (2.01)	4.18 (2.27)	7.39 (2.88)	9.33 (3.19)	24.40 (4.98)	26.50 (5.23)	30.96 (5.63)	25.80 (5.13)	23.54 (4.94)	14.67 (3.90)	9.43 (3.19)	3.09 (2.01)	11.73 (3.56)
21	ON14-27	0.00 (1.00)	0.85 (1.35)	0.93 (1.37)	1.51 (1.57)	2.24 (1.78)	2.67 (1.91)	4.00 (2.23)	10.41 (3.32)	21.47 (4.72)	23.96 (4.97)	28.50 (5.42)	25.04 (5.04)	22.47 (4.82)	13.16 (3.75)	4.62 (2.33)	1.69 (1.63)	10.22 (3.34)
22	OSK-1301	0.00 (1.00)	1.34 (1.52)	0.80 (1.34)	1.40 (1.53)	2.93 (1.96)	1.47 (1.53)	2.31 (1.81)	3.33 (2.06)	4.73 (2.38)	6.03 (2.63)	7.67 (2.93)	8.20 (3.00)	9.46 (3.21)	6.60 (2.75)	3.18 (2.01)	2.93 (1.96)	3.90 (2.20)
23	OSK-1304	0.00 (1.00)	1.03 (1.40)	1.20 (1.48)	1.67 (1.63)	2.12 (1.76)	2.39 (1.82)	5.48 (2.54)	7.45 (2.90)	14.47 (3.90)	16.24 (4.14)	18.95 (4.46)	22.38 (4.83)	21.62 (4.74)	14.20 (3.88)	7.60 (2.91)	3.11 (2.01)	8.74 (3.11)
24	OSK-1306	0.00 (1.00)	0.37 (1.16)	1.42 (1.54)	2.04 (1.73)	2.39 (1.83)	0.95 (1.39)	1.56 (1.59)	2.11 (1.75)	4.58 (2.35)	5.93 (2.60)	7.53 (2.90)	7.27 (2.86)	8.07 (3.00)	6.12 (2.66)	3.73 (2.14)	2.39 (1.83)	3.53 (2.12)
25	OSK-1308	0.08 (1.04)	0.64 (1.27)	1.06 (1.43)	1.80 (1.67)	2.54 (1.87)	3.06 (1.98)	6.07 (2.65)	8.60 (3.08)	14.71 (2.73)	20.34 (4.61)	25.58 (5.14)	23.31 (4.92)	26.63 (5.24)	9.56 (3.20)	2.31 (1.81)	1.90 (1.69)	9.26 (3.20)
26	OSK-1310	0.00 (1.00)	1.14 (1.46)	0.82 (1.34)	1.80 (1.67)	2.20 (1.76)	2.77 (1.92)	4.07 (2.23)	7.20 (2.84)	19.60 (4.53)	14.98 (3.92)	21.28 (4.70)	25.19 (5.09)	27.80 (5.33)	11.22 (3.49)	3.77 (2.14)	2.20 (1.76)	9.13 (3.17)
27	OSK-1312	0.00 (1.00)	0.29 (1.13)	0.00 (1.00)	0.36 (1.15)	0.54 (1.83)	0.68 (1.29)	1.78 (1.66)	2.68 (1.91)	5.83 (2.60)	14.95 (3.98)	10.17 (3.33)	6.59 (2.73)	8.21 (3.01)	4.57 (2.34)	5.55 (2.55)	1.93 (1.69)	4.01 (2.23)
28	OSK-1314	0.14 (1.06)	0.76 (1.31)	0.64 (1.25)	0.81 (1.34)	0.84 (1.87)	1.12 (1.45)	2.52 (1.84)	3.85 (2.19)	6.27 (2.67)	19.33 (4.50)	22.94 (4.83)	19.60 (4.53)	21.64 (4.74)	11.06 (3.46)	2.28 (1.79)	0.84 (1.35)	7.16 (2.85)
29	OSK-1317	0.08 (1.03)	1.20 (1.40)	1.20 (1.47)	1.89 (1.69)	0.96 (1.76)	0.93 (1.38)	1.37 (1.53)	3.06 (1.98)	7.00 (2.81)	20.02 (4.57)	23.44 (4.93)	26.71 (5.25)	33.82 (5.87)	13.53 (3.79)	6.51 (2.73)	2.55 (1.86)	9.02 (3.16)
30	OSK-1320	0.28 (1.11)	1.13 (1.45)	1.47 (1.55)	2.40 (1.83)	2.77 (1.23)	3.17 (2.02)	5.15 (2.46)	6.80 (2.79)	14.88 (3.97)	19.77 (4.55)	20.80 (4.65)	21.08 (4.69)	26.80 (5.25)	7.66 (2.92)	3.89 (2.20)	1.94 (1.71)	8.75 (3.11)
31	OSK-1323	0.17 (1.08)	0.60 (1.26)	1.07 (1.42)	1.33 (1.52)	2.67 (1.35)	3.04 (1.99)	2.42 (1.83)	5.28 (2.47)	11.53 (3.52)	20.73 (4.64)	21.38 (4.71)	22.03 (5.75)	27.37 (5.32)	16.05 (4.11)	11.12 (3.54)	3.62 (2.13)	9.40 (3.22)
32	ASKO-1213	0.00 (1.00)	0.62 (1.26)	2.10 (1.76)	2.33 (1.81)	3.89 (1.39)	4.31 (2.30)	7.27 (2.83)	8.27 (3.00)	14.34 (3.89)	15.21 (4.02)	18.92 (4.44)	21.07 (4.68)	18.65 (4.41)	11.71 (3.55)	7.60 (2.87)	3.14 (2.03)	8.71 (3.11)
33	OSK-1325	0.05 (1.02)	0.95 (1.39)	1.93 (1.71)	1.53 (1.59)	1.64 (1.93)	1.42 (1.54)	2.44 (1.84)	3.27 (2.05)	7.66 (2.93)	15.84 (4.09)	24.13 (5.01)	17.53 (4.28)	14.57 (3.93)	7.54 (2.91)	4.51 (2.34)	1.64 (1.61)	6.67 (2.76)
34	OSK-1327	0.01 (1.00)	0.86 (1.35)	1.33 (1.50)	2.93 (1.98)	3.12 (1.91)	3.49 (2.11)	3.71 (2.14)	5.29 (2.47)	8.10 (3.00)	17.78 (4.33)	25.73 (5.15)	21.02 (4.69)	14.20 (3.88)	7.92 (2.97)	3.27 (2.06)	1.40 (1.54)	7.51 (2.91)
35	OSK-1329	0.16 (1.07)	0.34 (1.15)	0.24 (1.10)	0.56 (1.24)	0.47 (2.20)	0.59 (1.26)	1.12 (1.45)	3.00 (1.99)	6.30 (2.69)	11.95 (3.59)	10.50 (3.38)	8.98 (3.14)	11.07 (3.47)	5.59 (2.56)	2.69 (1.90)	0.98 (1.40)	4.03 (2.23)
36	OSK-1332	0.00 (1.00)	0.66 (1.28)	1.20 (1.47)	2.07 (1.73)	2.27 (1.61)	2.90 (1.95)	4.22 (2.27)	5.60 (2.55)	9.35 (3.16)	13.10 (3.75)	14.26 (3.90)	16.37 (4.16)	17.39 (4.27)	9.61 (3.24)	2.17 (1.76)	0.94 (1.39)	6.38 (2.71)
37	OSK-1335	0.05 (1.02)	1.24 (1.49)	1.27 (1.49)	1.67 (1.62)	1.98 (1.20)	0.66 (1.28)	1.51 (1.58)	2.70 (1.91)	4.14 (2.24)	14.48 (3.93)	12.03 (3.56)	10.91 (3.44)	10.30 (3.35)	7.27 (2.86)	2.43 (1.80)	1.98 (1.72)	4.66 (2.37)
38	OSK-1337	0.00 (1.00)	0.45 (1.20)	0.87 (1.34)	1.73 (1.64)	2.08 (1.75)	2.59 (1.88)	3.53 (2.10)	5.67 (2.53)	11.33 (3.51)	10.66 (3.41)	12.23 (3.60)	11.20 (3.49)	11.51 (3.52)	4.97 (2.41)	3.53 (2.10)	2.08 (1.75)	5.28 (2.50)
39	OSK-1339	0.04 (1.01)	0.52 (1.23)	0.57 (1.25)	0.69 (1.29)	0.91 (1.38)	1.62 (1.61)	1.99 (1.71)	3.75 (2.16)	7.17 (2.83)	13.54 (3.80)	11.83 (3.57)	12.50 (3.66)	10.31 (3.36)	5.27 (2.48)	2.90 (1.97)	0.91 (1.38)	4.66 (2.37)
40	AFDR	0.22 (1.09)	1.03 (1.42)	1.68 (1.63)	2.57 (1.88)	3.31 (2.06)	3.08 (1.99)	6.05 (2.64)	7.28 (2.87)	8.39 (3.04)	17.25 (4.25)	21.38 (4.67)	17.51 (4.28)	21.61 (4.74)	5.49 (2.53)	6.42 (2.69)	3.31 (2.06)	7.91 (2.98)

	CD at 5 %	0.008	0.225	0.263	0.285	0.362	0.374	0.474	0.635	0.729	0.664	0.759	0.759	0.637	0.641	0.583	0.333	0.483
	SEm	0.033	0.080	0.093	0.101	0.128	0.133	0.168	0.225	0.258	0.235	0.269	0.269	0.226	0.227	0.207	0.118	0.173
	CV at %5	5.479	10.119	11.00	10.787	12.812	12.900	13.142	14.52	12.310	9.613	10.270	10.831	8.905	12.045	14.980	11.694	11.337
	Mean																	4.04

* Figure in parenthesis show square root transformed value.

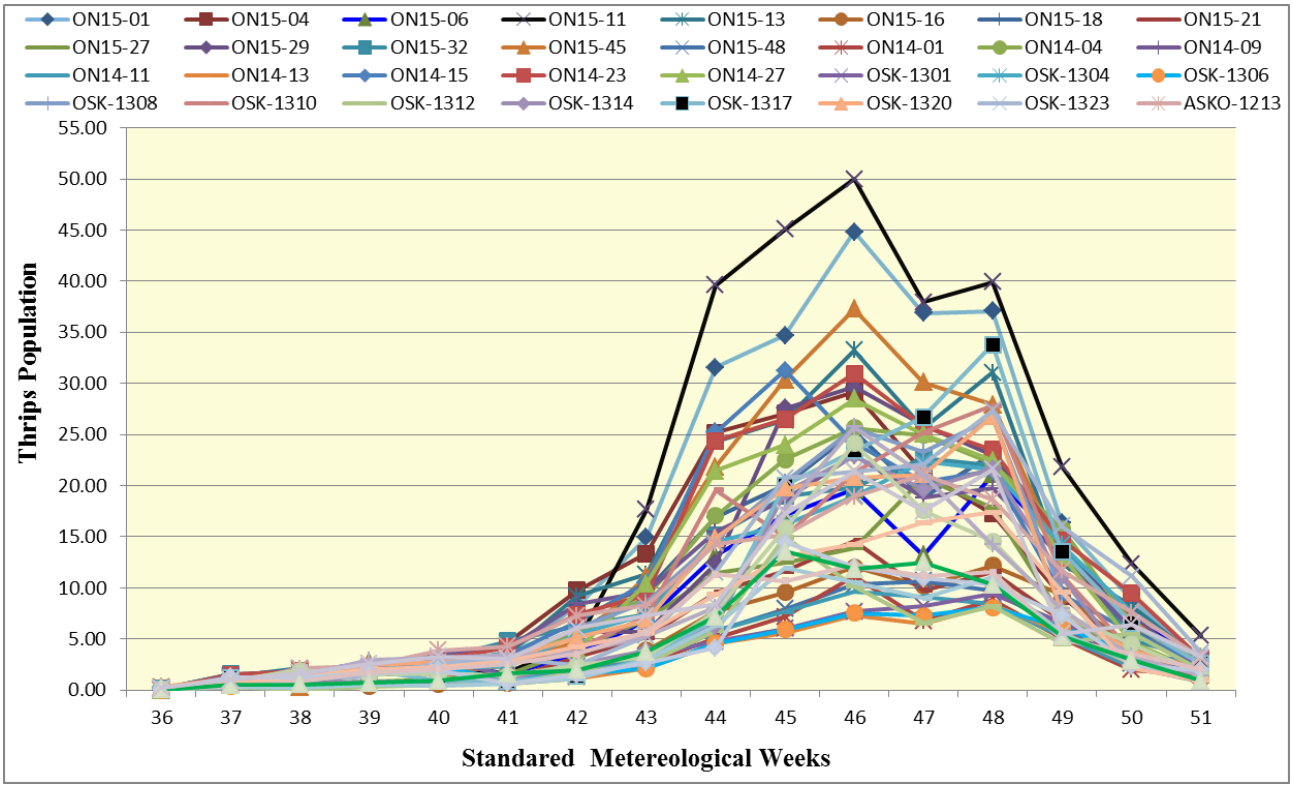

Fig 1: Population of thrips, *Thrips tabaci* L. on different onion genotypes

Table 1.3: Categorization of genotypes for their susceptibility to *T. tabaci*

Category of resistance	Scale	Genotypes ($\bar{X}i$)
Based on population of thrips/plant: $\bar{X}$ = 2.92 and sd = 0.56		
Highly resistance	Xi <2.36	ON14-13 (3.03), OSK-1306 (3.53), ON14-11 (3.61), ON14-01 (3.63), OSK-1301 (3.90), OSK-1312 (4.01), OSK-1329 (4.03), ON15-48 (4.20) (8 Genotype)
Resistance	Xi > 2.36 < 2.92	OSK-1335 (4.66), OSK-1339 (4.66) ON15-16 (4.71), ON15-21 (5.23), OSK-1337 (5.28), OSK-1332 (6.38),ON15-27 (6.49), OSK-1325 (6.67), OSK-1314 (7.16), OSK-1327 (7.51) (10 Genotype)
Susceptible	Xi >2.92< 3.48	AFDR (7.91),ON15-06 (8.03), OSK-1304 (8.74), OSK-1320 (8.75), OSK-1317 (9.02), OSK-1310 (9.13), ON14-09 (9.16), ON15-32 (9.23), OSK-1308 (9.26), OSK-1323 (9.40), ON15-18 (9.57), ON15-29 (10.12), ON14-04 (10.16), ON14-27 (10.22), ON14-15 (10.49), ON15-04 (10.56) (17 Genotype)
Highly Susceptible	Xi > 3.48 < 4.04	ON14-23 (11.73), ON15-45 (12.01), ON15-13 (12.29), ON15-01 (15.33) (4 genotype)
Highly-Highly Susceptible	Xi>4.04	ON15-11 (17.64)

***Source*:** rating scale as suggested by sheikh *et al.*, (2014)

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