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Screening of onion genotypes against *Thrips tabaci* Lind. in Central India

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Twenty-two (22) genotypes of onion (*Allium cepa* Lin.) was screened against *Thrips tabaci* Lind. in the experimental field of Department of Horticulture Maharajpur, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, India during late wet season in the year 2010-11. The incidence of *T. tabaci* was observed from 45th standard metrological week (SMW) to 3rd SMW, that is, from transplanting till harvesting, in all the 22 genotypes. The mean *T. tabaci* population varied from 0.45-6.64 per plant during this period among the genotypes. Out of 22 genotypes of onion screened against *T. tabaci*, BKHO 1018 had highest yield and was the most tolerant followed by BKHO 1006. Genotype BKHO 1005 was most susceptible and had the lowest yield. *T. tabaci* appeared in the second week of November, 2010, that is, 12th November (45th SMW) and active up to 3rd week of January. The peak activity of the pest was observed during 1st SMW (last week of December to first week of January). *T. tabaci* population had significantly positively correlation with the maximum and minimum temperature and sunshine hours; but, it was significantly negative correlated with morning relative humidity.

Key words: Genotypes, onion, *Thrips tabaci*, tolerant.

INTRODUCTION

Onion (*Allium cepa)* is widely cultivated in India for domestic consumption as well as for export (Brewster, 1994). The productivity of onion in India is 13.05 metric ton/ha in comparison with world productivity, 17.91 metric ton/ha.

Maharashtra State is the largest onion producer in India with a market share of 29%. Karnataka, Gujarat, Bihar and Madhya Pradesh are onion producing states in India. Madhya Pradesh produces 8.1 m ton onion from 0.053 mha. The major onion producing districts in Madhya Pradesh are Khandwa, Burhanpur and Indore. The productivity of onion varies widely in India due to biotic and abiotic stress. Damping off, Stemphylium blight, Purple blotch and Rot (diseases) as well as Thrips, Army worm and Gram cutworm (insects) induce biotic stress that lower the yield of onion (Lorbeer et al., 2002).

Among the insect pests of onion, *Thrips tabaci* Lind. (Thysanoptera: Thripidae) is a potential pest of onion in tropical areas (Rechter et al., 1999; Murai, 2000; Liu and Sparks, 2003). *T tabaci* attack onion at all the stages of crop growth, but their number increase from bulb initiation (Ibrahim and Adesiyun, 2009). This sap feeder cause direct damage (Koschier et al., 2002), causing curling and twisting of leaves which turn to white blotches and

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Table 1. Details of the onion genotypes.

Code of genotype	Source
NRCRO-1	DOGR
NRCRO-2	DOGR
NRCRO-3	DOGR
NRCRO-4	DOGR
NRCWO-1	DOGR
NRCWO-2	DOGR
NRCWO-3	DOGR
NRCWO-4	DOGR
Sel-397	IARI
Sel-157	Nirmal seeds
NOL-103	Nirmal seeds
NOL-115	IIHR
VG-18	IIHR
VG-19	IIHR
Soyal-2009	IIHR
COL-652	Hisar
Bhima Super	DOGR
RO-252	Durgapur
RO-282	Durgapur
Line-355	NHRDF
Pusa White Round	IARI
PKV White	PDKV Akola

DOGR- Directorate of Onion and Garlic Research; IARI- Indian Agricultural Research Institute; IIHR- Indian Institute of Horticultural Research; NHRDF- National Horticulture Research and development Foundation; PDKV- Panjabrao Deshmukh krishi Vidyapeeth.

silvery patches (Andaloro and Shelton, 1983; Childers, 1997; Jenser et al., 2003) reducing yield up to 50% (Gupta, 1994; Fournier et al., 1995, Kumar et al., 2001).

Chemical pest management has become uneconomical and environmentally hazardous. *T. tabaci* resistance to pyrethroids and organophosphate insecticides in New York is reported. Screening of onion genotypes against *T. tabaci* therefore is an economical and environmental friendly approach.

MATERIALS AND METHODS

Screening of 22 genotypes (Table 1) of *A. cepa* against *T. tabaci* was carried out in randomized block design (Figure 1 and Table 2), in the experimental field of Department of Horticulture, Maharajpur, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh during the year 2010-11.

Geographically, Jabalpur is situated between 220 49' and 240 8' North latitude and 780 21' and 800 58' East longitude, 411.78 m above mean sea level. Agro-climatically, it is in the Zone-IV Kymore Plateau and Satpura Hills Zone and in rice-wheat crop zone of the Central India. Jabalpur has a typical sub-tropical climate experiencing hot dry summer and cool dry winter. Temperature extremes vary between minimum temperatures of 20°C (in December and January months) to maximum temperature of 45°C (in May and June months). The mean annual rainfall ranges between 1000 to 1500 mm which is mostly received between mid June to first week of October, with occasional winter showers. The relative humidity remains minimum 20 to 35% during summer and medium (50 to 60%) during winter season, while it attains maximum values of 80 to 95% during rainy season. The meteorological data during the course of the study, that is, from August 2010 to January 2011 is mentioned in Table 3.

Method of observation

T. tabaci and its natural enemies were recorded from the lower side of leaves of ten randomly selected plants in a plot, once in a standard metrological week (SMW) from transplanting to the maturity of the crop. The data on pest population and the percentage data were transformed to square root ($\sqrt{x}$) and arc sine transformed values, respectively. Transformed data was statistical analyzed for the significance of different treatments, following the techniques of analysis of variance (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

The five growth stages of all the 22 onion genotypes were categorized against the SMW during the crop stages.

i. Vegetative stage: 45-47 SMW
ii. Bulb initiation stage: 48-50 SMW
iii. Early bulb development stage: 51-52 SMW

Table 2. Details of the experiment.

Particulars	Details
No. of genotypes	22
Design	RBD
Replication	3
Plot size	3 × 2 m
No. of rows/ plot	20
Row length	3.0 m
Spacing	
Row to row	15 cm
Plant to plant	10 cm
Fertilizer dose	100:50:75:50 kg NPK/ ha
Date of sowing	11-08-2010
Date of transplanting	29-09-2010
Schedule of irrigation	15 days interval
Date of harvesting	29-01-2011

Table 3. Weekly meteorological observation (August 2010 - January 2011).

SMW*	Temperature (°C)		Sunshine (h)	Rainfall (mm)	Relative humidity (%)		Rainy days
	Max	Min			Max	Min	
45	31.5	16.3			91	48	0
46	29.7	19.4	4.7	1.4	92	48	0
47	29.2	14.5	7.5	0	86	38	0
48	23.7	16.3	6.3	0	91	55	0
49	24.8	11.5	7.1	7.6	89	47	1
50	24.2	8.9	7.6	0	91	32	0
51	24	4.9	9.1	0	89	24	0
52	27	8.7	8.8	0	81	36	0
1	21	3.1	8.5	0	95	35	0
2	23.8	3.5	9.2	0	87	25	0
3	24.6	6.1	9.4	0	87	25	0

*Standard meteorological week.

iv. Late bulb development stage: 1-2 SMW
v. Maturity stage: 3 SMW

The incidence of *T. tabaci* was observed from 45th SMW to 3rd SMW, that is, from transplanting till harvesting, in all the 22 genotypes, but its population varied during this period among the genotypes. During the five growth stages of onion, there were four population peaks of *T. tabaci*: 1st Peak- 47th SMW; 2nd Peak- 49th SMW; 3rd Peak- 52nd SMW; 4th Peak- 1st SMW.

Among the 4 peaks, the highest was during 1st SMW, followed by that in 52th, 47th and 49th SMW. During each peaks, four genotypes with high *T. tabaci* population and 2 genotypes with lowest population were noted (Table 4).

During the 1st peak, BKHO 1016 had the highest mean of *T. tabaci* population (12.26) followed by BKHO 1015 (8.76), BKHO 1014 (8.2) and BKHO 1005 (7.8) while BKHO 1006 had the lowest mean *T. tabaci* population (2.73) followed by BKHO 1013 (3.33).

During the 2nd peak, again BKHO 1016 had highest mean *T. tabaci* population (7.13) followed by BKHO 1024 (6.66), BKHO 1008 (5.1) and BKHO 1014 (4.63) while the BKHO 1006 and BKHO 1013 had the least mean population (0.9 and 1.73 respectively).

During the 3rd peak, BKHO 1004 had the highest *T. tabaci* population (13.3) followed by BKHO 1005 (11.36), BKHO 1001 (9.96) and BKHO 1003 (8.56) while BKHO 1006 had the least mean *T. tabaci* population (3.87)

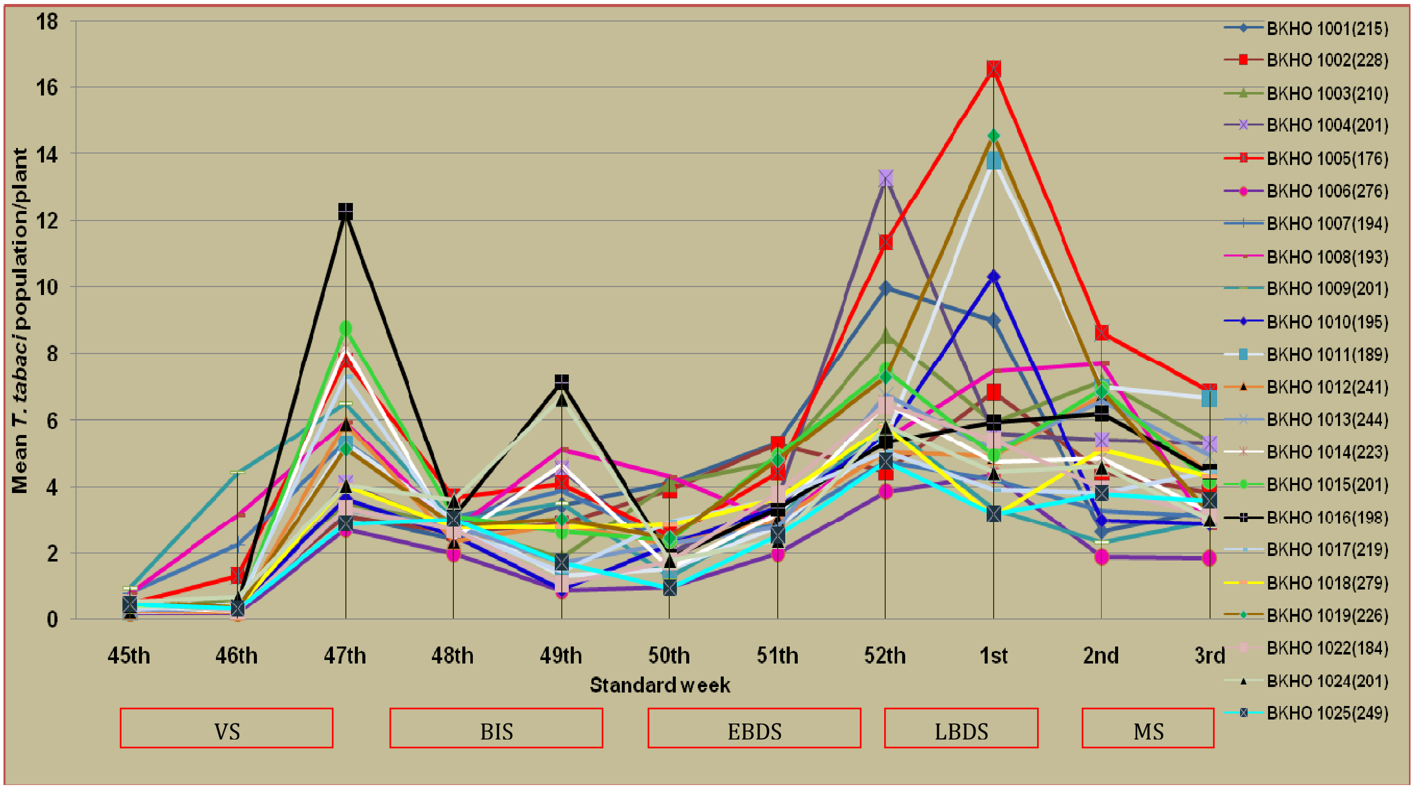

Figure 1. Screening of different genotypes of onion against *T. tabaci*. V- Vegetative, BI- bulb initiation, EBI- early bulb initiation, LBI- late bulb initiation, H- harvesting.

Table 4. Different peaks of *T. tabaci* on onion genotypes.

Peak	SMW	Growth stage	*T. tabaci* population in genotypes	
			High	Low
1	47th (58 DAT)	Vegetative	BKHO 1016, BKHO 1015, BKHO 1014, BKHO 1005	BKHO 1006, BKHO 1013
2	49th (72 DAT)	Bulb initiation	BKHO 1016, BKHO 1024, BKHO 1008, BKHO 1014	BKHO 1006, BKHO 1010
3	52nd (93 DAT)	Bulb development (early)	BKHO 1004, BKHO 1005, BKHO 1001, BKHO 1003	BKHO 1006, BKHO 1010
4	1st (100 DAT)	Bulb development (late)	BKHO 1005, BKHO 1019, BKHO 1011, BKHO 1010	BKHO 1018, BKHO 1025

*DAT- Days after transplantation.

followed by BKHO 1002 (4.43).

During the 4th peak, BKHO 1005 had the highest mean *T. tabaci* population (16.56) followed by BKHO 1019 (14.56), BKHO 1011 (13.83) and BKHO 1010 (10.33) where BKHO 1018 had the least mean *T. tabaci* population (3.13) followed by BKHO 1022 (3.2). BKHO 1006 continuously has least population (2.73, 0.9 and 3.87 respectively) of *T. tabaci* in the first 3 peaks (Table 5).

In the process of screening, six genotypes (Table 6)

Table 5. Mean population of *T tabaci* on different genotypes of *A cepa*

Genotype	Population of *T. tabaci* per plant in a Standard meteorological weeks											Mean	Mkt. yield (q/ha)
	45th	46th	47th	48th	49th	50th	51th	52th	1st	2nd	3rd		
BKHO1001	0.43(0.96)	0.4(0.95)	3.16(1.90)	2.43(1.71)	3.46(1.96)	4.13(2.15)	5.3(2.38)	9.96(3.22)	9(3.08)	2.66(1.77)	3.33(1.96)	4.02(2.13)	215.55
BKHO1002	0.3 (0.89	0.47(0.98)	3.13(1.90)	2.63(1.77)	2.9(1.77)	3.9(2.08)	5.26(2.39)	4.43(2.22)	6.83(2.55)	4.43(2.21)	3.83(2.06)	3.46(1.99)	228.71
BKHO1003	0.23(0.85)	0.67(1.08)	3.5(1.99)	2.86(1.83)	1.86(1.51)	4.1(2.14)	4.73(2.27)	8.56(2.99)	5.93(2.51)	7.16(2.77)	5.36(2.42)	4.08(2.14)	210.77
BKHO1004	0.37(0.93)	0.27(0.88)	4.1(2.14)	2.73(1.80)	4.53(2.18)	2(1.57)	3.63(2.03)	13.3(3.70)	5.6(2.42)	5.4(2.41)	5.3(2.38)	4.29(2.19)	201.1
BKHO1005	0.5(1.0)	1.33(1.34)	7.8(2.86)	3.7(2.03)	4.1(2.14)	2.53(1.72)	4.43(2.21)	11.36(3.40)	16.56(3.81)	8.63(3.02)	6.86(2.71)	6.16(2.58)	176.95
BKHO1006	0.27(0.84)	0.2(0.84)	2.73(1.79)	2(1.58)	0.9 (1.18)	1(1.22)	2.0(1.58)	3.87(2.09)	4.36(2.18)	1.9(1.46)	1.86(1.54)	2.03(1.59)	276.1
BKHO1007	0.83(1.15)	2.26(1.66)	5.36(2.40)	3.1(1.90)	3.9(2.07)	2.4(1.69)	2.86(1.83)	4.76(2.29)	4.23(2.16)	3.3(1.94)	3.13(1.90)	3.28(1.94)	194.33
BKHO1008	0.8(1.14)	3.16(1.91)	5.93(2.52)	2.73(1.80)	5.1(2.36)	4.3(2.14)	2.96(1.86)	5.46(2.44)	7.46(2.81)	7.7(2.78)	2.76(1.79)	4.39(2.21)	193.88
BKHO1009	0.97(1.19)	4.43(2.22)	6.5(2.62)	3(1.87)	3.53(1.99)	1.3(1.33)	3.16(1.91)	5.86(2.51)	3.36(1.97)	2.33(1.68)	2.96(1.85)	3.4(1.97)	201.77
BKHO1010	0.5(0.99)	0.4(0.95)	3.66(2.04)	2.53(1.74)	0.93(1.15)	2.26(1.66)	3.4(1.97)	5.5(2.45)	10.33(3.29)	3(1.86)	2.9(1.84)	3.21(1.93)	195.66
BKHO1011	0.23(0.85)	0.23(0.85)	5.3(2.38)	3.03(1.88)	1.33(1.32)	1.53(1.41)	2.8(1.82)	5.43(2.43)	13.83(3.78)	7(2.73)	6.66(2.66)	4.30(2.19)	189.44
BKHO1012	0.26(0.88)	0.23(0.85)	5.9(2.51)	2.36(1.69)	2.86(1.72)	2.26(1.65)	3.03(1.88)	5.03(2.35)	4.9(2.32)	6.73(2.67)	4.4(2.17)	3.45(1.99)	241.55
BKHO 1013	0.3(0.89)	0.3(0.89)	3.33(1.96)	2.83(1.82)	1.73(1.49)	2.3(1.67)	2.8(1.82)	6.76(2.69)	5.1(2.36)	6.56(2.60)	4.93(2.29)	3.35(1.96)	244.22
BKHO 1014	0.4(0.95)	0.26(0.87)	8.2(2.93)	2.46(1.72)	4.63(2.22)	1.56(1.41)	3.2(1.91)	6.5(2.64)	4.73(2.27)	4.86(2.31)	3.26(1.93)	3.64(2.03)	223.19
BKHO 1015	0.43(0.96)	0.3(0.89)	8.76(3.03)	3.13(1.90)	2.66(1.47)	2.4(1.69)	4.93(2.32)	7.5(2.80)	4.96(2.32)	6.93(2.71)	4.16(2.15)	4.19(2.17)	201.48
BKHO 1016	0.43(0.96)	0.46(0.98)	12.2(3.56)	3.13(1.90)	7.13(2.75)	1.86(1.52)	3.36(1.96)	5.36(2.41)	5.93(2.53)	6.2(2.56)	4.43(2.19)	4.59(2.26)	198.45
BKHO 1017	0.3(0.89)	0.46(0.98)	7.3(2.78)	2.7(1.79)	1.46(1.39)	2.96(1.82)	3.66(2.04)	5.06(2.35)	3.9(2.08)	3.83(2.04)	4.46(2.22)	3.28(1.94)	219.22
BKHO 1018	0.43(0.96)	0.4(0.94)	4.06(2.13)	2.8(1.81)	2.8(1.77)	2.86(1.82)	3.66(2.04)	5.8(2.51)	3.13(1.91)	5.1(2.35)	4.3(2.18)	3.21(1.93)	279.44
BKHO 1019	0.6(1.05)	0.36(0.93)	5.13(2.37)	2.86(1.83)	3.03(1.85)	2.46(1.69)	4.8(2.29)	7.3(2.79)	14.56(3.87)	6.86(2.64)	3.2(1.92)	4.65(2.27)	183.44
BKHO 1022	0.5(0.99)	0.26(0.87)	3.36(1.96)	2.73(1.80)	1.1(1.21)	1.76(1.50)	3.8(2.06)	6.46(2.64)	5.4(2.42)	3.93(2.07)	3.16(1.91)	2.95(1.86)	184.93
BKHO 1024	0.57(1.03)	0.7(1.09)	4.06(2.13)	3.6(2.02)	6.66(2.65)	1.8(1.44)	2.4(1.70)	5.83(2.51)	4.43(2.19)	4.6(2.22)	3.03(1.87)	3.42(1.98)	201.96
BKHO 1025	0.47(0.98)	0.33(0.91)	2.9(1.84)	3.03(1.88)	1.73(1.47)	0.96(1.21)	2.53(1.74)	4.76(2.29)	3.2(1.89)	3.8(2.05)	3.6(2.02)	2.48(1.73)	249.6
Mean	0.45	0.812	5.39	2.83	3.1	2.39	3.57	6.64	6.71	5.13	3.99		
CD 5%	0.179	0.16	0.469	0.206	0.608	0.499	0.327	0.459	0.898	0.678	0.465		
SEm±	0.063	0.056	0.164	0.072	0.213	0.175	0.115	0.161	0.315	0.238	0.163		

Figures in parenthesis are square root (√x+0.5) transformed values.

were identified which had lowest mean population of *T. tabaci* during the 4 different peaks. Incidentally, these six genotypes also had the highest yield. Similarly, there was variation in the colour of leaf and bulbs of their genotypes. BKHO 1006 had light green leaves and white bulb, while BKHO 1025 had yellow green leaves and white bulb. BKHO 1010, BKHO 1019, BKHO 1013 and BKHO 1005 though had blue green leaves but the bulbs were dark red, red, white and light red coloured, respectively.

Ten (10) genotypes (Table 7) which had highest mean population of *T. tabaci* population during 4 peaks were the lowest yielder. These had variation in the colour of leaves and bulb. BKHO 1011 and BKHO 1014 had yellow coloured leaves and light red colour of bulb. Genotypes BKHO 1005, BKHO 1019, BKHO 1016, BKHO 1008, BKHO 1015, BKHO 1003, BKHO 1001 and BKHO 1014 though had blue green coloured leaves but the bulbs were dark red, light red, white, bronze,

Table 6. *A cepa* genotypes with lowest *T. tabaci* population.

Genotype	Mean *T. tabaci* population/plant in SMW											Yield q/ha	Colour	
	45th	46th	47th	48th	49th	50th	51st	52nd	1st	2nd	3rd		Leaf	Bulb
BKHO 1006	0.27 (0.84)	0.2 (0.84)	2.73 (1.79)	2 (1.58)	0.9 (1.18)	1 (1.22)	2 (1.58)	3.87 (2.09)	4.36 (2.18)	1.9 (1.46)	1.86 (1.54)	276.1	Light green	White
BKHO 1025	0.47 (0.98)	0.33 (0.91)	2.9 (1.84)	3.03 (1.88)	1.73 (1.47)	0.96 (1.21)	2.53 (1.74)	4.76 (2.29)	3.2 (1.89)	3.8 (2.05)	3.6 (2.02)	249.6	Yellow green	White
BKHO 1010	0.5 (0.99)	0.4 (0.95)	3.66 (2.04)	2.53 (1.74)	0.93 (1.15)	2.26 (1.66)	3.4 (1.97)	5.5 (2.45)	10.33 (3.29)	3 (1.86)	2.9 (1.84)	195.66	Blue green	Dark red
BKHO 1018	0.43 (0.96)	0.4 (0.94)	4.06 (2.13)	2.8 (1.81)	2.8 (1.77)	2.86 (1.82)	3.66 (2.04)	5.8 (2.51)	3.13 (1.91)	5.1 (2.35)	4.3 (2.18)	279.44	Blue green	Red
BKHO 1013	0.3 (0.89)	0.3 (0.89)	3.33 (1.96)	2.83 (1.82)	1.73 (1.49)	2.3 (1.67)	2.8 (1.82)	6.76 (2.69)	5.1 (2.36)	6.56 (2.60)	4.93 (2.29)	244.22	Blue green	White
BKHO 1002	0.3 (0.89)	0.47 (0.98)	3.13 (1.90)	2.63 (1.77)	2.9 (1.77)	3.9 (2.08)	5.26 (2.39)	4.43 (2.22)	6.83 (2.55)	4.43 (2.21)	3.83 (2.06)	228.71	Blue green	Light red

Figures in parenthesis are square root ($\sqrt{x+0.5}$) transformed values.

Table 7. *A cepa* genotypes with highest *T. tabaci* population.

Genotype	Mean *T. tabaci* population per plant in SMW											Yield q/ha	Colour	
	45th	46th	47th	48th	49th	50th	51st	52nd	1st	2nd	3rd		Leaf	Bulb
BKHO 1005	0.5 (1.0)	1.33 (1.34)	7.8 (2.86)	3.7 (2.03)	4.1 (2.14)	2.53 (1.72)	4.43 (2.21)	11.36 (3.40)	16.56 (3.81)	8.63 (3.02)	6.86 (2.71)	176.95	Blue green	Dark red
BKHO 1019	0.6 (1.05)	0.36 (0.93)	5.13 (2.37)	2.86 (1.83)	3.03 (1.85)	2.46 (1.69)	4.8 (2.29)	7.3 (2.79)	14.56 (3.87)	6.86 (2.64)	3.2 (1.92)	183.44	Blue green	Light red
BKHO 1016	0.43 (0.96)	0.46 (0.98)	12.26 (3.56)	3.13 (1.90)	7.13 (2.75)	1.86 (1.52)	3.36 (1.96)	5.36 (2.41)	5.93 (2.53)	6.2 (2.56)	4.43 (2.19)	198.45	Blue green	White
BKHO 1011	0.23 (0.85)	0.23 (0.85)	5.3 (2.38)	3.03 (1.88)	1.33 (1.32)	1.53 (1.41)	2.8 (1.82)	5.43 (2.43)	13.83 (3.78)	7 (2.73)	6.66 (2.66)	189.44	Yellow green	Light red

Table 7. Contd.

Genotype	Mean *T. tabaci* population per plant in SMW											Yield q/ha	Colour	
	45th	46th	47th	48th	49th	50th	51st	52nd	1st	2nd	3rd		Leaf	Bulb
BKHO 1008	0.8 (1.14)	3.16 (1.91)	5.93 (2.52)	2.73 (1.80)	5.1 (2.36)	4.3 (2.14)	2.96 (1.86)	5.46 (2.44)	7.46 (2.81)	7.7 (2.78)	2.76 (1.79)	193.88	Blue green	Bronze
BKHO 1004	0.37 (0.93)	0.27 (0.88)	4.1 (2.14)	2.73 (1.80)	4.53 (2.18)	2 (1.57)	3.63 (2.03)	13.3 (3.70)	5.6 (2.42)	5.4 (2.41)	5.3 (2.38)	201.1	Yellow green	Light red
BKHO 1015	0.43 (0.96)	0.3 (0.89)	8.76 (3.03)	3.13 (1.90)	2.66 (1.47)	2.4 (1.69)	4.93 (2.32)	7.5 (2.80)	4.96 (2.32)	6.93 (2.71)	4.16 (2.15)	201.48	Blue green	White
BKHO 1003	0.23 (0.85)	0.67 (1.08)	3.5 (1.99)	2.86 (1.83)	1.86 (1.51)	4.1 (2.14)	4.73 (2.27)	8.56 (2.99)	5.93 (2.51)	7.16 (2.77)	5.36 (2.42)	210.77	Blue green	Light red
BKHO 1001	0.43 (0.96)	0.4 (0.95)	3.16 (1.90)	2.43 (1.71)	3.46 (1.96)	4.13 (2.15)	5.3 (2.38)	9.96 (3.22)	9 (3.08)	2.66 (1.77)	3.33 (1.96)	215.55	Blue green	Light red
BKHO 1014	0.4 (0.95)	0.26 (0.87)	8.2 (2.93)	2.46 (1.72)	4.63 (2.22)	1.56 (1.41)	3.2 (1.91)	6.5 (2.64)	4.73 (2.27)	4.86 (2.31)	3.26 (1.93)	223.19	Blue green	Light red
BKHO 1024	0.57 (1.03)	0.7 (1.09)	4.06 (2.13)	3.6 (2.02)	6.66 (2.65)	1.8 (1.44)	2.4 (1.70)	5.83 (2.51)	4.43 (2.19)	4.6 (2.22)	3.03 (1.87)	201.96	Blue green	Dark red

Figures in parenthesis are square root (√x+0.5) transformed values.

white, light red and dark red, respectively. *T. tabaci* is the serious pest of onion (Mound, 1977; Rechter et al., 1999; Murai, 2000; Schmutterer et al., 1969) and it causes yield loss varying from 10-50% (Gupta, 1994; Fournier et al., 1995; Kumar et al., 2001; Montano, 2010). Thus, worldwide screening of onion genotypes against *T. tabaci* have been carried out by various workers (Brar et al., 1993; Duchovskiene, 2006; Shakeel et al., 2006; Alimousavi et al., 2007; Martin et al., 2010). Peak population of *T. tabaci* in onion has been reported during September (Liu, 2004), November (Lorini et al., 1986), November to March (Ibrahim, 2010), December (Ibrahim and Adesiyun, 2009), February to May (Ibrahim and Adesiyun, 2009). Thus, population peak of *T. tabaci* varied depending on the location and genotype.

In the present finding, it was observed that incidence of *T. tabaci* at critical crop stages determined the yield of the crop. Incidence at vegetative stage and bulb initiation stages do not influence the yield, while high incidence at early bulb development stage and late bulb development stage is detrimental to the yield of crop. On the basis of susceptible in our case, BKHO 1005 had highest population peak during early and late bulb development stages. This genotype had lowest yield. Genotype BKHO 1006 had lowest population during the first three consecutive population peaks. BKHO 1006 was second highest yield. The genotype BKHO 1018 never had lowest population during any growth stages, except in the late bulb development stage where it had lowest population. The highest yield was recorded in BKHO 1018. It thus proves that incidence of *T. tabaci* at growth stages decides the susceptibility and tolerance level of onion. Colour of leaves and bulb also has influence on the incidence of *T. tabaci* in onion. The earlier findings are in accordance with our findings. The light green coloured leaves and white colour of bulb had lowest *T. tabaci* population, while blue green leaves and dark red colour of bulb had highest *T. tabaci* population. Earlier workers reported resistance and susceptible on the basis of mean population/plant (Lewis, 1997), leaf colour (Harvey, 1924), bulb colour (Verma, 1996; Lall and Singh, 1968), leaf surface and canopy of plant (Jones et al., 1934), wax percentage (Alimousavi et al., 2007). Thus onion plant architecture too plays an important role in the level of tolerance to *T. tabaci.*

Conflict of Interests

The author(s) have not declared any conflict of interests.

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