Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(4): 479-481
© 2019 JEZS
Received: 28-05-2019
Accepted: 30-06-2019

SK Mishra
Jawaharlal Nehru Krishi Vishwa Vidyalaya Dryland Horticulture Research and Training Centre, Garhakota, Sagar, Madhya Pradesh, India

RK Saraf
Jawaharlal Nehru Krishi Vishwa Vidyalaya Dryland Horticulture Research and Training Centre, Garhakota, Sagar, Madhya Pradesh, India

Vikas Gupta
Jawaharlal Nehru Krishi Vishwa Vidyalaya Dryland Horticulture Research and Training Centre, Garhakota, Sagar, Madhya Pradesh, India

Akhilesh Tiwari
Jawaharlal Nehru Krishi Vishwa Vidyalaya Dryland Horticulture Research and Training Centre, Garhakota, Sagar, Madhya Pradesh, India

Correspondence
SK Mishra
Jawaharlal Nehru Krishi Vishwa Vidyalaya Dryland Horticulture Research and Training Centre, Garhakota, Sagar, Madhya Pradesh, India

Screening of tomato hybrids against white fly, *Bemisia tabaci* (Gen.) under field condition

SK Mishra, RK Saraf, Vikas Gupta and Akhilesh Tiwari

Abstract
Seven tomato hybrids viz; TMT 685, Abhimanyu, Shivaji, Vaishnavi, Suruchi, TMT-507 and PKM-1 were evaluated against whitefly, *Bemisia tabaci* during the year 2015–16 in a Randomized Complete Block Design with three replication having plot size of 4.5 x 3.6 m at JNKVV, DHRTC Farm, Garhakota (M.P.). The population of whitefly was recorded on tomato at weekly interval from appearance of the whiteflies. The results revealed that none of the hybrids was found completely free from the infestation. The infestation of whitefly started in the last week of August. The infestation increased gradually and reached to its peak in the last week of September. Thereafter, the population declined abruptly. The average minimum (5.69/plant) and maximum (9.85/plant) whitefly population during crop season was observed on Vaishnavi and PKM-1, respectively. According to mean of whitefly population the highest resistance was found in Vaishnavi followed by Suruchi, TMT-685, Shivaji, TMT-507, Abhimanyu and PKM-1. The highest marketable fruit yield (318.51 q/ha.) was found in Vaishnavi while, the minimum (97.53 q/ha) marketable fruit yield was recorded in PKM-1 hybrid. Among all the hybrids, Vaishnavi recorded only 8.20% disease incidence and found statistically significant as compared to other hybrids while the maximum disease incidence was observed in hybrid PKM - 1 (27.35%).

Keywords: Screening, seasonal incidence, *Bemisia tabaci*, hybrid, *Lycopersicon esculentum*

1. Introduction
Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular and widely grown vegetable crops of both tropics and subtropics of the world [10]. India is the largest producer of tomato covering an area of 7.74 lakh ha with an annual production of 187.32 lakh tones [1]. In India, the major tomato producing states are Orissa, Madhya Pradesh, Karnataka, Andhra Pradesh and Telangana. In Madhya Pradesh, tomato is cultivated in an area of 0.73 lakh hectares with a production of 22.85 lakh tones [1]. The production of tomato is often limited to a great extent due to pest attack. Tomato is infested by almost 13 major insect pests [6] but most important are fruit borer, *Helicoverpa armigera* Hubner, whitefly, *Bemisia tabaci* Gen, jassids, *Amrasca devastans* Ishida, nematodes and diseases like fungal, bacterial, phytoplasma infections and also crop is affected by large number of viral diseases [2]. Of all these, the whitefly, *Bemisia tabaci* (Gen.) transmitting many deadly diseases in solanaceous, cucurbitaceous vegetable crops and pulse crops. The crop is infested by a number of sucking pests in vegetative stage and borers at fruiting stage. Among the sucking insects, whitefly *(Bemisia tabaci*) is one of the most damaging as it also acts as vector of tomato leaf curl virus [9]. Whitefly is an important pest under the order hemiptera and carries piercing and sucking type of mouthpart [7]. They cause direct and indirect damage to the tomato especially in the early growth stage. Both nymphs and adults suck the cell sap from the lower leaf surfaces. In addition, they disrupt transportation in conducting vessels and apparently introduce a toxin that impairs photosynthesis in proportion to the amount of feeding [12]. When several insects suck the sap from the same leaf, yellow spots appear on the leaves, followed by crinkling, curling, bronzing, and finally drying of leaves. This phenomenon is known as “hopper burn” [8]. In case of severe damage all leaves of the plants become crinkled or twisted with drastic reduction in photosynthesis which ultimately causes severe yield reduction. Tomato leaf curl virus (ToLCV) is a geminivirus (Geminiviridae: subgroup – III) which is the most important and destructive viral pathogen in many parts of India. Keeping in view the importance of whitefly on tomato, present investigation was undertaken to screen the tomato hybrids against whitefly under field condition.

2. Materials and Methods

Seven tomato hybrids viz; TMT 685, Abhimanyu, Shivaji, Vaishnavi, Suruchi, TMT-507 and PKM-1 were evaluated against whitefly, *Bemisia tabaci* during the year 2015–16 in a Randomized Complete Block Design with three replications. The plot size was 4.5 x 3.6 m and row to row and plant to plant distances were 60 and 60 cm, respectively. The crop was transplanted on 7th August, 2015. The experimental plots were kept free from weeds by weeding and hoeing. All the agronomic management practices were followed from time to time as per package and practices booklet of the region. Observation on whitefly population on tomato hybrids was recorded on five randomly selected and tagged plants per plot at weekly interval soon after the appearance of the whiteflies. The data obtained on whitefly population from experimental field were transformed in to $\sqrt{x} + 0.5$ and subjected to analysis of variance. Tomato leaf curl virus disease incidence was also recorded to know the susceptibility of hybrids to disease.

3. Results and Discussion

It is well known that certain varieties or hybrids or strains of crops are attacked less by insects than other because of natural resistance. In cultural practices, currently employed to minimize the losses caused by white fly, growing of resistant varieties / hybrids against the white fly, is one of the most important tool in the white fly management without additional cost. In the present investigation, seven tomato hybrids against white fly infestation was judged by studying the population buildup of white fly at weekly interval. Various workers have earlier tried to screen tomato cultivars against insect-pests [11, 3, 3, 4]. The data presented in Table-1 indicated that none of the hybrid was found completely free from the infestation. The white fly infestation did not appear over them up to 34th Standard Meteorological Week (SMW). The infestation started from 35th SMW and four hybrids viz; PKM-1, Abhimanyu, TMT-507 and Shivaji were found infested with white fly (av. 0.88 to 3.18 white fly/plant) (Table-1 and Fig 1). The maximum white fly population (3.18 white fly/plant) was observed on PKM-1 while, the minimum white fly population (0.88 white fly/plant) was observed on Shivaji which was found significantly superior over rest of the treatments. The variability of resistance recorded in tomato hybrids was in order of Shivaji > TMT-507 > Abhimanyu > PKM-1. All the hybrids were found infested by white fly on 36th SMW and thereafter the infestation increased gradually and reached to its peak on 41st SMW. The maximum whitefly population was recorded on 41st SMW on all tomato hybrids, thereafter it started declining gradually. Vaishnavi supported minimum number of white fly i.e. 12.99 white fly/plant on 41st SMW as against the maximum of 21.35 white fly/plant on PKM-1. An overall comparison over the entire crop season (Table-1) showed that the Vaishnavi was the least preferred host (5.69 white fly/plant) and the PKM-1 was the most preferred host (9.85 white fly/plant)

The ascending order of resistance in tomato hybrids according to mean white fly population of all the observation recorded during crop season was Vaishnavi > Suruchi > TMT-685 > Shivaji > TMT-507 > Abhimanyu > PKM-1.

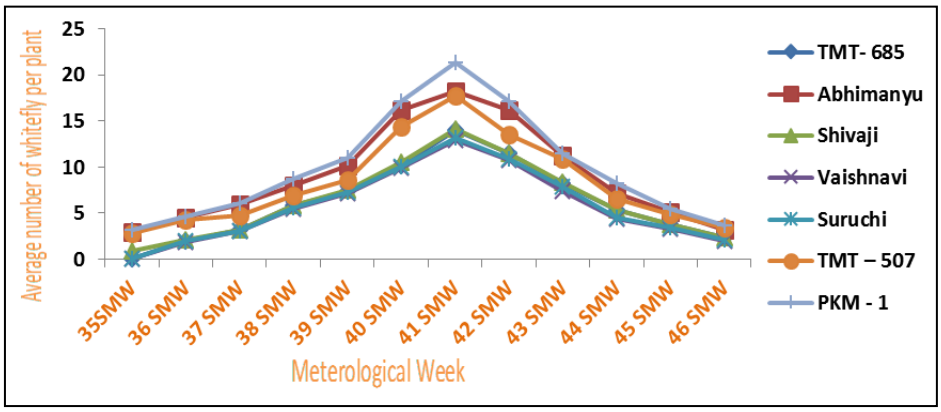

Fig 1: Population build - up of white fly on tomato hybrids

Table 1: Seasonal incidence of white fly on different tomato hybrids

S. No	Tomato hybrids	Whitefly population per plant* Standard Meteorological Week (SMW)												Overall Mean	Yield (qt./ha)*
		35	36	37	38	39	40	41	42	43	44	45	46		
1	TMT- 685	-	2.03 (1.59)	3.17 (1.91)	5.78 (2.50)	7.36 (2.80)	10.15 (3.26)	14.02 (3.81)	11.44 (3.45)	8.23 (8.73)	5.35 (2.41)	3.74 (2.05)	2.29 (1.67)	6.13	265.78
2	Abhimanyu	2.93 (1.85)	4.45 (2.22)	5.92 (2.53)	8.05 (2.92)	10.15 (3.26)	16.15 (4.08)	18.25 (4.33)	16.21 (4.08)	11.24 (3.42)	7.12 (2.76)	5.09 (2.36)	3.16 (1.91)	9.06	113.20
3	Shivaji	0.88 (1.17)	2.11 (1.61)	3.23 (1.93)	5.84 (2.42)	7.53 (2.83)	10.50 (3.31)	14.18 (3.83)	11.50 (3.46)	8.35 (2.97)	5.40 (2.42)	3.80 (2.07)	2.36 (1.69)	6.30	232.40
4	Vaishnavi	-	1.85 (1.53)	3.01 (1.87)	5.44 (2.43)	7.18 (2.77)	9.95 (3.23)	12.99 (3.67)	10.73 (3.35)	7.45 (2.81)	4.40 2.21)	3.25 (1.93)	2.03 (1.59)	5.69	318.51
5	Suruchi	-	1.97 (1.57)	3.07 (1.88)	5.62 (2.47)	7.27 (2.78)	10.06 (3.24)	13.14 (3.69)	10.94 (3.38)	7.89 (2.89)	4.54 (2.24)	3.38 (1.96)	2.16 (1.63)	5.83	290.55
6	TMT – 507	2.88 (1.83)	4.26 (2.17)	4.80 (2.30)	6.89 (2.71)	8.55 (3.00)	14.32 (3.84)	17.73 (4.26)	13.56 (3.74)	10.83 (3.36)	6.58 (2.66)	4.85 (2.31)	3.40 (1.97)	8.22	164.35
7	PKM - 1	3.18 (1.91)	4.68 (2.27)	6.09 (2.56)	8.75 (3.04)	10.95 (3.38)	17.20 (4.20)	21.35 (4.67)	17.15 (4.20)	11.50 (3.46)	8.20 (2.94)	5.45 (2.43)	3.70 (2.06)	9.85	97.53
	SEm ±	0.006	0.007	0.006	0.004	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.004		4.96
	CD (0.05)	0.020	0.023	0.017	0.014	0.010	0.007	0.006	0.005	0.009	0.011	0.008	0.013		16.85

Figure in parenthesis are $\sqrt{x} + 0.5$ transformed values

*Means of three replication

3.1 Marketable fruit yield

The difference among the hybrids on marketable fruit yield was highly significant. The fruit yield per hectare ranged from 97.53 to 318.51 q ha^{-1} (Table 1). Among all tomato hybrids the maximum fruit yield per hectare was observed in hybrid Vaishnavi (318.51 q ha^{-1}), which was significantly superior over all the other hybrids followed by Suruchi (290.55 q ha^{-1}).The hybrid PKM-1 gave the lowest marketable fruit yield (97.53 q ha^{-1}) followed by Abhimanayu (113.20 q ha^{-1}) Both these hybrids were statistically at par with each other for fruit yield. The mean fruit yield per hectare found to be highest in hybrid Vaishnavi due to less number of white fly infestation and its good plant growth and quality parameters.

3.2 Disease incidence

All the hybrids significantly differed in relation to disease incidence percentage and the mean value for this trait exhibited a range of 8.20 – 27. 35%. (Table-2 and Fig 2). Among all the hybrids, Vaishnavi recorded only 8.20% disease incidence and found statistically significant as compared to other hybrids while the maximum disease incidence was observed in hybrid PKM - 1 (27.35%). Disease incidence is directly related to the fruit yield. Hybrids which showed less incidence of disease produced higher yield. Similarly, Chellemi *et.al* [5] studied the performance of tomato hybrids in relation to disease incidence and reported that the incidence of bacterial wilt disease ranged from 0.00-83.00%.

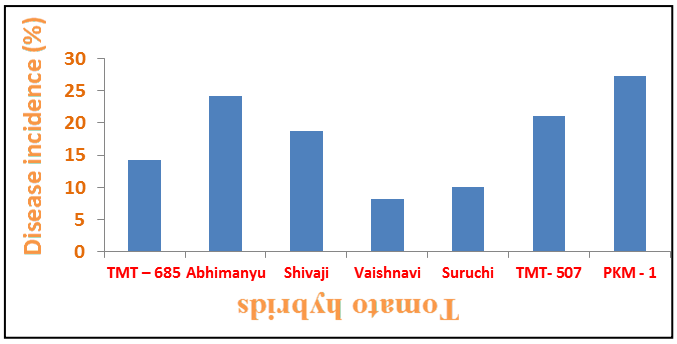

Fig 2: Tomato leaf curl disease incidence in different hybrids under field condition

Table 2: Tomato leaf curl disease incidence in different hybrids in field condition

S. No.	Tomato hybrids	Disease incidence** (%)
1	TMT – 685	14.26 (22.17)*
2	Abhimanyu	24.17 (29.43)
3	Shivaji	18.70 (25.61)
4	Vaishnavi	8.20 (16.63)
5	Suruchi	10.08 (18.50)
6	TMT- 507	21.10 (27.31)
7	PKM - 1	27.35 (31.51)
SEm ±		0.20
CD (0.05)		0.62

*Figure in parenthesis are arcsine transformed values
**Means of three replication

4. Conclusions

Based on the present findings, it could be concluded that among seven tomato hybrid Vaishnavi is more suitable for growing commercially as it has high yield potential and resistance to various biotic/ abiotic stresses.

5. References

1. Annonymous. Agricultural statistics at a glance. Government of India Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare Directorate of Economics and Statistics, 2017.
2. Anonymous (http://www.tomatoleafcurlandwhitefly.org/release.html), 2011.
3. Baldin EL, Vendramim JD, Lourencao AL. Resistance of tomato genotypes to the whitefly *Bemisia tabaci* (Gennadius) biotype B (Hemiptera: Aleyrodidae). Neotropical-Entomology. 2015; 34 (3):435-441.
4. Bustos MS, Gilardon E, Gorustovich M, Olsen A. Tomato genetic resistance to *Spodoptera eridania* (Cramer, 1.784) (*Lepidoptera: Noctuidae*). Horticultura-Argentina. 2004; 23(55):17-21.
5. Chellemi, DO, Olsan SM, Scott JW. Field evaluation of tomato genotypes for resistance to bacterial wilt. Proceedings Florida State Horticultural Society. 1994; 107:151-153.
6. Cohic, F. Les parasites animawax de la tomato. Noumea Institute France Oceamic, 1956, 8.
7. David BV, Ananthakrishnan TN. General and Applied Entomology. Second Edition. Tata McGraw-Hill Publishing Company Ltd, 2006, 27
8. Das G, Islam T. Relative efficacy of some newer insecticides on the mortality of jassid and white fly in brinjal. International Journal of Research in Biosciences, 2014; 4(3):89-9
9. Dempsey M, Riley DG, Srinivasan R. Insecticidal Effects on the Spatial Progression of Tomato Yellow Leaf Curl Virus and Movement of Its Whitefly Vector in Tomato. Journal of Economic Entomology, 2017; doi: 10.1093/jee/tox061
10. Govindappa MR, Bhemanna M, Arunkumar Hosmani, Ghante VN. Bio-efficacy of newer insecticides against tomato leaf curl virus disease and its vector whitefly (*Bemisia tabaci*) in tomato. International Journal of Applied Biology and Pharmaceutical Technology. 2013; 4(3):226-231
11. Naik RM, Shukla A, Khatri AK. Evaluation of tomato cultivars against major insect pests under Kymore Plateau zone of Central India. JNKVV Research Journal 39(1):99-101
12. Sharma K, Chander S. Spatial distribution of jassid, *Amrasca biguttula biguttula* (Ishida) on cotton. Indian Journal of Entomology, 2005; 60(4):326-328.
13. Srinivasan and RS Uthamasamy**.** Rapid plant screening technique - a novel tool for the evaluation of antixenosis resistance mechanism of tomato accessions to whitefly in laboratory condition. Resistant Pest Management Newsletter. 2004*;* 14(1):5-6.