

RESEARCH ARTICLE :

Influence of *Bemisia tabaci* Gennadiu on Bt cotton ecosystem in Marathwada region of Maharashtra

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SUMMARY : The severity whitefly is becoming a major concern to transgenic cotton farmers. Keeping this in view scientific survey of white fly (*Bemisia tabaci* Gennadius) incidence on Bt cotton was carried out from last five years (2009-10 to 2013-14), in six major cotton growing districts (*viz.* Parbhani, Hingoli, Nanded, Jalna, Aurangabad & Beed) in Marathwada region of Maharashtra under Crop Pest Surveillance and Advisory Project (CROPSAP) by using ICT tools and total 171 ETL based advisories were issued twice in a week to monitor the pest. On the basis of taluka wise roving survey, the district wise mean data represented in Table 7 and stated that during 2009-10, maximum whitefly (per 3 leaves) incidence was recorded in Hingoli (5.92) followed by Jalna (5.20) and minimum in Beed (1.40) district. Similarly during 2010-11, the population was highest in Hingoli (8.72) followed by Jalna (7.72) and lowest in Beed (1.36). During 2011-12, it was more in Hingoli district (4.20) followed by Nanded (3.48) and minimum in Beed (0.76). During 2012-13, Hingoli district was severely infested by whiteflies (5.52) followed by Jalna (4.84). Whereas during 2013-14, Jalna district recorded highest population of whitefly (6.52) followed by Hingoli (5.44) and Parbhani (4.00). On the basis of five years survey data, the severity of whiteflies incidence was more during 2010-11. It was minimum during 2011-12, whereas similar trend of whitefly population was recorded in the years 2009-10, 2012-13 and 2013-14. It was further concluded that Hingoli and Jalna districts of Marathwada were identified as hotspots for whiteflies.

KEY WORDS :

 Bt cotton, Ecosystem,
Political status

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BACKGROUND AND OBJECTIVES

Cotton is the important cash crop of Marathwada region. A total of 160 species of insects have been recorded on cotton and account for a considerable yield loss to the extent of 35.2 per cent out of these pests now a day on Bt cotton whitefly causes serious damage to Bt cotton in Marathwada. The whitefly may cause 60.2-99.7 per cent loss in

seed cotton (Singh *et al.*, 1983). Since pest epidemic can be disastrous, a survey was carried out to know the status of whitefly on farmers field. Constant monitoring of crop was carried out through roving survey to monitor and record the reaction of the Bt cotton to whitefly.

Cotton is known as one of the most important commercial crop playing a key role in economical, social and political status of the

world. Cotton is a premier cash crop of the most of SAARC countries with an enormous potential of employment generation, both in rural and urban sectors. In India, more than 60 million people are engaged in cultivation, processing, marketing and other cotton related activities. Cotton is a predominant raw material of Indian textile industry which contributes for more than 14 per cent of the annual value addition of industrial production and more than 30 per cent of the total export with 4 per cent of its gross domestic product. Bt cotton technology has been introduced in India in 2002. Bt technology based hybrids have played major role in cotton production and productivity in India. But it is not effective against sucking pests which are still posing a threat to cultivation of Bt cotton. Whitely is becoming a major sucking pest on Bt cotton. The present survey of whitefly incidence on Bt cotton was carried out during to know the seasonal incidence, peak period of whitefly incidence. These studies are useful to undertake timely whitefly management practices to the farmers of all districts of Marathwada.

RESOURCES AND METHODS

The talukawise roving survey was carried out in six major cotton growing districts viz. Parbhani, Nanded, Hingoli, Beed, Jalna and Aurangabad of Marathwada to record the status of thrips under “Crop Pest Surveillance and Advisory Project (CROPSAP)” during 2011-12. During the survey five fields from each taluka were observed and the incidence of whiteflies were recorded from 10 randomly selected plants from each fields from villages of all six districts Parbhani (Parbhani, Purna, Palam, Gangaked, Sonpeth, Pathri, Selu, Manvat, Jintur), Hingoli (Hingoli, Vasmat, Kalamnuri, Sengaon, Aundha

Nagnath), Nanded (Ardhapur, Nanded, Loha, Bhokar, Mukhed, Naigaon, Mudkhed), Beed (Parli, Ambejogai, Kej, Majalgaon, Georai, Dharur, Vadavani), Jalna (Partur, Mantha, Jalna, Badnapur, Bhokardan, Ambad), Aurangabad (Phulambri, Soygaon, Kannad, Vaijapur, Khultabad, Sillod, Aurangabad, Gangapur) of Marathwada. Depending upon the stages of crop population of thrips were recorded from three leaves (bottom, middle and top).

OBSERVATIONS AND ANALYSIS

The highest population of the whiteflies during 2009-10 on cotton in Parbhani district was observed in Pathri (5.00) followed by Parbhani (4.17) and the lowest population was in Jintur (2.24) where as the average population of the whiteflies during this year 3.48/3 leaves. During the year 2010-11 the peak population of the whiteflies was observed in Pathri (7.52) followed by Manvat (6.67) whereas the lowest population was observed in Gangakhed Taluka (3.67) of Parbhani district and average population was 5.24 per 2 leaves. The highest population of the whiteflies was observed in Sonpeth (1.87) followed by Manvat (1.67) during the year 2011-12 in cotton whereas it is minimum in Parbhani taluka (0.96). The average population of whiteflies was 1.36 during the year. From the Table 1 the average population of the whiteflies during the year 2012-13 was 3.12 and peak level was observed in Parbhani (4.00) followed by Purna taluka (3.67) whereas lowest population of whiteflies was in Selu taluka (2.50). The population of the whiteflies was reached maximum in Purna taluka (4.87) followed by Pathri (4.69) whereas the lowest population was observed in the Gangakhed taluka (3.17) during the year 2013-14. From this Table 1

Table 1 : Average of population of whiteflies on cotton in Parbhani district during 2009-2014

Taluka	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Parbhani	4.17	5.40	0.96	4.00	3.50	3.61
Purna	3.92	4.19	1.50	3.67	4.87	3.63
Palam	2.39	3.80	1.17	3.00	3.17	2.71
Gangakhed	2.50	3.67	1.00	3.17	3.25	2.75
Sonpeth	3.67	5.17	1.87	3.00	4.21	3.58
Pathri	5.00	7.52	1.24	2.67	4.67	4.22
Selu	3.43	6.21	1.44	2.50	4.17	3.55
Manvat	4.00	6.67	1.69	3.20	4.20	3.95
Jintur	2.24	4.53	1.39	2.87	3.96	3.00
Mean	3.48	5.24	1.36	3.12	4.00	3.44

the average population of the whiteflies from the year 2009-2014 on cotton was found 3.44 / 3 leaves and the peak level was observed in Pathir taluka (4.22) followed by Manvat (3.95) and lowest population was observed in Palam taluka (2.71).

The highest population of the whiteflies during the year 2009-10 in Hingoli district was in Basmat taluka (7.68) followed by Aundha Nagnath (6.08) whereas lowest population in Sengaon (4.20). During the year 2010-11 the peak population of the whiteflies was found in Basmat Taluka (10.6) followed by Hingoli taluka (9.8) and lowest population in Sengaon (7.3). The highest population of the both nymph and adult of whiteflies was 5.6 whiteflies / 3 leaves followed by 5.2 whiteflies / 3 leaves in Hingoli and Basmat talukas, respectively during the year 2011-12. The population of the whiteflies found maximum / higher in Hingoli followed by Basmat during the year 2012-13 and lowest population during 2012-13

in Kalamnuri taluka of Hingoli. During the year 2013-14 the population of whiteflies reached its peak in Basmat (7.0) and Hingoli (6.6) and found minimum in Kalamnuri (3.9). From this the average population of the whiteflies on cotton in Hingoli district during the year 2009-14 was highest in Basmat (7.46) followed by Hingoli (7.34) and its minimum population was during 2009-14 was in Sengaon and mean population was 5.96.

The data from Table 4 stated that during the year 2009-10 the highest population of whiteflies was found in the Beed taluka where as lowest population in Ashti taluka the mean of the population is 1.40. During the year 2010-11 the highest population was found in Ambajogai (3.0 whiteflies / 3 leaves) followed by Beed and lowest in Ashti and mean is 1.36. The highest population of the nymphs and adults or the whiteflies during the year 2011-12 was found in Beed taluka followed by Ambajogai where as lowest in Ashti taluk

Table 2 : Average of population of whiteflies on cotton in Nanded district during 2009-2014

Taluka	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Nanded	5.18	6.18	5.46	4.86	2.38	4.812
Ardhapur	2.96	3.16	2.96	2.0	1.20	2.456
Loha	5.62	6.00	5.34	4.18	2.04	4.636
Kandhar	2.90	3.34	2.86	2.00	1.14	2.448
Naigaon	4.20	5.34	4.2	6.00	2.16	4.38
Mudkhed	4.94	5.86	4.8	4.46	2.00	4.412
Mukhed	2.68	3.86	2.0	2.12	1.16	2.364
Umri	2.36	3.90	3.7	3.86	1.0	2.964
Bhokar	2.00	5.00	3.4	3.90	1.10	3.08
Kinvat	2.00	4.86	3.86	3.40	1.00	3.024
Himyatnagar	2.94	4.70	3.58	2.92	0.8	2.988
Deglur	2.20	5.00	2.18	2.84	1.0	2.644
Biloli	4.20	5.18	4.2	5.00	1.14	3.944
Dharmabad	3.86	4.36	2.00	3.00	0.76	2.796
Hadgaon	1.8	4.14	3.00	2.92	0.80	2.532
Mahur	2.0	4.00	2.14	2.86	0.80	2.36
Mean	3.24	4.68	3.48	3.52	1.28	3.24

Table 3 : Average of population of whiteflies on cotton in Hingoli district during 2009-2014

Taluka	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Hingoli	6.00	9.8	5.6	7.2	6.6	7.04
Basmat	7.68	10.6	5.2	6.8	7.0	7.46
Kalamnuri	5.64	7.7	3.0	4.20	3.9	4.89
Sengaon	4.20	7.3	3.2	3.90	4.0	4.52
Aundha N.	6.08	8.2	4.0	5.5	5.7	5.89
Mean	5.92	8.72	4.20	5.52	5.44	5.96

and the mean population of the whiteflies during the year 2011-12 was 0.76. From the year 2012-13, the population of the whiteflies reached peak level in Beed followed by Ambajogai and lowest in Shirur Kasar and Ashti and the mean population was found 1.36. The highest population during the year 2013-14 was 3.16 in Beed taluka followed by 2.86 in Ambajogai whereas lowest population *i.e.* 1.02 was in Shirur Kasar and average population 1.92. From the table the average of population of whiteflies on cotton in Beed district found highest in Beed Taluka (2.40) followed by Ambajogai (2.13) where as the lowest population of whiteflies per 3 leaves was found in Ashti taluka of Beed *i.e.* 0.72 whiteflies per 3 leaves.

As per Table 5 on the basis of average population of whitefly on cotton in Jalna district during the year 2009-2014. The highest number of whitefly of mean population found in Jalna district such as (7.21) followed by Partur (6.5%) followed by Mantha (5.92), followed by Badnapur (5.50), followed by Bhokardan (4.43), followed by Ambad (4.42), followed by Jafrabad (4.14) and Ghansavangi (3.70) has to be found the lowest number of whitefly in above villages. In the year 2009-10 the highest number of population found in Jalna (7.16) and followed Partur (6.46), Mantha (5.34), Badnapur (5.18), Ambad (4.80), Jafrabad (4.26) and Ghansavangi and Bhokardan (4.20). During the year 2010-11 the highest number of population of whitefly found in Jalna (10.14), followed by Partur (9.00), Mantha (8.16), Badnapur (7.80), Bhokardan (7.7), Jafrabad (6.80), Ghansavangi (6.16) and Ambad (6.00). During the year 2011-12 the maximum number of whitefly population is found in Jalna (3.24), followed by Mantha (2.86), Badnapur (2.50), Partur (2.00), Ambad (1.56),

Jafrabad (1.2), Bhokardan and Ghansavangi is (1.00). As per during the year 2012-13 the maximum number of whitefly population observed in Jalna (8.34) followed by Partur (6.18), Mantha (5.90), Ambad (4.60), Bhokardan (4.28), Jafrabad (3.24) and Ghansavangi (3.18). During the year 2013-14 the highest number of whitefly population is found in Jalna (9.18) followed by Partur (9.20), Mantha (7.34), Badnapur (7.06), Jafrabad (5.20), Ambad (5.18), Bhokardan (5.00) and Ghansavangi (4.00).

The data from Table 6 reflected that during 2009-10 the highest whiteflies population was recorded in Aurangabad Taluka (2.56) followed by Phulambri (2.48) and lowest in Paithan, Khultabad and Kannad (1.00), similarly during 2010-11, Aurangabad taluka (4.10) was highly infested by whiteflies followed by Phulambri and Soygaon with a population 3.96 and 3.80, respectively. During 2011-12 also, Aurangabad (2.18) and Phulambri (1.150) talukas are highly infested where as Paithan taluka (0.60) recorded lowest infestation. Where as during 2012-13 Vaijapur taluka was recorded comparatively highest population of whitefly (1.96) followed by Phulambri (1.36) and Khultabad (1.16). During 2013-14, Sillod taluka (1.60) was comparatively more infested, followed by Phulambri (1.30) and Kannad (1.10) on the basis of five years survey, it is observed that highest whiteflies infested was recorded in 2010-11 and in Aurangabad to Phulambri talukas are noticed as hotspots for whiteflies.

On the basis of taluka wise roving survey, the district wise mean data represented in Table 7 and stated that during 2009-10, maximum whitefly (per 3 leaves) incidence was recorded in Hingoli (5.92) followed by

Table 4 : Average of population of whiteflies on cotton in Beed district during 2009-2014

Taluka	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Beed	3.2	2.3	1.2	2.16	3.16	2.40
Ambajogai	2.0	3.0	1.0	1.80	2.86	2.13
Kej	2.3	1.9	0.8	1.60	2.60	1.84
Majalgaon	1.3	1.2	0.72	1.00	1.68	1.18
Georai	1.2	1.0	0.6	1.86	1.60	1.25
Dharur	1.0	1.0	0.68	1.20	1.8	1.14
Wadavani	0.6	0.8	0.8	1.18	1.66	1.01
Parli	1.4	1.3	0.8	1.36	2.18	1.41
Patoda	1.0	1.36	0.6	1.20	1.36	1.10
Shirur Kasar	0.8	0.6	0.66	0.8	1.02	0.78
Ashti	0.6	0.5	0.5	0.8	1.20	0.72
Mean	1.40	1.36	0.76	1.36	1.92	1.36

Jalna (5.20) and minimum in Beed (1.40) district. Similarly during 2010-11, the population was highest in Hingoli (8.72) followed by Jalna (7.72) and lowest in Beed (1.36). During 2011-12, it was more in Hingoli district (4.20) followed by Nanded (3.48) and minimum in Beed (0.76). During 2012-13, Hingoli district was severely infested by whiteflies (5.52) followed by Jalna (4.84). Whereas during 2013-14, Jalna district recorded highest population of whitefly (6.52) followed by Hingoli (5.44) and Parbhani (4.00). On the basis of five years survey data, the severity of whiteflies incidence was more during

2010-11. It was minimum during 2011-12, whereas similar trend of whitefly population was recorded in the years 2009-10, 2012-13 and 2013-14. It was further concluded that Hingoli and Jalna districts of Marathwada were identified as hotspots for whiteflies.

The present findings are supported with the findings of Rote and Puri (1991) and Patel (1992) who reported that *B. tabaci* was at peak during 2nd week of October to 3rd week of November. Daware *et al.* (2003) reported first appearance of whiteflies from first week of August (31st MW) and peaked in first week of October to second

Table 5 : Average of population of whiteflies on cotton in Jalna district during 2009-2014

Taluka	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Jalna	7.16	10.14	3.24	6.34	9.18	7.21
Partur	6.46	9.00	2.00	6.18	9.20	6.57
Mantha	5.34	8.16	2.86	5.90	7.34	5.92
Badnapur	5.18	7.80	2.5	5.00	7.06	5.50
Bhokardan	4.20	7.7	1.0	4.28	5.00	4.43
Ambad	4.80	6.0	1.56	4.60	5.18	4.42
Jafrabad	4.26	6.80	1.2	3.24	5.20	4.14
Ghansavangi	4.20	6.16	1.0	3.18	4.00	3.70
Mean	5.20	7.72	1.92	4.84	6.52	5.24

Table 6 : Average of population of whiteflies on cotton in Aurangabad district during 2009-2014

Taluka	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Aurangabad	2.56	4.16	2.18	1.96	1.80	2.53
Phulambri	2.48	3.96	1.50	1.36	1.30	2.12
Soygaon	1.12	3.80	1.16	1.08	1.00	1.63
Kannad	1.00	2.16	1.00	1.00	1.10	1.25
Vaijapur	1.36	2.00	0.92	0.96	0.80	1.21
Khultabad	1.00	2.30	1.00	1.16	0.86	1.26
Sillod	1.28	2.16	0.86	0.80	0.60	1.14
Gangapur	1.16	1.00	0.86	0.80	0.60	0.88
Paithan	1.00	1.86	0.60	0.60	0.58	0.93
Mean	1.44	2.60	1.12	1.08	0.96	1.44

Table 7 : Average of population of whiteflies on cotton in Marathwada during 2009-2014

District	No. of whiteflies / 3 leaves					Mean
	2009-10	2010-11	2011-12	2012-13	2013-14	
Parbhani	3.48	5.24	1.36	3.12	4	3.44
Hingoli	5.92	8.72	4.2	5.52	5.44	5.96
Nanded	3.24	4.68	3.48	3.52	1.28	3.24
Aurangabad	1.44	2.6	1.12	1.08	0.96	1.44
Jalna	5.2	7.72	1.92	4.84	6.52	5.24
Beed	1.4	1.36	0.76	1.36	1.92	1.36
Mean	3.45	5.05	2.14	3.24	3.35	3.45

week of November (40th-46th MW). Prasad *et al.* (2008) observed that the peak incidence of whiteflies was from 44th to 48th standard week (November). Mohapatra (2008) reported the peak population of *B. tabaci* attained during 44th standard week (October 29 to November 4). Parsai and Shastry (2009) observed the incidence of whitefly from 33rd – 48th SMW with its maximum incidence (21.1-31.1 per three leaves) during 41st SMW. The findings are also supported with those of Sharma *et al.* (2004) and Pawar *et al.* (2008). The incidence of whitefly was more in second fortnight of September to first fortnight of October in all the districts of Marathwada and this period should be considered as important to undertake effective the whitefly management practices.

Roving survey :

Roving survey of cotton growing area for whitefly area for whitefly indicated that for the control of whitefly most of the used the Imidacloprid based insecticides which are mostly ineffective. In general 4-6 sprays of insecticides were applied by the farmers, fields having whitefly infestation showed leaves with yellow spots coupled with sooty mould. Severly infested plants were found stunted. Farmers mostly applied 2-3 sprays of Acephate, Triazophos and Difenthiuron which increased the cost of cotton cultivation besides hampering the growth the alternately reducing the cotton yield by 15-20%.

Earlier studies have established considerable economic benefits of Bt cotton cultivation to the farmers of all strata and in this regard there is urgent need to monitor pest problems at field level. Bhosle *et al.* (2010) indicated that the use of excessive nitrogenous fertilizers during early stage of crop and use of growth promoting hormones has led to dense crop canopy, resulting in severe infestation by whitefly. Pest situation revealed that incidence of lepidopteron insects has gone down, however incidence of sucking insect pest in on increase causing significant yield losses.

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REFERENCES

- Bhosle, B.B.**, Badgujar, A.G., Sharma, O.P., Bhede, B.V., More D.G. and Patait, D.D. (2010). Status of Sucking Insect Pests on Transgenic BG-I and BG-II Cotton in Marathwada Region. *Indian J. Plant Protec.*, **38** (1) : 104-106.
- Daware, D.G.**, Kurtadikar, J.S., Lavekar, R.C. and Bhosle, B.B. (2003). Achievements in insect pest management in cotton. *State level seminar on pest management for sustainable Agriculture* February 6-7, 2003 MAU, Parbhani: 4-6.
- Mohapatra, L.N.** (2008). Population dynamics of sucking pests in hirsutum cotton and influence of weather parameters on its incidence in western Orissa. *J. Cotton Res. Dev.*, **22** (2): 192-194.
- Parsai, S.K.** and Shastry, P.P. (2009). Seasonal incidence of key pests and their natural enemies on cotton. National Symposium on “*Bt-cotton: Opportunities and Prospects*” at ICCR, Nagpur, November 17-18-,2009:125-126.
- Patel, J.R.** (1992). Integrated pest Management in Cotton Hybrid-6. Ph.D. Thesis, Gujarat Agricultural University, Anand, GUJARAT (INDIA).
- Pawar, A.V.**, Chavan, S.J., Bhute, N.K. and Kadam, D.R. (2008). Population dynamics of sucking pest complex on cotton at Marathwada region of Maharashtra. *J. Plant Prot. Environ.*, **5** (1): 150-153.
- Prasad, N.V.S.D.**, Rao, N.H.P. and Mahalakshmi, M.S. (2008). Population dynamics of major sucking pests infesting cotton and their relation to weather parameters. *J. Cotton Res. Dev.*, **22** : 85-90.
- Rote, N.B.** and Puri, S.N. (1991). Population dynamics of whitefly *B. tabaci* on cotton and its relationship with weather parameters. *J. Cotton Res. Dev.*, **5** (2) : 181-189.
- Sharma, P.D.**, Jat, K.L. and Takar, B.L. (2004). Population dynamics of insect pests on American cotton (*Gossypium hirsutum* L.) in Haryana. *J. Cotton Res. Dev.*, **18** (1): 104-106.
- Singh, J.**, Butter, N.S. and Madan, V.K. (1983). Assessment of losses due to whitefly, *B. tabaci* in hirsutum cotton. *Indian J. Ent. Spl. Issue*, **2** : 362-366.

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