



## Impact of weather factors on the population dynamics of whiteflies, *Bemisia tabaci* (Gennadius) infesting bhendi

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### Abstract

Field studies revealed that the incidence of whitefly on bhendi was noticed from 6<sup>th</sup> MSW and reached its peak on 14<sup>th</sup> MSW (6.89 whitefly/3 leaves) during rabi 2018. Then it gradually decreased up to the end of crop season. However, the lowest population was observed in the 6<sup>th</sup> MSW (2.86 whitefly/3 leaves). Population density of whitefly was noticed from 23<sup>rd</sup> MSW to 38<sup>th</sup> MSW ranging from 3.08 to 3.64/3 leaves and the highest population was recorded at 29<sup>th</sup> MSW (6.39) followed by 30<sup>th</sup> MSW (6.37) during kharif season. The present studies concluded that whiteflies populations on bhendi plants favoured minimum temperatures while humidity and rainfall did not significantly affect the dynamics of whiteflies in *rabi* 2018 and *kharif* 2018.

**Keywords:** *Bemisia tabaci* infestation, bhendi, population dynamics, weather factors

### Introduction

Bhendi (*Abelmoschus esculentus* (L.) Moench) plant belongs to the family Malvaceae and it is commonly known as 'bhendi' or lady's finger in India. The high iodine content of fruits controls goiter while leaves are used in dysentery. The root and stem are used for clearing cane juice in preparation of jaggery. Matured fruits and stems containing crude fiber are used in the paper industry (Malaichattiwar *et al.*, 2014). The major bhendi producing states are Andhra Pradesh, West Bengal, Assam, Uttar Pradesh, Bihar, Orissa, Maharashtra, Karnataka and Tamil Nadu. In Tamil Nadu, this crop occupies 11,000 ha with a productivity of 75.4 thousand tones ha<sup>-1</sup> in the state (Anonymous, 2016) [1]. One of the most important constraints in the production of bhendi is due to insect pests. Most destructive insect pests were leafhopper, *Amrasca biguttula biguttula* (Ishida), whitefly, *Bemisia tabaci* (Gennadius) Aphid, *Aphis gossypii* (Glover), *Helicoverpa armigera* (Hübner), Spotted bollworm, *Earias vitella* (Fabricus) (Kale *et al.*, 2005) [5]. Among which, the recorded yield losses caused by sucking pests were 94.0% by whitefly, *Bemisia tabaci* (Gennadius) and 54.04% by aphids, *Aphis gossypii* (Glover), 32.06 to 56.0% by leafhopper *Amrasca biguttula biguttula* (Ishida) (Meenambigai *et al.*, 2017) [10]. They are the important pests in the early stage of the crop which desap the plants, make them weak and reduce the yield (Krishnaiah, 1980) [7].

Seasonal incidence is the study of growth and structure of population together with the factors that regulate their size and cause fluctuations in their density, abiotic factors (temperature, rainfall, relative humidity, light period and intensity, etc.) are the most important environment resistance factors that regulate the cyclic occurrence of the pest. The population dynamics helps in planning the need based application of insecticides as it reveals the peak activity as well as insect free periods during crop growth.

### Materials and Methods

Field experiments were conducted at farmer field, Sivapuri,

Annamalai Nagar (Situated at 11° 24'N latitude and 79°41'E longitude and an altitude of 5.79 m above the mean sea level, Tamil Nadu, India to study the seasonal incidence of sucking pests on bhendi during *rabi* and *kharif* of 2018. The popular bhendi variety (cultivar: Arka Anamika) was sown at a spacing of 45 × 30 cm and 50 cents of bhendi was earmarked for the survey and maintained with all the recommended agronomic practices to raise a good crop without insecticides spray. The earmarked crop area was divided into three blocks and each block was considered as a replication. Observations were made on sucking pests on bhendi at a weekly interval from two week after sowing to till the end of harvest under unsprayed conditions. To know the seasonal incidence of whiteflies (nymph + adults) observations were made at weekly intervals on 10 randomly selected plants throughout the year. From each plant top, middle and bottom leaves were considered. The data thus obtained were converted to mean population per leaf and subjected to statistical analysis mean Insect population =  $\Sigma xn$ .

The weather parameter *viz.*, maximum and minimum temperature, rainfall, relative humidity, sunshine hours were obtained from the automatic weather station, Meteorological observatory at Annamalai University, during the cropping periods. In order to study the influence of key weather factors on pest incidence and simple correlation was worked out between pest incidence and meteorological factors as per Gomez and Gomez (1984) [4].

### Results and Discussion

#### Seasonal incidence of whiteflies, *B.tabaci* on okra Rabi 2018

The results in rabi season studies revealed that the incidence of whitefly on bhendi was noticed from 6<sup>th</sup> MSW and reached its peak on 14<sup>th</sup> MSW. Then it gradually decreased up to the end of crop season. The highest population was recorded at 14<sup>th</sup> MSW (6.89 whitefly/3 leaves) followed by 15<sup>th</sup> MSW (6.74 whitefly/3 leaves). However, the lowest

population was observed in 6<sup>th</sup> MSW (2.86 whitefly/3 leaves). Population density of whitefly was noticed from 6<sup>th</sup> MSW to 21<sup>th</sup> MSW ranging from 2.86 to 3.28/3 leaves and the highest population was recorded at 14<sup>th</sup> MSW (6.89) followed by 15<sup>th</sup> MSW (6.74). Present results are in agreement with the reports of Soomro *et al.* (2012) [16].

The population of whitefly was non-significant and positive association with maximum and minimum temperature. The result of present findings corroborates with the reports of kalkal *et al.* (2013) [6]. However, R.H. exhibited a negative association with whitefly population. Kumari *et al.* (2012) [8] and Singh *et al.* (2013) [15] reported that the correlation between the incidence of whiteflies and weather parameters was negatively correlated.

The rainfall (r =0.247) exhibited non-significant positive association with whitefly population. The results are in accordance and conformity with the observations made by Singh *et al.* (2013) [15] and Shukla (2014) [13] were noticed sucking pest population was non-significant with positive association.

**Kharif 2018**

The results in kharif season studies showed that the

incidence of whitefly was found the highest at 29<sup>th</sup> MSW (6.39 whitefly/3 leaves) and it was lowest at 23<sup>rd</sup> MSW with 3.08 whitefly/3 leaves. Population density of whitefly was noticed from 23<sup>rd</sup> MSW to 38<sup>th</sup> MSW ranging from 3.08 to 3.64/3 leaves and the highest population was recorded at 29<sup>th</sup> MSW (6.39) followed by 30<sup>th</sup> MSW (6.37). Present results are in agreement with the reports of Sharma and Rishi (2004) [12]. The results on correlation studies in kharif 2018 indicated that maximum temperature (r = -0.373) was negatively correlated with whitefly population. The present results are in agreement with the result of Das *et al.* (2003) [3], Purohit *et al.* (2006) [11] and Sharma and Rishi (2004) [12] were observed that maximum temperature was negatively correlated with sucking pests on bhendi. Minimum temperature and wind speed were exerted non-significant positive association with whitefly population. The present findings are in line with the findings of Dabhi *et al.* (2013) [2]. The rainfall exhibited non-significant positive association with jassid, aphid and whitefly populations. The results are in accordance and conformity with the observations made by Singh *et al.* (2013) [15] and Shukla (2014) [13] were noticed sucking pest population was non-significant with a positive association.

**Table 1:** Studies on the seasonal activity of sucking pests and their natural enemies on bhendi during rabi season 2018

Month	MSW	No. of Whitefly / 3 leaves	Weather parameter				
			Temperature °C		Relative humidity (%)	Wind speed (Km/hr)	Rainfall (mm)
			Maxi.	Mini.			
Feb	5	0.00	28.4	18.5	91	3.8	000.00
	6	2.86	29.4	21.1	90	2.7	000.00
	7	3.47	30.1	21.4	92	3.1	000.00
	8	3.59	29.5	20.3	90	2.9	000.00
	9	4.29	30.9	17.8	91	2.9	000.00
Mar	10	5.03	31.4	19.0	87	2.1	000.00
	11	5.59	31.8	24.4	87	2.8	023.50
	12	6.26	33.8	22.3	89	2.7	000.00
	13	5.84	34.8	24.9	82	3.6	000.00
April	14	6.89	34.3	24.3	86	3.2	000.00
	15	6.74	33.8	25.4	86	2.6	004.20
	16	5.31	35.2	25.3	84	3.6	000.00
	17	4.24	36.0	25.5	85	3.9	000.00
May	18	4.06	37.1	26.8	79	4.5	000.00
	19	3.20	36.3	26.4	81	4.6	000.00
	20	3.67	36.2	26.4	79	4.6	000.00
	21	3.28	35.8	26.0	80	3.5	000.00

Mean of three replications

Date of sowing: 22.01.2018

MSW: Meteorological Standard Week

**Table 2:** Studies on seasonal activity of sucking pests and their natural enemies on bhendi during kharif season 2018

Month	MSW	No. of whitefly / 3 leaves	Weather parameter				
			Temperature °C		Relative humidity (%)	Wind speed (Km/hr)	Rainfall (mm)
			Maxi.	Mini.			
June	22	0.00	38.00	27.40	78	6.40	000.00
	23	3.08	37.00	22.40	81	6.80	040.60
	24	4.16	36.90	26.10	80	7.70	032.70
	25	4.25	36.50	25.90	79	7.20	000.00
	26	5.13	36.70	25.60	80	5.30	009.20
	27	5.75	35.40	24.80	84	5.00	034.80
July	28	6.10	35.10	26.40	83	7.20	000.00
	29	6.39	36.10	26.20	80	7.20	004.00
	30	6.37	36.70	25.90	82	5.40	015.80
	31	5.86	36.30	25.00	84	4.90	020.40
Aug	32	4.27	35.20	25.10	95	5.20	028.40
	33	5.64	35.40	25.60	81	8.00	010.20

	34	4.47	35.10	25.30	85	5.10	012.40
Sep	35	5.61	33.80	24.20	89	3.60	132.60
	36	3.76	35.00	25.00	84	4.30	0.00
	37	4.20	35.20	25.70	86	4.00	000.40
	38	3.64	34.00	25.20	86	2.90	018.80

Mean of three replications Date of sowing: 17.05.2018 MSW: Meteorological Standard Week

**Table 3:** Correlation coefficients between weather parameters and weekly observed whiteflies infestation on bhendi during rabi and kharif season 2018

Season	Sucking pests/ Natural enemies	Weather parameters				
		Temperature (°C)		Relative humidity (%)	Wind speed (Km/ hr)	Rainfall (mm)
		Max.	Min.			
Rabi 2018	Whitefly	0.377	0.327	-0.146	-0.374	0.247
Kharif 2018	Whitefly	-0.373	-0.108	0.163	0.030	0.169

\*Significant P =0.05 CD (P=0.05): 0.590

\*\* Highly significant P =0.01 CD (P=0.01): 0.468

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