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Dispersal Flight Activity of *Bemisia tabaci* (Gennadius) in Relation to Time of the Day and Weather Parameters*

V. K. Borad and S. N. Puri**

Department of Entomology, Marathwada Agricultural University, Parbhani-431 402 (India)

ABSTRACT

Dispersal flight activity of adult whiteflies, *Bemisia tabaci* (Gennadius) in air outside the crops in relation to time of the day and weather parameters was investigated. Flying adults were monitored by yellow sticky traps on hourly count basis. Dispersal movement of adults in air was not closely related to specific time of the day. However, greater number of adults were trapped before noon in most days of the study period. The correlation between trap catches and temperature as well as morning vapour pressure was found to be positively significant whereas it was negatively significant with wind velocity. The effect of relative humidity and sunshine hours on adults dispersal was found non significant.

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INTRODUCTION

The whitefly, *Bemisia tabaci* Gennadius (Homoptera : Aleyrodidae), is a serious pest of *kharif* cotton, winter vegetables (brinjal, tomato, chilli, etc.) and sunflower crop in Marathwada region at Maharashtra. It causes widespred damage in cotton and vegetable crops by direct feeding and by spreading viral diseases that can lead to yield reduction upto 75% (Duffus and Flock, 1982). Movement within and between crop fields by flight activity results in spread of virus diseases and whitefly reinfestation after few days of insecticidal applications. Little is known about the patterns of dispersal flight activity in relation to time of the day or impact of environmental variables on this activity. Therefore, a serious nature of the whitefly problem and the need for information regarding their dispersal patterns in air in relation to time of the day and weather parameters prompted to the present investigation.

MATERIALS AND METHODS

The dispersal flight activity of adult whiteflies in air was evaluated by trapping them on yellow sticky traps. The traps used were made of cylindrical tins (10 cm diameter and 13.5 cm height). The outer surface of tins was painted with lemon yellow paint and fitted with wooden stick. Three or four evenly spaced marking lines were drawn lengthwise along the cylinder to facilitate counting of the trapped adults. A thin layer of transparent grease yellow in colour was applied on the trap surface, so that it was sticky but not thickly covered. The

* A part of Ph.D Thesis of first author submitted to the Marathwada Agricultural University, Parbhani (M. S.)
** Present address : Associate Research Scientist, Wheat Research Station, Gujarat Agricultural University, Vijapur-382 870

traps were set at a height of 1.25 m above the ground and minimum 5 meter away to the North, South, East and West periphery of the brinjal field which was heavily infested by whitefly. An hourly counts on trap catches begining from 7 a.m. until 6 p.m. on each day were recorded from 17th November to 15th December, 1989.

The temperature, relative humidity and vapour pressure were recorded at 7 a.m. and 14 p.m. While the wind velocity prevailling between 7 a.m. and 14 p.m. and the sunshine hours recorded every day were taken into account. For detecting the actual inter-relationship between dispersal flight patterns of whitefly with weather parameters, correlation co-efficients were worked out between average number of trap catches obtained between 7 a.m. and 14 p.m. every day during the study period.

RESULTS AND DISCUSSION

An hourly counts on trap catches presented in Table 1 and Figure 1, revealed that dispersal activity of *B. tabaci* adults occurred throughout the day light period. A very few whitefly adults were trapped during night hours from 6 p.m. to 7 a.m. During second forthnight of November, adults movement in air outside the crop fields increased sharply in morning hours until 10 a.m. and maximum trap catches were recorded between 9 and 10 a.m. Thereafter, trap catches decreased gradually in each hour upto 18 hours when observations were terminated. Similar trend of adults dispersal was observed in first week of December except peak period which was recorded one hour late than in the previous weeks. While, during 2nd week of December, movement of adults in air was found to be negligible in early morning between 7 and 9 hours. It slowly increased thereafter towards noon and reached its peak between 14 to 15 hours, as indicated by trap catches. Thus dispersal flight activity of the adult *B. tabaci* in air was not related to specific time period of the day and did not remain same in all observational weeks.

The perusal of weather data recorded during the study period revealed that when average combined temperature at 7 a.m. during second forthnight of November was comparatively high (14.3° and 12°C in 3rd and 4th week of November). The movement of adults increased sharply from 8 a.m. upto 10 a.m. This might be due to the increased temperature towards noon upto certain temperature threshold. Likewise, during the first week of December, when morning temperature slightly decreased (11.1°C at 7 a.m.) the trap catches comparatively decreased during early morning and peak was obtained one hour late than in the previous weeks. While, during the second week of December, very few adult whiteflies were moving in the air during morning hours between 7 and 9 a.m. as indicated by negligible number of trap catches recorded in this period. This might be due to a very low temperature during that period (8.4° C at 7 a.m.). Thereafter, dispersal flight activity gradually increased towards noon and it was higher between 13 and 16 hours when maximum ambient temperature around 28° C (28.4° C at 14 p.m.). Adults flight activity sharply decreased towards sunset in all days of observations.

These results are similar to those of Gerling and Horowitz (1984) and Byrne and Von Bretzet (1987) on flight activity of *B. tabaci*. In their studies greater number were caught during the day, primarily between 10 and 16 hours. Bellow *et al.* (1988) studied patterns in diel flight activity of the insect and reported that

TABLE 1

Average number of *B. tabaci* adults trapped on yellow sticky traps during different hours of day.

Trapping period	*Average* numbers of whitefly adults trapped/day*				*Mean ***
	November 89		*December 89*		
	Third week	*Forth week*	*First week*	*Second week*	
7 - 8 a. m.	3.00 (± 1.63)	2.47 (± 2.27)	0.61 (± 0.61)	0.06 (± 0.18)	1.42 (± 1.81)
8 - 9 a.m.	10.14 (± 9.88)	4.57 (± 2.37)	1.50 (± 0.92)	0.11 (± 0.27)	3.95 (± 6.14)
9 - 10 a.m.	22.64 (± 28.57)	10.18 (± 5.61)	3.46 (± 3.43)	2.03 (± 2.00)	9.32 (± 15.93)
10 - 11 a.m.	10.50 (± 7.30)	6.36 (± 3.41)	5.57 (± 3.06)	2.34 (± 1.38)	6.06 (± 5.03)
11 - 12 a.m.	7.75 (± 1.10)	5.39 (± 3.38)	5.39 (± 3.59)	3.50 (± 2.58)	5.44 (± 3.08)
12 - 13 p.m.	7.00 (± 3.92)	4.92 (± 2.59)	3.07 (± 1.44)	3.81 (± 2.63)	4.52 (± 3.02)
13 - 14 p.m.	4.75 (± 2.65)	4.65 (± 3.86)	2.54 (± 1.33)	5.09 (± 3.53)	4.18 (± 3.03)
14 - 15 p.m.	2.71 (± 2.07)	3.68 (± 3.89)	3.32 (± 2.30)	6.56 (± 5.12)	4.17 (± 3.84)
15 -16 p.m.	2.25 (± 2.04)	3.82 (± 3.68)	3.61 (± 2.18)	5.06 (± 2.82)	3.73 (± 2.80)
16 -17 p.m.	1.86 (± 1.52)	3.64 (± 3.16)	2.82 (± 1.50)	2.97 (± 2.41)	2.83 (± 2.23)
17 - 18 p.m.	0.86 (± 0.59)	1.25 (± 1.01)	1.64 (± 0.91)	0.88 (± 0.80)	0.96 (± 0.82)
18 - 7 p.m.	0.43 (± 0.47)	0.39 (± 0.59)	0.00 (± 0.00)	0.13 (± 0.35)	0.23 (± 0.43)
Total	73.21	50.21	33.04	36.78	

* Average of four traps. ** Mean of 29 days observations.

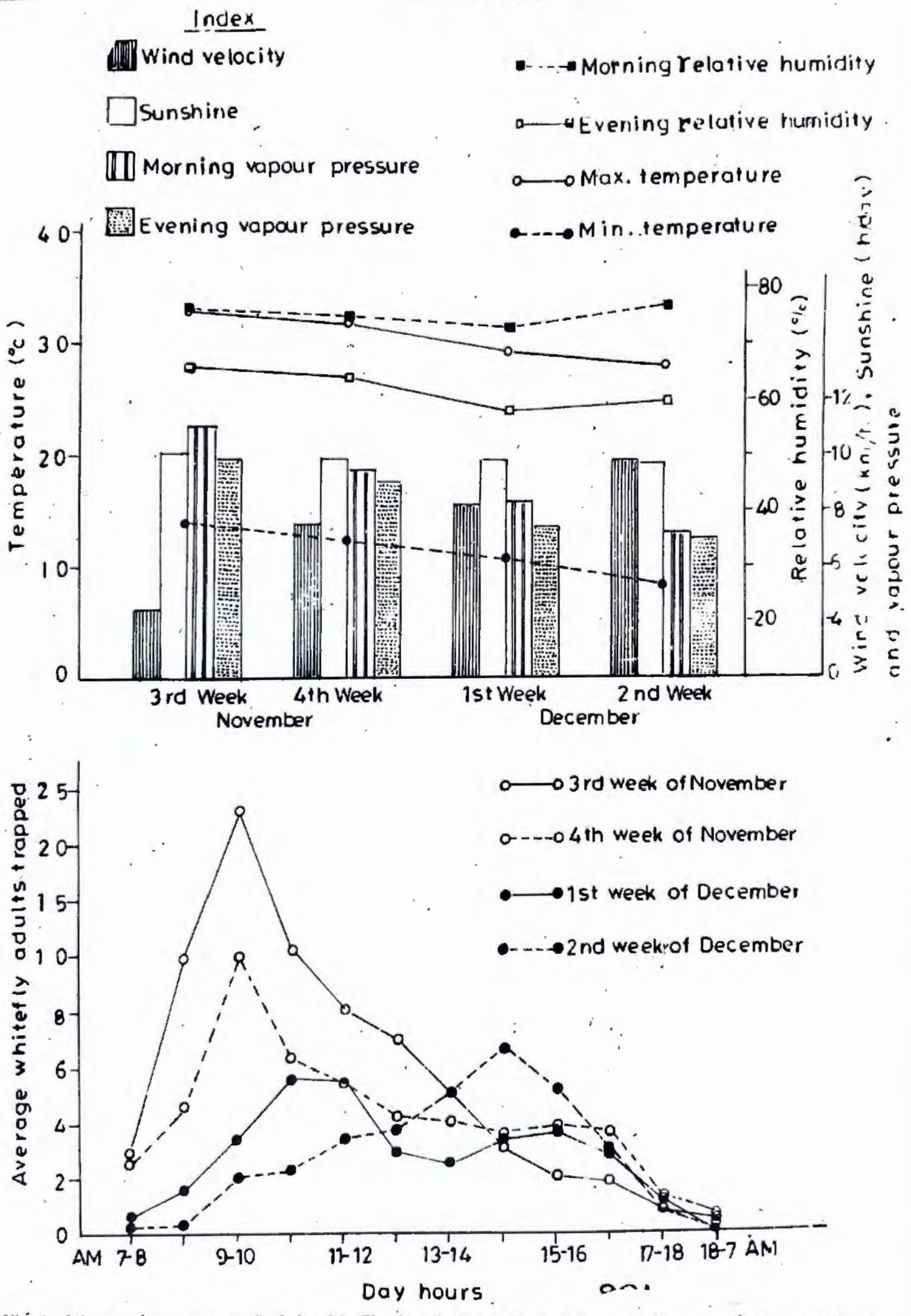

Fig. 1 : Dispersal movement of adult whiteflies in relation to time of day as well as, weather parameters.

adult whiteflies were caught primarily between sunrise and sunset with the general increase in number towards mid day.

The correlation studies indicated that dispersal flight activity of adult whiteflies was strongly and positively correlated with minimum, maximum temperatures and morning vapour pressure as their correlation co-efficient were highly significant (r = 0.480, 0.572 and 0.487, respectively, n = 29). Whereas, the association with wind velocity was found to be negative and highly significant (r = -0.537). The effects of relative humidity, sunshine hours and evening vapour pressure were found to be non significant.

Byrne and Von Bretzel (1987) also found significant positive association between temperature and adults caught. The results of the present study agree with those of Bellow *et al.* (1988), who reported positive and significant relationship between temperature and number of adults caught on traps and non significant relationship with relative humidity. Butler and Henneberry (1989) also reported negatively significant correlation with wind velocity. The present results are almost in agreement with the above results.

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