

Studies on the Population Abundance of Sugarcane

Top Shoot Borer, *Scirpophaga nivella* F.

A. H. Shah*, K. R. Patel** and M. S. Purohit***

Gujarat Agricultural University, Navsari Campus, Navsari

ABSTRACT

An investigation was carried out on the population abundance of sugarcane top shoot borer, *Scirpophaga nivella* F. in relation to preceeding weather conditions by continuously trapping the adult moths every night, for the period from March, 1973 to April 1974 with the help of light trap at the Sugarcane Research Station Farm, N. M. College of Agriculture, Navsari in South Gujarat (latitude 20.°57' N and longitude 72°54' E).

Investigation showed that there existed a negative correlation both for the vapour pressure (in mm) as well as average temperature (in °C) of the previous day and the number of insects captured by light trap, having correlation "r" value, which was significant in both the cases.

(Received on 30th Oct. 1977)

INTRODUCTION

In the study of population of phototropic insects, light trap catches, present a more reliable information than the population counts obtained from simple field surveys. Regular light trap captures have not only been found useful to determine the activity of insect pests in relation to several weather factors but have also helped to study the population dynamics of the insect during particular period (Williams, 1940, 1951, 1961; Banerjee and French 1952, Southwood 1960; Chrichton 1960 as well as Banerjee and Mookerjee 1976).

The present investigation was carried out in *Litoral Paddy—wal* crop zone of Gujarat, on a single species, *Scirpophaga nivella* F., the sugarcane top shoot borer, to study its population dynamics in relation to weather conditions.

MATERIALS AND METHODS

Sugarcane top shoot borer, *Scirpophaga nivella* F., is a serious pest of sugarcane in South Gujarat. Rothamsted light trap was fixed at the Sugarcane Research Station Farm of N. M. College of Agriculture, Navsari in South Gujarat. The killing bottle of

*Professor of Entomology (Department of Entomology)

**Assistant Statistician (Main Irrigation Research Centre)

***Lecturer in Entomology (Department of Entomology)

OBSERVED NO OF INSECTS

$$r = -0.4008^{**}$$

$$R = 0.4252^{**}$$

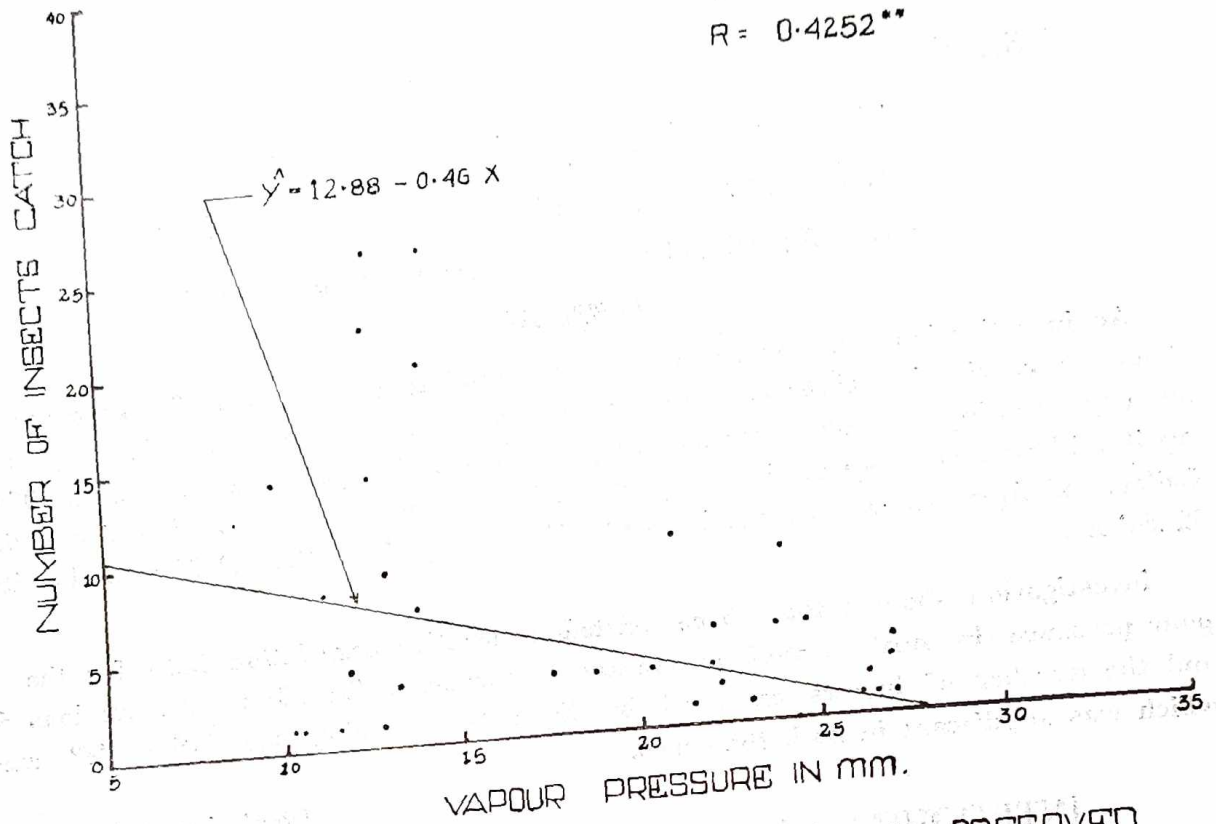
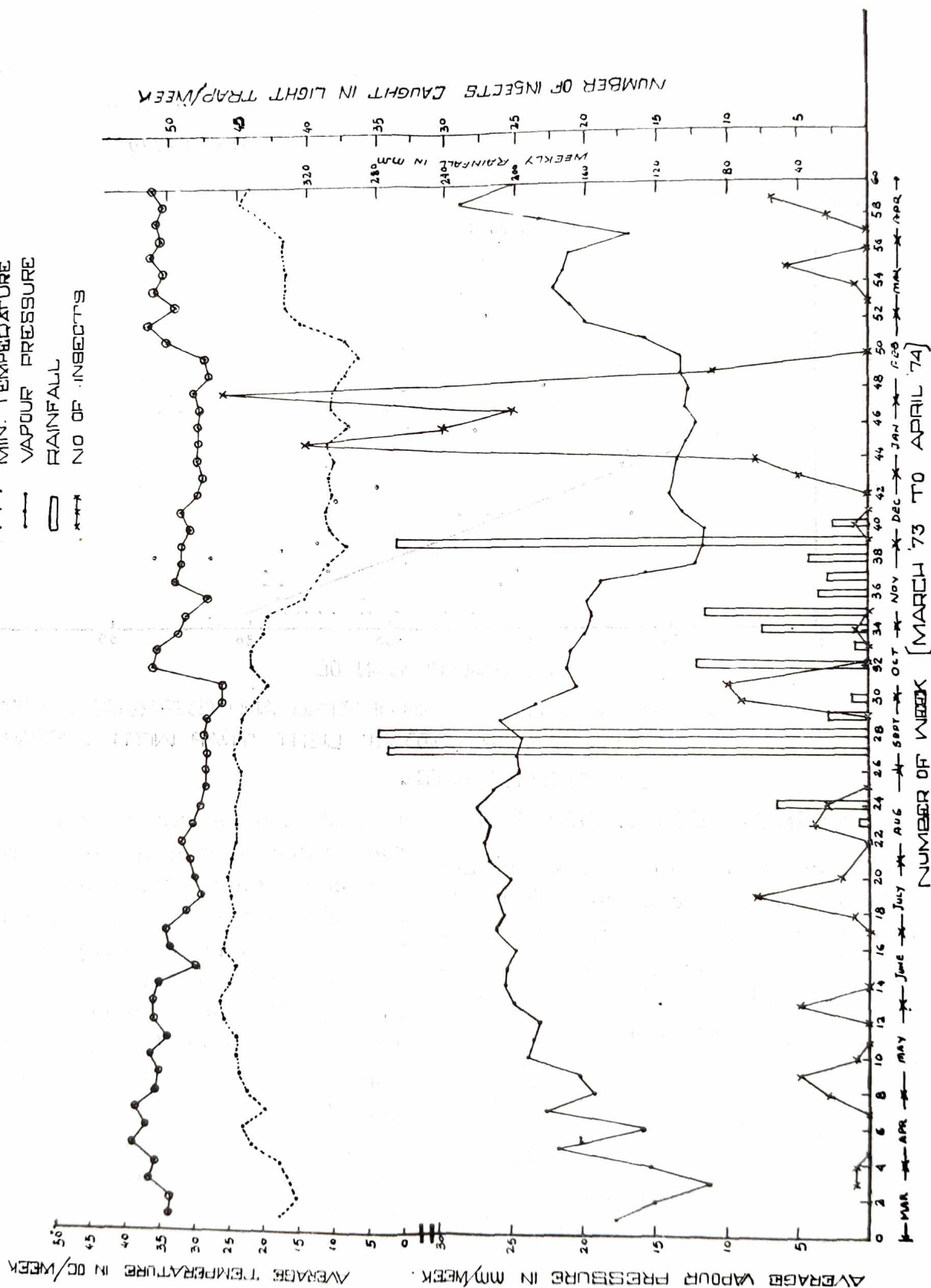


FIGURE:2 THE RELATION OF ESTIMATED AND OBSERVED FREQUENCY OF INSECT CAPTURED AT LIGHT TRAP WITH VAPOUR PRESSURE IN mm.

the trap was charged every third day with potassium cyanide and the lamp (200 watt electric bulb) was used as light source. The trap was placed at a height of 150 cm. from ground level in the open field so that the moths are attracted from a longer distance. The trap was operated every night between 6.00 p.m. and 7.00 a.m. from March, 1973 to April, 1974. Daily catch of *S. nivella* was recorded and has been shown as weekly frequency of insect capture during the period under report (Figure 1). Data on the day to day weather parameters i.e. maximum and minimum temperatures, vapour pressure and rainfall during the period of trapping (March, 73 to April, 74) were collected from the meteorological observatory situated on the farm. The same were worked out as average per week and are shown in Figure 1. Williams (1951) reported that the population changes depend largely on the preceding weather condition. Therefore correlation and regression on number of insect captured in the trap with vapour pressure on the day preceding to insect capture (Figure 2) and the number of insect captured in the light trap with the average temperature on the day preceding to insect capture, (Figure 3) have been worked out.

FIGURE: WEEKLY METEOROLOGICAL DATA AND NUMBER OF INSECTS CATCH AT LIGHT TRAP PER WEEK FOR THE PERIOD MARCH '73 TO APRIL '74.



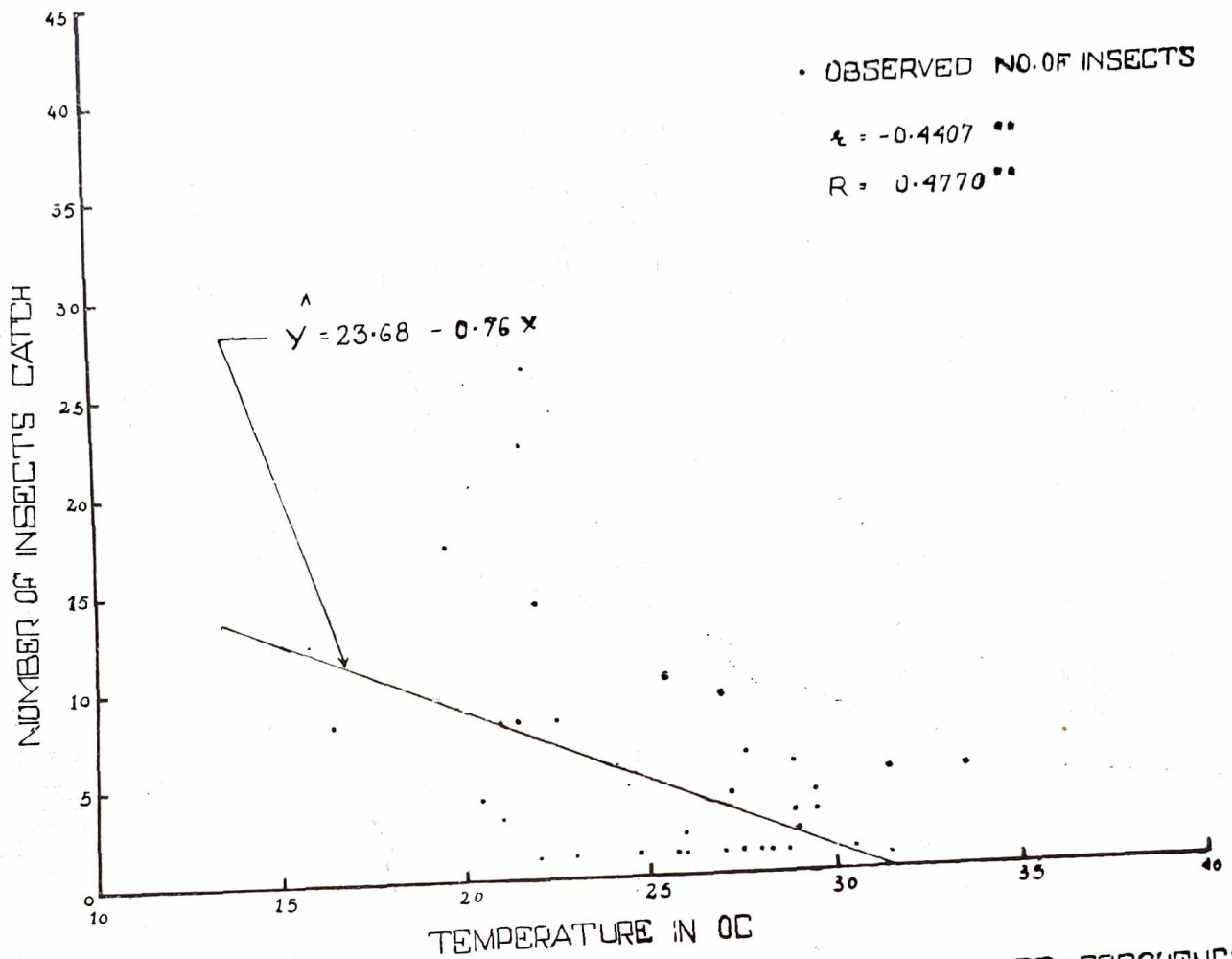


FIGURE:3 THE RELATION OF ESTIMATED AND OBSERVED FREQUENCY OF INSECT CAPTURED AT LIGHT TRAP WITH AVERAGE TEMPERATURE IN °C.

RESULTS AND DISCUSSION

Figure 1 gives the nature and distribution of *S. nivella* in relation to weather condition in different weeks by using the values of weekly insect catch per night, as well as weekly mean of vapour pressure, minimum temperature, maximum temperature and rainfall. It can be seen that *S. nivella* breeds through out the year with five distinct broods per year. This is in concurrence with Patel (1963) who has also reported that in South Gujarat area there are five generations of the pest as found from field observations. The population per week was high

in post monsoon season as well as to some extent during the dry period of monsoon. Figure 1 shows that the number of moths caught during the period of maximum activity (Jan.Feb) correlated with maximum temp. to the tune of 30° C and minimum temp. of 11° C (7° C to 14° C); while the vapour pressure was to tune of 12.5 mm (11.3 to 14.0). Amongst these parameters it was found that the vapour pressure and temperature have definite relationship with the number of insect catch.

Data of vapour pressure of previous day of the insect captured when

TABLE 1

Observed and expected frequency of the sugarcane top borer caught in the light trap in relation to average temperature (°C) and vapour pressure (mm) for the period March 1973 to April 1974.

Observation Number	Temperature in °C	Vapour pressure in mm	Observed frequency	Expected frequency in relation to	
				Temperature °C	Vapour Pressure in mm.
1	2	3	4	5	6
1.	27.0	10.5	1	3.2	8.1
2.	23.6	12.8	1	3.7	7.0
3.	29.6	23.8	0	1.2	1.9
4.	30.0	20.8	0	0.9	3.3
5.	28.9	17.6	3	1.7	4.8
6.	29.5	18.8	0	1.3	4.2
7.	29.5	22.0	5	1.3	2.8
8.	28.9	21.4	1	1.7	3.0
9.	31.2	23.7	0	0.0	2.0
10.	29.9	23.9	0	1.0	1.9
11.	29.1	23.5	0	1.6	2.1
12.	29.0	23.5	0	1.6	2.1
13.	30.8	26.7	0	0.3	0.6
14.	31.3	24.7	5	0.0	1.5
15.	30.5	26.1	1	0.5	0.9
16.	29.5	27.0	4	1.3	0.5
17.	27.2	27.0	4	3.0	0.5
18.	26.0	23.6	2	3.9	1.9
19.	28.3	27.1	1	2.2	0.4
20.	28.1	26.1	0	2.3	0.5
21.	28.9	28.5	0	2.4	0.0
22.	27.5	26.5	1	2.8	0.7
23.	29.5	26.9	3	1.3	0.5
24.	29.0	26.2	2	1.6	0.8
25.	28.8	25.6	1	1.8	1.1
26.	26.5	24.1	0	3.5	1.8
27.	26.3	24.0	9	3.7	1.8
28.	24.0	20.8	10	5.4	3.3

1	2	3	4	5	6
29.	28.5	23.3	0	2.0	2.1
30.	26.0	18.1	0	3.9	4.6
31.	28.0	23.1	1	2.4	2.3
32.	29.7	20.4	0	1.1	3.5
33.	27.1	23.1	0	3.1	2.3
34.	20.5	19.2	0	8.1	4.1
35.	22.6	18.2	0	6.5	4.5
36.	25.6	15.8	0	4.2	5.6
37.	21.5	11.1	0	7.3	7.8
38.	22.0	10.0	0	7.0	8.3
39.	22.0	11.5	1	7.0	7.6
40.	22.1	14.0	0	6.9	6.4
41.	23.0	10.2	1	6.2	8.2
42.	20.4	11.9	4	8.2	7.4
43.	21.5	13.7	8	7.3	6.6
44.	22.0	13.5	14	7.0	6.7
45.	21.7	12.7	26	7.2	7.0
46.	21.4	12.9	8	7.4	7.0
47.	21.6	12.5	22	7.3	7.1
48.	21.5	10.9	8	7.3	7.9
49.	19.6	13.8	17	8.8	6.5
50.	10.7	14.0	20	8.7	6.4
51.	21.8	14.2	26	7.1	6.4
52.	21.0	13.4	8	7.7	6.7
53.	21.0	13.3	3	7.7	6.8
54.	27.5	21.1	0	2.8	3.2
55.	27.1	21.1	0	3.1	3.2
56.	25.6	22.3	0	4.2	2.6
57.	26.3	22.4	0	3.7	2.6
58.	26.0	21.5	1	3.9	3.0
59.	27.9	22.0	3	2.5	2.8
60.	27.0	20.3	3	3.2	3.5
61.	27.5	21.3	0	2.8	3.1
62.	29.1	18.8	3	1.6	4.2
63.	27.6	16.8	2	2.7	5.2
64.	33.5	23.8	5	0.0	1.9

shown on 'X' axis of the graph against the number of insect catch at light trap of succeeding day on 'Y' axis of the graph (Figure 2). It was found that there existed negative correlation. The regression equation worked out was $Y = 12.88 - 0.46X$, and $r = -0.4008$. Considering the trend regarding temperature, the same also correlated negatively with the number of insect captured on succeeding day (Figure 3) having regression equation of $Y = 23.68 - 0.76X$ and $r = -0.4407$. Both these results therefore proved that with decrease in vapour pressure as well as temperature on previous day, the population of *S. nivella* increased significantly on the following day.

In order to assess the relationship between the observed and estimated number of insect captured in the light trap, in relation to the vapour pressure in mm and the temperature, of the preceeding day, graphs were drawn (Figure 2 & 3). These graphs revealed a fairly negative linear trend between the estimated and observed number of insect catch in both the cases. The closeness of fit was judged by working out the 'R' value which was 0.4252 and 0.4770 respectively. The values of 'R' indicating that the closeness of fit was highly significant for both the parameters. This analysis has also indicated the behaviour of *S. nivella* insect with the weather parameter.

These finding are in concurrence with the findings of Banerjee and Mookerjee (1976) who reported that the change in population of *Tryporyza incertulas* (Walk) in relation to preceeding

weather conditions under West Bengal conditions. Gupta (1953), Singh et al. (1957), Agarwal and Siddiqui (1964) as well as Kalra and Sidhu (1965) have emphasized the role of temperature and humidity, in parts of southern India and thus the present findings are also in concurrence with the same. These results are of great practical significant, to forecast the probable increase in populations, number and duration of brood generation, of *S. nivella*, which would ultimately help in deciding timely application of chemicals.

REFERENCES

- Agarwal, R. A., and Z. A. Siddiqui. 1964. Sugarcane pests. Entomology in India, New Delhi. *Ent. Soc. Ind.*: 149-186.
- Banerjee, S. N. and R. A. French. 1952. A note on the variability in the appearance of the brood in some British Lepidoptera. *Proc. R. Ent. Soc. London (A)* **27**: 111-116.
- Banerjee, S. N. and A. L. Mookerjee. 1976. Studies on the changes in population to preceeding weather conditions. *Indian J. Pl. Prot.* **4** (2): 130-148.
- Chrichton, M. J. 1960. A study of captures of Trichoptera in a light trap near Reading Rerkshire, *Trans. R. Ent. Soc. London* **112**: 319-344.
- Gupta, B. D., 1953. Resume of work done in India under the Insect Pests Scheme during 1946-47 to 1950-51. New Delhi, Publ. *Indian Cent. Sug. Comm.* 111 pp.
- Kalra, A. N. and A. S. Sidhu, 1965. Biology of sugarcane top borer, *Scirpophaga nivella* F. in the Punjab. *Indian Sug.* **15**: 37-43.

- Patel, R. M. 1963. Observations on the life history and control of the sugarcane top borer (*Scripophaga nivella* Fabr.) *Indian J. Ent.* **18**: 389-396.
- Singh, H., Kalra, A. N. and A. S. Sidhu. 1957. Incidence of sugarcane top borer in relation to humidity and temperature. *Indian J. Sug. Res. Dev.* **1**: 36-47.
- Southwood, T. R. F., 1960. The flight activity of Heteroptera, *Trans. R. Ent. Soc. London.* **112**: 173-220.
- Williams, C. B. 1940. An analysis of four years capture of insects in light trap part II. The effect of weather conditions on insect activity and the estimation and forecasting of changes in the insect population. *Trans. R. Ent. Soc. London.* **90**: 228-306.
- Williams, C. B. 1951. Changes in insect population in the field in relation to preceding weather conditions. *Proc. R. Soc. (B)* **138**: 130-156.
- Williams, C. B. 1961. Studies in the effect of weather conditions on the activity and abundance of insect population. *Phil. Trans. B.* **224**: 331-378.