https://doi.org/10.29321/MAJ.10.A03342

Madras agric. J. 63 (8—10) : 545—549, Aug.—Oct., 1976

Ecology of Coffee Green Bug, *Coccus viridis* (Green) and its Entomopathogenic Fungus, *Cephalosporium lecanii*: Zimm.

By

S. EASWARAMOORTHI[1] and S. JAYARAJ[2]

ABSTRACT

Under field conditions, the green bug *Coccus viridis* (Green) population was positively correlated and the infection by the fungus, *Cephaloporium lecanii* Zimm., negatively so with mean maximum most and minimum-most temperatures recorded at 8 a.m. and 4 p.m. While maximum-most relative humidity (afternoon) showed nagative correlation with the pest population, forenoon and afternoon mean humidity and maximum most humidity (afternoon) showed positive correlation with the fungus infection. Total rainfall one and two weeks prior to the observation was negatively correlated with the pest population and positively with the fungus infection. The multiple correlation showed the greater influence of temperature than humidity on the pest population as well as on the fungus infection. There existed a negative correlation between the pest population and the natural infection of the fungus.

INTRODUCTION

The White halo fungus, *Cephalosporium lecanii* Zimm., has long been known to infect the coffee green bug, *Coccus viridis* (Green) in several countries (Gustafsson, 1971). The infection by this fungus under field conditions mainly depends upon favourable weather factors. Ritchie (1935) reported that *C. lecanii* exetred little control of the pest during irregular and scanty rainfall periods. Drought conditions are found to reduce its activity. A study was therefore made at Pillaveli Estates, Lower Pulney Hills, Madurai district to investigate the natural infection by *C. lecanii* under field conditions and to determine the favourable weather conditions for its greater infection.

MATERIALS AND METHODS

Five rows of coffee (*Coffea arabica*) bushes were selected in the middle of a field where all plant protection measures were suspended. In each row two bushes and in each bush four branches were selected at random and tagged. In each branch coccid population on the top four leaves were counted. The same bushes were observed throughout the study and the population was expressed as number of coccids per 16 leaves. Forty counts were made during Feb.-April, 1974 and Aug. 74 - Feb. 75 at weekly intervals.

The wet and dry bulb temperatures were recorded twice daily at 8 a.m. and 4 p.m. and the rainfall daily

1-2: Department of Entomology, Tamil Nadu Agricultural University, Madurai.

at 8 a.m. The mean value of the weather data of the week prior to the date of observation was computed in the case of temperature and humidity. In the case of rainfall, total rainfall one and two weeks prior to the date of observation was computed. In addition, the minimum - most values recorded for temperature and maximum - most values recorded for temperature and humidity in the week prior to the observation were also taken into account for correlations.

The influence of weather factors on the incidence of green bug and on the natural infection by the fungus was computed by working out correlation co-efficients. Multiple correlations were also worked out to know the influence of the weather factors.

RESULTS AND DISCUSSION

i) **Population of Green bug:** The green bug population was 528.2 per 16 leaves on February 16, 1974 which slowly increased and reached a peak of 863.7 on March 2, 1974. It then subsided somewhat and reached a second much higher peak of 1088.7 by the end of March 1974. A low population of 184.1 was observed in the first week of August, when the study was continued after a break. The population continued to be low upto the middle of January 1975 and after that it again showed an increasing trend (Table I).

Temperature influenced positively the population and the influence was greater for the mean, minimum-most

TABLE I. Population of green bug and its natural infection by the fungus

Date	Green bug population	% fungus infection	Date	Green bug population	%fungus infection
16-2-74	528.2	13.29	16-2-74	528.2	13.29
23-2-74	732.6	10,21	12-10-74	127.7	46.55
2-3-74	863.7	9.91	19-10-74	133.9	47.72
9-3-74	675.9	13.22	26-10-74	134.3	50.05
17-3-74	704.5	10.91	2-11-74	111.2	50.95
23-3-74	736.4	10.17	9 11-74	97.8	58:57
30-3-74	762.5	10.02	16-11-74	123.9	56.83
6 4-74	790.7	9.10	23-11-74	146.8	48.32
13-4-74	763.0	8.99	30-11-74	193.1	37.24
20-4-74	948.3	6.84	7-12-74	240.8	31.64
27-4-74	1088.7	5.25	14-12-74	238.9	32.66
3-8-74	184.1	24.55	21-12-74	210.3	34.03
10-8-74	246.2	21.30	28-2-75	300.5	24.02
17-8-74	262.8	20.69	4-1-75	288.0	28-82
24-8-74	221.8	29.54	11-1-75	290.6	31.31
31-8-74	186.4	34.69	18-1-75	402.5	25.12
7-9-74	208.6	24.84	25-1-75	458.5	17.81
14-9-74	197.1	23.98	1-2-75	480.0	17.59
21-9-74	220.7	17.91	8-2-75	643.7	12.30
28-9-74	227.9	19.31	15-2-75	692.6	12.10
5-10-74	115.5	45.01			

TABLE II. Correlation between weather elements and the population of green bug and its natural infection by the fungus

Weather elements	Population of green bug	Natural infection by the fungus
Maximum-most temperature C (8 a. m.)	0.609**	-0.900**
Maximum-most temperature °C (4 p. m.)	0.753**	-0.873**
Minimum-most temperature °C (8 a. m.)	0.615**	-0.809**
Minimum-most temperature °C (4 p.m.)	0.765**	-0.854**
Fore-noon relative humidity % (Mean)	-0.242NS	0.507*
After-noon relative humidity % (Mean)	-0.395NS	0.620**
Fore-noon relative humidiry % (Maximum-most)	-0.052NS	0.095NS
After-noon relative humidity % (Maximum-most)	-0.542**	0.604**
Total rainfall one week prior (mm)	-0.407**	0.350*
Total rainfall two weeks prior (mm)	-0.405**	0.488**

* Significant at 5% level ** Significant at 1% level NS Not Significant

and maximum-most temperature values at 4 p.m. than at 8 a.m. There was no significant influence by relative humidity except for the high negative correlation the maximum-most relative humidity (afternoon) with the pest population (Table II). The multiple correlation showed the greater influence of temperature (x_1) than the humidity (x_2) on the green bug population ($Y = -355.63 + 0.722^{**}x^1 - 0.063\ x_2^{NS}$). Total rainfall received one and two weeks prior did not favour the build-up of green bug population as seen from significant negative correlation (Table II).

The green bug population was high in the hot, less rainy months of February and March and low in cool and rainy months. Ritche (1935) reported that green bugs occurred during period of scantly and irregular rainfall while Gopalakrishnan (1973) observed the pest to reach serious proportions during drought periods.

ii) **Fungus infection:** When the study was stared, 13.3 per cent fungus infection was noticed on 16-2-74 which decreased progressively and reached the minimum of 5.3 per cent by the end of April. From the first week of August up to the middle of September it condinued to be more than 20 per cent. From the first week of October, the fungus became very active and maximum natural infection of 58.6 per cent was seen on November 9, 1974 (Table I).

Temperature influenced negatively the fungus infection and the maximum-most temperature at 8 a.m. seemed to have greater influence. The mean relative humidity of the afternoon showed a high positive correlation followed by the maximum-most relative humidity (afternoon) (Table II). Greater influence of temperature (x_1) than humidity (x_2) was evident from the multiple correlation ($Y = 69.85 - 2.318^{**}\ x_1 + 0.166\ x_2^{NS}$). Total rainfall received two weeks prior showed greater positive associa

tion than the total rainfall one week prior (Table II).

Temperature and humidity had shown significant negative and positive correlations respectively with the fungus infection. In the invasion of entomogenous fungi through the integument, the temperature range for massive mortality due to mycosis extends lower than usually observed with other diseases (Muller-Kogler, 1965). According to Bosch *et al.* (1959) low temperature and high humidity favoured epizootic by *Entomophthora exitialis* in the populations of *Therioaphis maculata* Buck.

The influence of rainfall had already been reported in the case of *Beauveria bassiana* by Bobb (1965) and in the case of *Entomophthora aphidis* and *E. fresenii* by Berthelem *et al.* (1969). Dean and Wilding (1971) established the importance of rainfall 1-2 weeks prior to cause epizootic in the case of alfalfa and cereal aphids by *Entomophthora* sp.

The greater effect of temperature on the fungus infection than humidity observed now is in accordance with the results of Getzin (1961). The infection by different fungi at low humidities was observed in the case of *Pyrausta nubilalis* (Hubn.) (Toumanoff, 1933) and by *B. bassiana* in the case of *Carpocapsa pomonella* (L.) (Jaynes and Marucci, 1947).

iii) Relationship between green bug population and the fungus infection : It was evident that when the level of fungus infection goes down, there was a flare in the pest population ($r = -0.648^{**}$). This can be favourably compared with the reports of Hurpin (1967) that entomogenous fungi are only imperfectly density-dependent.

ACKNOWLEDGEMNT

The authors are grateful to Mr. W. P. A. R. Nagarajan and Mr. W. P. A. R. Rajaram for their constant help in the conduct of this study. The financial support given by the Indian Council of Agricultural Research, New Delhi is gratefully acknowledged. This paper formed a part of dissertation submitted to the Tamil Nadu Agricultural University by the senior author.

REFERENCES

BERTHELEM, P., J. MISSONNIER and Y. ROBERT. 1969. The black aphid *Aphis fabae* and the cultivation of spring broad beans *(Vicia fabae)*. Factors limiting the population of the insect and possibilities of extending cultivation in the West of France. *Annls. Zool. Ecol. Anim.*, 1: 183-96.

BOBB, M. L. 1965. Insect parasite and predator studies in a declining sawfly population. *J. econ. Ent.*, 58 : 925-26.

BOSCH, R. V. D., E. I. SCHLINGER, E. J. DIETRICK and I. M. HALL. 1959. The role of imported parasites in the biological control of the spotted Alfalfa aphid in Southern California in 1957. *J. econ. Ent.*, 52 : 142-54.

DEAN, G. J. and N. WILDING. 1971. *Entomophthora* infecting the cereal aphids *Metopolophium dirhodum* and *Sitobion avenae*. *J. Invertebr. Pathol.*, 18 : 169-76.

GETZIN, L. W. 1961. *Spicaria roleyi* (Farlow) Charles, an entomogenous fungus of *Trichoplusia ni* (Hubner). *J. Insect Pathol.*, 3 : 2-10.

GOPALAKRISHNAN, P. 1973. "Green-bug" on the Shevaroys. *Indian Coffee*. 36 : 1

GUSTAFSSON, M. 1971. Microbial control of aphids and scale insects. In *Microbial Control of Insects and Mites* (Burges, H. D. and M. W. Hussey. Ed.). Academic Press, London, pp. 375-84.

HURPIN, B. 1967. In *"Insect Pathology and Microbial control"*. North-Holland Publ. Co., Amsterdam. pp. 135-61.

JAYNES, H. A. and P. E. MARUCCI. 1947. Effect of artificial control practices on the parasites and predators of the codling moth. *J. econ. Ent.*, 40 : 9-25.

MULLER-KOGLER, E. 1965. In *"Pilzkrankheiten bei Insekten"*. Verlag Paul Parey Hamburg and Berlin. pp. 130.

RITCHIE, A. H. 1935. Rep. Entomologist. *Rep. Dept. Agric. Tanganika*, 1934, 73-83.

TOUMANOFF, C. 1933. Action des champignous entomophytes surla pyrale du mais *(Pyrausta nubilalis)* *Ann. Parasitol Humine Comparee.*, 11 : 129-43.