Journal of Plantation Crops 21 (Supplement) : 182-185 (1993)

A MANAGEMENT SCHEDULE FOR THE COCOA MEALY BUG *PLANOCOCCUS LILACINUS* CKLL. BY SPOT APPLICATION OF INSECTICIDES

C. P. RADHAKRISHNAN NAIR

Central Plantation Crops Research Institute, Regional Station, Kayangulam, Krishnapuram 690 533, Kerala.

ABSTRACT

***Planococcus lilacinus* Ckll. which has a wide distribution in all the cocoa growing tracts of India is the dominant species of mealy bug on the crop. Various species of attendant ants, particularly the red ant *Oecophylla smaragdina* Fab., are seen consistently associated with mealy bug colonies. Observations on symbiotic relationship of the ants with the mealy bugs suggest that the pest can be indirectly managed by tackling the attendant ants. In cocoa the build up of the pest commences with the cessation of rains in October-November and the activity of ants also begins simultaneously. A field trial revealed that spot applications of insecticides at their initial population build up were significantly effective in maintaining the pest population and its natural enemies in a garden where the ant population was regulated periodically revealed that predation of the mealy bug by natural enemies was effective till the onset of the summer season. The advantages of spot application of insecticides over the blanket application of insecticides which is generally practised for control of the pest are discussed in the paper.**

INTRODUCTION

A catalogue of insect pests reported by Nair (1981) included 54 species of insects associated with Cocoa (*Theobroma cacao* L.) in India. Among the insect pests of cocoa reported from India, the mealy bug *Planococcus lilacinus* Ckll. is the dominant species. In nature, the mealy bugs are attended by various species of symbiont ants and they augment the movement and dispersal of the mealy bugs. Investigations caried out at the Central Plantation Crops Research Institute, Regional Station, Vittal, Karnataka on the fluctuation in population of *P. lilacinus* revealed that the lowest level of population of the pest was during rainy months (July-August)and the peak levels during summer months(April-May). Normally the pest is controlled in the field during its peak period of incidence by the blanket appliation of insecticides given as foliar sprays at monthly intervals (Nair, 1979). Taking into consideration the disadvantages of the above recommendation, the possibility of minimizing the pesticidal application was considered and appropriate alterations of the existing practice were tested in the field. The result of these investigations are discussed in this paper.

MATERIALS AND METHODS

Two field experiments were carried out at Vittal, Dakshina Kannada district, Karnataka and Karukachal, Kottayam district, Kerala with an objective to reschedule the period of application of insecticides for manoeuvring the pest population. Only spot application of insecticides was resorted to with a view to minimizing the use of pesticides. The pest population was monitored at monthly intervals and whenever the pest incidence was over 25 per cent an insecticide (monocrotophos or fenthion) was applied at a concentration of 0.05 per cent. The insecticides were alternated for each spray. The pest incidence at pre-treatment and post treatment periods was assessed by way of percentage of plant population lodging the pest.

Observations on symbiont ants were made in a cocoa garden at Vittal for a period of two years at monthly intervals. Occurrence of various species of ants was recorded to study their dominance during different months of the year. The ant species associated with the pest were collected and identified by the Commonwealth Institute of Entomology, London, U. K.

For regulating the insecticidal application on various plant parts of cocoa it was felt necessary to study the pattern of incidence and build up of the pest population and the symbiont ants. Hence, observations on these aspects were also made at monthly intervals for a period of 24 months at Vittal. Correlations were worked out between the association of symbiont ants and the spread of mealy bug incidence.

Observations were made on the incidence of natural enemies in a garden at Vittal where populations of the pest and the symbiont ants were regulated through insecticidal spray and the data were compared with those collected from a field where no such regulations were attempted. Five samples each of the mealy bug colonies on pods were collected from the above gardens at 15 days interval and they were kept under observation for emergence of natural enemies in the laboratory.

RESULTS AND DISCUSSION

Analysis of the data on spot application of insecticides revealed that this method was highly effective in maintaining the pest incidence at lower level of less than 15 per cent. The effect of the insecticidal application lasted for a period of 45 days. The percentage of pest incidence at both the locations before and after insecticidal application showed significant difference (Table I).

The residual effect of spot application of insecticides was evident by the incidence of the pest after 45 days of insecticidal spray. Based on the observations on pattern of build up of the pest it was concluded that starting with post monsoon period in November-December a total of 4-5 spot applications may be required to curtail the pest incidence.

Table I. Table of means showing per cent incidence of *P.lilacinus* in the spot application method

Observational period	Pest incidence (%) at	
	Vittal	Karukachal
Pre-treatment (Nov. - Dec.)	31.80	37.75
Post- treatment (May - June)	11.42	13.71
't' value	5.44**	2.81*

** Significant at P = 0.01 * Significant at P = 0.05

The pest population build up in cocoa starts in the inner canopy level starting with the cushions on the main trunk mostly, the build up of mealy bug colonies and attendant ants spreads to other areas and ultimately it spreads to the outer canopy area. Hence in the field earlier spot application of insecticides can be restricted to inner canopy areas.

Tbe major symbiont ant species associated with *P. lilacinus* in the field were *Oecophylla smaragdina* Fab., *Technomyrmex sp., Solenopsis geminata* F., *Anoplolepis longipes* Jerd. and *Monomorium* sp. The first two species were found to have a stronger association with the pest. During peak period of pest incidence a higher number of plant population lodged *O. smaragdina* followed by *Technomyrmex sp.*

Observations on the interaction of the attendant ants with *P. lilacinus* revealed that a significant positive correlation existed between spread of the mealy bug incidence and association of *O. smaragdina* (r = 0.42). No significant correlation could be observed between the pest incidence and independent occurrence of other species of ants. In general, the build up and spread of *P. lilacinus* had a positive correlation with the build up of the associate ants. The correlation coefficient on the same worked out for the incidence of these insects for two locations was highly significant (r = 0.79^{xx} and 0.99^{xxx}). This explains that the activity of the symbiont ants promoted colonization and dispersal of mealy bugs from plant to plant. Working on these points Strickland (1951) reported *Planococcoides njalensis* (Laing), the vector of cocoa swollen shoot virus (CSSV) in West Africa having a close association with the ants and its population density being so high when tending species of ants were present and *vice-versa.*

P. lilacinus is regulated to a certain extent by the activity of predators like *Spalgis epius* Westwood (Lepidoptera: lycaenidae) and *Pullus sp.* (Coleoptera : coccinellidae). Observations on

the incidence of these predators in a garden where spot application of insecticides was carried out revealed that the incidence of natural enemies ranged from 0-60 per cent as compared to 0-40 per cent in an unsprayed garden during post-monsoon period when the pest population build up commenced. Attempts on the establishment of the exotic predator (*Cryptolaemus montrouzieri* Mulsant) for biocontrol of *P. lilacinus* on cocoa did not yield fruitful results. In this instance it was observed that the attendant ant *O. smaragdina* has been detrimental to the activity of the predator. The activity of ants has been reported to be one of the limting factors for the establishment of *C. montrouzieri* (Chacko *et al.*, 1978).

Spot application of insecticides for regulation of the attendant ants and the build up of the pest shall be helpful in further attempts on the establishment of natural enemies. The above method of judicious application of pesticides avoided a blanket application of chemicals over a large canopy area during summer months when the pest population occupied almost the entire inner and outer canopy areas of the plant. The experimental evidences on the use of spot application method are suggestive of its feasibility in an integrated pest management system against the cocoa mealy bug *P. lilacinus*.

ACKNOWLEDGEMENT

The author is grateful to the late Dr. K. Shama Bhat, former Joint Director, CPCRI Regional Station, Vittal and Dr. K.V. Ahamed Bavappa, formerly Director, CPCRI, Kasaragod for the facilities provided. Thanks are also due to Shri B. P. Nair, presently Asst. Director, Central Silk Board,Bangalore for the statistical analysis of the data and to Shri G. B. Pillai, Principal Scientist (Retd.) for critically going through the manuscript.

REFERENCES

CHACKO, M.J., KRISHNAMOORTHY BHAT, P., ANANDA RAO, L.V., DEEPAK SINGH, M.B., RAMANARAYAN, E.P. and SREEDHARAN, K. 1978. The use of the Ladybird beetle *Cryptolaemus montrouzieri* for the control of coffee mealy bugs. *J. Coffee Res.* 8(1) : 14-19.

ENTWISTLE, P.F. 1972. Pests of Cocoa. Longman Group Ltd. Londoon 779 pp.

NAIR, C.P.R. 1979. Effect of some insecticides on the control of cacao mealy bug. Proc. PLACROSYM-II. eds. C.S. Venkataram *et. al.* UPASI, Cinchona 461-465 pp.

NAIR, C.P.R. 1981. Investigations on insect pests of cacao *Theobroma cacao* L. in Kerala with special reference to the mealy bug *Planococcus lilacinus* Ckll. (Homoptera : Pseudococcidae). Ph.D. Thesis submitted to Kerala Agricultural University, Thrissur, Kerala 156 pp.

STRICKLAND, A.H. 1951. The entomology of Swollen shoot of cacao II. The bionmics and ecology of the species involved. *Bull. ent. Res.* **44** : 65-103.

DISCUSSION

A.G.S. REDDY : *Planacoccus lilacinus* is also found in coffee where the natural predator lady bird beetle is released so as to give biological control. Only thing is that, the predator being voracious feeder, needs the prey in plenty. It is that the predator has to be periodically released. This is the situation in coffee. How it is in cocoa on the build up of mealybug? Is there any other species of mealybug found in cocoa.

C.P. RADHAKRISHNAN NAIR : In cocoa the predatory lady bird beetle *Cryptolaemus* was released for two years. The release was done during March-May i.e., during peak period of the pest incidence. But due to the higher activity of the associated ant, *oecophylla* the predator could not establish in the field. In isolated cases the beetle was found feeding on cocoa mealybug after a few days of release in the absence of *Oecophylla*. But in due course, as the *Oecophylla* ccupied almost all cocoa plants by trans-canopy migration, the predator vanished. Perhaps, in the light of the present findings a reattempt on the colonisation of the predator from October-November when the an activity is very minimum can be made.

B. RADHAKRISHNAN : What were the insecticides you have tested. Are they beneficial to the natural enemies?

C.P. RADHAKRISHNAN NAIR : The insecticides used were fenthion/monocrotophos (0.05%) each one alternated. These insecticides were used only in spot application method. Thus to that extent the hazards are minimised. The residual action of these insecticides on natural enemies has not been studied.

M. ABDUL KALAM : By costwise, how much you can save by spot application as to the normal method?

C.P. RADHAKRISHNAN NAIR : Costwise the spot appllication method works out to one third of the cost involved in blanket application method in an year.