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The Seasonal Occurrence and Control of the Cocoa Stem Borer, *Eulophonotus myrmeleon* Fldr. (Lepidoptera: Cossidae) on Cocoa in Ibadan, Nigeria

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Abstract: Among the stem borers attacking cocoa, *Eulophonotus myrmeleon* was observed to be the most important at CRIN headquarters, Ibadan, Nigeria. Pest incidence increased during the rainy season with total values of 81.6, 84.1 and 75.5% within a span of four months (April to July) in 2003, 2004 and 2005, respectively. Very low pest incidence occurred during the dry season. The percentage of damaged trees, as a result of the feeding activities of the stem borer, ranged from 4.6 to 5.8% per year, a proportion that is considered high for a tree crop like cocoa. Due to the nature of damage inflicted on the plant, recovery from *E. myrmeleon* damage is rarely possible. The generally acceptable physical means of control of poking the insect within the hole with a wire, - a common practice among farmers, proved inefficient. However, spraying the adult moths twice with insecticide during their active reproductive phase coupled with the physical control, gave an effective control as pest damage was reduced to as low as 1.3 and 0.7% in 2004 and 2005, respectively. This paper therefore highlights the incidences of the borer at different times of each year under study and attempts at developing an Integrated Pest Management (IPM) strategy at controlling *E. myrmeleon.*

Key words: *Eulophonotus myrmeleon* % Seasonal occurrence % Incidence % Integrated pest management

INTRODUCTION

Cocoa is an important export crop in Nigeria, Ghana, Cote d'Ivoire, Cameroun, Togo and Sierra Leone. In 1992, 59.9% of the world's cocoa was produced by Africa, 25.5% by Latin America and the Caribbean and the remaining 14.6% by Asia and Oceania [1]. Nigeria reported her first cocoa export in 1900 [2]. By 1914, Nigeria was producing only about 4,000 tonnes per annum and this was less than two percent of the total world production. Between 1913 and 1930, Production increased to about 80, 000 tonnes per annum. Nigeria's cocoa production continued to soar and by 1965, it had become the second largest producer in the world with an annual output of about 270, 000 tonnes. This was equivalent to 18% of world production [2]. Cocoa export has been a significant factor in the economic growth of Nigeria. In 1969 alone, cocoa earned N106 million, which accounted for 40% of all agricultural exports for that year [2]. Today, Nigeria is the fifth largest producer of cocoa in the world after Cote d'Ivoire, Ghana, Indonesia and Brazil [3]. This was not so in the 1970's when Cote d'Ivoire was placed distant third in Africa with 143, 000 tonnes behind Nigeria's 196, 000 tonnes. Nigerian cocoa output has declined from over 300,000 tonnes to 155,000 tonnes with average annual growth rates declining from 8.3% during the 1992-1996 period to 1.8% during the 1997-2001 period.

Yield loss of cocoa attributable to insect pest infestation is quite enormous. Estimation of crop losses due to capsids are always complicated by the inadequacy of records and the complexity of losses from other causes such as fungal and viral diseases and drought. Crop losses in cocoa due to capsids and mealybugs have been estimated at 25-30% per annum [4]. In 1957, crop loss in Ghana attributed to capsid damage alone was estimated at 60,000 to 80,000 tonnes of dry cocoa (i.e. about 25%) [5]. Yield loss may be as high as 75% in cocoa farms attacked by capsids and left unattended for a period of over three years [6].

Stem borers have been reported in the past as minor insect pests of cocoa and those found occurring on cocoa include *Phosphorus virescens, Phosphorus gabonator, Tragocephala castnia* and *Apate monachus.* These pests were also found in other tree crops such as kola and coffee[7, 8, 9, 10]. However, in recent times, it has been observed that damage caused by cocoa stem borer, *Eulophonotus myrmeleon* Fldr. (Lepidoptera: Cossidae) is becoming increasingly important. During a field trip to

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farmers' farms in Wasimi and Idanre in Ondo State (Anikwe, J. C. Pers. Com.), which represent the heartbeat of cocoa production in Nigeria, high damage symptoms of this Lepidopterous insect pest were observed in farmers' farms. Indeed, the cocoa stem borer, which had been reported in Nigeria, before now as a minor insect pest, is fast becoming a major pest of cocoa and urgency must be given to its study in order to evolve a sound control measure for this pest.

This study was therefore conducted at the Cocoa Research Institute of Nigeria (CRIN), Headquarters in Ibadan to investigate the importance of the stem borer, *E. myrmeleon* as a major pest of cocoa in Nigeria and to identify the best possible way of controlling the pest that will be environment friendly, cost effective and less laborious to farmers.

MATERIALS AND METHODS

Study Site: The study was carried out between January 2003 and December 2005 at two separate cocoa plots of 1-hectare size each located at CRIN Headquarters, Ibadan.

Each plot was sub-divided into four blocks containing 240 mature cocoa trees giving a total of 960 trees per study site. The two plots were selected and classified in each site based on treatment or no treatment application. The plot on which the stem borer was controlled was referred to as 'Treated plot' whereas the plot on which there was no control of any sort of the stem borer was referred to as 'Untreated plot'. Weather parameters (rainfall, temperature and relative humidity) were recorded throughout the study period.

Seasonal Occurrence of the Cocoa Stem Borer, *E. myrmeleon* in Ibadan: The sampling protocol targeted observations on damage inflicted to the trunks and main branches of the cocoa tree as a result of the boring activities of the active stage (larval) of *E. myrmeleon*. Monthly field observations on the incidence of the insect pest were made from both plots between 8.00 hours and 15.00 hours GMT. Observation was made on each tree by closely looking at the trunks and main branches for damage symptoms caused by the pest to a height of 1.5 m. Damage was recorded numerically as found on each tree and no rating key was used to categorize damage. The damage on cocoa trees was recognized by the bored hole found in the trunk of the tree usually at hand height and exudates were seen just at the entrance of hole and frass mingled with deposits of wood shavings were seen at the entrance of hole and at the base of freshly damaged trees.

Control of the Cocoa Stem Borer, *E. myrmeleon* in Ibadan: The first year (2003) was characterized by the use of physical control method on the treatment plot as employed by the local farmers. Such physical control practice, which involved the poking of the holes tunneled by the larvae with a poking stick or wire would not only kill the larvae but in addition stopped further damage by the active stage of the insect pest. In the second year, early season control of the pest along with other foliar pests started in April 2004 at the treated plot. The treated plot was sprayed twice with insecticide (Diazinon 600EC) at the recommended dosage rate of 0.25% active ingredient on a monthly basis starting from April and this coincided with the period when the adult moths were present and active in the field. Chemical spray was repeated in 2005 on the treated plot as in the previous season coupled with the popular physical practice of poking fresh holes created by the larvae of *E. myrmeleon*. The total yearly damage incidences on treated and untreated plots were compared.

RESULTS AND DISCUSSION

Seasonal Occurrence of the Cocoa Stem Borer, *Eulophonotus myrmeleon*: The result of the three-year study on the seasonal occurrence of the cocoa stem borer at CRIN Headquarters, Ibadan is presented in Table 1. Damage caused by *E. myrmeleon* was very devastating during the full establishment of the rainy season. The highest number of freshly bored trunks was observed in May 2003 and 2004 whereas the peak damage occurred in June 2005 (Table 1). Within a space of four months in the rainy season (April to July), 81.6, 84.1 and 75.5% of the total damage by the pest occurred in 2003, 2004 and 2005 respectively. The mean monthly records of relative humidity, temperature and total monthly rainfall from 2003 to 2005 are summarized in Fig. 1. It appeared that rainfall

Table 1: Prevalence of the cocoa stem borer, *E. myrmeleon* on cocoa in Ibadan, Nigeria

	Total number of freshly damaged trees per month		
Months	2003	2004	2005
January	2	0	1
February	1	0	2
March	3	2	2
April	10	8	10
May	12	13	10
June	11	9	11
July	7	7	9
August	2	3	5
September	1	1	2
October	0	1	1
November	1	0	0
December	0	0	0

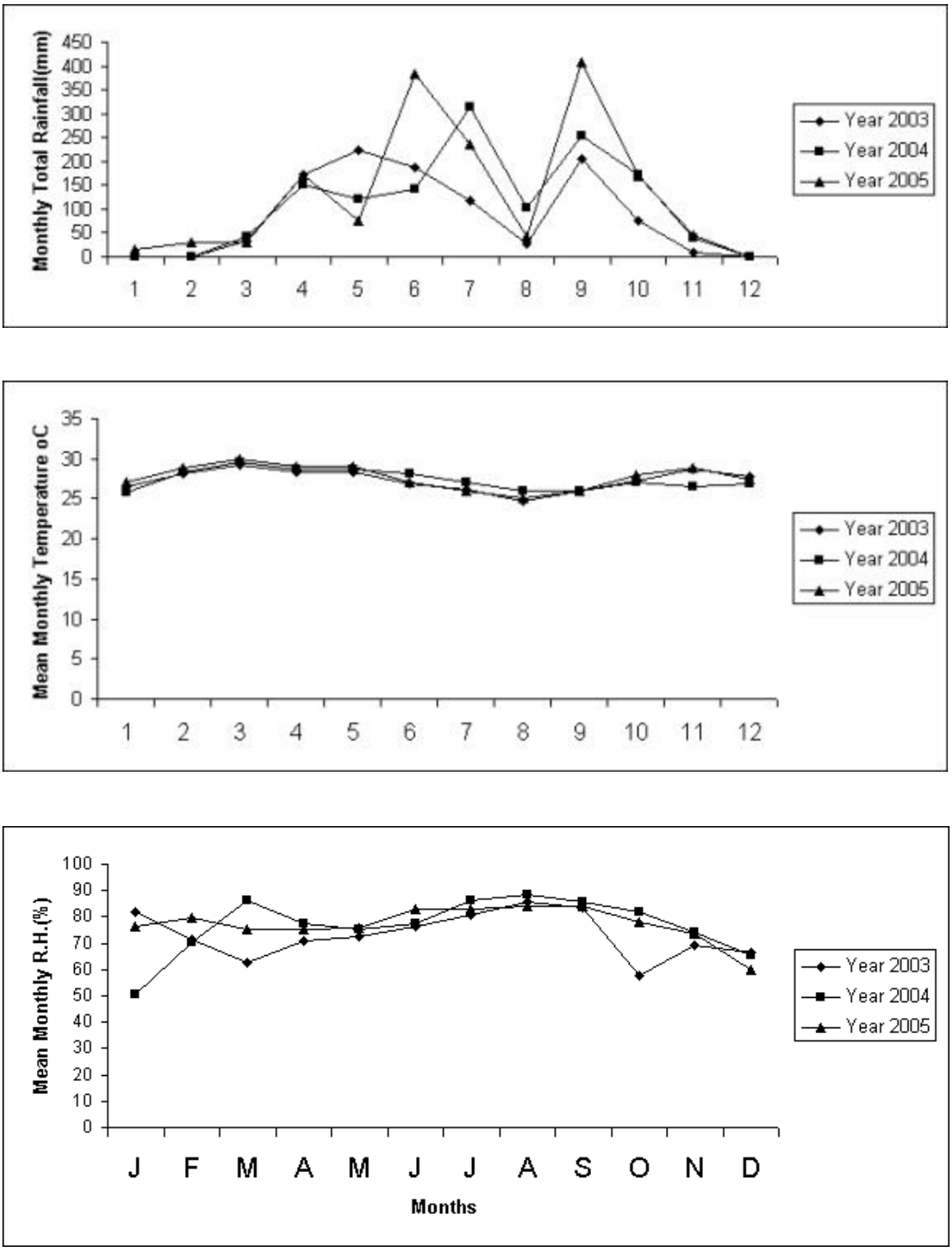

Fig. 1: Total monthly Rainfall, Mean monthly Temperature and Relative Humidity at CRIN Headquarters, Ibadan, Nigeria

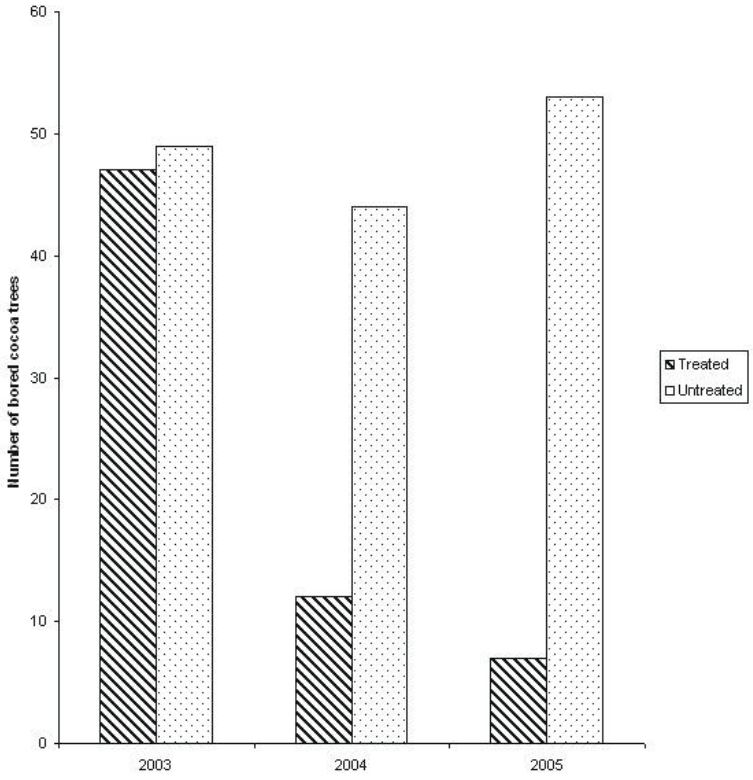

Fig. 2: Incidence of *E. myrmeleon* on treated and untreated cocoa plots in Ibadan, Nigeria

played a major role in the reproductive and developmental activities of *E. myrmeleon* on cocoa as increase in the incidence of the insect pest was observed during the rainfall period. Only one larva of *E. myrmeleon* was observed within a tunnel of cocoa tree bored by this insect pest.

Recent damage caused by *E. myrmeleon* is characterized by the presence of wood shavings and frass deposits at the entrance of the hole in the trunk and at the base of the cocoa tree. In addition, emissions of gummy mucilage exudates were noticed flowing off from the entrance hole down the trunk of the tree. A combination of these symptoms makes the damage by *E. myrmeleon* peculiar to the cocoa plant and gives an idea of the extent of damage inflicted on cocoa by this important insect pest of cocoa, which is fast assuming a major pest status. Damage progression is characterized by drop in fruit production, sudden death or die back of the cocoa tree. The other stem borers such as *Tragocephala castnia* and *Phosphorus virescens*, which are both beetles and minor pests of cocoa, were not encountered during this study period.

Incidentally, no fresh damage was recorded in December throughout the study period and only one recently damaged trunk was found in November 2003. There was a generally low pest occurrence during the dry season and this may probably be as a result of the inactivity of the adult moths observed during this period. However, there is the need to generate more quantitative data on the seasonal occurrence and to have a sound knowledge of the biology of the pest before an effective and sustainable control strategy can be developed.

Incidence and Control of the Cocoa Stem Borer, *E. myrmeleon:* A total of 50, 44 and 53 trunks were bored out of the 960 cocoa trees sampled in 2003, 2004 and 2005, respectively and these corresponded to 5.1, 4.6 and 5.8% damaged trees respectively (Fig. 2). Indeed, for tree crops, these are appreciably high pest incidences vis-à-vis the damage pattern of *E. myrmeleon.* The cocoa tree seldom recovers from the damage inflicted on it by the stem borer. However, prior to this period, *E. myrmeleon* was only documented as one of the insect pests found in rehabilitated cocoa plot at CRIN Headquarters [10]. Various authors have reported the presence of some other stem borers as minor pests of cocoa. For example, Daramola [7] and Ojo [8] reported that the larvae of *Tragocephala castnia* Thoms.

(Coleoptera: Cerambycidae) were found to bore into the stems of kola and cocoa trees. [9] reported *Phosphorus virescens* and *Phosphorus gabonator* (Coleoptera: Cerambycidae) as two species of stem borers affecting kola trees, which have been occasionally seen in cocoa farms. *Apate monachus* F. (Coleoptera: Bostrychidae), a polyphagous pest, was reported as a minor pest attacking the trunks of robusta coffee in Nigeria [11]. Figure 2 also shows the effect of damage by *E. myrmeleon* on the plot with application of physical control of poking larvae within the hole in the first year and subsequently, treated with minimal insecticide. The result showed a very high pest incidence of 5.2% of damaged trees compared with 5.1% in the untreated plot in 2003. However, there were significant declines in the incidence of the pest in 2004 and 2005 to 1.3 and 0.7% damage, respectively as a result of the minimal insecticide applications undertaken both years in addition to the physical practice. The insecticide sprays targeted only the adult moths at a time when they were about to begin active reproductive activity in the field. Moreover, the developmental stages (egg-larva-pupa) are concealed within the plant tissue where chemical insecticides could not reach. The result showed that physical method alone remained inefficient for the control of *E. myrmeleon.* This result proved that poking of the larvae within the holes could not prevent pest damage and so was not effective, as damage to the trees would have occurred. It was, however, observed that when these larvae were poked at the early stages of attack, further damage to the trees would be halted and the development of secondary symptoms of attack arrested.

The timing of spray of insecticide (in April) is contrary to the recommended schedule of anti-capsid sprays, which begins in August in Nigeria and continues monthly afterwards till December [12]. The issue here is that cocoa Entomologists have over the years neglected the control of insect pests of cocoa other than mirids and the control of cocoa capsids (mirids) have been erroneously accepted to be synonymous with control of other insect pests of cocoa. This assertion is further corroborated by Idowu [12] when he stated that the economic relevance of the cocoa mirids has almost completely diverted attention from intensive studies of the minor insect pests of cocoa. The resurgence of the cocoa stem borer, *E. myrmeleon* in cocoa farms in Nigeria as observed in this study may not be unconnected with the above-mentioned reason. The minimal use of insecticide coupled with the use of cultural/physical control is geared towards developing an Integrated Pest Management strategy for the control of the pest.

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REFERENCES

1. Mariau, D., 1999. Integrated Pest Management of Tropical Perennial Crops. Science Publishers, Inc. USA., pp: 167.
2. Opeke, L.K., 2003. Increasing Cocoa Production in Nigeria During the Third Millennium In Occasional Publications No. 2. CAN, pp: 24-32.
3. International Cocoa Organisation, 2003. Project on Improvement of Cocoa Marketing and Trade in Liberalizing Cocoa Producing Countries. ICCO, London, UK.
4. Wills, J.B., 1962. Agriculture and Land use in Ghana. Oxford University Press, London, pp: 45.
5. Padi, B., G.K. Owusu and N.K. Kumah, 1996. A record of *Desplatsia dewevrei* (De Wild and Th. Dur) (Tiliales: Tiliaceae) as an alternative and potential breeding host plant for the cocoa mirid, Sahlbergella singularis Hagl. Proc. 12th Intern. Cocoa Research Conf., November 1996, Salvador, Bahia, Brazil.
6. Anon, 1951. Capsid research: Chemical control. Ann. Rep. W. Afr. Cocoa Res. Inst. 1949-50: 40-42.
7. Daramola, A.M., 1978: Insect pests of kola in Nigeria. Research Bulletin No. 3 CRIN, Ibadan.
8. Ojo, A.A., 1981. Investigations into the control of the kola stem borer, *Phosphorus virescens* Oliver (Cerambycidae: Coleoptera) in Western Nigeria. *Turrialba*, 31(3).
9. Ndubuaku, T.C.N., 1989. Economic insect pests of kola. In: Progress in Tree Crop Research, 2nd edition, CRIN, Ibadan, Nigeria. pp: 115-126.
10. Okelana, F.A., 1989a. Observations on insect pests infestation in rehabilitated plots. CRIN Ann. Report, Ibadan, Nigeria, pp: 27-28.
11. Okelana, F.A., 1989b. Bio-ecology and control of insect pests of coffee. In: Progress in Tree Crop Research, 2nd Edn., CRIN, Ibadan, Nigeria, pp: 152-165.
12. Idowu, O.L., 1989. Control of economic insect pests of cacao. In: Progress in Tree Crop Research, 2nd Edn., CRIN, Ibadan, Nigeria. pp: 89-102.