No. 3.

POTENTIAL INSECT PESTS ON ZINGIBERACEAE *)

by

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RINGKASAN

Pengamatan telah dilaksanakan terhadap beberapa Zingiberaceae untuk mengetahui jenis-jenis serangga yang dapat menjadi hamanya. Dari banyak jenis serangga yang teramati merusak bagian-bagian tanaman Zingiberaceae ini, lima terlihat mempunyai potensi sebagai hama serius, yaitu Attacus atlas, Kirana diocles, Xanthoptera *sp.*, Jamides alecto *dan* Prodioctes *sp. Walaupun demikian, berdasarkan kegunaan bagian yang dirusak, hanya satu yang perlu mendapat penanganan pemberantasannya, yaitu* Prodioctes *sp. Untuk jenis-jenis lainnya tindakan yang perlu dilakukan lebih lanjut adalah tentang pemonitoran perilaku populasi. Dengan demikian gejala peledakan populasi dapat diketahui sehingga tindakan preventif dapat dilakukan.*

SUMMARY

On some species of Zingiberaceae, observation have been done to record the possible insect pests on these host plants. Among the many species observed that cause damage on parts of these zingiberaceous plants, five were observed to show potentials as serious pests. These were Attacus atlas, Kirana diocles, Xanthoptera *sp.*, Jamides alecto *and* Prodioctes *sp. However, based on the usefulness of the plant parts damaged, only one species could be considered as the dangerous pest that had to be handled carefully. This was* Prodioctes *sp. For other species, the need of further researches covers monitoring the population behaviour which is related to population out break, so that preventive action can be measured.*

INTRODUCTION

Production of modern medicine as well as traditional "jamu" (medicine) in Indonesia requires a lot of supply of zingiberaceous rhizomes. The increase of demand on this commodity results in the more extensive planting of the zingiberaceous plants. A futher consequence of this planting is more provision of habitats for many insects.

Many of the insects living on Zingiberaceae are phytophagous, causing, to some extent, damages to the host plants. This situation is no doubt disliked by the plant owners. To overcome this situation, one of the aspects to be approached is the observation of the potential insect pests of the zingiberaceous species. First of all is to identify what insect pests are present on the host plants and the behaviour of these insects. The information gathered from this identification will enable the plant owners to decide what they will do as far as the insect pests are concerned.

*) Research funded by National Biological Institute — LIPI on Biological Resources.

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The purpose of this observation is to probe a little deeper the relationships between the insects and the host plants. From this point, further step may be taken, so that practical measure required by the plant owners may be suggested. These observations involved aspects of both the host plants and the insects. On the host plants involved, observations were done to identify the species, consequences of the insect visits, species of insects causing damages and the mechanism and pattern of attack. From these observations, potential insects may be determined.

MATERIALS AND METHODS

Observations and data collecting were done in West Java from April 1982 to March 1984 (Fig. 1). Some localities, such as Bogor Botanical Gardens, small plantations at Cibubur, Cikeyas and Cijeruk were observed regularly every week. In those localities, *Zingiber officinale*, *Curcuma domestica* and *Languas galanga* were planted in large areas of more than 500 m^2. Otherwise, the zingiberaceous plants were grown in 50 — 100 m^2 of land. The elevation of the research areas were ranging from 100 m in Cibubur to 1,250 m in Lembang. The observations were conducted in all seasons in the two years of observation.

For measuring the intensity of damage and to determine the main part of host plant as the focal point of attack, a simple formula was applied. The application of this formula required the measurement of the entire part of plant in question and part of the plant being damaged. To measure these parts, a graded scale was used. The formula applied was the ratio between area of part being damaged and entire area of part in question. Especially for determining the food preference of *Xanthoptera* sp., Kolmogorov-Smirnov formula was applied (SIEGEL, 1976).

To determine the position of leaves on stem, each leaf is numbered. The leaf bud is number 0, continued by the following leaf. The younger the leaf, the lower the number it has (Fig. 2).

RESULTS AND DISCUSSION

Data collected from the study showed that 18 species of insects could cause damage to parts of 11 species of Zingberaceae (Table 1). Most of these species were found to be attacking leaves. However, *Jamides alecto* was found to cause rot on inflorescence, while *Prodioctes* sp. and *Mechistocerus violatus* caused damages on stems. A species of *Aphis* attacked leaves as well as stems.

Out of the species recorded, only five have been considered as highly important. Four of them belonged to Lepidoptera, while only one was a species of Coleoptera. Their importance had been shown by their characteristics in the volume of the damages they caused, further effects of damages, frequency of attacks and their population sizes.

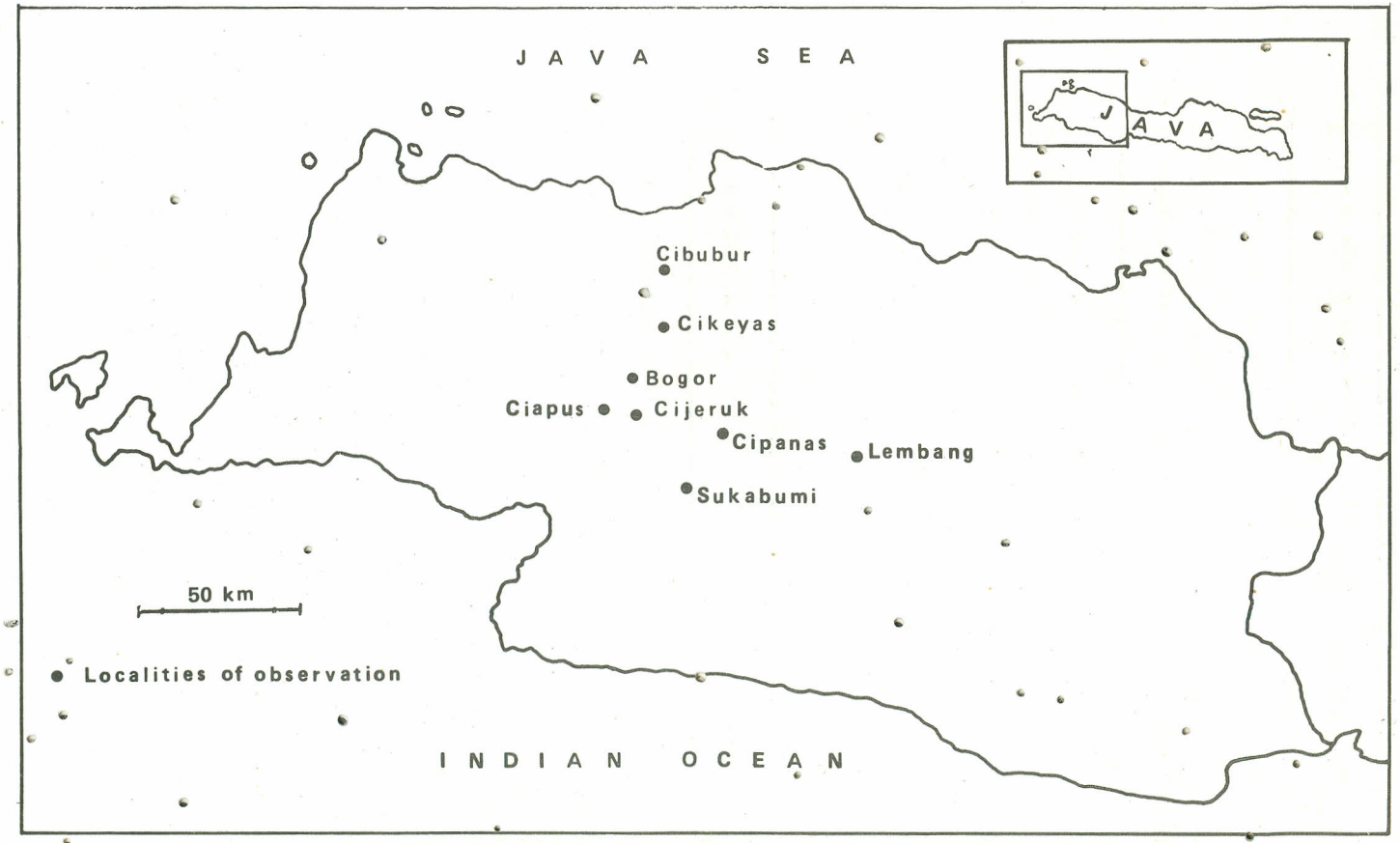

Figure 1. Data collecting localities in West Java.

Table 1. Insect pest and host plant species with part of plant which are damaged by each pest species.

Species of insect pest \ Host plant species	*Amommum cardamomum*	*Curcuma domestica*	*Curcuma mangga*	*Curcuma xanthoriza*	*Curcuma zedoaria*	*Hedychium corronarium*	*Languas galanga*	*Nicolaia speciosa*	*Zingiber officinale*	*Zingiber amaricans*	*Zingiber zerumbet*	Total no. of host plants
Lepidoptera												
1. *Acherontia lachesis*	—	L	—	—	—	—	—	—	—	—	—	1
2. *Attacus atlas*	—	L	—	—	—	—	L	—	L	—	L	4
3. *Dasychira horsfieldi*	—	—	—	—	L	—	—	—	—	—	—	1
4. *Jamides alecto*	—	—	—	—	—	I	I	—	—	—	—	2
5. *Kirana diocles*	—	L	L	L	L	L	L	L	L	L	—	9
6. *Setora nitens*	—	—	—	L	—	—	—	—	—	—	—	1
7. *Orgyia postica*	—	—	L	—	—	—	—	—	L	—	—	2
8. *Usdaspes folus*	—	L	—	—	—	—	—	—	—	—	—	1
9. *Xanthoptera* sp.	—	—	—	—	—	—	L	L	—	L	L	4
Hemiptera												
10. *Aphis* sp.	—	LS	—	—	—	—	—	—	—	—	—	1

Table 1 (continued). : Insect pest and host plant species with part of plant which are damaged by each pest species.

Species of insect pest \ Host plant species	*Amomum cardamomum*	*Curcuma domestica*	*Curcuma mangga*	*Curcuma xanthorriza*	*Curcuma zedoaria*	*Hedychium coronarium*	*Languas galanga*	*Nicolaia speciosa*	*Zingiber officinale*	*Zingiber americans*	*Zingiber zerumbet*	Total no. of host plants
Coleoptera												
11. *Exopholis hypoleuca*	—	—	—	—	—	—	—	—	LS	—	—	1
12. *Mechistocerus violatus*	S	—	—	—	—	—	—	—	—	—	—	1
13. *Prodioctes* sp.	S	—	—	—	—	—	—	—	—	—	—	1
Orthoptera												
14. *Attractomorpha crenulata*	—	L	—	—	—	—	—	—	—	—	—	1
15. *Catantops angustifrons*	—	L	—	—	—	—	—	—	—	—	—	1
16. *Oxya sinensis*	—	L	L	—	—	—	—	—	—	—	—	2
17. *Phloeoba catenata*	—	L	—	—	—	—	L	—	—	—	—	2
18. *Valanga geniculata*	—	—	L	—	—	—	—	—	—	—	—	1
Total number of pests species	2	9	5	2	2	2	5	2	4	2	2	37

L = Leaf S = Stem I = Influorescence

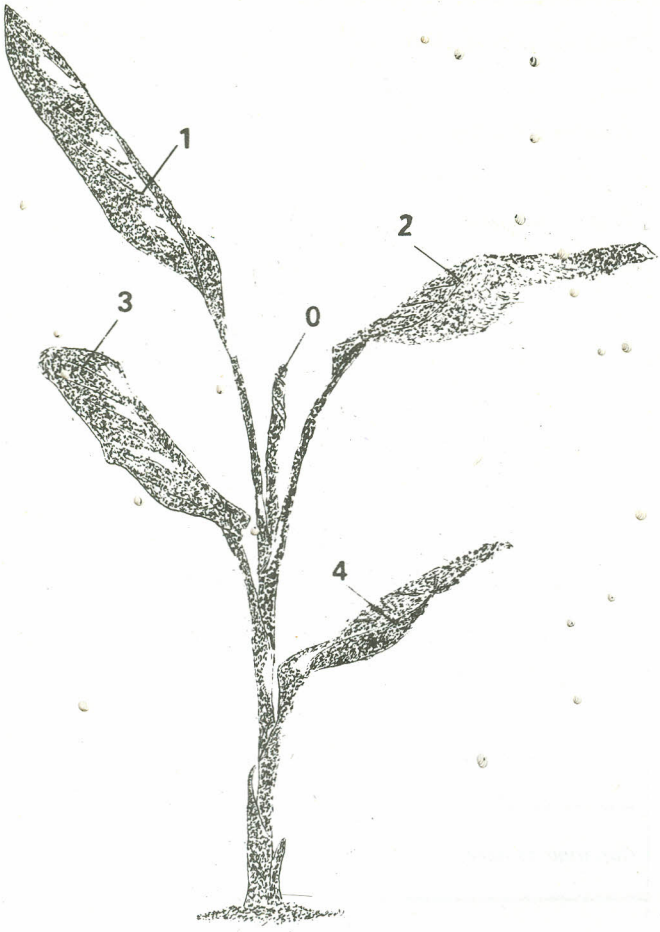

Figure 2. Numbering of leaves used to identify the position of leaves on stem.

Attacus atlas Linnaeus

This species was found in a rather large number. One leaf might harbour 1 — 5 caterpillars of first to third instars. This population size could cause 10 — 50% damage on leaves. However, there seemed to be choice of leaves being attacked. These caterpillars most likely prefered younger leaves, numbering 3 — 6 from the tip of plant (Fig. 3).

The adult stage of *A. atlas* is nocturnal. The larvae were always slow moving and motionless at day time. However, some of them fed on leaves in low speed on the lower surface during the day time. Since 1929 (DAMMERMAN, 1929; KALSHOVEN *et al.*, 1951) until 1983 (BARLOW, 1983) this species has been recorded to attack more than

Figure 3. A larvae of *Attacus atlas* feeding leaf of *Curcuma domestica.*

40 species of dicotyledons, but never did the other group of plants. However, in this observation, *A. atlas* was found to cause damage on *Curcuma domestica*, *Zingiber officinale*, *Z. zerumbet* and *Languas galanga*, which are species of monocotyledonous plants. During a period of April to May 1983, 75% of *C. domestica* plants in 500 m^2 cultivated land near Bogor was destroyed. In the surrounding area which was planted with mainly fruit trees (jack fruit and annona) serious attack was also suffered by these fruit trees. This species was not encountered in the same locality in the same season of 1984.

In this study area, parasitism was observed. Two species of *Apanteles* were found parasitising the eggs of the moth. A large number of caterpillars were found in weak condition, blackish in coloration and some even dead. From these caterpillars, four species of microorganisms were isolated, namely *Acinetobacter* sp., *Bacillus* sp., *Eschericia coli* and *Micrococcus* sp. Certain virus was also isolated. The certainty of their role in the death of the caterpillars has yet to be determined.

Xanthoptera sp.

This is a species of noctuid moth, which had never before been recorded as pest of Zingiberaceae. During the study period, the popu-

lation of *Xanthoptera* sp. was observed to be very abundant. One leaf of *Nicolaia speciosa* was observed to harbour 200 — 375 caterpillars. On one stem of the same host plant species, more than 1,500 caterpillars were counted.

This nocturnal species had a typical pattern of damage. The earlier instars destroyed the leaves by scraping the undersurfaces of the leaves. The leaves affected would turn dry, due to the damage on the parenchymal tissues. The fullgrown caterpillars showed different type of damage. The later instars, including the fullgrown, fed on the entire leaf tissue, leaving only the ribs of the leaf. During the day time, the caterpillars were motionless, positioning themselves along or parallel to the ribs of the leaf.

Nearly 75% of the total leaf number on each stem were destroyed by this species. There was negative correlations ($y = -3,99\ x + 101,55$) between the age of the leaves and number of individual caterpillars found on the respective leaf. The lower the position of the leaf, the lower the number of caterpillars attacking the leaf. In total, the larvae caused about 60% damage on stems of each cluster of the host plant.

Based on the number of the individual caterpillars and calculated by Kolmogorov-Smirnov formula (SIEGEL, 1976) ($p < 0,01$) the priority of preference of this species was *Nicolaia speciosa*, *Zingiber* spp. and *Languas galanga*. This finding was not recorded previously.

Kirana diocles Latreille

This species belongs to Hesperidae. Like other members of this butterfly family, *K. diocles* caused leaf roll.

This species was not found in large number. One leaf may be hosting one to three caterpillars. Most of these caterpillars were of the first to third instars. However, they were found in high frequency. The other instars were rarely found. On one leaf, only one caterpillar of the later instars might be found. In small plantation of *C. domestica*, *K. diocles* caused about 15% destruction of the vegetation. There was no indication of seasonal appearance. This species could be found in the plantation in any month during the observation period. This situation was also found in the other localities of observation.

Apanteles taprobanae was found to parasitise the caterpillars of *K. diocles*. About one-tenth of the caterpillars was found parasitised by this wasp. These parasites caused weakness and blackish coloration of the caterpillars. After pupation of the parasitised caterpillars, one pupa might host more than 15 individues of these parasitic wasps.

Another species of Hesperidae has as well been recorded as a pest of *Zingiber* (KALSHOVEN, 1951). *Udaspes folus* in the observation was recorded to attack leaves of *Curcuma domestica*, but none of the species of *Zingiber* was affected.

anywhere and any time. Other species are found in large number, but as is the case with *K. diocles*, they attack only the leaves, causing no important damage on the utilised part of the plant (rhizomes).

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