STUDIES ON HIDARI IRAVA LEAF CONSUMPTION IN RELATION TO WARNING SYSTEM IN THE CONTROL OF THE COCONUT PEST

By
Wily A. Baringbing, and Bariyah-Baringbing [1]

ABSTRACT

Two-month laboratory and field experiments were carried out to investigate amount of leaflet consumed by the leaf-eating caterpillar. *Hidari irava Moore*, during the larval stadium in an effort to determine the right time to control the pest chemically. The experiment was conducted in Pakuwon Experimental Garden, West Java, Indonesia in 1990. A total of 70 larvae of the hesperiid were reared in laboratory. Mature coconut leaflets replaced daily with fresh material. Were cut arid measured for food of the caterpillars in glass containers.

Fifty mature hybrid coconuts, Malayan Red Dwarf (MRD) x West African Tall (WAT), were studied to calculate the leaflet weight of each leaf. A leaf was cut from each palm. There were 50 leaves used altogether.

Results of the study showed that a single larva, from the second to fifth instars, consumed 13.90 g œconut leaflet. Weight of leaflets per leaf was 2,562.79 g and 66,455.29 g per tree. A population of 18.43 larvae per leaf caused 10% damage to the crown of a palm tree.

INTRODUCTION

The leaf-eating caterpillar, *Hidari irava Moore* (*Lepidoptera: Hesperiidae*), is one of the serious pests of the coconut palm in many parts of Indonesia (Baringbing and Bariyah, 1977). According to the 1980 survey results more than 4,000 ha were attacked by the insect in 10 provinces in the country. Therefore, the *hesperiid* ranks tenth among the 13 most serious pests in the country (Table 1) (Baringbing. 1986). In severe cases of infestation the entire lamina are eaten away by the caterpillars leaving only the midribs behind. It is a common sight in the 10 provinces to have a large number of palms in an almost completely defoliated condition. Lever (1969) reported that the leaves of the old palms are attacked more severely than those of young ones. Besides coconut palms, the other recorded host plants of *H. irava* are: *Arenga pinnota, Elaeis guineensis, Areca catechu, Metroxylon sagu, Livistona chineensis, and Bambusa arundanacea* (Lever, 1969; Tjoa. 1953; Kalshoven, 1981).

The butterfly of *H. irava* lays eggs in chains or masses covered with the scales. The egg is hemispherical in shape and measures about 1.5 mm in diameter. The freshly laid egg is yellowish in color and within 24 hours, a violet spot appears on it. The color of the egg changes to bluish or whitish violet after 4 days and the violet spot turns to black. The greenish yellow caterpillar, when fully grown, is 46 - 53 mm long and possesses a large dark brown head and a violet stripe on the body which is widened posteriorly. The caterpillar phase comprising of 5 instars, lasts for 32 - 37 days. The pupa is 30 - 32 mm long. It is attached to the leaflet by its hind end supported by a silken girdle. The pupa is pinkish brown and covered with a bloom of powdered waxy material. The pupal stage lasts 10 days. The total life Cycle of the pest from egg to adult is completed in 50 - 60 days. The butterfly measures 42 - 54 mm in wing expanse, has 4 prominent golden yellow spots and l to 3 translucent spots on each of the forewings. The butterflies are very active al nighttime. During the day, thy hides in shady places like the banana plantation or roofs of houses near the coconut plantations.

[1] Research Coordinator and Senior Research Staff, Coconut Research Sub Institute, Pakuwon, West Java and Research Institute for Spices and Medicinal Crops, Bogor, respectively.

Table 1. The serious coconut pests in Indonesia

Coconut pest	Total infested area (ha)	Location (Province)
1. *Oryctes rhinoceros* Linnaeus	146,895	15
2. *Rynchophorus* spp.	41,575	3
3. *Batrachedra arenosella* Walker	35,809	4
4. *Sexava* spp.	32,254	3
5. *Aleurodicus destructor* Mackie	26,585	3
6. Rodents	12,346	2
7. Wild pig	10,837	8
8. *Brontispa longissima* Gastro	10,198	7
9. *Artona catoxantha* Hampson	5,298	12
10. *Hidari irava* Moore	4,004	10
11. Monkey	1,747	3
12. *Setoro nitens* Walker	630	2
13. *Darna* sp.	540	1

Source: Wirjosoehardjo, 1981 Baringbing, 1986

Tjoa (1953) reported *Apanteles hidaridis* (*agilis*) (Braconidae). *Xanthopimpla gampsura* (Ichneumonidae). *Sturinia inconspicitoides* (Tachinidae), *Neotelenonius javae* (Scelionidae), and *Brachlymeria euploeae* (Chalcididoe) as indigenous parasites of *H. irava* in Java. However, these indigenous natural enemies do not seem to exert enough control on the pest so as to maintain the pest population below the level of the economic injury. Some systemic insecticides such as monocrotophos, methamidophos, Phosphamidon, and dicrotophos were found to give satisfactory control. These can be administered cither through trunk injection or root infusion (Baringbing *et al*., 1981).

The objective of the experiment was to investigate amount of leaflet consumed by the caterpillar during the larval stadium in an effort to decide the right time to control the pest chemically.

MATERIALS AND METHODS

Laboratory and field experiments to test the amount of coconut leaflets consumed by the leaf-eating caterpillar, *H. irava*, during the laarval stadium was carried out in Pakuwon Experimental Garden. It is 450 meters above sea level and situated in Sukabumi regency, West Java province, Indonesia. Field study was conducted to test the weights of leaflets from the palm trees. The experiment lasted for 2 months from March until May 1990.

Laboratory experiment

Seventy first instar larvae of *H. irava* were put into 7 glass containers, 10 into each, and reared in laboratory. These caterpillars were fed with leaflets of hybrid coconut cultivar Malayan Red Dwarf (NMD) x West African Tall (WAT). Replacements of food with new fresh leaflets were held daily. Weight measurements of these leaflets, without midribs, were conducted before and after the materials were consumed by the pest.

Field study

Complete Randomized Design was used in the study. Fifty hybrid coconuts: MRD x WAT planted in 5 hectares at a planting density of 10 palms each was observed. From each 6 year old tree

a healthy leaf, Nos. 8 - 18, was cut. The leaflets of each leaf were then counted; its weight without midribs was also measured.

RESULTS AND DISCUSSION

Results of both the laboratory and field experiments are shown in Tables 2, 3, and 4.

Weight measurements of the leaflet consumed by *H. irava* were conducted beginning from the second to the last (fifth) instar larva. The first instar, which lasted for 3 days only consumed a relatively small portion of coconut leaflet. Before eating the lamina, the first instar feeds its own eggshell. The feeding scars on the underside of the leaflets are short. The parallel-sided furrows are bound by principal veins of the leaflet. The upper epidermis and the larger cross-veins are not eaten at this stage. The scars resemble the ladders, with cross-veins as rungs. Although second instar spent more days to develop than any other instar in the larval stadium, it only consumed 2,355 g or 16.80% of the total food in the stage. Comparatively, the third instar, lasting for 7 days, consumed the greatest portion at 4,660 g or 33.52% of food. Contrary to the second instar, the insect ate much more per day in the fourth instar which lasted for only 4 days. The fifth instar, which lasted for 7 days, consumed less food per day, compared to the third one particularly in the last 3 days. This may be so as it begins to end the eating period in the process of pre-pupa stadium. In the experiment, a larva of *H. irava* consumed 13,903 g in 28 days in laboratory condition. It is possible that the insect consumes more food in the wild compared to that in the cage. According to the authors' observations, if the larvas were disturbed or their foods were not enough in the cage, they tended to shorten their life cycle and then start pupating.

Table 3 shows that a leaf of MRD x WAT palm at 6 years old weighs 2,562.69 g or 66,455.29 g per tree. These data are very useful for a decision maker, farmer or manager, in determining the percentage of leaflets damaged by *H. irava* attacks in a coconut plantation. Based on the data in Table 4, one can calculate the damage caused through the number of the caterpillars in each leaf. According to the study, the presence of 18.43 larvae per leaf resulted in a 10% damage to each palm. To obtain more accurate calculation of defoliation of the other coconut cultivars, it is suggested to measure the leaf weight and then divide it with 13,903 (total leaf weight in gram consumed by a single lama during the stadium). If pesticide is to be used as a control measure, the target insect should be suppressed at the first instar as it is very susceptible to any kind of poison. Detoxification system is no longer effective at the fifth instars. Sison (1975) in his studies on coconut leaves attacked by the Asiatic rhinoceros beetle, *Oryctes rhinoceros Linnaeus* (*Coleoptera: Dynastidae*) stated that there is a positive correlation between the loss of nut production and leaf damage. Accordingly, correlation between percentages of nut loss yielded the following figures:

Leaf Damage (%)	% Decrease in Nut Production
0-10	1
10-20	4
20-30	6
30-40	8
40-60	12
60-80	17
80-100	23

Since no such experiment has been conducted yet in the country. Then the above figure is very helpful to determine the right time to suppress the population of the hesperiid pest.

Table 2
Observations of coconut leaf consumed by H. irava during the larval stadium, from 2nd to 5th instars, in Pakuwon laboratory, West Java, Indonesia, in 1990

Day	Number of larvae reared	Leaf consumed in 24 hr (g) instar larva				Total leaf consumed (g)
		2nd	3rd	4th	5th	
Date of	Obs.	Mar. 9-17	Mar. 18-24	Mar. 25-28	Mar. 29-Apr.4	
1	70	9,702	50,910	55,442	49,890	165,944
2	70	12,350	53,347	54,818	42,430	162,945
3	70	16,190	56,714	52,367	49,102	174,373
4	70	16,873	54,107	67,455	46,898	185,333
5	70	15,981	57,076	0,000	31,678	104,735
6	70	14,092	43,513	0,000	21,066	78,671
7	70	17,509	10,547	0,000	12,350	40,406
8	70	20,754	0,000	0,000	0,000	20,754
9	70	21,498	0,000	0,000	0,000	21,498
10	70	18,527	0,000	0,000	0,000	18,572
Total	70	163,467	326,214	230,082	253,414	973,186
Mean	70	2,335	4,660	3,288	3,620	13,903
%		16.80	33.52	23.64	26.04	100.00

Insecticides are most powerful tool for use in pest management. They are highly effective adaptable to most situations, flexible in meeting changing agronomic arid ecological conditions, arid relatively economical (Metcalf. 1982). Based on Tables 2, 3, and 4 it is recommended that control measures be conducted by infusing the root with certain. Systemic insecticides when the population of the insect larvae approaches around 18.43 per leaf. If at this density the pest is suppressed, then 10% of leaflet damage can be avoided. This figure, according to Sison (1975) will result in 1% loss in nut production.

Table 3
Observations of leaves and leaflets of the hybrid coconut palm, MRD x WAT, in Pakuwon Experimental Garden, West Java, Indonesia in 1990.

No. of palms observed	Age of palm (years)	No. of fronds each tree	Position of leaflets in crown frond	No. of leaflets each midribs each frond (g)	Weight of leaflets without	Total Wight of leaflets each tree (g)
10	60	269	8 - 16	2,126	25,712.15	692,216.20
10	60	253	9 - 16	2,143	26,734.42	676,656.84
10	60	248	10 - 18	2,096	24,690.90	616,301.84
10	60	267	11 - 18	2,094	26,157.02	698,477.09
10	60	258	8 - 15	2,125	24,840.21	639,112.65
Total 50	300	1,295		10,584	128,137.70	3,322,764.63
Mean 1	6	25.9	8 - 18	211.68	2,562.69	66,455.29

Table 4
Percentage of coconut leaf damage caused by *H. irava* in Pakuwon Experimental Garden, West Java, Indonesia, in 1990.

No.	Population density of *H. irava* per leaf	Leaflet damage per leaf	
		weight (g)	(%)
1.	0.00	0,000	0.00
2.	9.22	128,135	5.00
3.	18.43	256,169	10.00
4.	36.87	512,538	20.00
5.	55.30	768,807	30.00
6.	73.73	1,025,076	40.00
7.	92.16	1,281,345	50.00
8.	110.60	1,537,614	60.00
9.	129.03	1,793,883	70.00
10.	147.46	2,050,152	80.00
11	165.89	2,306,421	90.00
12.	184.33	2,562,690	100.00

CONCLUSION AND RECOMMENDATION

Total weight of coconut leaflet consumed by a single larva of *H. irava* during the second to fifth instar was 13.903 g and a leaf weight of MRD x WAT was 2,562.69 g. It is recommended to control the pest in the 1st instar chemically by infusing the root with systematic insecticide or when population density reaches 18.43 per leaf.

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