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Distribution of *Maruca testulalis* Geyer (Lepidoptera: Pyralidae) Eggs and Larvae on Sesbania [1]

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ABSTRACT

The distribution of eggs and larvae of legume pod borer (LPB) (*Maruca testulalis* Geyer) at different parts of sesbania plant was studied in an experimental field at Changhua, Taiwan. Almost all eggs (99.1%) were laid on the foliage with 97.9% of these eggs laid on the lower leaf surface. Oviposition was observed in the middle and basal portions of the blade of pinnately compound leaves of the 1st to the 14th fully expanding leaves from the shoot apex. Overall, 96.7% of the larvae fed on the upper leaves. The 1st instar larvae initially feeding around the oviposition site right after hatching moved to the distal part of the leaf blades where larvae up to the 4th instar aggregated and webbed by rolling up the leaflets. The fifth instar larvae entered a prepupation stage in the middle portion of the leaf blades. The detailed analysis of LPB distribution on the sesbania plants in the study should contribute towards developing control strategies for this important pest of grain legumes.

Key words : *Maruca testulalis*, oviposition, feeding sites, sesbania.

INTRODUCTION

The legume pod borer (LPB), *Maruca testulalis* Geyer, is an important pest of grain legumes in the tropics and subtropics [8]. Cowpea, *Vigna unguiculata* (Walp) and common bean, *Phaseolus vulgaris* L. are attacked by LPB in Taiwan [1,4]. Furthermore, sesbania (*Sesbania roxburghii* Merii), the major green manure for soil improvement, is also damaged seriously by the LPB and has became an essential host plant beyond the cultivated periods and areas of grain legumes in the fields (Liao, unpublished data). LPB larvae feed on both flowers and leaves of the sesbania plant. Although sesbania is not a food and cash crop, the migration of LPB from sesbania to pod bean plants might have some potential problems to pest control because chemical insecticides are rarely applied for sesbania cultivation. The biology of LPB has been studies extensively on cowpea[2,3,5,6,7,9,10], however, no information of LPB on sesbania can

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be found in the literature up to date. A detailed understanding of the distribution and behaviour of LPB on sesbania is essential for the management of this borer. In this study, we examined the distribution of the various stages of LPB on sesbania in the field.

MATERIALS AND METHODS

A 50 m^2 field of sesbania at the experimental farm of Taichung District Agricultural Improvement Station, Changhua, Taiwan, was divided into four equal plots. Sesbania plants of 40- to 60-day-old were used. Fully expanding leaves were investigated from the shoot apex and during the sampling period the internodes for the 1st to 8th leaves were shorter than 1.5 cm. View from the top, these do look like a single plane and regard as upper leaves. Natural infestations of the LPB were monitored. During April to June 1998, when the LPB activity was at peak (Liao, unpublished data), counts of LPB at various stages were made on randomly selected 20 plants per plot. The plants were cut off just above the soil surface and LPB eggs and larvae on the shoots were counted. Instar stages of larvae were recognized by the head-capsule size.

For oviposition sites, each pinnately compound leaf was divided into three equal portions, i.e., distal, middle and basal from the tip. Each leaflet was horizontal separated onto three equal parts, i.e., distal, middle, and basal from the apex. Otherwise, the longitudinal direction was partitioned onto three divisions, i.e., adjacent the midrib, mesophyll and margin of leaflet. For larvae feeding sites, the divided pattern of pinnately compound leaf was the same as eggs counting.

RESULTS

Oviposition sites

Almost all eggs (99.1%) of 828 examined were laid on pinnately compound leaves, with only 8 eggs laid on the shoot surface near the apex. Most of the eggs (97.0%) were found on the lower surface of the leaf (Tab.1). While eggs were observed from the 1st to the 14th leaves, 64.3% were on upper leaves, i.e., the 1st to 8th leaves (Fig. 1).

Table 1. Number of eggs of *Maruca testulalis* laid on different parts of sesbania plants

	Leaves*		Stems	Total
	Upper surface	Lower surface		
No. eggs/20 plants	17	803	8	828
% laid	2.1(2.1) *	97.0(97.9)	0.9	100

* Figures in brackets show percentage of eggs found on surface of the leaf.

More than 87% of the observed eggs were located on the middle and basal portions of the leaf blade, only 12.2% were on the distal part (Table 2). According to Table 3, on horizontal

direction, vertical the midrib of leaflet, females moth preferred to deposit eggs on the distal and middle parts of leaflets. Furthermore, on longitudinal direction, 50.8% eggs were adjacent to the midrib of leaflets, with 36.7% on mesophyll and only 12.5% on the margin of leaflets. Among the 388 leaflets examined, there were 29 leaflets (7.5%) with two eggs, and only 7 leaflets (1.8%) with three eggs each. Each of the remaining 352 leaflets (90.7%) had one egg.

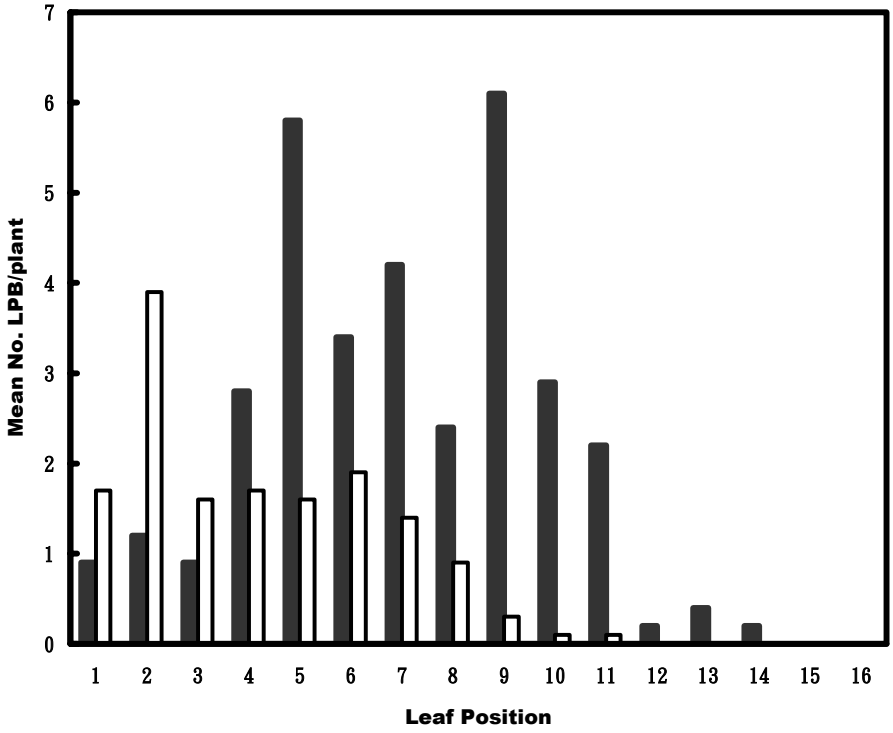

Fig. 1. Number of eggs and larvae of *Maruca testulalis* on different leaf positions from the shoot apex of sesbania plants. ■ , eggs; □ , larvae.

Table 2. Occurrence of *Maruca testulalis* at different parts of pinnately compound leaves of sesbania in May, 1998

Segment of blade	Mean No. LPB/20 leaves							
	Egg	Larval intar						
		1 st	2 nd	3 rd	4 th	5 th	Prepupa	Total
Distal	15.50[*a]	8.50[a]	22.50[a]	15.75[a]	8.00[a]	4.00[a]	0.75[a]	59.50
Middle	52.75[b]	0.75[b]	8.00[b]	2.75[b]	0.75[b]	3.25[a]	4.75[b]	20.25
Basal	58.75[b]	0.75[b]	-	0.25[c]	-	-	-	1.00
Total	127	10.00	30.50	18.75	8.75	7.25	5.50	80.75

Values are means of four replicates.

*Different letter denotes mean separation with column by Duncan's multiple range test at 5% level.

Larva feeding sites

The feeding sites of the various stages of the LPB ranged from the first to 11th leaves, but more than 96.7% of the larvae were found on upper leaves (Fig. 1). On one occasion, larvae were found boring into the stem between the 7th and 8th leaves of a heavily infested plant. On exposed leaves, the LPB webbed or folded the next and opposite leaflets together. Except for newly hatched individuals, larvae were never found feeding on exposed parts of the leaf without some protective covering. They only came out when the food material was depleted or detached, or at pupation stage. Larvae tended to hide away from bright light. After hatching, first instars initially feed around the oviposition site, and then moved onto the distal part of the blade. The 1st to 4th instar larvae were concentrated on the distal portion of leaf blade (Table 2). Approximately 45% of fifth instars were observed on the middle portion of blade, and 86.4% prepupae were found on this segment. The 2nd through the 5th instars of the LPB showed poor preference to feed on the basal portion of blade, except one 3rd instar was observed (Table 2). Upon reaching maturity, larvae dropped from the folded leaflets onto the soil and pupated under leaf debris. Sometimes pupation also occurred inside the folded leaflets.

Table 3. Number of eggs of *Maruca testulalis* laid on different portions of leaflets of sesbania*

	Horizontal division			Longitudinal division		
	Distal	Middle	Basal	Adjacent midrib	Mesophyll	Margin
No. eggs	56	55	9	61	44	15
% laid	46.7	45.8	7.5	50.8	36.7	12.5

* 110 leaflets examined.

DISSCUSSION

This is the first paper with detailed studies on the distribution of the various stages of the LPB on sesbania plants. Because sesbania was to be plowed onto soil in the pre-flowering stage, all data were collected during the vegetative growth period. The female moth deposited mostly their eggs on leaves (Table 1), and these results are in agreement with previous study on cowpea [(5)]. On cowpea, the larvae, in the absence of flower buds and flowers, feed on young tender shoots, peduncles, and stem [(5)]. However, larval infestation has been found to be highest on flowers, followed by flower buds, terminal shoots, and pods [(2)]. Otherwise, the preference feeding site are floral parts and pods. Our results suggest that the young leaves of sesbania are the main preferred feeding site for larvae of the LPB before the flowering stage (Fig.1). Furthermore, the LPB fed on leaves to complete the whole life stages (Table 2). It appears that sesbania may offer a good food source for LPB in the field. Although we did not focus on floral parts of sesbania, the LPB also attacks floral buds and young flowers of sesbania (data not shown). Notably, the first to third instar larvae were found on these parts, but older larvae moved to leaves and also webbed groups

of leaflets to make shelters. We suspect that the space within the bud might be too small to shelter the LPB larger than the third instars. Besides, larvae of the LPB have never bored into sesbania pods.

On the blade of pinnately compound leaves, the LPB female moth is most likely to attach their eggs to the middle and basal portions of leaf blade (Table 2). As larvae hatch, first instars move to the distal part, the main feeding site for the first through the fourth instars. At the fifth instar stage, LPB might move to the middle portion of leaf blade, and then enter into the pre-pupation stage (Table 2). The female moth of the LPB prefers to oviposit abundantly on upper leaves and next three of middle leaves, while the larval population was high on upper leaves on sesbania (Fig. 1). These observations imply that attention should be paid to the sampling technique for studies on this insect pest.

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豆莢螟(*Maruca testulalis* Geyer)的卵及幼蟲在田菁上的分布[1]

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摘　要

本試驗於彰化縣大村鄉台中區農業改良場試驗田進行，目的欲闡明豆莢螟卵及幼蟲在宿主田菁不同部位之分布情形。幾乎所有豆莢螟的卵(99.1%)皆產在田菁葉片上，其中又約有97.9%產於葉的下表面。豆莢螟產卵範圍包括由莖頂以下算起第一至第十四片完全展開的葉片，並位於羽狀複葉葉片的中段及後段。有96.7%的幼蟲偏好取食上位葉。卵孵化後，第一齡幼蟲在產卵位置的四周取食，隨後開始遷移至葉片的前段。多數的一至四齡幼蟲集中於葉片的前段，在此，豆莢螟幼蟲會吐絲並將數片小葉摺捲成巢。五齡幼蟲開始遷移至葉片的中段部位並進入前蛹期。本報告首次提供豆莢螟幼蟲在田菁上之分布分析，應有助於對此重要害蟲防治策略之擬定。

關鍵字：豆莢螟、產卵、取食位置、田菁。

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