

**BIOLOGY OF *PALEMBUS (MARTIANUS) DERMESTOIDES*
CHEVROLAT (COLEOPTERA; TENEBRIONIDAE)¹**

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ABSTRACT

Palembus (Martianus) dermestoides Chevrolat was reared on corn flour with Brewer's yeast and ground corn. Its life history, habits, external morphology, host range and natural enemies were observed.

The life cycle of the beetle on corn flour with Brewer's yeast ranges from 35 to 41 days with an average of 36 days. The mean duration of the different stages are: egg, 4 days; larva, 27 days; and pupa 5 days. Adult longevity is 60 days. On ground corn, the life cycle ranges from 36 to 38 days with an average of 37 days. The mean duration of the different stages are: egg, 4 days; larva, 27 days and pupa 5 days. Adult longevity is 75 days.

Based on duration of developmental period and growth index, corn flour with Brewer's yeast, peanut and rice were most suitable hosts of this insect. However, it could also thrive on corn, wheat, sorghum and mungbean.

Key words: *Palembus (Martianus) dermestoides*; Korean bug; biology; life history; host range

INTRODUCTION

Palembus (Martianus) dermestoides Chevrolat locally known as Korean bug is a beetle introduced from South Korea. Some Chinese swallow live beetles as a remedy for a variety of ailments ranging from low back pain to respiratory disorders (Sullivan, et al. 1977). Hitherto, in the Philippines, it is fed to fighting cocks for breeding.

Yoshiba (1974) studied the life history of *Martianus dermestoides* bred on rice bran at laboratory conditions of 30°C and 61% to 71% relative humidity. The complete life cycle was about 42 days. The beetle feeds on rice bran, wheat, flour, bread, apple, pollen, dried yeast extract, saccharose and royal jelly. It has a high rate of increase and able to overwinter at any heated place. These characteristics of *P. (M.) dermestoides* make it a potential pest of stored products. In the Philippines, it is commonly observed on flour, ground corn, peanut, rice, mungbean, sorghum and wheat.

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This study aimed to determine the life cycle, external morphology, habits, host range and natural enemies of *P. (M.) dermestoides*. It was reared on corn flour with Brewer's yeast and ground corn since these media are commonly infested by these beetles. Brewer's yeast was added to improve the nutritive quality of the diet and ensure maximum egg laying capacity and growth of the beetles.

It is known that climate affects the biology of a species, thus, it is essential to conduct this study under local condition. All observations were done in the Department of Entomology, University of the Philippines at Los Baños, College, Laguna and nearby warehouses from May to October 1984.

MATERIALS AND METHODS

Life History and Habits

The beetle obtained from the National Institute of Science and Technology served as the stock culture. Beetles were placed in ball jars (170 x 90 mm diameter) containing corn flour for egg production. Laid eggs were removed daily by using a sieve and kept separately in petri dishes to observe the incubation period. After hatching, the larvae were placed individually in vials (75 x 25 mm diameter) containing corn flour with Brewer's yeast (10: 1 v:v) as the culture medium. Vials were stoppered with tissue paper. Another batch of beetles were placed singly in Gerber bottles with two grams of ground corn. The life history and habits of the beetles were compared using these two media. The number and duration of larval instars were determined by daily observation of the exuviae and the change in size of the larva in each culture medium. Pupation was likewise observed.

Ten pairs (1:1 sex ratio) of newly emerged adults were placed separately in ball jars with corn flour and Brewer's yeast. The eggs laid until adults died were counted.

The total developmental period from egg to adult emergence was likewise observed.

Taxonomy and Description of Stages

The beetle was determined by Dr. Z. Kazab¹ as *Palembus (Martianus) dermestoides* Chevrolat.

The morphology and anatomy of *P.(M.) dermestoides* were described from live and alcohol preserved specimens. The external morphology of the egg was studied from fresh specimen. The description of the external morphology of the larva and adult was based on specimens mounted on slides.

¹ Bernice Pauahi Bishop Museum, Honolulu, Hawaii

Host Range

The host range of *P. (M.) dermestoides* was observed in the laboratory. Two hundred grams of the different potential hosts (white corn, wheat, rice mungbean, cowpea, flour, soybean, peanut, sorghum, and pole bean) were placed in wide mouth ball jars covered with cheese cloth. There were three replicates per host. They were sterilized by heat treatment for 24 hours and each replicate was artificially infested with 60 first instar larvae. The developmental period and adult emergence were noted. The overall efficiency of a host was evaluated by growth index patterned after Gokhale (1973).

Natural Enemies

Eggs, larvae, pupae and adults of *P. (M.) dermestoides* were collected from warehouse and flours from markets and reared in the laboratory on their host. The insects were observed daily with the use of a dissecting microscope for the possible parasites or pathogens which might be present.

RESULTS AND DISCUSSION

Life History and Habits

The duration of the different stages of *P. (M.) dermestoides* on corn flour with Brewer's yeast and ground corn are shown in Table 1. Figure 1 shows the various stages of the life cycle of the insect.

Egg. Eggs are laid singly and scattered over the surface of the food. When newly laid, they are cream white turning darker when about to hatch. The chorion is translucent, thin and very delicate. When about to hatch, the outline of the egg changes from oval to slightly concave. Incubation ranges from 3 to 6 days for both media.

Larva. The larva undergoes 5 to 7 instars and its total duration ranges from 25 to 39 days on corn flour with Brewer's yeast. On ground corn the larva undergoes 4 to 5 instars and the total duration ranges from 25 to 31 days. The variation in the developmental period and number of instars could be attributed to changes in temperature and nutritive differences of the two diets.

Larval eclosion is by means of a split in the chorion contiguous to the dorsum of the thorax. The first instar larva is creamish white, elateriform, eleven segmented with numerous setae in all parts of the body. The head capsule is light brown with well developed mouthparts. The second instar is similar in form but the color is light reddish brown. At the third and fourth instars the larval skin becomes sclerotized and dark reddish brown. The fifth and seventh instar larvae are deep reddish brown. The head is subequal to the prothorax, mesothorax and metathorax. Spiracles are present on the cephalic portion of the mesothorax. Abdomen is nine segmented with spiracles on segment 1 to 8. The ninth segment has a non-

Table 1. Developmental period (days) of *P. (M.) dermestoides* on two host materials ¹

Stage	Range (days)		Mean (days)	
	Corn flour + Brewer's Yeast	Ground corn	Corn flour + Brewer's Yeast	Ground corn
Egg				
Incubation	3-6	3-6	4	4
Larva				
1st	6-9	5-8	6	6
2nd	2-5	5-6	4	5
3rd	2-5	5-6	4	5
4th	2-7	4-7	3	5
5th	2-9	4-8	4	5
6th	2-10	—	5	—
7th	2-6	—	4	—
Total larval period	23-31	25-30	27	27
Pupa	3-7	5-6	5	5
Egg to emergence	32-41	36-38	36	37
Adult longevity	51-74	65-89	61	75

¹ Data based on 52 individuals

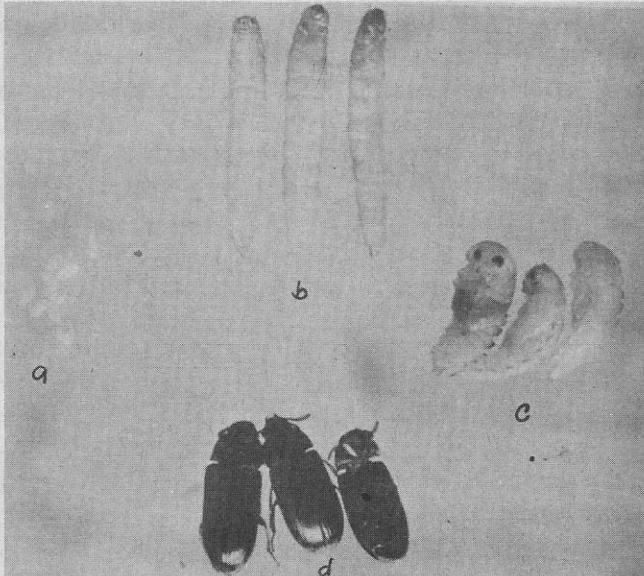


Figure 1. The various stages of *P. (M.) dermestoides* Chevrolat a. eggs b. larvae c. pupae d. adults Magnification, 10X

segmented and fixed urogomphus.

Pupa. There is a prepupal period. When the larva matures, it undergoes a gradual contraction of segment. The old larval skin splits along the mid-dorsal line of the thorax and a pure white pupa emerges. Ecdysis from pupa to adult lasts from 3 to 5 minutes. Pigmentation of the pupa occurs in the following sequence: the eyes and mandibles become red, then the antennae, legs, wing pads, and abdominal sclerites become reddish brown. The pupa vigorously twitches the tip of its abdomen when disturbed. The sexual differences at the pupal stage can be seen in the genital appendages. The male has the two globular papillae not widely separated (Fig. 2a) but the female papillae are strongly separated (Fig. 2b).

Pupal period ranges from 3 to 7 days on corn flour with Brewer's yeast and 5 to 6 days on ground corn.

Adult. Adults emerge any time of the day. The newly emerged adult is yellowish brown and eventually turns reddish brown to light red when mature. It immediately becomes very active.

Adults mate 5 to 7 days after emergence. Oviposition is from 8 to 10 days after the first copulation. The total number of eggs laid by a female ranges from 34 to 141 with an average of 95 eggs.

Adult longevity ranges from 51 to 74 on corn flour with Brewer's yeast and 65 to 80 days on ground corn.

Cannibalism occurs among adult beetles inspite of adequate food and space.

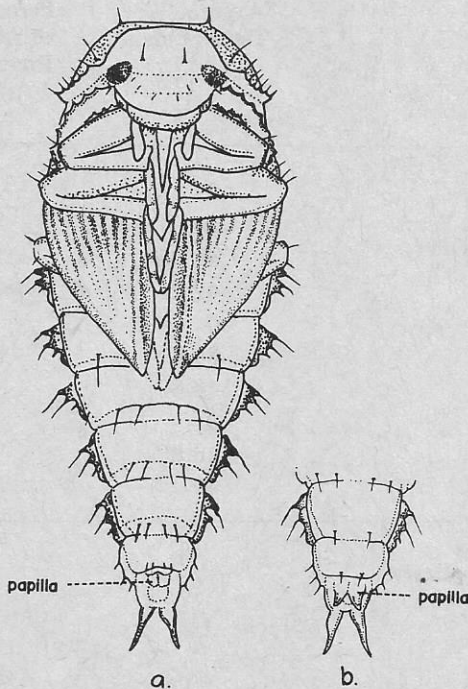


Figure 2. Free hand drawing of the pupa of *P. (M.) dermestoides* a. male (400X) b. female (400X)

Host Range

Corn flour, peanut and rice were the most suitable hosts for this insect as shown by relatively short developmental period, high percentage of emergence and high growth index (Table 2). It can also thrive on white corn, mungbean, sorghum, and wheat but not on soybean, cowpea and pole bean. Percentages of emergence on mungbean, sorghum, wheat and white corn were low. This could be attributed to the hard seed coat which prevented the larvae from penetrating the food. This supports the findings of Le Cato (1976) and Gokhale (1973). Highest percentage of emergence and longer development period were observed on beetles reared on corn flour.

The efficiency of food based on growth index was as follows: corn flour > peanut > rice > ground corn > mungbean > sorghum = wheat grain. The larvae did not thrive on soybean, pole bean and cowpea.

Table 2. Developmental period (days) and adult emergence of *O. (M.) dermestoides* in different stored products.¹

Hosts	Average Development (AV)	Percentage of Adults Emergence (N)	Growth Index (N/AV)
Cowpea	0	0	0
Corn flour + Brewer's Yeast	36	71	1.97
Mungbean	49.35	19	0.38
Peanut	42.26	64	1.52
Pole bean	0	0	0
Rice	36.50	50	1.37
Sorghum	46.88	9	0.19
Soybean	0	0	0
Wheat	46.88	9	0.19
Ground corn	37	32	0.86

¹ / Average of three replicates

Natural Enemies

There were no natural enemies observed during the experiment.

SUMMARY

1. The life history, habits, external morphology, host range and natural enemies of *Palembus (M.) dermestoides* were studied on corn flour with Brewer's yeast and ground corn.

2. The developmental period on corn flour with Brewer's yeast ranges from 34 to 41 days with an average of 36 days. The mean duration of each stage are as follows: egg, 4 days; larva, 27 days and pupa, 5 days. The larva undergoes 5 to 7 instars. Adult longevity ranges from 51 to 74 days with a mean of 60 days.

3. The developmental period on ground corn ranges from 36 to 38 days with an average of 37 days. The mean duration of each stage are as follows: egg, 4 days; larva, 27 days and pupa, 5 days. The larva undergoes 4 to 5 instars. Adult longevity ranges from 65 to 89 days with an average of 75 days.

4. Based on the developmental period and growth index, corn flour, peanut and rice are more suitable hosts for this insect than white corn, mungbean, sorghum and wheat. The beetles did not thrive on soybean, pole bean and cowpea.

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