International Journal of Agricultural Technology 2017 Vol. 13(7.3): 2197-2204
Available online http://www.ijat-aatsea.com
ISSN 1686-9141

Biology of *Pergesa acteus* (Lepidoptera: Sphingidae)

Danarun S.[1], S. Bumroongsook[2*] and S. Tigvattananont[3]

[1,2]Department of Plant Production Technology, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand; [3] 17 Ngamwongvan Rd., Thasai Subdistrict, Muang District, Nonthaburi, Thailand.

Danarun S., S. Bumroongsook and S. Tigvattananont (2017). Biology of *Pergesa acteus* (Lepidoptera: Sphingidae). International Journal of Agricultural Technology 13(7.3): 2197-2204.

Green pergesa hawk moth (*Pergesa acteus* (Cramer, 1779)) is a moth belonging to the family Sphingidae, order Lepidoptera. They are considered to be one of the important insect pest in genus *Caladium*, family Araceae. They feed on and destroy Caladiums and widely distributed in most parts of Thailand. The biological studies of this insect was conducted under the laboratory conditions (34 ^{o}C; 70% RH) using young leaves of *Caladium bicolor* for rearing larval stages. Males and females were fed with 25% of honey solution. The eggs were laid singly on the lower surface of the host plant leaves. Egg incubation period was 3.41±0.07days. The mean of head capsule width of 1st, 2nd, 3rd, 4th and 5th instar larvae were 0.85±0.06, 1.27±0.04, 1.78±0.05, 2.54±0.08 and 3.90±0.09 mm and corresponding dorsal horn lengths 2.85±0.25, 4.80±0.48, 6.76±1.09, 7.32±1.12 and 2.84±0.23 mm, respectively. The total time that it stays in the caterpillar stage is about 18.29 days. The length of pupal stage was 14.34±1.12 days. The lifespan of the female green pergesa hawk moth is slightly longer than that of the male 2.83±0.70 and 2.43±0.50 days, respectively.

Keywords: *Pergesa acteus*, Caladium

Introduction

The hawkmoth, *Pergesa acteus* (Cramer, 1779) is widely distributed throughout South and Southeast Asia, commonly known as a hummingbird hawk moth (Barlow, 1982). Some hawk moth adults are nocturnal feeders and many of them are diurnal and ingest nectar from flowers as an energy diet (Kendrick, 2010). *Pergesa acteus* are pollinators of Caladium genus of flowering plants araceae family in tropical regions (Johnson and Martins, 2013). The flowers are called a spadix which has small flowers borne on its stem. Caladium plants are also a popular ornamental plant because they have odor and colourful flowers to attract green pergesa hawkmoths (*Pergesa acteus*) to transfer pollen from one flower to another. Adult female hawk moth lays egg singly on the lower surface of its host plant. These larvae are heavy leaf

[*] **Coressponding Author:** S. Bumroongsook, **E-mail:** suvarin.bu@kmitl.ac.th

feeders. During outbreak, these hawkmoth caterpillars may cause damage to infested host plants beyond recovery.

The objectives were focused on morphology and biology of the *Pergesa acteus* as basic research for management program.

Materials and methods

Sample collection

Eggs and larvae were collected from Caladium plants. Eggs were placed in the petri dish (9 cm of diameter) and larvae were kept in different sizes of plastic boxes depending upon the number of larva. These samples were bought back to the entomological laboratory, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang for further studies.

Morphology and biology of the green pergesa hawk moth

Morphological characteristicsof eggs, larvae, pupa and adults was recorded including measurement of. Sex dimorphism was observed, measured and photographed (n=30).

Pergesa acteus from pupa, both male and female were transferred to the cage in size 40 × 60 × 60 cm, and provided them with 25% of honey solution. Caladium leaves on a small twig was placed for egg laying sites for females to lay their eggs on. Mating behavior and duration time for development was observed. The leaves were changed daily for caterpillar food.

Results and Discussion

Morphology and biology of the green pergesa hawk moth

Egg: Eggs are spherical shape, green color and reflective surface with diameter of 1.67±0.08 mm. (Fig. 1). Its incubation period was 3.41±0.07 days.

Larvae: The body length of larval instar 1-5 was 8.73±1.81, 14.20±2.85, 21.63±3.51, 33.70±7.20 and 57.67±10.84 mm, respectively; corresponding head capsule width 0.85±0.06, 1.27±0.04, 1.78±0.05, 2.54±0.08 and 3.90±0.09 mm, respectively; dorsal horn length 2.85±0.25, 4.80±0.48, 6.76±1.09, 7.32±1.12 and 2.84±0.23 mm. respectively (Table 1, Fig 2). The fourth instar larvae have 2 forms: green and brown color (Fig 3).

Pupa: The pupa is a life stage between immature stage and adult of green pergesa hawk moth. It is large, brownish color and 40.57±2.75 mm. in length

with the cremester width 2.31±0.27 mm. and 2.71±019 mm long. The pupal period was 14.34±1.12 days (Fig 4).

Male: Adult male has ciliate antenna, 13.35±0.87 mm long. The body length is 32.90±2.34 mm. The wingspan is 63.61±3.11 mm. The forewings are 10.85±0.88 mm wide and 29.39±1.84 mm long. The hindwing width is 8.77±0.84 mm and 17.45±1.31 mm in length (Fig 5).

Female: Adult female has filifrom antenna, 12.70±0.50 mm in length. Its body length is 33.74±2.32 mm. The wingspan is 67.65±4.14 mm. The forewing 11.84±0.75 mm wide and 31.10±1.62 mm long. The hindwing is 9.50±0.73 mm wide and 19.23±1.31 mm long (Table 2-3). Female green pergesa hawk moth is slightly longer than that of the male.

Host plants of Pergesa acteus

From observation, host plants of *Pergesa acteus* was described in Table 4. Twenty three species are in Araceae family: *Alocasia cucullata, A. zebrina, A. princeps, A.macrorrhizos, A. sanderiana., Amorphophallus yunnanensis, Amorphophallus* sp., *Caladium bicolor, C. humboldtii* , *C. schomburgkii, Colocasia esculenta* cv., *C. esculenta* cv. Rhubarb, *Colocasia esculenta* (L.), *C. esculenta, C. gigantea, Spathiphyllum cannifolium, Typhonium trilobatum, Xanthosoma sagittifolium, X. violaceum, Monstera obliqua, Philodendron 'Burle* Marx', *Syngonium podophyllum* and *Syngonium* sp.; 1 species in Balsaminaceae: *Impatiena balsamina*; 2 species in Onagraceae: *Ludwigia hyssopifolia* and *L. octovalvis* and and 1 species in Vitaceae: *Vitis vinifera*. *Pergesa acteus* exibit abrard host range. Larval host plants and host range are noted (Ghorpade *et al*., 2013).

Figure 1. Egg of *Pergesa acteus***.**

Table 1. Developmental stages of the green pergesa hawk moth (*Pergesa acteus*)

Growth stages	Duration time (days)	Body length (mm)	Head capsule width (mm)
egg	3.41 ±0.07		
1 st instar	2.11 ±0.12	8.73 ±1.81	0.85 ±0.06
2 nd instar	1.75 ±0.36	14.20 ±2.85	1.27 ±0.04
3 rd instar	1.95 ±0.12	21.63 ±3.51	1.78 ±0.05
4 th instar	2.21 ±0.08	33.70 ±7.20	2.54 ±0.08
5 th instar	4.99 ±0.48	57.67 ±10.84	3.90 ±0.09
pupa	14.34 ±1.12	40.57 ±2.75	
male	2.43 ±0.50	32.90 ±2.34	
female	2.83 ±0.70	33.74 ±2.32	

[1]Values are means of thirty replicates ± SD

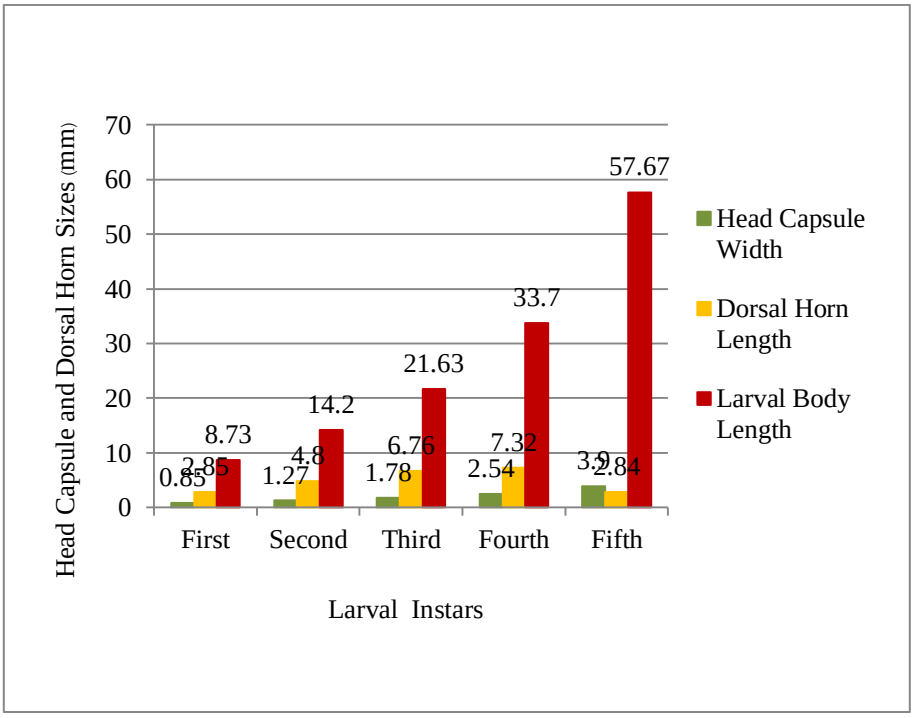

Figure 2. Head capsule width, caudal horn length and larval length increase through the growth and development of the green pergesa hawk moth.

Figure 3. The 4th instar larvae have 2 forms: green (left) and brown (right).

Figure 4. Pupa of the *Pergesa acteus*.

Figure 5. Adult male of the *Pergesa acteus.*

Table 2. The length[1] of antenna and proboscis in millimeter of the male and female

Sex	Antennal length	Proboscis length
Male	13.35 ±0.87	60.68 ±5.07
Female	12.70 ±0.50	63.71 ±5.85

Values are means of thirty replicates ± SD

Table 3. Sizes[1] in millimeter of fore- and hind- wing include wingspan of *Pergesa acteus*

Sex	Fore wing		Hind wing		Wingspan
	Width	Length	Width	Length	
Male	10.85 ±0.88	29.39 ±1.84	8.77 ±0.84	17.45 ±1.31	63.61 ±3.11
Female	11.84 ±0.75	31.10 ±1.62	9.50 ±0.73	19.23 ±1.31	67.65 ±4.14

[1]Values are means of thirty replicates ± SD

Table 4. Larval host plants of the green pergesa hawk moth

Plant family	Host plant species	Common name	Vernacular name
Araceae	*Alocasia cucullata* (Lour.)	Chinese Taro	Nang kwak
	A. zebrina K.Koch & Veitch	-	-
	A. princeps W.Bull	-	-
	A.macrorrhizos (L.)	Giant taro	Kradat
	A. sanderiana Bull.	Kris plant	Kaeo nama
	Amorphophallus yunnanensis Engl.	-	Buk dang
	Amorphophallus sp.	-	Buk kammayi
	Caladium bicolor Vent.	Fancy leaved caladium	Bon see
	C. humboldtii Schott.	-	Bon see pyayasavet
	C. schomburgkii Schott.	-	Bon bai pho
	Colocasia esculenta cv.	-	Kradat dam bai thuai
	C. esculenta cv. Rhubarb	-	Kradat kan daeng
	Colocasia esculenta (L.)	Taro	Phueak
	Colocasia esculenta	-	Bon nam
	Colocasia gigantea Hook.F.	-	Khun
	Spathiphyllum cannifolium (Dryand.)	Peace Lily	Deli bai klusi
	Typhonium trilobatum (L.)	-	Utts phit
	Xanthosoma sagittifolium (L.)	Tannia	Thung ngem thung toag
	Xanthosoma violaceum Schott.	Elephant Ear	Kradat dam
	Monstera obliqua (Miq.)	Window-leaf	Plu-cha-lhu
	Philodendron 'Burle Marx'	-	Pilodendron
	Syngonium podophyllum	Arrow head plant	Ngern-lai-ma
	Syngonium sp.	-	Om ngern om thong
Balsaminaceae	*Impatiena balsamina* L.	Garden balsam	Tian baan
Onagraceae	*Ludwigia hyssopifolia* (G.Don)	Water primrose	Tian na
	Ludwigia octovalvis (Jaq.)	-	Tian na
Vitaceae	*Vitis vinifera* L.	Grape vine	Angun

References

Barlow, HS. (1982). An introduction to the moths of southeast Asia. 7. pp.,. pls., 1.figs.KualaLumpur.

Ghorpade, K, Patil, RR and Chandaragi, MK. (2013). Notes on Hawk Moths (Lepidoptera Sphingidae) in the Karwar-Dharwar transect, peninsular India: a tribute to T.R.D. Bell (1863-1948)[1]. Colemania 33:1-16.

Cramer, P. (1779).Papillons Exotiques des Trois Parties du Monde, L'Asie, L'Afrique *et* L'Amerique, 1: 155 pp. Baalde and Barthelemy Wild, Amsterdam and Utretch.

Johnson, SD. and Martins DJ. (2013). Interactions between hawkmoths and flowering plants in East Africa: polyphagy and evolutionary specialization in an ecological context. Biological Journal of the Linnean Society 110: 199–213.

Kendrick, RC. (2010).The genus Macroglossum Scopoli 2111 (Lepidoptera: Sphingidae, Macroglossinae) in Hong Kong. HKE B 1 (2): 27-12.

(Received 25 October 2017; accepted 25 November 2017)