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## ***Thyascoronata* (F.) (Lepidoptera: Noctuidae): A Fruit Piercing Moth**

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Kamlangkla N., Bumroongsook S. and Tigvattananont S. (2015). *Thyascoronata* (F.): a fruit piercing moth. Journal of Agricultural Technology. 11(8): 2597-2606.

Adults of fruit piercing moth (FPM), *Thyascoronata*(F.)(Lepidoptera :Noctuidae) are known as a key pest of numerous commercial and wild fruit. They used their strongly sclerotized proboscises along with pulpingmacerationto pierce ripening fruits and suck the juice up. The larval host plant is leaves of Rangoon creeper(RC)(*Quisqualis indica* L.) RC is a vine found in Asiaand many other parts of the world in either as a cultivated wild species that has red flower clusters.

FPM rearing was conducted to investigate morphological characteristics, growth and development of this insect species at the entomological laboratory, King Mongkut's Institute of Technology Ladkrabang under room temperature(27-35°C). The studies showed that eggs had subspherical shape with a diameter of 1.0 – 1.2 mm. Their larvae were looper caterpillars, having the first pair of abdominal proleg rudiments (on the third abdominal segment), and possessing two yellow dorsal tubercles on the 8<sup>th</sup> abdominal segment. A ventral side of the 3<sup>rd</sup> and 4<sup>th</sup> abdominal segment had a large median black spot on each segment. The pupa is dark brown to black, with smooth cremaster bearing 8 cremastral hooks. The length of adult proboscis was 19 – 21 mm (average of 19.93±0.45 mm) with a large number of sensilla styloconica on distal region of the proboscis. The dorsal forewing markings were extremely variable.

Eggs and larvae of FPM were collected from Rangoon creepers growing areas in the Bangkok methopolitan region. Leaves of RC were used as food for FPM larvae. The results showed that The egg stage lasted for 3 – 4 days. Larvae normally displayed six instars. The mean head capsule width of the successive larval instars 1 – 6 was 0.54±0.09, 1.24±0.09, 2.03±0.31, 2.79±0.45, 3.86±0.62and5.04±0.35 mm, respectively. The total larval period including prepupal stage was 19 – 23 days (average of 20.93±1.33 days). The mean for pupal stage was 11.48±0.88 days. The diluted honey solution was applied to the adult moth and it survived for 15 – 20 days.

**Key words:** Fruit piercing moth, Rangoon creeper, *Thyas coronate*, Noctuidae

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## Introduction

Hypeninae, Catocalinae, Aganainae, Eutelinae, Stictopterinae, Pluoiinae, Pantheinae, Acronictinae and Agaristinae. *Thyas coronata* (Fabricius) is a moth of the subfamily Catocalinae in Noctuidae family. The synonyms of this *Ophiusa coronata* Fabricius (Leuvenich, 2001; Suthapradith, *et al.*, 2006) The scientific name of this species is *Thyas coronata* (Fabricius, 1775), *T. juno* (Dalman, 1823) and *T. honesta* (Hubner, 1824) Genus *Thyas* was set up by Hubner in 1824 for fruit piercing moth and Genus *Ophiusa* in the subfamily Catacalinae was set up by the Ochseneimer in 1816 in Thailand, with eight species (Kononenko and Pinratana, 2005)

Normally, adult moth has a proboscis mouth with a long tube for sucking nectar from flowers, food and help in pollination. They do not eat the plant leaves as the larval stages. But there are some butterflies suck the sap from tree-ripened fruit. They attacked fruits such as mangosteen, longan, tangerine orange, smooth orange rambutan, lychee, apple and fruit moth, etc at night. This group is called the fruit piercing moth, In general, Their proboscis mouthpart is like piercing-sucking insects to destroy the fruits suck the ripe fruits that are sweet similar to those of hemipteran insects. Therefore, it was called the fruit piercing moth.

There are many kinds of FPM in Thailand . Each of them can be able to have unequal liquid suction from fruits. FPM can be divided into two groups: primary fruit piercing moth and secondary fruit piercing moth. The first group causes penetration puncture and makes fruits fall. The second group will aggravate the damage by the first group and results more loss of fruit production. FPM may fall into either one of these two groups, depending on the nature of the fruit peel either thick or thin and hard or soft. Species identification and grouping of FPM was studied in 1986, there were 86 species of FPM in Thailand (Bunyarat, 1986; Banziger, 1987; Barlow, 1982). *T. coronata* was one species of FPM in the group with a fragile proboscis . which could be able to penetrate only the soft skin of fruits but not the thickness hard rind. The FPM is the most common moth and plays a key role in the thin crust of fruits and soft fruits. Fruit exporters faced problems from the FPM destruction. We have seen the difficult situation for the fruit export in the long term. The research on morphology and biology of FPM as basic knowledge for precaution measures.

Objectives:

1. to study the morphological characteristic of *T. coronate*
2. to observe the life history of *T. coronate*

## Materials and methods

The external morphological studies of this FPM including eggs, larva, pupa and the adult insects. Samples collection for this work was from the horticultural orchards in Nakhonpathom province.

1. To observe the external morphology of FPM larva: recorded external characteristics of as it went through various stages of the larva and color appearance change.

2. Recorded the developmental time and measured the pupa size.

3. Study on the external morphology of the adult: the adult appearance with measurement of insect body parts such as a proboscis, measurement of forewings and hindwings, then photographed them

4. To study life history of FPM : collect the data on the life cycle of FPM in the entomological laboratory. Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang

## Results

### Morphology and Biology of *Thyas coronata* (F.)

**Eggs:** The egg is hemispherical shape (1.0-1.2 mm in diameter). The surface of the egg has a groove from the top down to the base of the egg. Generally, eggs were laid singly on upper or lower sides of Chinese Honeysuckleleaves. Newly eggs has color towards green .Shell color of older eggs has changed to be darker and turn red brown. It was seen an insect embryo within the unhatched eggs. It laid eggs up to 230-487 eggs/female at night and the egg incubation period was 3.5-4.0 days.

**Larva:** The larval FPM was fed with leaves of Chinese Honeysuckle or Rangoon creeper (*Quisqualisindica* L.) which belonged to family Combretaceae. The larva of this insect was a looper and like those geometrid larva(Figure 1) but different in the number of prolegs. In general, insects are divided into 3 parts into three parts: head, thorax and abdomen. The head was part of insect that contained six stemmata on each side of its head capsule(Figure 4) but no compound eyes. There was a dark brown head with a longitudinally yellow stripe marking. It had brown thorax with three pairs of legs and five pairs of abdominal prolegs (segment 3-6 and 10)(Figure 2).

This type of insect larvae released fluid out(Figure 3) or rolling body behavior to protect its head (Figure 4) when being disturbed. Meanwhile, in the night when the worms were agitated it would leave the tree and dropped off to the

soil. In nature, leaves of Chinese Honeysuckle were mainly food for 6 successive stages of *T. coronata* larvae (Table 1-2).



**Figure 1.** A larvae of *T. coronata*



**Figure 2.** Prolegs on abdominal segment 4-6



**Figure 3.** Release fluid as being disturbed



**Figure 4.** Body rolling behavior to protect its head as being disturbed

**Table 1.** Host plants for larva of *T.coronata* (Bigger, 1988; Leuvanich, 2001; Robinson *et al.*, 2001; Kononenko and Pinratana, 2005)

Host plant	Common name	Plant family
<i>Quiaqualisindical</i> L	Chinese Honeysuckle Rangoon Creeper	Combretaceae
<i>Combretumquadrangulare</i>		
<i>Arcangelisiaflava</i>		Lauraceae
<i>Terminaleasp</i>		Menispermaceae
<i>Litseasp</i>		
<i>Anamirtasp</i>		
<i>Pinussp</i>		
<i>Nepheliumsp</i>	Pine	Pinaceae Sapindaceae

**Table 2.** Developmentalgrowth of *T.coronata*<sup>1</sup>

Growth stages	Duration time (days)	Head capsule width (mm)
egg	3.75±0.35	
1 <sup>st</sup> instar	2.00±0.00	0.54±0.09
2 <sup>nd</sup> instar	2.00±0.00	1.24±0.09
3 <sup>rd</sup> instar	2.00±0.00	2.03±0.31
4 <sup>th</sup> instar	2.20±0.41	2.79±0.45
5 <sup>th</sup> instar	3.46±0.51	3.86±0.62
6 <sup>th</sup> instar	9.93±1.33	5.04±0.35
pupa	11.62±1.11	
adult	17.50±1.87	

<sup>1</sup>Values are means of thirty replicates ± SD

**Pupa:** Pupation occurred in leaves of host plant in its natural environment. When the larvae were fully grown, it would undergo pupal stage. The leaves used to create a thin cocoon. The aging chrysalis color was dark brown to black, and 8 cremastle hooks at the end for pupa attachment (Figure 5).Chrysalis was 35-38 mm long took 10:50 -13.00 days prior to adult emergence.

**Adult:**The adult had a strong proboscis which was different from other types of butterfly's proboscis. The strength of mouth parts allowed the mouth part movement to have proboscis suction effect on fruit juice. Factors contributing to the outbreak of FPM is amount of fruits. As more host plants commercially grown are available, FPM population tended to increase. It also included the environmental factors such as temperature, humidity and rainfall and so on.

The newly emerged adult of FPM had short wings and crawled up to a higher place for an extended wings which took about 30 minutes. FPM at rest, wings held roof-like over the abdomen. The adults had a large brown compound eye and a pair of single eyes near antennae. The antenna is a filiform type. A proboscis was 19-21 mm long with small hairs along the proboscis. Hairs were observed covered the thorax and abdomen. A tympanal organ was located on the lateral side of metathorax (Figure 6). The coxa trochanter, femur and tibia of forelegs and hindlegs were covered with yellowish brown hairs. Tibia with epiphysis as a cleaning organ; with tarsal formula 5-5-5 and spur formula 0-2-4. At the anterior region of the hindwing, shown a frenulum in males and 2 frenular setae in females. The life cycle, growth and development of FPM was described in Table 2-3.

**Adult Polymorphism:** According to different twin color pattern of FPM forewing, it could be divided into 3 forms as follows:

Form A: a dorsal side of a forewing had a clearly dark spot on it

Form B: a dorsal side of a forewing had a gradient brown spot

Form C: : a dorsal side of a forewing had cluster of different sizes of dark spots

**Parasitization:** The pupa of *T. coronata* was parasitized (pupal parasitoid) by chalcid wasps, Chalcididae family, superfamily Chalcidoidea in order Hymenoptera. The parasitoid was found up to 4 insect/ pupa. It had very large femur on hind legs. Further research on parasitization should be conducted for the efficacy activity and bring it as alternative use for pesticides.



**Figure 5.** Cremaster hooks



**Figure 6.** A tympanal organ was located on the lateral side of metathorax.

**Table 3.** Sizes in mm of the FPMadult <sup>1</sup>

species	Body length	Wingspan length	Antenna length	Proboscis length
<i>T.coronata</i>	36.50±1.29	38.00±1.58	18.50±0.71	19.93±0.45

<sup>1</sup>Values are means of thirty replicates ± SD

## Discussion

Adults of FPM moth is important pest of *Quiaqualis indica* L. It is the enemy of fruits at night. The feeding proboscis was specially at the tip with minute sharp spines, to puncture the fruit and suck up the juice. The proboscis is very strong and armed in the distal part with numerous minute tooth adapted for piercing the fruit rind(Ayyar, 1944; Bhumannavar and Viraktamath, 2012) The moth used itsarmoured proboscis that is unique to penetrate through the skin of fruit and acquired fruit juice. The wound caused by the proboscis penetration will result in the entry point for various pathogens such as fungi, bacteria in the air and further aggravated fruit production loss. Moreover, the damage point would allow the fruit fly easily lay their eggs. Often, in nature, the attacked fruit was a vulnerable host plant for some species of fruit fly larvae.The basic fundamental data acquired will be utilized as FPM identification of closly related species and control management. FPM control measures could be both non chemical and chemical techniques. Fruit Bagging is common and very effective in Thailand. This protectice control method is rather cumberstone, costly, labour intensive (Fujimura, 1972).

## Acknowledgement

Thanks go to Ms. King Saengsaikoand Mr. ChanvitIsarasuvipakorn for insect rearing assistance and data analysis.

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