

ZAMIA PALM, A NEW HOST OF CYCAD BORER, *CHILADES PANDAVA* HORSFIELD (LEPIDOPTERA : LYCAENIDAE) IN EGYPT

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ABSTRACT: *The ornamental palm, Zamia spp (Zamiaceae) was recorded for the first time as a new host recorded in Egypt (Ismailyia governorate) for the cycad borer, Chilades pandava Horsfield (Cycadaceae) which was recorded in several regions of the world. This insect belongs to the family Lycaenidae which add to the two families of Egyptian borers (Fam. Cossidae& Fam.Sesiidae) representing the third family of Lepidopterous borers. In Egypt this insect infests Cycas revoluta palm at some governorates (Giza, Qalyubia, Cairo, Alexandria and the North Coast). Chilades pandava larvae cause several damages in Zamia and Cycas palm fronds leading to partial or entire death of infested palms. Description and durations for developmental stages are recorded. The duration of egg, caterpillar, prepupa, pupa and adult stages ranged between 1-2, 6-10, 2-3, 4-6 and 7-10 days, respectively. The different stages of this insect detecting short life cycle and numerous generations.*

Key words: *Zamia palm, Chilades pandava, Lepidopterous borers, butterfly*

INTRODUCTION

Ornamental cycas palms (Family: Cycadaceae) are considered one of important valuable trees, which are expensive price, cultivated and grown in gardens, Squares of towns and privet gardens of palaces. Many palm species are referred to genus Cycas (Cycadophyta), these different species are susceptible vulnerable by several species of various pests.

Zamia palms found infested by Cycas butterfly (*Chilades pandava*), which discovered for the first time on this host by the authors during 2015 year.

The caterpillars of *C. pandava* feed on various species of Cycas and the species is recognized pest of *Cycas revoluta* (Sago palm), Fric *et al.*, 2014, also *Cycas rumphii* (Cycadaceae). The Cycad blue (*C. pandava*) is not only an important pest of cultivated species but it may cause serious threat to native species around the tropics and subtropics it was document that the species may cause severe defoliation leading to

plant mortality (Wu *et al.*, 2010; Marler *et al.*, 2012). This butterfly (*Chilades pandava*) was reported from large numbers (85) of Cycas species (Marler *et al.*, 2012).

Cycas revoluta (Cycadaceae) plants are preferred larval host plant of *Chilades pandava*, while *Acacia* spp and *Albizia lebeck* are used as alternative larval host plants, and many nectar plants for adults (Tiple *et al.*, 2009)

In Egypt *Chilades trochylus* Frr.:Lycaenidae, (Macro Lepidoptera) was reported by El-Zoheiry and Mohamed (1949) whereas, *Chilades pandava* was recorded from Birqash(Giza), AlQanatir (Qulyubia), Cairo area (Fric *et al.*, 2014), Alexandria and North Coast (Abo-Shall *et al.*, 2014).

MATERIALS AND METHODS

During the research work on economic insects infesting the palm trees, the field visitations to numerous palm orchards and the continued visual observation showed heavy insectal infestation of Family: Zamiaceae palms, *Zamia* spp, (Photo1) at Abu-Sultan, Fayed (Ismailyia governorate)

by Cycas blue butterfly, *Chilades pandava* (Horsfield).

Infested parts (fronds, flowery-phore) of Zamia palms (Photo 2) were collected and transferred to laboratory and kept under natural conditions (July, 2015). The immature stages were noticed, the emerged adults were collected and sexed. 20 Couples of adults were introduced to 5 wire-cages (50x 50x80cm) provided with intact healthy fronds of Zamia palms. The different developmental stages of *C. pandava*, from the egg to adult, were studied under laboratory conditions of temperature degrees 29- 34C° and relative humidity of 58 – 79%. The deposited eggs were gathered with the leaflets from each cage and put in transparent plastic box (30x20x10cm) covered with muslin cloth, the incubation period was estimated. The hatching larvae were placed in boxes, as previous mentioned, provided with fresh young intact fronds, the larval duration was recorded, the formed pupae were observed until the adult emergence. The boxes were provided with cloth pieces moist with sugar solution for feeding the adults, the longevity of adult was recorded. The life cycle was calculated. The hosts, distribution, description, measurements, duration of various stages and economic injury were recorded.

RESULTS AND DISCUSSION

Distribution:

Native range to SE Asia including Thailand, Vietnam, China and probably Burma, Cambodia and Laos specializing on Cycas. This butterfly appears to be widespread in the *Cycas revoluta* farms in China. Moore *et al.*, 2005 report that this pest has been introduced to Saipan and Guam, where it is currently contributing to population destruction of *Cycas micronesica*. *Chilades pandava* was originally confined to

oriental region from India to Philippines and recently invaded temperate Asia (Korea and Japan) as well as Madagascar, Reunion, Mauritius and Guam (Wu *et al.*, 2010).

Field observations :

The adults are usually observed flying in the vicinity of the host plant, the ornamental sago palm which can be found in many gardens in commercial, recreational and private residential areas. They are viewed as a pest by gardeners as their presence usually leaves the prized ornamental plants without new growth. The adults visit flowers for nectar and have the habit of sunbathing with open wings in sunny condition.

Field observations revealed that varied numbers of Cycas palms in some examined orchards appear distinguish symptoms of rust diseases which are caused by active fungi, these symptoms are graduated where the fronds become yellow and wilt then lay over the trunk, the leaves will be fall down and the tree appear without any leaves, later the germs of fungi show as black powder on the heart of palm. Because the Cycad palm trees are vulnerable to the infestation by *Chilades pandava* butterfly so, this insect may be participated in the transmission of spores of rust fungal disease from infected palms to healthy ones.

Life stages of *C. pandava*:

Eggs:

The mated female lays its eggs individually on young fronds (on the underside or edges of attached leaves). The egg is turban-shaped, of about 0.4 - 0.5 mm in diameter (Table1), with a depressed micropylar at the center of the upper surface and with flattened base. The colour of deposited egg are pale greenish and turn blackish just before hatching. The egg surface is reticulated with a fine pattern of ridges and indentations, Photo (3 & 4).

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Photo (1) Zamia palm



Photo (2) infested fronds



Photo (3) : Deposited egg on the leaf

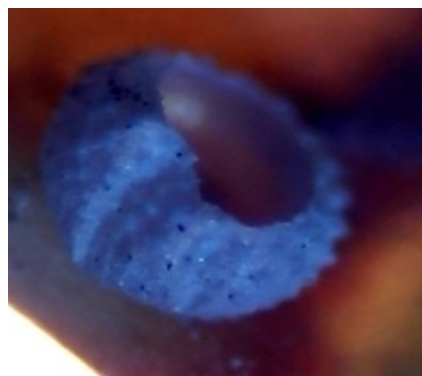


Photo (4): Hatching egg

Table (1): Measures and durations of different developmental stages of *C. pandava* lepidopteran on *Zamia* palms under Lab.cond of 29-34C° and 58-79%R.H.

Stage	Measurement (mm)	Duration (days)
Egg	0.4 – 0.5	1- 2
caterpillar	1.9 -15	6-10
prepupa	11-13	2-3
Pupa	9.5 -11.5	4-6
Adult	24 - 27	7-10

Larvae :

The eggs hatch after about 1- 2 days (Table1). The hatching larva does not consume the rest of the egg shell after its emergence, photo. (5). It has a pale yellowish body with length of about .0.9-1mm. The body also features long setae dorso-laterally and along the body. The head capsule is black. The young caterpillar feeds by nibbling away a layer of the leaf lamina. The caterpillar could appear in two colour forms: the first (yellow form) is yellowish with a strong green undertone, and whitish, narrow, intermittent bands occur dorso-laterally and laterally; the second (the red form) is reddish brown instead.

The caterpillar pass four larval instars to attain the prepupa, the duration of these larvae ranged 6-10 days, and their length ranged from 1.9 mm to 15 mm., Table (1)

The larvae are elongate, slightly flattened especially in the last instar, with small black, shining head capsule concealed in the thoracic segments.

The field observation showed that the larva is attended by ants. These ants exploit it to obtain sugary fluid secreted from gland (nectary organ) on the dorsum of 7th abdominal segment, besides the pair of tentacular organs on the 8th segment (Abu-Shall *et al* 2014)

The prementum of full grown larva carries spinneret and labial palp. The body surface is densely covered with numerous

short whitish setae .The prothorax has one pair of circular spiracles bordered with dark brown peritreme and the thorax shield is dark brown in colour. The abdomen consists of ten segments with a pair of lateral circular spiracles on each of 1st to 8th segments. There is a pair prolegs on the 3rd to the6th and10th abdominal segments, these differ in the different instars of larvae (Braby, 2000).

Prepupae:

When the caterpillar reach to full grown, it stops foods intake and seeks out a pupation site . During this time, the body gradually, shortened. It chooses a spot in gaps or cavities present between dried leaves. The prepupa which is about 11-13 mm prepares for pupation by spinning a silk girdle and a silk to pad which it attaches via anal claspers (hooks). The duration of prepupa lasted of about 2-3 days, Table (1).

Pupae:

Pupation takes place in rolled leaf shelters or in flowery-phore or in tunnel created by the larva. The larva cleans and expands the tunnel perior to pupation, leaving only a thin layer of plant tissue for the butterfly to break through this emergence.

Depending on the colour form of the final instar catterpillers, the pupa can be yellowish green almost entirely, or yellowish to dark reddish brown with numerous black speckles. The pupa has a typical lycaenid

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shape, (Photo 6). The length of pupa is about 9.5 -11.5 mm. After 4-6 days later (Table 1), the pupa turns black, first in the wing pad and thorax, then progressively in abdomen. The extent of the bluish patch in wing pads gives an early indication of gender of the soon -to- emerge adult. The next day, the pupal stage comes to an end with the emergence of adult butterfly.

Adults:

Adult butterfly is ornate (Photo7: a,b,c). The male is blue with thin black borders on both wings and it has a black tornal spot on hind wing. The female is in paler blue with

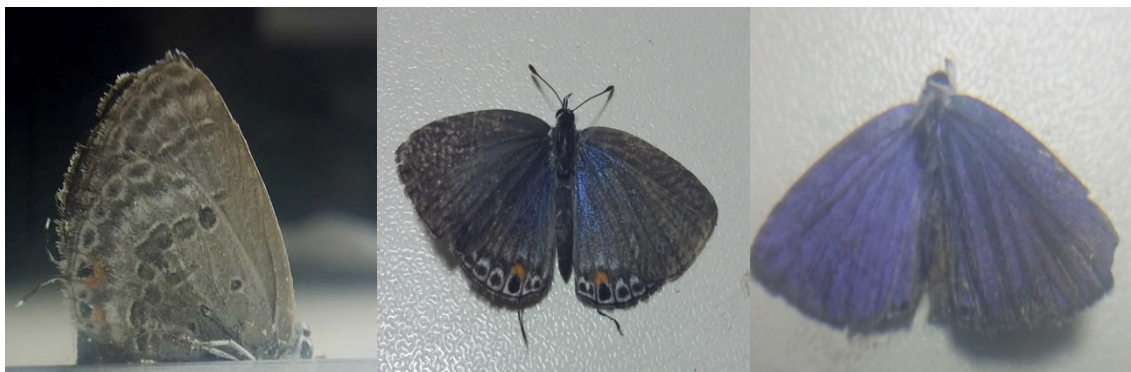
broad borders on the forewing and it has a series of submarginal spots on the hindwing, of which the spots in space 2 is crowned in orange. Both sexes are pale grayish brown. Both wings have the usual submarginal, marginal and post-discal series of spots and cell-end bars flanked with white. In the hind wing, there is a black spot in the cell, two black spots in space 7, another one just below vein 1a and orange-crowned tornal spots in spaces 1b and 2. There is white-tipped filamentous tail at vein 2 in the hindwing. The width of adult wings (wingspan) ranged 24 -27mm. and the butterfly longevity was 7-10 days.



Photo(5): Larva of *Chilades pandava*



Photo(6): Pupae of *Chilades pandava*



(a): Adult butterfly

(b): Grayish brown colour

(c): Blue colour of adult

Photo (7: a,b,c) : *Chilades pandava* butterfly

Four subspecies of this cycad specialist Lycaenidae species are currently recognized: *Chilades pandava* lanka is known from Sri Lanka, *Chilades pandava* peripatria occurs exclusively in Taiwan, *Chilades pandava* vapanda occurs in the Philippines, and widespread *Chilades pandava* pandava is found in mainland China and Southeast Asia (Hsu,2002 , Igarashi and Fukuda,2000 , Wu *et al.*, 2010).

This butterfly species show environmentally induced but genetically determined discrete seasonal forms (Seasonal polyphenism). The seasonal forms may have contrasting life history strategies in response to varying seasonal and social conditions such as ambient temperature and day-length, differential availability of secure resting places, nectar plants for adult and larval host plants, and a different set predators and predation risk (Brakefield and Larsen 1984; Brakefield *et al.*, 2007; Nijhout, 2003 ; Shapiro1976)

Pervious data on durations of different developmental stages of *C. pandava* indicated to short life of these stages through annual activity periods. Continued seasonal appearance with short lifecycle clearly detected numerous annual generations, these results are coincident with Kunte and Tiple (2009).

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نخيل الزاميا - عائل جديد لحفار نخيل السيكاكس *CHILADES PANDAVA HORSFIELD*

رتبة حرشفية الأجنحة فصيلة ليكندى فى مصر

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المخلص العربى

يعتبر نخيل الزاميا واحدا من أشجار الزينة النادرة التى تسجل فى هذا العمل لأول مرة فى مصر (محافظة الإسماعلية) كعائل جديد لحفار نخيل السيكاكس *Chilades pandava* Horsfield والذى يتبع رتبة حرشفية الأجنحة فصيلة ليكندى والتى تضاف إلى فصائل الناخرات ممثلة الفصيلة الثالثة للناخرات حرشفية الأجنحة فى مصر (فصيلة كوسيدى وفصيلة سيدي). وقد تم تسجيل هذا الحفار على نخيل السيكاكس فى محافظات الجيزة والقاهرة والقليوبية والأسكندرية والساحل الشمالى .

اشارت النتائج الى ان يرقات هذه الحشرة تحفر فى سعف نخيل الزاميا مسببه أضرار شديدة مؤدية إلى الموت الجزئى أو الكلى للنخيل المصاب . كما تم وصف وتصوير وحساب أطوار النمو المختلفة لهذا الحفار . اظهرت النتائج ان مدة الأطوار المختلفة باليوم تراوحت بين ١- ٢ يوم ، ٦- ١٠ يوم ، ٢- ٣ يوم ، ٤- ٦ يوم ، ٧- ١٠ يوم لكل من البيض واليرقات وطورما قبل العذراء والعذارى والحشرات الكاملة ، على التوالى. وقد أظهرت النتائج قصر فترات النمو للأطوار المختلفة للحشرة تحت الدراسة مما يعنى وجود عدة أجيال لهذه الحشرة على مدار العام .