# *OPHELIMUS MASKELLI* (HYMENOPTERA: EULOPHIDAE) A NEWLY INTRODUCED EUCALYPTUS GALL MAKER IN EGYPT

**Hanan M. Ramadan and Hedaya H. Karam**

*Received on: 2/6/2005* *Accepted on: 6/7/2005*


## ABSTRACT

*Ophelimus maskelli (Ashmed) (Hymenoptera : Eulophidae) is an exotic tiny wasp accidentally introduced into Egypt, producing galls on Eucalyptus. The wasp is presently distributed in Mediterranean basin, and has overlapping generations annually. In this research, symptoms of infestation are distinguished from another eulophid eucalyptus gall-forming, Apeostocetus sp. which previously recorded in Egypt. Morphological characters are described from specimens collected from Eucalyptus camaldulensis. Some biological observations are reported. Ophelimus maskelli is thelytokous,i.e. only known from females. Mean development time from oviposition to emergency is about 120 days at laboratory conditions of 20 ± 2 °C and 80 ± 5% RH. Mean survival time for wasps fed on aqueous honey solution is 6.3 days. Mean number of ovarian eggs is 250 ± 50 per female, larvae and pupae live in protruding galls of leaves. The adult emerges after cutting an exit hole through the gall.*


*Key Words: Ophelimus maskelli, eucalyptus gall inducer*

## INTRODUCTION

Eucalyptus has been introduced into Egypt more than a hundred years ago. It proved to be adapted under all the climatic and soil conditions of the country. Eucalyptus trees are widely grown in Egypt to be used as windbreak and for producing timber for high value end-uses. Although eucalyptus leaves are sclerophyllous, and their toughness can be an effective barriers against leaf-eating insects (Edward and Wanjura, 1990), they are now plagued in Egypt (from the beginning of 2000s) by two serious new insect gall makers. One was identified as *Aprostocetus* sp. (Ramadan, 2004), the second is the subject of this investigation. It is a species belonging to the eulophid genus *Ophelimus* (previously named as *Rhincopeltella*). This genus comprises approximately 50 species of micro wasps which develop in galls in various species of Eucalyptus (Boucek, 1988). The origin of this genus seems to be Australia, the home of eucalyptus (Raman and Withers, 2003). In 1987 *Ophelimus eucalypti* (Gahan) invaded New Zealand and spread throughout the country (Withers *et al.* 2000). *Ophelimus maskelli* (Ashmead) which is concerned in this study now seems to be common in many areas in the Mediterranean basin like Spain, Morocco, Israel, Iran and Italy (La Salle, personal communication). All samples have been collected from *Eucalyptus camaldulensis*, the most economically important hardwood species of the dry lowland areas in the entire Mediterranean and Middle east region (FAO, 1964). These small wasps have not a considerable power of flight, therefore wind may assist in their dispersal and invading the coastal areas of Egypt, where they badly damaged young trees and nurseries.

Since this insect is recorded here as new pest in Egypt. The aim of the present work is to distinguish the symptoms of infestation of this pest from that of the previously described gall maker, (*Aprostocetus* sp.), presenting the identification characteristics and some observations on its biology.

## MATERIALS AND METHODS

Heavily infested leaves with galls from *Eucalyptus camaldulensis* trees were collected from the field and placed in ventilated jars. The emerging wasps were mounted on glass slides using Hoyer's solution for the light microscope examination. Some wasps were prepared for the scanning electron microscope (SEM) examination by chilling to death and then directly mounted on the stub by using double sided sticky transparent tape in suitable positions under a stereoscopic microscope. The specimens were coated with gold in (JOEL JFC- 1100 E) high resolution sputter and then examined in a JOEL (JSM-5300) Scanning Electron Microscope at the Faculty of Science, Alexandria University.

The key of Boucek (1988) was used for identification to the genus level, then this identification was confirmed by Prof. Dr. T.C.Narendran, FASc, Systematic Entomology Laboratory, Dept. of Zoology, University of Calicut, Kerala 673635,India.The species level was achieved by Prof. Dr. John La Salle, CSIRO Entomology, GPO Box. 1700, Canberra, ACT 2601, Australia. Measurements of the body regions were carried out by ocular micrometer.

For the biological observations, five newly emerged females were dissected on glass slides in glycerol to record the number of ovarian eggs. Ten newly emerged females were individually confined in transparent muslin bags, each bag was closed around a young leaf of a seedling of eucalyptus planted in a pot under laboratory conditions of 20 ± 2 °C, 80 ± 5% RH and 14: 10 LD. Fine droplets of aqueous honey solution (1 : 1) were added on the wall of the muslin bag as a source of food for the female wasp. Every two days other droplets of honey solution were added until the death of the wasp. The leaves were left encaged in the muslin bags for about 4 months till the emergence of new adults. Eucalyptus seedlings were watered weekly until the end of the experiment. Some galls were slit obliquely with a razor blade and the larvae

Department of Economic Entomology, Faculty of Agriculture, Alexandria University

and pupae were examined through a stereo-binocular microscope.

## RESULTS AND DISSCUSSION

### A) Symptoms of infestation with *Ophelimus maskelli* and *Aprostocetus* sp.

The galls made by *O. maskelli* are present on the leaf blade, they are pimple like and are well separated from each other. On the other hand, the galls of *Aprostocetus* sp. are present on the midribs of the leaves or the small twigs and never on the actual leaf blade, the swellings are coalescing (Fig. 1)

### B) Characteristics of *O. maskelli* :

*O. maskelli* is a tiny wasp, with body length ranged from 0.8 to 1.1 mm. with an average of 0.9 ± 0.02 mm. (Fig. 2). Head and body are black without any metallic luster. Legs have the same colour of the body except for the fore tibia, proximal and distal parts of mid tibia and the three basal segments of tarsi which are white in colour. The last tarsal segment and antennae are brown. Wings are hyaline with light brown veins having hyaline area between parastigma and marginal vein. It possesses all the defining characters of the family Eulophidae (Boucek, 1988): antenna inserted below frons (Fig. 3). Pronotum short and does not reach tegula. Tarsi are 4 segmented, there is a straight fore tibial spur. It possesses also, the defining characters of its subfamily, Eulophinae, the following: Mesoscutum without median groove and with entire groove-like notuli (Fig. 4). The axillae are advanced anterior to the scutellum. The scutellum with 2 pairs of setae and without sub lateral groove. The fore wing venation is not interrupted at the base of parastigma, and the submarginal vein is smoothly joined to the marginal vein. The postmarginal vein is distinct and longer than stigmal vein. Abdominal tergites 7 and 8 are not separated dorsally.

**The key characters of the species under study *O. maskelli* are:**

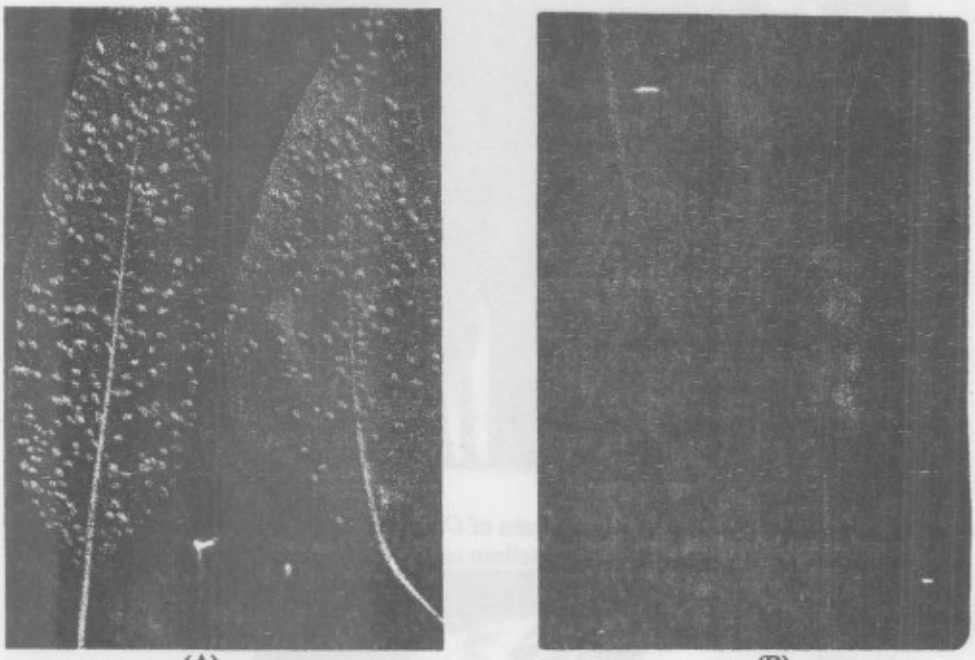
Antenna is clavate, with 10 segments, short radical. The scape is not exceeding vertex level (Fig. 3), and the first 4 flagellar segments are reduced to annelli, only one funcular segment and 3 segmented clava (Fig. 5). Mandible is bidentate and each of maxillary and labial palp consists of 2 segments (Fig. 6). Propodaeum is without median carina. The outer margin of propodael spiracles are exposed and not covered with callus (Fig. 7). Gaster is petiolate, oval with ovipositor hidden from above. There are 4 cercal setae, the longest two are sub equal in length and slightly curved (Fig. 8). Submarginal vein is with only one seta (Fig. 9). The latter character and the one funicular segment are unusual for the genus *Ophelimus* and are specifically for the species *maskelli* (La Salle, Personal communication).

### c) Biological observations:

The species has overlapping generations in the field, as different stages of development can be found at the same time. Only females of *O. maskelli* were collected from infested leaves, so its type of reproduction is thelytokous parthenogenesis. Egg-laying occurs soon after adult emergence. The eggs are laid singly in both surfaces of the leaf under the epidermal layer. The tenebra of the ovipositor is down word curved and serrate which facilitate insertion of the eggs into the leaf. Average number of ovarian eggs was 250 ± 50 per female. Green young galls were formed one month after oviposition, each gall is housing one larva. With further maturation, galls turn red and then brown housing the pupae and pharate adults. The egg is bean shaped and about 86 μ in length (Fig. 10 A). The larva is white legless grub (Fig. 10B), while the pupa is exerate. About four months after oviposition, the adult wasp emerge by cutting a tiny circular hole in one side of the gall. Adult longevity ranged from 4 to 8 days with an average of 6.3 days when fed on aqueous honey solution. Withers *et al.* (2000) studied the biology of *O. eucalypti*, in New Zealand, this species differs from our species *O. maskelli* in having males, the female produces up to 350 eggs during its life span which extends to about 10 days.

## ACKNOWLEDGMENT

The authors wishes to thanks Prof. Dr. John La Salle, CSIRO Entomology, , Canberra, ACT 2601, Australia and Professor Dr. T.C.Narendran, FASc, Systematic Entomology Laboratory, Dept. of Zoology, University of Calicut, Kerala, India, for the identification of the gall wasp of the present study.



(A) (B)

Figure (1): Symptoms of infestation by (A) *Ophelimus maskelli* gall wasp and (B) *Aprostocetus* sp. gall wasp.

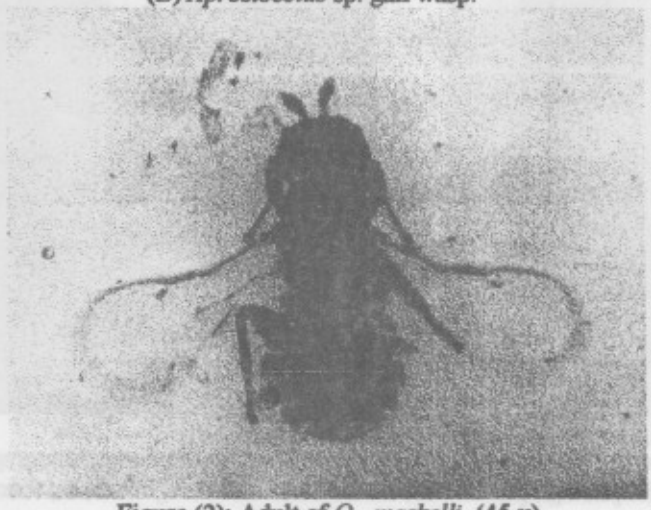


Figure (2): Adult of *O. maskelli.* (45 x)

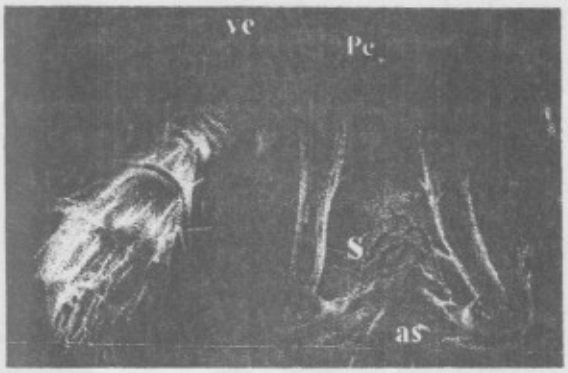



Figure (3): SEM photograph showing insertion of the antenna, as., antennal socket; Pe., pedicel; s., scape and ve., vertex..

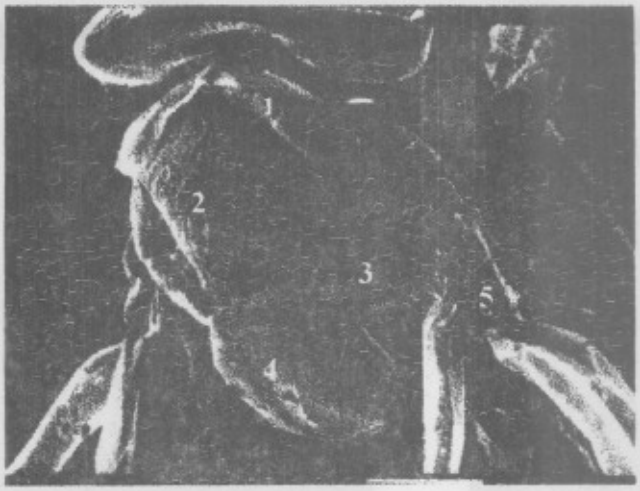
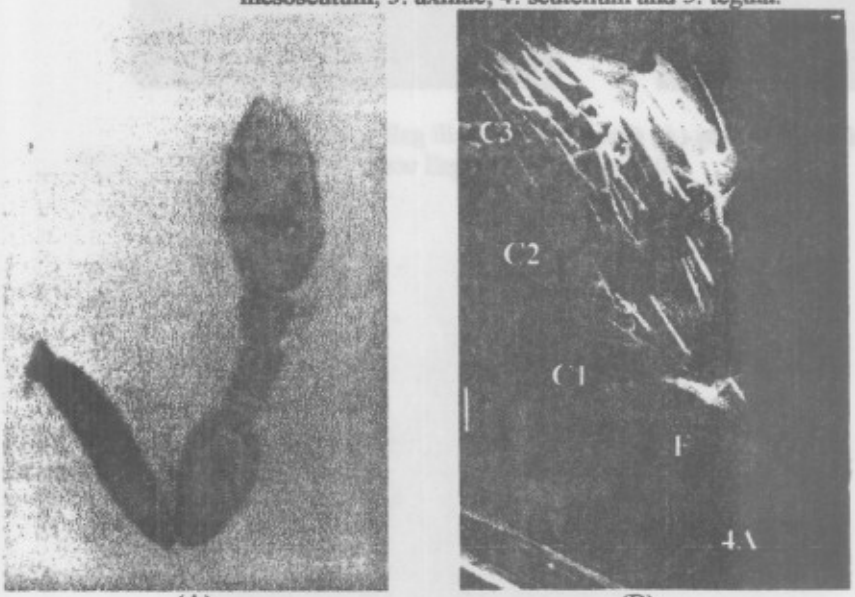



Figure (4): SEM photograph showing mesosoma of *O. maskelli*. 1: pronotum; 2: mesoscutum; 3: axillae; 4: scutellum and 5: tegula.




(A) (B)

Figure (5): Antenna of *O. maskelli* (A) light microscope photograph (B) SEM photograph. C1, C2, C3 the three claval segments; F., funcular segment and 4A., the four anellei.

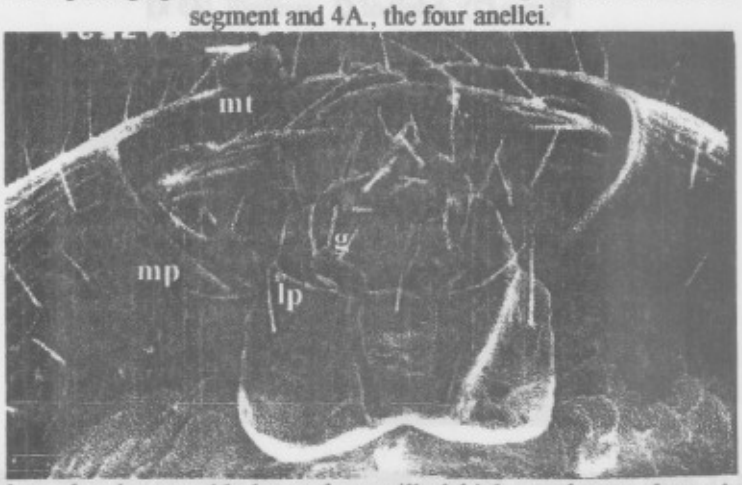



Figure (6): SEM photo showing mandibular teeth, maxillo-labial complex g., glossa; lp., labial palp; mp., maxillary palp and mt., mandibular teeth.

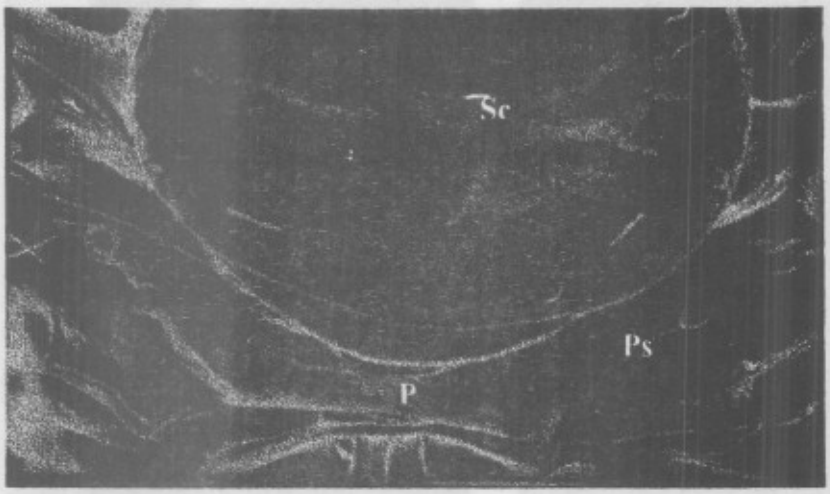



Figure (7): SEM photograph showing propodael spiracles (Ps.) P.: Propodaeium, and Sc.: Scutellum.


Figure (8): SEM photograph showing button like cerci with 4 setae Ce.: cerci and Ovs. ovipositor sheeth.

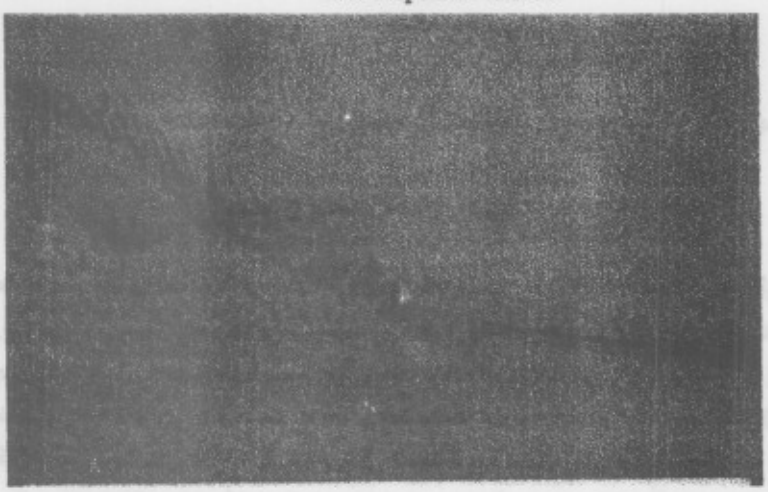
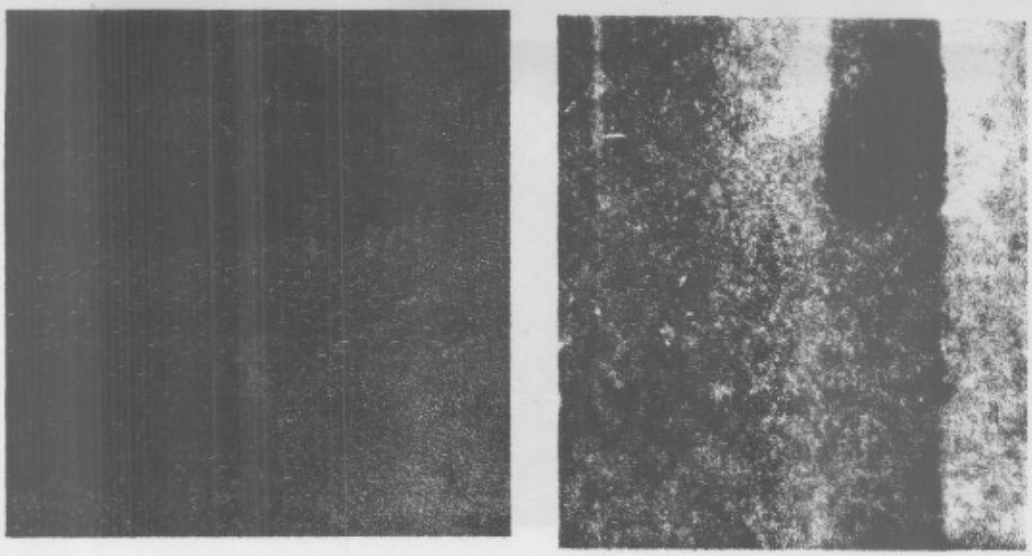


Figure (9): Venation of fore wings 1: submarginal vein, 2: marginal vein, 3: post marginal vein, 4: parastigmal vein and 5: single characteristic seta of *Ophelimus maskelli*.



(A) (B)

Figure (10): (A) Eggs. (B) larvae of *O. maskelli* arrow indicates membranous larvae.

## REFERENCES


Boucek, Z. (1988). Australian chalciodoidea (Hymenoptera). A biosystematic revision of genera of fourteen families, with reclassification of species. CABI, Oxon. 832 pp.

Edwared, P. B. and Wanjura, W. (1990). Physical attributes of eucalyptus leaves and the host range of chrysomelid beetles. In Proc. 7th Int. Symp. Insect-Plant relationships. Samp. Biol. Hung. 39.

FAO (1964). Eucalyptus for planting. FAO Forestry Series, 11. FAO, Rome, Italy.

Raman, A. and Withers, T. M. (2003). Oviposition by introduced *Ophelimus eucalypti* (Hym.: Eulophidae) and morphogenesis of female-induced galls on *Eucalyptus saligina* (Myrtaceae) in New Zealand. Bull. Entomol. Res. 93: 55 – 63.

Ramadan, Hanan M. (2004). Morphological characteristics and distribution of *Aprostocetus* sp. (Hymenoptera : Eulophidae: Tetrastichinae) a gall wasp of eucalyptus new for Egypt. Alex. J. Agric. Res. 49 (2): 59 – 63.

Withers, T. M.; Raman, A. and Berry, J. A. (2000). Host range and biology of *Ophelimus eucalypti* (Gahan) (Hym.: Eulophidae) a pest of New Zealand eucalyptus. NZ Plant Protection 53: 339 – 344.


## الملخص العربى

### *Ophelimus maskelli* حشرة جديدة وافدة لمصر صانعة للأورام على أشجار الكافور

د. حنان محمد رمضان و أ.د. هداية حمزة كرم


تم فى هذا البحث تسجيل لحشرة *Ophelimus maskelli* وافدة حديثا للبيئة المصرية و تسبب أورام على نصل ورق الكافور. وتنتشر هذه الحشرة حاليا فى حوض البحر الأبيض المتوسط . و قد تم وصف أعراض الإصابة لهذه الحشرة ومقارنتها بأعراض إصابة صانعة أورام أخرى سجلت على الكافور سابقاً بمصر وهى *Aprostocetus* sp. وتم أيضا وصف مورفولوجى لهذه الحشرة بالاستعانة بالميكروسكوب الضوئى و الالكترونى . و قد سجلت بعض الملاحظات البيولوجية فهذه الحشرة لها عدة أجيال متداخلة سنويا و هى تتكاثر بكريا منتجة أفرادا فقط. و يمكن للأنثى البقاء لمدة ٦,٣ يوم فى المتوسط عند تغذيتها على محلول عسل مخفف فى المعمل. و يبلغ متوسط عدد البيض لكل انثى ٢٥٠ ± ٥٠ بيضة و تعيش أطوار اليرقة و العذراء داخل الأورام على سطح الورقة حتى تصل إلى طور الحشرة الكاملة التى تحدث ثقبا للخروج على جانب الورم، و أجمالى دورة الحياة تقريبا أربعة أشهر.