A DESCRIPTION AND SHORT NOTES ON THE SWEET POTATO PYRALID MOTH

Megastes grandalis Guen.

- by -


Introduction.

The sweet potato pyralid moth (*Megastes grandalis* Guen) was first described from Brazil by Gueneé (Dett. and Pyr, p. 376, 1854). There have been no other reports until Urich recorded it as a pest in the Reports of the Department of Agriculture for Trinidad and Tobago for the years 1919 and 1920. It is well distributed throughout the island, and during certain seasons is a very serious pest, which undoubtedly is responsible for the high price of sweet potatoes in Trinidad since quantities are imported from the Northern Islands where the moth so far has not been recorded.

This paper has been prepared in the hope that a description of the stages of this moth will be useful to enable it to be recognised if it finds entry into other countries.
**Damage.**

The damage is done by the larva which feeds on and tunnels through the portions of the plant underground, only leaving the cortex untouched. The effect on the plant is noticed especially during the dry season in the stunting of its growth, and the shedding of its leaves with consequent lack of tuber production. If tubers are formed, the larva often penetrates down to them through the roots and riddles them with tunnels, in size about equal to its own width. There is no visible sign that the tuber is attacked until it is cut across, when the tunnels can be seen. It is seldom that the skin is broken by the larva inside, although the feeding may be very close to the surface. The burrows are always clean and free from rot, which contrasts with the damage done by weevil larva. The presence of the larva in the plant can be recognised by the stunting and shedding of the leaves of the plant; by the accumulation of frass on the surface of the ground around the crown; by the splitting of the crown and by the ease with which it can be broken off.

The mortality of cuttings is often due to the presence at the time of planting of larva which then destroy the internal tissue before roots have been developed.
Description of the Egg.

The eggs are oval in outline, flattened, about 1.5 x 1.2 mm. When laid in captivity they are sometimes almost globose. When laid together they overlap one another. They are bright green in colour, later becoming a dull purple colour at the time of hatching, when they are very difficult to see on the plant. They are slightly corrugated with an irregular hexagonal network. They are firmly fixed to the plant so that the empty shells remain in position, and are obvious on account of their translucent white colour.

Description of the Larva.

The larva when full grown measures 30 mm long by 4 mm. wide. The head is chestnut brown and the body white, strongly suffused with pink on the dorsal surface. Pinnacula on the body segments brown. The first and second stage larva do not show the pink colouration of the later instar.

Only primary and subprimary setae are present. Prolegs five pairs; crochets triordinal in a penellipse broken outwardly; prothoracic shield nearly as broad as segment, divided; a narrow shield on posterior margin of meso- and meta-notum, without setae. Spiracles oval; prothoracic one larger than the others.
Technical characters of larva:

(a) Body setae moderately long, arising from chitinised annular bases. The dorsal shield of the prothorax bears the normal six setae three behind the anterior, and three near the posterior margin; \( \beta \) seta is situated postero dorsal of \( \delta \) seta; \( \delta \) seta between \( \alpha \) and \( \gamma \) setae; \( \rho \) seta on a level with \( \epsilon \) seta. On the meso and meta notum \( \beta \) group \( (\varphi + \beta) \) and \( \rho \) group \( (\gamma + \rho) \) on separate pinnaeula. On the abdominal segments (1 to 8), \( \alpha \) and \( \beta \) setae on separate pinnaeula. On the ninth abdominal segment \( \alpha \) seta has migrated ventral of \( \beta \) seta and is situated on the same pinnaeulum as \( \rho \) seta. On the meso and meta thorax \( \epsilon \) and \( \rho \) setae associated together. On abdominal segments (1 to 8) \( \epsilon \) seta is rudimentary associated and ventral of \( \rho \) seta. On all segments except the ninth and tenth \( \kappa \) group \( (\kappa \) and \( \eta) \) bisetose, on prothorax in front of spiracle, on other segments ventral of spiracle. A pinnaeulum on meso and meta thorax bears a subprimary seta \( \theta \) posterior to the spiracle. It is present on abdominal segments (1 to 7) but does not bear a seta. \( \Pi \) group unisetose except bisetose on the prothorax. A pinnaeulum is present postero-ventral of \( \kappa \) group, bearing the subprimary seta \( \mu \) on the eighth abdominal segment only. \( \sigma \) seta present as usual. \( \Pi \) group on prolegs trisetose.
Adfrontal setae (Adf₁ Adf₂) and puncture Adfa; Adf₁ at centre of sclerite; Adf₂ above apex of frons; Adfa approximate and below Adf₂. Frontal setae (F₁) and puncture F₂) near anterior margin of frons and equidistant from each other.

Clypeus two normal setae.

Labrum with deep median incision setae normal three lateral setae near margin; three median setae placed triangularly; puncture Mₐ between M₁ and M₂.

Mandibles longer than broad with five teeth; one long and one short seta on dorsal side just above the condyle.

Antennae: three jointed, with second one considerably longer than any other; a seta is present at apex of second joint as long as the whole antenna; two pupillae also present at apex; third joint surmounted by a small pupilla.

Description of the pupa.

The pupa is 15-18 mm long, chestnut brown on dorsal side with head somewhat darker; wing cases and ventral surface yellowish brown. No hooks setae or tubercles are present; pilifers well developed; maxillary palpi present; normal sclerites of head present; frontoclypeal suture not apparent; prothoracic and mesothoracic legs do not extend cephalad between sculptured eyepiece and antennae; wings
extending to basal margin of fourth abdominal sternum; metathoracic legs extend to apex of wings; metathoracic legs extending beyond the wings; femora of prothoracic legs clearly indicated; antennae not nearly reaching tips of wings; cremaster absent; spiracles oval and prominently raised; genital opening slitlike in both sexes, and opening large.

Notes on life history.

In the field the female selects as concealed a spot as possible for her eggs. They are firmly fixed in the axils of the leaf petioles or on either side of the basal veins on the underside of the leaf. They may be laid singly, two or three together, or as many as five in a row. They are never laid in a cluster; when several are together one overlaps another in a neat row.

In captivity the number of eggs laid by single females varied from 130-180 deposited over a period of two or three days. Only fertilised eggs will hatch. They take a week to hatch in March and April. In the field only a few eggs can be found on any one plant.

As soon as the larva hatches, it begins to feed near the spot where the egg was laid. Sometimes it only gnaws the surface, but at times bores a short tunnel into the
stem. In the field a larva soon leaves and travels on the outside to a position just above the surface of the ground where it finally enters the stem and bores down the root. It is through this hole or where the stem is split that frass is ejected so that the tunnels are not fouled.

The length of the larval stage is about 5-7 weeks. When full grown the larva spins a long silken cocoon from the opening above ground through which the moth will emerge. The exit hole is blocked by silk and frass or by a thin section of rind, which remains lightly attached at the edges. The pupa at the lower end is further protected from the entrance of other insects by a silken funnel around the head end which would not hinder the exit of the moth. Four or five days are spent in the white rather dense silken cocoon before pupation. The pupal period lasts 13-16 days. The empty case remains within the cocoon when the moth issues forth.

The imago is a typical large pyralid moth hiding away during the day amongst the leaves. Copulation in captivity took place during the early morning soon after emergence and lasted several hours. The majority of the eggs are laid the night following emergence; oviposition may continue for a few days before the female dies.

At present only the sweet potato Ipomoea butata is known as a food plant of the larva.
Parasites.

An egg parasite and a larval parasite have been bred from collected material. Eggs which had turned black were found on the muslin of a breeding cage on the 9th March. These were placed in an egg box and on 14th March several parasites emerged. These resembled closely a drawing of Trichogramma minutum by Terzi. The adults were caged with some four-day old eggs of the pyralid and a second generation parasite emerged on the 25th March.

Tachinid flies were obtained from full grown larva. The host develops normally until after it has spun its cocoon when the parasites emerge from their hosts and pupate inside the silken cocoon from which the adult fly appears after 10 to 12 days. Generally two tachinid larva are able to develop within the body of one caterpillar. A specimen of another Tachinidae was also obtained.

Mr Urich tells me that he has seen an Ichneumonid parasite piercing the eggs of Megastes grandalis; later he has bred out the parasite from the full-grown larvae that develop from these eggs. The writer has not been able to obtain any specimens of this Ichneumonid from his material.

1 Sarcophaga sternodonta Towns
2 Masicia ?26dominalis Wolp.
3 Xiphosoma azteca Cress
Summary.

Megastes grandalis was first reported from Brazil, but there have been no other reports until 1919 it was reported from Trinidad as a serious pest during certain seasons of the year to the roots and tubers of the sweet potato. At present this is the only host plant.

The eggs are laid two or three together in the axils of the leaf petioles or on the underside of the leaf. The larva at first feeds near the place where it hatches, then travels to the base of the stem and bores its way in eating out tunnels through the roots and tubers, leaving the cortex untouched. It pupates in a silken cocoon near the surface. The moths live only a few days during which oviposition takes place. Descriptions of the immature stages are given. The writer obtained a Trichogramma egg parasite and a tachinid larval parasites.

This work was undertaken at the Imperial College of Tropical Agriculture, Trinidad, West Indies.

The Imperial Bureau of Entomology kindly identified the parasites.
NOTES ON THE CHINCH BUG AS A PEST OF GRASS LAWNS

by J. W. Cowland B.A.

During the session 1924-1925 at the Imperial College of Tropical Agriculture the writer at Professor Ballou's suggestion, undertook a study of the chinch bug which had been noticed in August severely damaging the grass on his lawn. The chinch bug, Blissus leucopterus, Say has been a pest of considerable importance in the wheat and corn belts of America and has an extensive literature. This is the first reference as far as the writer knows of its occurrence in Trinidad and as a pest outside the United States.

Dr. L. C. Howard (in litt) says that Mr. Hyslop has not been able to find any indication of its occurrence as a pest south of the Florida Peninsular where it sometimes injures the so-called St. Augustine and other lawn grasses rather seriously. Collectors have recorded its presence in the West Indies from a few specimens collected from Porto Rico, Grenada, St. Vincent, and Cuba. Champion in the Biologia Centralli Americana records four places in Guatemala.

The writer has found this bug destroying the grass in the Botanical Gardens at St. Vincent during his visit there in December. Van Duzee has found two brachypterous specimens of this bug in Jamaica. Walcott reports the bug on discarded cane stalks and as abundant and causing injury to roots of guinea grass (Panicum maximum.) This bug constitutes 10% of the food of a lizard (Anis pulchellus) in Porto Rico.

INJURY.

probably Cynodon dactylon
The damage to the plant is caused by the collective sucking of the adults and nymphs which cluster round the base of the grass plants or inside the leaf axils. The position where they have been feeding is marked by small areas of dead tissue which coalesce until the base of the plant turns brown and dries off. During wet weather or under artificial conditions where a free circulation of air is not afforded, this rotting of the plant is accentuated by a fungus growth gaining entrance at the base.

The grass is first noticed to be drying up and dying in places which quickly increase in size depending on the number of bugs present, while the weeds as Desmodium spp. Euphorbia piliifera, Brynglum foetidum and Cyperus rotundus locally known as Nut grass are uninjured and tend to close these areas until the grass has had time to re-establish itself again from outside areas. The presence of weeds and of a large number of bugs on the edge of the dead patch will serve to distinguish the damage from that caused by mole crickets. In the latter case the vegetation is completely destroyed for a time, especially where the lawn is frequently trampled, by the insects both loosening and feeding on the roots but generally recovers quickly as soon as the pest has gone. The burrows of these insects can often be traced by the upturned earth.

This bug has been found feeding on many kinds of grasses: a list has been given by Webster (3). In Trinidad this bug seems to confine itself to Savannah Grass, Paspalum sp. probably as it affords a suitable shelter. The writer has been unable to find its presence in patches of Bermuda grass (Cynodon dactylon) although this grass has been reported by Webster as a host plant.
DESCRIPTION OF THE STAGES.

A description of the egg and nymphal stages has recently been published by Luginbill (4) whose account has been found to agree closely except in the following points. In the first instar the coriaceous patch on each side of the meson extends almost over the entire mesonotum; metanotum and first two abdominal segments of a yellowish white colour appearing as a wide band across the middle; the former with a narrow dark line on either side of the meson which is wider at the lateral ends. At the base of the fourth and fifth segments there is a small circular dark area around a central chitinised slit situated on the two sutures.

In the second instar, mesonotum as in preceding instar; metanotum pale clearly distinguishable from the yellowish white of the first two abdominal segments; the central slit on the abdomen is wider and dark area more transverse.

In the third instar the antennae are dusky with the terminal segment somewhat darker. Metanotum with lateral and hind margins yellowish.

In the fourth instar segments 3 and 4 of antennae black, 1 and 2 amber. The wing pads extend up to the first abdominal segment. Segments 1 and 2 pale cloudy, remaining segments olivaceous or blackish with traces of a dark velvety area on the meson of the third segment which becomes very pronounced in the next instar. The suture separating the fifth from the sixth abdominal segment extends further caudad on the centre of the notum.

In the fifth instar head, prothorax, wings and abdomen distinctly covered with short setae. Wings extending as far as caudal margin of second abdominal segment; the remaining abdominal segments
segments almost black with a number of darker blotches. Webster (3) gives Say's description of the adult and Lugrinbill (4) the sexual differences.

**LIFE HISTORY.**

**MATING.**

Copulation does not occur for several days after the bugs have become adult and may take place two or three times before any eggs are laid. They remain in coitus for several hours; when disturbed either they separate or the female drags the male about. It is necessary that copulation should take place at frequent intervals for fertile eggs to be laid. Generally six or eight days elapse between emergence and the date of the first egg.

**OVIPOSITION.**

Eggs are laid on or near the grass plants on which the insect feeds and are concealed as carefully as possible. They may be found in the following positions, either near the crown of the plant or under the outer leaf sheaths or amongst the dead material still adhering to the plant. One or two have been found loose in the soil but these probably had been knocked off as they are very loosely attached to the plant. The position that seems to be favored in the field for egg laying is inside the dead leaves that still enfold the stem. The female probably cannot insert her ovipositor under the living leaf sheath as normally in Paspalum sp. the stem is tightly clasped. In the case of maize as noted by American workers the eggs occur more often under the leaf sheath.

**NUMBER OF EGGS LAID.**

The number of eggs laid varies to a considerable extent;

some
some observers record from 100 to 150 eggs even up to 200. In experiments carried out in the laboratory to find out the fecundity of the females, newly hatched males and females were confined with small grass shoots which were renewed as required. The number of eggs obtained in two cases were 22 and 36 laid in 22 and 16 days respectively. In another trial a male and female were placed together under lamp chimneys over grass plants growing in pots. This was examined carefully for eggs and nymphs periodically. The result obtained was 44 eggs laid in 42 days in the only experiment where both male and female were found at the end. Several eggs are generally laid during one day with a gap of one or two days before the next oviposition. The female dies soon after the last egg is deposited.

EGG STAGE and LARVAL INSTARS.

Eggs were placed as soon as laid in small metal boxes with a bottom of plaster of paris which was kept moist in the dark. The length of the egg stage varied from twelve to sixteen days as not all the eggs laid on a single day hatch together.

Several days before hatching the eyes and abdomen of the bug could be clearly made out owing to the pink colouration showing through the transparent shell. The majority of the eggs are fertile but several collected in the field never developed at all.

Considerable difficulty was experienced at first in breeding the bugs right through from the egg to the adult as drops of water formed on the glass tubes in which the nymphs got caught. In the field all stages were to be found together throughout the period of these notes. There are five instars. The length of each nymphal instar varied considerably. The first and final instars...
instars are longer than the other three. The total length of
the immature stage was from 43-50 days in the majority of cases
while two took over 60 and 70 days respectively. Breeding was
continuous in the field throughout the period of these notes.
The total life cycle from egg to the death of the adult is
just over three months. The egg stage about 2 weeks, nymphal
stage 6 - 7 weeks, adult stage stage 4 - 6 weeks.

HABITS OF THE CHINCH BUG.

There are two forms of the adult, a long winged form capable
of flight and a short winged one incapable of flight. In America
it is the former that hibernates and migrates in Spring to grain
fields. In Trinidad the short winged form with an occasional
long winged form only have been found except at the time when the
attack was first noticed as material collected in August showed
a fair percentage of long winged adults. The grass has kept
sufficiently green to supply the necessary food during the dry
season January to May so that breeding has been continuous through­
out this period.

It was noticed that a species of ant

FEEDING AND PROTECTIVE HABITS.

The bugs are gregarious in all stages and positively thigmo-
readily attacked and carried off living nymphs and newly hatched
fleas when feeding either close to the base of the tillers or
in the axils of the leaves, they are sheltered in the former case
by the dead outer leaf sheath and in the latter case by the older
leaf blades which in Savannah grass are broad and encircle the
easy to be

When resting they collect in close contact either half buried
in any loose soil or well concealed amongst the grass plant. The
shell as this was the only one obtained, the second or second
first
first instar larvae adopt the latter position. On bright sunny days the bugs may be seen running over the turf but on being approached, quickly fall off and then death; after a few seconds they right themselves and hide under dead grass or in cracks in the soil. On dull rainy days or at dusk they remain in small colonies and can be collected easily.

The bug appears to require a protection from excessive damp as they have only been found on grass that is cut frequently. When fifty bugs were transferred to a patch of savannah grass that had remained uncut for sometime only two were recovered a fortnight afterwards. The flight of the long winged adult is short and jerky.

NATURAL CONTROL.

Since September 1924 the numbers of the bugs have been gradually decreasing, only small isolated spots remaining infested. At first it was thought it might be due to the fungus (Sporotrichum globuliferum) but after careful search no bugs attacked by it, could be found although it is known to be present in the island.

It was noticed that a species of ant kindly identified by the Bureau of Entomology at Washington, readily attacked and carried off living nymphs and newly emerged adults as well as leaf hoppers that were present.

From a collection of twenty one eggs obtained on 11th December 1924, an egg parasite emerged on the 24th December. This has been referred to Washington and they report it to be...

The pupa could be clearly seen through the transparent egg shell. As this was the only one obtained, the amount of control it exerts,
it exerts, could not be ascertained. Flint (5) collected all the data available on the enemies of the chinch bug.

REMEDIAL MEASURES.

Many measures have been recommended for the control of the chinch bug which consist chiefly of killing them at the time of hibernation or migration during harvest from one field to another. In Trinidad there is no definite resting or migratory period hence control measures are limited to a direct application of some insecticide that will kill the bug without injuring the grass. This was rendered easier owing to the restricted area which was infested at that time (January) and to its nature.

In extensive tests commenced in 1922 in Illinois, it was found that 6 inch strips of calcium cyanide, in dust or granule form used in conjunction with an oil barrier, at the rate of 1 oz. to a strip and laid at right angles to the barrier every 2 rods killed from 75 - 95% of the migrating bugs.

The following measures were tried in Trinidad. Small plots were laid out to test the effect on the bugs and on the grass of Calcium cyanide in dust and flake form when it was sprinkled over an infested area at the rate of 1 oz. per square yard (300 lbs per acre). In the dust form an excellent result was obtained, no bugs being recovered alive afterwards but the grass was scorched a little especially in the spots where the bugs had been feeding. In the flake form at the quantity applied very little control was apparent.

To minimize the burning effect of the cyanide, air slaked lime was mixed with the dust in the following amounts per square yard on three plots:

½ oz. Calcium
Addenda to the Paper on the Chinch Bug

The parasite and the predator mentioned in the paper, have now been kindly identified by the U.S.D.A. Bureau of Entomology. They report the parasite to be *Eumicrosoma benefica* which is the same hymenopteron that has been discovered as an egg parasite in the U.S.A. The predator is the Ant, *Pheidole* sp.
REFERENCES

1. VAN DUZEE  
   Notes on Jamaican Hemiptera.  

2. WALCOTT  
   Insectae portoricensis.  

3. WEBSTER  
   Chinch Bug.  

4. LUGINBILL  
   Economics of the Chinch bug.  
   U.S.D.A. Bull 1016. 1922.

5. FLINT  
   Insect enemies of the chinch bug.  

6. FLINT and BALDUF  
   Calcium cyanide for chinch bug control.  
Cassidara malachrae. n.sp. Psyllidae.

by


Head and body emerald green with a flavous patch on the praescutum of mesothorax and on each side of the scutum near base of forewing; legs yellowish; abdomen with a dorsal patch flavous; antennae of ten segments; with two basal ones pale, with two distal ones black, with intermediate ones pale each with a black apical ring. Ocelli surrounded with orange pigment. Compound eyes purplish.

Head (see Figs. 2 & 3) deeply cleft in front clothed very sparsely with minute setae, arcuate behind; vertex short, concave between ocelli, and with lobes diverging towards anterior margin of eyes; also with deep depressions between anterior and posterior ocelli and with triangular depression behind posterior ocelli which are situated well forward. Proboscis long, acutely pointed, black at tip. Antennae not as long as body with the usual psyllid characters, two basal segments thick and short, third segment slender, longer than any other; terminal segment with two thick setae of unequal length.

Thorax (see Fig. 2) not much broader than head sparsely punctate, proepisternum larger than epimeron; pleural suture curved apparently not extending to pronotum. There is present on the metatibiae a large basal spur and five stout apical spines, three anterior and two posterior; at apex of basal tarsal segment one claw-like spine present towards the meson. Wings about two and a half times as broad as long, distinctly angulate at apex; pterostigma present and open.

Genitalia (see Fig. 5). Anal valve large and truncate, apical lobe bearing rather long setae, posterior lobe large, naked except for two dorsal setae, forceps long curved somewhat acutely pointed, pubescent; genital valve sharply curved, basal portion pubescent.

Length
Length of body 2.9 mm.

Length of forewing 3.1 mm.

Width of vertex between eyes 0.37 mm. is the destruction of a definite area for a leaf of immediate neck 0.68 mm. which dry and

Width of thorax

Habitat Port of Spain, Trinidad, on Malachra alceifolia (Jacq.)

Date February 9th, 1925.

Holotype in British Museum.

Female is similar but a little larger.

Genitalia (see Fig. 4). Genital segment very stout rather acute at apex and very slightly upturned; dorsal valve with tip roughened as a file, behind with long hairs extending as far as apex. Ventral valve nearly as long as dorsal one; apex roughened.

Pubescence rather scanty.

All stages were collected on February 9th and 16th 1925 on this malvaceous weed growing in a damp spot near the sea shore amongst a clump of castors (Ricinus communis).

The egg is small, pear-shaped, provided at the apical end with a filamentous prolongation arising from a small tubercle. Length 0.23 mm. excluding the hairlike extension which measures 0.1 mm. Greatest width 0.18 mm. The surface of the egg is quite smooth and transparent, pale cream in color.

The identification of a species when only the nymphal form is available has not been attempted by any worker. There are five nymphal instars. The nymphs are pale green and flat, covered with a white cottony substance. They normally carry a translucent sticky globule attached to the anus as in so many psyllids.

The minute eggs are inserted into the tissues of the leaf between the veins from the underside. They are more numerous round
round the edges of the leaf. No preference is shown for a leaf of a definite size or age. The result of oviposition is the destruction of the cells in the immediate neighbourhood which dry and form a very small scab on both sides of the leaf. Just before hatching the eggs project a short way. They take six days to hatch.

The nymphs on hatching make their way to the apical bud and feed there. No gall or malformation occurs, when fully grown they move and feed on the fully expanded leaves and then the final moult is undertaken. The nymphal stage lasts about a month.

An attempt was made to get them to lay eggs when caged on cotton but they died very shortly although they oviposited freely when caged on Malachra.

This work was done at the Imperial College of Tropical Agriculture, Trinidad, West Indies.