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BIOLOGY OF SNOUTBEETLE ON CITRUS

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ABSTRACT

Snoutbeetle (Curculionidae: Coleoptera) attacking citrus has four developmental stages (egg, grubs, pupa and beetle) and total life cycle lasted for 69 – 107 days depending on the month of infestation.

The eggs which are whitish in color are deposited on the soil and measures 1.5 – 2 mm long. It hatches onto small grubs after 5 – 12 days. Newly hatched grubs are light orange measuring 2.5 to 3 .5 mm long. They turn white as they develop. Fully grown grubs measures 8 – 12 mm long. They feed on the roots for 19 – 45 days.

The pupae are white in color with brown shades on the head and legs during the later stage. They are 8 – 11 mm long and emerge into adult after 8 – 15 days. Newly emerged beetle initially stays on the soil 3 – 6 days. They are colored white just after emergence and color changes to light brown as they mature. Fully grown beetles are usually dark brown with some gray markings. They are flightless so they crawl from the soil and goes up to the plant start feeding. The beetles are mostly found in groups in crowded or rolled leaves and they usually fall to the ground when disturb. Under laboratory condition, the adult beetles could live 25 – 45 days.

Both grubs and adult beetles feed on the plants. The grubs feed on the roots of seedlings causing stunting or wilting and death of severely infested seedlings. Adults feed on the foliar part of the plant. They chew the leaves and shoots of plant including the emerging buds of newly budded seedlings. Total feeding on newly budded rootstocks caused rebudding of infested seedlings.

The different stages of Snoutbeetle were found throughout the year however, they are more abundant during certain months. For beetles, population is higher during the month of September to October and April to May. Eggs and early instars were mostly monitored during the month of June to July and January to February.

Aside from citrus, the adult beetles were observed feeding on the leaves of guava, chestnut, geranium flowers, salvia and two species of weeds. Grubs were found feeing on the roots of strawberry.

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RATIONALE

Citrus is one of the major fruit crop grown in the Cordillera region. To increase production, expansion and rehabilitation of orchards is presently being promoted. To support these activities, bulk of planting materials is needed. At present, different private and government nurseries are propagating citrus planting materials in the region using local and imported rootstocks. However, these nurseries could hardly supply the demands of growers because of different limiting factors.

Snoutbeetle (Coleoptera: Curculionidae) is one of the major insect pest affecting the mass propagation of citrus planting materials in the locality. This pest attacks orchard trees however, damage on newly established orchards and nursery plant is more important. The larva d=feeds on the roots causing wilting, stunting and death of heavily infested seedlings. The beetle which feeds on the leaves, also affects the general growth of the plant especially when seedlings are defoliated.

Severe damage occurs when beetles entirely feed on the merging shoots (scion) of newly budded rootstocks. Infested plants could be rebudded but this operation prolongs the period of producing healthy budded seedlings and eventually increases the cost of production.

The pest is presently difficult to control. Handpicking of adult beetles is being done in some nurseries to reduce population but this operation is laborious and not effective in bigger nurseries or during heavy infestation. Insecticides are mostly used against the adult beetle however; applied chemicals are usually not effective because of the characteristic of the beetle. Their ability to develop resistance to commonly used chemicals contributes to the present problem in controlling the pests.

Studies to control the pest are presently being conducted and the immature stages are targeted for better control of the pest. This study was therefore conducted to gather information which is important in developing control strategies against the pest. Their life cycle, seasonal abundance and general characteristics especially the immature stages were observed.

REVIEW OF LITERATURE

Taxonomic and Biology Studies

Species of Snoutbeetle identified on citrus – The reported specie of Snoutbeetle affecting citrus are *Pachyrrhynchus* spp. Described as greenish brown Snoutbeetle in the Philippines (Cendaña, **et al.**, 1983); *Scobus granosus* Fabreus which is called citrus Snoutbeetle in South Africa (Bedford, 1978); *Asynonychus cervinus* commonly known as Fuller rose weevil in New South Wales (Hely, **et al.**, 1982) and the two species of Fuller rose beetle (FRB) identified as *Pantomorus cervinus* and *Pantomorus godmani,* which is a problem on citrus in C California (Diskson, 1986) Smith, Beattie and Broadley (1997) also reported pother species feeding on the different parts of citrus, namely citrus leaf eating weevil (*Eutinophaea bricristata* Lea), elephant weevil (*Orthorhinus cylindrirostris* (Fab), citrus fruit weevil (*Neomerimnetes sobrinus* Lea) spinelegged citrus weevil (*Maleuterpes spiniper* Blackburn) and apple weevil (*Ottorhychus cribricollis* Gyllenhal).

Nature of Damage - The described damage caused by the different snoutbeetle are almost similar. The larvae feed on the roots of their host plants by chewing the fibrous roots or bark of bigger roots (Bedford, 19780. The beetles which mainly attack the aboveground parts feed by =chewing the margins of the leaves creating coarsely-serrated edge and sometimes only the stalk or midrib remains (Hely, **et al.**, 1982).

Description and Life History - Fukker rose beetle lay their eggs during late summer in crevices of bark, base of plants or calyxes of fruits (Dickson, 1986) while *Sciobus granosus*lay their eggs on orchard weeds like *Eleusine indica* (L.) where leaves are folded and glued to form as "egg purse"(Bedford,1978).

Newly hatched larvae fall to the ground and move freely on the ground by crawling. Larval stages of *Pantomorus godmani* takes about 6 – 10 months (Dickson, 1986) according to Hely, **et al**. (1982), the incubation to pupal development of *Asynonychus cervinus* takes about a year. Adult emerges from the soil during the warm month of the year usually after the rain and adult live about 2 – 3 months of September and continue until April.

Host plant – Bedford (1978) reported that citrus snoutbeetle (*Sciobius granosus)* has a wide range of host plant. It attacks all citrus cultivars and

could establish itself on a number of exotic plant species. It could breed on *Salix viminalis* L. or the basket willow, on *Medicago sativa* (Lucerne).

Fuller' rose beetle occurs on a wide range of broadleaf plant including ornamentals and seeds. It also attacks commercial tree crops like stone fruits, avocado and walnut. Apple weevil (*Onorhynchus cirbricolis)* also attacks pome fruits, roses and some ornamentals (smith, Beattie and Broadley, 1997).

Management Strategies against Snoutbeetle

Mechanical and cultural practices – Population of adult beetles could be minimized by collecting or handpicking the beetles. Placing a mechanical barrier to present the beetles from gaining access to the foliage of the tree and suppression of alternate host plants and weeds are also recommend. New planting should be clean cultivated for a period in order to starve the residual population of the pest (Bedford, 19788).

Use of Pesticides –In areas with history of weevil damage pre-emergence soil application of insecticide at a higher rate could prevent the mergence of adult weevils. Reinfestion could also be reduced by spraying the trunks and lower branches of affected trees with residual broad-spectrum insecticide (Smith, Beattie and Broadley, 1997).

OBJECTIVES

1. To determine the different developmental stages of snoutbeetle
2. To observe the lifecycle of snoutbeetle
3. To describe the morphological characteristics of the different stages
4. To observe the nature of damage of the pest
5. To monitor the seasonal abundance of the pest
6. To observe other host plants.

EXPECTED OUTPUT

1. Different stages of the snoutbeetle determined
2. Duration and morphological characteristics of the different stages observed
3. Damage on plants observed and described
4. Seasonal abundance and host plants of the snoutbeetle observed.

METHODOLOGY

Maintenance and host plants – Citrus rootstocks were potted on plastic bags and maintained under screenhouse as host plant of the snoutbeetle and also as source sample insects for laboratory and nursery trials.

Biology Study – Newly ovipositor eggs from potted seedlings under the screen house were collected and individually placed in potted seedlings under laboratory condition. Duration, morphological and behavioral characteristics of the different development stages were observed.

Seasonal abundance and host plants – Adult beetles were monitored every month in five greenhouses with different stages and varieties of seedling/mother plants. 30 sample plants pert greenhouse were randomly sampled and adult found on the leaves and shoots were counted.

Immature stages were also monitored in one greenhouse where mass propagation of citrus was mainly done. Three beds within the greenhouse containing seedlings were identified as sampling area. 10 sample seedlings per 100 seedlings were randomly uprooted every two month and soil and roots of uprooted seedlings were checked for presence of immature stages of snoutbeetle. Other plants attacked by the pest were also monitored to determine other host plants.

Data gathered for Biology Study

1. Duration and morphological characteristics of different stages of snoutbeetles
2. Nature of damage
3. Population of adult and immature stages of snoutbeetle
4. Alternate host plants

RESULTS AND DISCUSSION

Life cycle and morphological description – The duration and morphological description of the different stages of snoutbeetle was observed under laboratory condition.

Snoutbeetle attacking citrus undergoes four developmental stages, namely: egg, grub (larva), pupa and adult beetle. Under laboratory condition, the duration from egg laying to adult emergence ranges from 36 – 68 days. Total cycle lasts for 69 – 107 days (Table 1).

Egg – The eggs are deposited on his soil usually near the roots of the seedlings. They are whitish in color measuring 1.5 – 2 mm long. Incubation lasts for 5 – 12 days.

Grub – Newly hatched grubs are light orange measuring about 2.5 to 3.5 mm long. They turn white as they develop and fully grown grubs 8 – 12 mm long or an average of 10.3 mm. The grubs were found feeding on the roots for 19 – 34 days last July to October 2006 and 25 – 45 days last January to April, 2007.

Pupa – The beetle pupates on the soil for 8 – 15 days. The white pupae are about 8 – 11 mm long. As it develops, shades of brown color appear on the mouth and legs.

Adult – Newly emerged beetles initially stays on the soul for about 3 – 6 days. They are colored white just after emergence and slowly change to light brown before they go out of the soil. Matured beetles are usually dark brown with some gray markings. They are flightless so they crawl from the soil and goes up to the plant to start feeding. The beetles are most found in groups in crowded or rolled leaves and they usually fall to the ground when disturb. Under laboratory condition, the adult beetles lived 25 – 38 days last July – October 2006 and 25 – 45 days last January to April 2007

Table 1. Length (mm) and duration (days) of the stages of citrus snoutbeetle under laboratory Condition

Stages of Snoutbeetle		Length (mm)		Duration (days)			
		Range	Mean	Range	Mean	Range	Mean
Egg		1.5-2.5	1.80	5-10	7.5	5-12	9
Grub				19-34	24.3	25.45	37.5
	Newly hatched	2.5-3.5	2.95				
	Full grown	8-12	10.3				
Pupa		8-11	9.9	8-15	11.6	8.15	12
Adult		8-11	9.6				
	Newly emerged (soil)			3-5	4.1	3.6	4.7
	Feeding stage			25.38	33.1	25.45	36.10
Egg – Adult emergence				36-54	43.4	49.68	58.5
	Total			69.93	80.6	86.107	99.3

Nature of damage – Snoutbeetle is very destructive because both the grubs and the adult beetles feed on the plants.

Grub – This stage stays in the soil and causes more damage on young rootstocks and buddlings. It feeds on the barks of roots and also trunk or main stem of seedlings which are covered with soil. Initial feeding on young seedlings caused yellowing of seedlings. Infested seedlings which had developed secondary roots recovered however, they are usually yellowing and have stunted growth. Severely damaged roots result to death of seedlings.

Adult beetle- The adult feeds on the foliar part of the plant. They chew the leaves and shoots of plants thus affecting the growth and development of infested plants. Severe infestation could lead to stunting especially seedlings. More severe damage is caused when the beetles feed on newly budded rootstocks. They chew or totally consume the merging buds so rebudding of infested seedlings is needed.

Seasonal Abundance – The different stages of snoutbeetle were found throughout the year. However, they are more abundant during the certain month. For beetles, population is higher during the months of September to October and April to May. Eggs in early stage were mostly monitored during the months of June and January to February.

Population was further observed and the following data were gathered.

Immature stages of snoutbeetles were sampled in one greenhouse where citrus rootstocks and buddlings are mostly propagated and maintained. Different stages were sampled during the monitoring period and all stages could be found in one seedling (Table 2)

Table 2. Total number of immature stages of snoutbeetle counted from May to November 2007 (from 10 samples seedlings)

Monitoring Period/Stage monitored	CITRUS ROOTSTOCK SEEDLINGS		
	Calamandarin (100 buddable)	Calamandarin (100 seedlings)	Carrizo (100 seedlings)
May			
No infested	10	7	7
seedlings	0	5	3
Grubs-early instar	2	7	8
Grubs-late instar	4	3	2
Pupa	3	0	0
New	9	15	13
Total			
July			
No infested	8	5	7
seedlings	0	1	3
Grubs-early instar	5	6	3
Grubs-late instar	4	4	5
Pupa	1	0	
New Adult	10	10	11
Total			
September			
No infested	10	5	8
seedlings	0	0	0
Grubs-early instar	6	8	6
Grubs-late instar	3	3	5
Pupa	1	4	3
New Adult	10	15	14
Total			

Population of grubs and pupa were higher during the months of May and September and more stages were observed from the younger Calamandarin and Carrizo seedlings which were plant March 2007. Presence of immature stages on rootstock seedlings which were planted March 2007 shows that snoutbeetle infested the seedlings about one month after pricking.

Newly developed adults still under the soil were also observed mostly in the months of May and September. This indicates that adult emergence starts during these months and adult damage could be expected by June and October.

More seedlings were infested in buddable Calamandarin rootstocks. However, the number of immature stages counted was fewer than the Calamandarin and Carrizo which were younger. Infested seedlings were probably from previously infestation and adult may have emerged before the sampling.

Population of adult beetles – Adult snoutbeetle was observed in five greenhouses with different stages and varieties of citrus. Beetles were observed every month in lost of the greenhouses however, the number were mostly higher during the months of May to June and September to October (Table 3). Most of the seedlings and trees during these months were flushing.

Table 3. Total number of adult snoutbeetles in different greenhouses from January to 2007 to March 2008 (from 30 sample seedlings/mother plants)

MONTHS	CITRUS GREENHOUSES				
	1 (seedling/buddings)	2 Mother plants/buddings	3 Mother plants	4 Mother plants	5 Mixed seedlings
2007 January	0	7	0	0	2
February	0	20	0	0	5
March	0	25	0	5	11
April	0	21	5	3	10
May	0	53	15	7	15

SUMMARY AND CONCLUSION

Citrus snoutbeetle undergoes four developmental stages. Life cycle last for 679 – 107 days and the destructive stages which are the grubs and adults live 19 – 45 days and 25 – 45 days, respectively.

The different stages were found throughout the year. However, They are more abundant during certain months. The adult beetle also feeds on other plants like guava, chestnut, geranium flower, salvia and two species of seeds. Grubs were found feeding on the roots of strawberry.

Results show that the different stages the pest could be found the whole year but are abundant during certain period because of the stages of their host plants and the duration of the different stages.

Immature stages permanently stay on the oil until they emerge into adult. These stages are therefore easier to control considering their habitat, duration and morphological characteristics.

To implement control strategies, regular monitoring is needed. Monitoring period and stage of the host plants will be considered.

RECOMMENDATION

The gathered information will help in better management of the pest based on the results, the following recommendations are given:

1. Adult beetles are difficult to control because of their morphological characteristics. Measures must be done during the immature stages of the pest.
2. Immature stages are found in the soil so regular monitoring is needed based on the observed seasonal abundance.
3. The snoutbeetle could feed on the plants so damage of both grubs and beetles must be observed. Weed around the nurseries which serve as alternate host plants must be regularly removed.

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