Laboratory rearing of the litchi moth, *Cryptophlebia peltastica* (Lepidoptera: Tortricidae)

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ABSTRACT

The litchi moth, *Cryptophlebia peltastica* (Meyrick) (Lepidoptera: Tortricidae) is a pest of litchi, *Litchi chinensis* Sonnerat, in South Africa. The female lays her eggs on the skin of the fruit and newly hatched larvae eat through the skin and into the fruit flesh and seed. The aim of the present study was to rear high numbers of the litchi moth in captivity for future research. Infested litchi fruit was collected at 3 different locations during the growing season. Final instar larvae found in the fruit were placed in plastic containers with sand for the larvae to pupate in. Pupae found were placed in boxes for adult moths to emerge. Adults that emerged were collected and placed in a cage at 3 different temperatures and 3 different humidities. Eggs laid were placed singly into honey flasks with a steam sterilized maize meal medium. Not one of these eggs hatched. From the results found, it seems that the optimum temperature for egg laying is 30ºC and relative humidity of 80% – 100% with a complete night cycle. Further work starting with many more individuals is required to establish a laboratory population.

SAMEVATTING

Die lietsjiemot, *Cryptophlebia peltastica* (Meyrick) (Lepidoptera: Tortricidae) is 'n plaag op lietsjie, *Litchi chinensis* Sonnerat, in Suid-Afrika. Die wyfie lê haar eiers op die vrug se skil en die pas uitgebroeide larwes vreet deur die skil en vrugvleis tot by die pit. Die doel van die huidige studie was om groot getalle van die lietsjiemot vir toekomstige navorsing in die laboratorium te teel. Besmette lietsjievrugte is tydens die groeiseisoen by drie lokaliteite versamel. Finale instar-larwes wat in die vrugte gevind is, is in plastiese houers met 'n lagie sand geplaas sodat die larwes daarin kon pupeer. Die papies is in broeikaste geplaas om sodoende die volwasse motte te kan versamel. Die motte wat versamel is, is in hokke by 3 verskillende temperature en 3 verskillende relatiewe humiditeite geplaas. Eiers wat deur die motte gelê is, is afsonderlik in heuningflesse met 'n stoomgesteriliseerde mieliemeelmedium geplaas. Nie een van die eiers het ontwikkel nie. Volgens die resultate blyk dit dat die optimum temperatuur vir eierlegging 30ºC is met 'n relatiewe humiditeit van 80% – 100% en 'n algehele nagsiklus. Om 'n moontlike laboratoriumkultuur van die lietsjiemot te kan vestig is dit belangrik om 'n groot hoeveelheid individue te kry om mee te begin.

INTRODUCTION

The litchi moth, *Cryptophlebia peltastica* (Meyrick) (Lepidoptera: Tortricidae) is a wide spread pest in South Africa and also occurs in Madagascar, Seycelles, Mauritius and Reunion (Bradley, 1952; Quilici *et al.*, 1988). The litchi moth also attacks indigenous plants and the macadamia, but has not yet been recorded on citrus (Newton & Crause, 1990). The biology and damage of *C. peltastica* are similar to that of *C. leucotreta*, a major pest on citrus. Although both species infest litchi, fruit samples have shown that *C. peltastica* is responsible for the vast majority of losses (Newton & Crause, 1990).

The litchi moth lays her eggs singly during the development stage on the skin of the fruit. The newly hatched larvae eats through the skin and into the seed where the insect develops into a red larvae, witch changes into a pupa. Infested fruit sometimes rot on the tree due to fungus attacks through the hole where the larvae penetrated, but sometimes the damage is not noticeable at harvest time and decay only sets in during transit or marketing. Skin damage during the fruit growth period can lead to fruit crack. The excuvia of the pupa can be seen protruding from infested fruit which have been stored for a long period (De Villiers, 1988).

The false codling moth, *C. leucotreta* is very well described in literature because of it's severity as a pest on citrus and a technique to rear the false codling moth in captivity has been established. Since the two species are so closely related one would assume that the techniques that are used to rear the false codling moth would be similar for the litchi moth. Unfortunately this is not true and in previous attempts to rear the litchi moth, researchers struggled to get the adult moths to mate and the females to lay eggs.

In this study the technique used to rear the false codling moth was used and modified to try to rear the litchi moth in the laboratory.

MATERIAL AND METHODS

Collection of infested fruit

Infested fruit were collected in different production areas namely: ARC – Nelspruit, ARC – Friedenheim and Tzaneen area (Table 1). All fruit were examined and final instar larvae found were placed in plastic containers with sand for the larvae to pupate in. Smaller larvae found in the fruit were left in the fruit and the fruit was also placed on sand so that larvae could pupate when they were fully grown.

Laboratory procedure

Pupae found in the soil were placed in boxes for adults to emerge. Adult moths that emerged were collected and placed in a cage consisting of a kitchen sieve with a round piece of

hardboard that fits the opening of the sieve. The sieve and the hard board were held together with clamps. The piece of hard board was covered with wax paper for adult female moths to lay eggs. The sieves containing the adults were placed at different temperatures, different humidities and light cycles. Sieves were checked daily for egg laying activities and the wax paper was changed daily. Eggs found on the wax paper were placed singly into honey flasks containing a growth medium.

The technique used to rear the false codling moth in captivity was also used for the litchi moth (Schwartz, A. 1981).

A maize meal substrate is used as growth medium for the larvae. Honey flasks with a contents of 500 g are used for rearing the larvae. The following ingredients are used in the substrate: maize meal, distilled water and benomil. Benomil is first added to a little water and mixed well. It is then added to the maize meal and mixed. Benomil are used to prevent unwanted growth of fungi. The medium is then placed into the honey flasks. The flasks are then sealed with a cotton wool plug witch is wrapped with cellophane to prevent the plug from becoming wet when it is steam sterilized. The flasks are then placed in an autoclave and sterilized for 20 minutes.

Because of the cannibalistic nature of the larvae, the eggs were cut out and placed singly into the flasks. The surface of the wax paper and the eggs was treated with a disinfectant to prevent the growth of unwanted fungi. The pieces of wax paper with the eggs were placed in the honey flasks together with a pure culture of a nutritious fungus, *Rhizopius* sp. The fungus develops on the medium and serves as food for the newly hatched larvae.

The flasks were then sealed with the cotton wool plug. A fresh culture of *Rhizopius* sp. was obtained from ARC – Plant Protection in Pretoria. The culture is currently maintained at the ARC-ITSC. The cellophane was removed from the cotton wool plug and flasks were placed in a incubation chamber with a temperature of 27ºC and 60% relative humidity. Unfortunately not one of the eggs placed in the honey flasks hatched.

RESULTS

Collection of infested fruit

Laboratory procedure

A total of 110 pupae were obtained from all the fruit. After placing the pupae in the boxes only 80 moths emerged. The moths were divided and placed in the kitchen sieves at 3 different temperatures: 25ºC, 27ºC and 30ºC and relative humidities: 50%, 70% and 80%-100%. First eggs were found on 13 December 2004 on the wax paper of the sieve placed at 30ºC with relative humidity of 80% to 100% and a complete night cycle. A total of 53 eggs were found in this sieve during the study. No eggs were found on the wax paper in the other sieves.

CONCLUSION

In most producing areas the infestation levels of moths were low during the past season except for the Nelspruit farm where most of the larvae were collected. Not enough pupae were found to eventually establish a laboratory population. Because of the high natural mortality of the pupae, a high number of individuals are needed to start a laboratory population. A constant temperature of 30ºC with relative humidity of 80% – 100% with a complete night cycle seems to favour mating and egg laying of the moths. Not one of the eggs placed on the artificial medium in the honey flasks hatched. It seems that the medium used for rearing false codling moth is not suitable for rearing the litchi moth.

Future research

Alternative hosts such as the doppruim, *Papea capensis*, pods of the Karooboerboon (*Schotia afra*), the Pride of the Cape (*Bauhinia galpinii*), the flamboyant (*Delonix regia*), the pride of Barbados (*Ceasalpinia pulcherima*) and certain *Acacia* species must be investigated to see if high numbers of individuals can be obtained from these host plants.

Minor changes to the currently used medium also need to be investigated to ensure that the eggs hatch and the larvae develop properly. Products such as concentrated litchi juice mixed with the maize meal medium, grounded dried litchi peel, litchi fruit flesh or crushed litchi seed mixed with the growing medium need to be investigated.

Temperature and relative humidity play an important role in egg and larval development. Temperature and relative humidity used in our study derived from false codling moth studies. Temperature and relative humidity for litchi moth development may vary and must therefore be investigated.

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Table 1. The number of moth infested fruit found in the total number of fruit sampled at different localities.

Farm name	Area	Number of fruit examined	Total number of infested fruit
ITSC – Nelspruit	Nelspruit	1500	375
ITSC – Friedenheim	Nelspruit	1500	7
Whentley Properties	Tzaneen	1500	3