

Last Call LFM™ – second year commercial trial Final report 2008

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ABSTRACT

The field trial was conducted to test the efficacy of Last Call LFM™, an “attract and kill” product, in litchi orchards in Malelane, South Africa. The trial was followed on from the previous year on the same farm. This particular farm was selected for the second year because of the distances between separate blocks. In 2006 it was clear that Last Call LFM™ has a “spill over” effect into nearby orchards used as control blocks. The aim of this season was to evaluate the efficacy of Last Call LFM™ by making applications earlier in the season before the litchi fruit moth population could establish itself. A more elaborate fruit inspection was also employed to test the integrity of the inspection method. The litchi fruit moth numbers did not increase significantly in the control blocks of this trial. The fruit damage as a result of litchi fruit moth was extremely low at 0.1% on average.

INTRODUCTION

The tortricid genus, *Cryptophlebia*, contains several species that attacks litchis throughout the world. In South Africa, Madagascar, Mauritius, Seychelles and Reunion, *Cryptophlebia peltastica* is a major pest on litchis.

Cryptophlebia peltastica is a fruit borer. The eggs are laid on the surface of the fruit and the larva bore down into the seed, which is completely eaten. Fruit damage is present in young fruit at about 5 mm size, as well as mature fruit that have started to colour. One larva may damage two or even three fruit when young fruit are attacked early in the season. The litchi fruit moth has a wide range of alternate hosts in which to carry on the life cycle after the litchi fruit harvest. It is likely that the litchi fruit moth moves out of the litchi orchard after harvest and then has to start to build in population within the orchard when litchis become available again the following season. Therefore the population for a particular area or season may be highly influenced by the availability of alternate host plants as well as climate conditions in the months leading up to the litchi season.

The litchi season is extremely short when compared to fruit such as citrus or avocados. For this reason it gives the grower a limited time in which to control various pests of litchis and chemical residues are more likely to remain behind in such a short space of time. The litchi fruit moth does most of the damage toward the end of the season when the fruit is ripening and this limits the opportunities to control it even further.

Last Call LFM™, “attract and kill”, has two different modes of action. Male litchi fruit moths are attracted by the infused female pheromone which is specific to this particular species. Males will think that the droplet is a female and try to mate with it, coming into contact with the droplet and a lethal dose of insecticide.

Further, all the droplets slowly release pheromones that are in direct competition with pheromones from the female litchi fruit moths as well as from the monitoring trap. It is difficult for males to locate unmated females. This is

in theory tested by comparing numbers of moths caught in monitoring traps in a control block to those of a test block. When the male moth counts are significantly lower in the test blocks at the same time interval, this is known as “trap shutdown”. Overall the two methods of action are essentially reducing the chance of males and females coming together and this is known as “mating disruption”.

If there are less mated females then there will be less eggs laid on the fruit, the litchi fruit moth population will not have a chance to establish early in the season and ultimately there will be less damage to the crop at the end of the season.

MATERIALS AND METHODS

Monitoring Lure

The LFM PheroLure™ consists of a small rubber septum that has been impregnated with a biochemical mixture. The mixture has been identified as being the sex pheromone released by female *Cryptophlebia peltastica* to attract the males of the same species for mating. The lure was placed on the inside of the trap on top of the sticky liner in the middle.

Trap design

Yellow Delta Traps™ were used along with the delta trap sticky liner. The trap is triangular in shape with apertures at each end. The sticky liners have a total surface area of 370 cm², coated with a polybutene glue to which attracted males will stick. The ends of the trap may be folded inwards into the “closed” position. In this configuration the apertures measure 35 × 35 × 35 cm and the length 18 cm.

Method design

Two traps were placed in each test and control block regardless of the block size. The traps were baited with the LFM PheroLure™. Traps were checked every week and the sticky liners were only replaced when they were unsuitable for use. The LFM PheroLure™ was replaced after 12 weeks. The number of male moths per trap were counted



and recorded every week. Fruit inspections were made during the trial with the final inspection at harvest time.

The first Last Call LFM™ application of 3000 droplets/ha was made during flowering in July. The droplets were applied by hand with the aid of 2 m and 3 m extension poles. Between 8 and 12 workers were required to make the applications, which did not take more than three days. A second application of 3000 droplets/ha was made six weeks later and a third application of half the dose was applied six weeks later, just before harvest at the beginning of November.

The trial started on 27 July 2007 and ended on 14 December 2007. The trial ran for a total of 147 days.

RESULTS

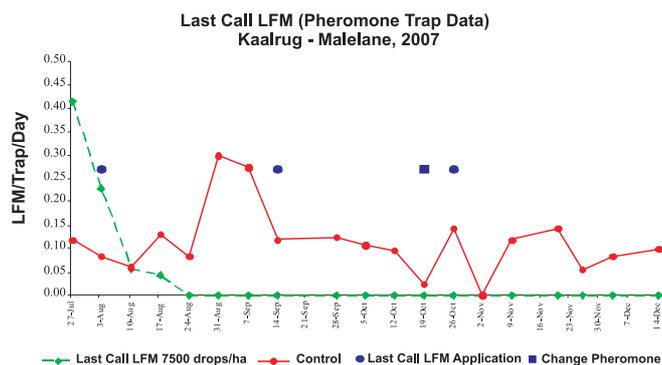


Figure 1. 2007 trial layout. Numbers of male litchi fruit moths caught weekly during the 2007 Last Call LFM™ trial.

Last Call LFM Trial, Compare the Number of Moths / Day before and after Last Call LFM Application vs Control

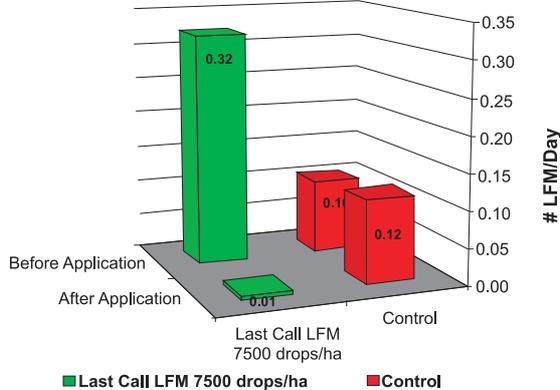


Figure 2. Comparison of moth numbers before and after the application of Last Call LFM™.

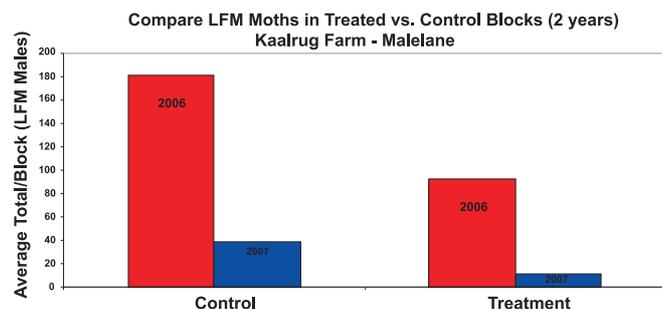


Figure 3. Comparison of male litchi fruit moth numbers on Kaalrug Farm in 2006 to 2007.

Fruit were inspected on random bunches throughout the trial. At final inspection damaged fruit was picked from the tree and cut open to reveal signs of litchi fruit moth infection.

The raw data was inserted into a Microsoft Excel spreadsheet for processing.

Trial layout:

Block	Age (yrs)	Size (ha)	Cultivar	Treatment/Control
Block1	38	9.4	Mauritius	Control
Block 2	38	6.9	Mauritius	Treatment
Block 3	38	3.6	Mauritius	Cryptogran
Block 4+5	20	2.0	Mauritius	Control
Block 6+7	25	2.9	Mauritius	Cryptogran
Block 8	20	1.7	Mauritius	Control
Block 9	20	4.4	Mauritius	Last Call
Block 10	20	3.8	Mauritius	Control
Block 11	20	7.5	Mauritius	Last Call
Block 12	13	3.1	Mauritius	Last Call
Block 13	13	3.5	Mauritius	Last Call
Block 14	13	3.4	Mauritius	Control

**Compare LFM Numbers in Untreated Blocks
Kaalrug vs. Farm 2**

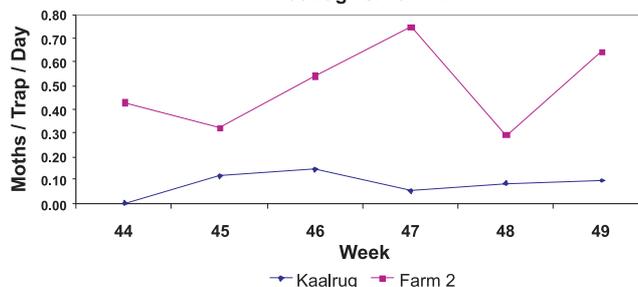


Figure 4. Comparison of litchi fruit moth numbers on Kaalrug Farm vs. Farm 2, a neighbouring farm that did not administer any early Last Call LFM™ applications.

**Compare overall damage in Treated and Untreated Blocks
Kaalrug 2007**

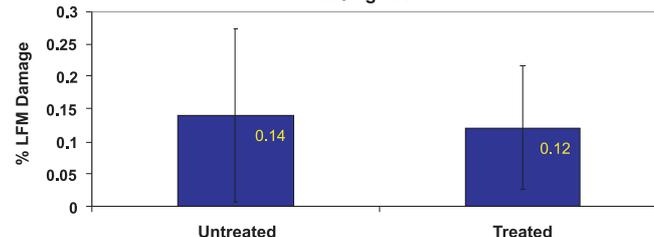


Figure 5. Comparison of LFM damaged fruit in the control and test trial blocks.

**Compare LFM Damage on Kaalrug Farm
from 2006 and 2007**

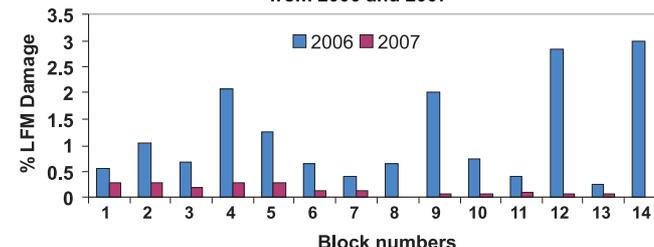


Figure 6. Comparison of LFM damage in individual blocks, 2006 vs. 2007, on Kaalrug farm.

INTERPRETATION OF RESULTS

It is important to note that, fortunately, 2007 was a good year all round for litchis in this area. Unfortunately litchi fruit moth numbers were low in general, which could be attributed to a number of various reasons. This, however, did have a direct impact on the trial, and results on fruit damage could not be conclusively established.

There are three contributing factors to the low moth population which can be discussed. Neither of them can be conclusively argued, but are likely possibilities. The first factor is the climate. A cold winter could have halted the growth of the moth population in the off season. Further a warm or sunny litchi season could have had a negative effect on the number of eggs reaching maturity.

The second factor involves the effect of the previous years' application of Last Call LFM™. It is possible that the number of moths were reduced before the off season, making it difficult for the population to survive the winter. The third option is the effect of the early application of Last Call LFM™ in the current season. It may be that the product worked well by suppressing the population in problem blocks, therefore preventing any sudden and exponential rise in the numbers of moths. From this point we can only discuss certain observations that may be of value in future research.

In **Figure 1** and **2** we can see that the moth numbers were below 0.5 moths / trap / day. This figure was between 1 and 3 for 2006. The difference in moth numbers in the treated and control blocks illustrates the "trap shut down" effect caused by the Last Call LFM™.

This means that moths are unable to find the traps and ultimately the females due to the mating disruption effect of the pheromone being released. **Figure 3** illustrates the large difference in moth numbers on the farm as a whole between 2006 and 2007.

A few points can be highlighted when comparing 2006 and 2007 moth numbers.

Block 12 and Block 14 were both control blocks in 2006. In Block 12 the highest number of moths were trapped and the second highest in Block 14. In **Figure 6** we can see that the fruit damage as a result of LFM was the highest in these two blocks as well. This is hardly a coincidence.

In 2007 block 12 was designated as a treatment block with the belief that a positive effect would be clearly distinguished or greatly enhanced in a problem block when compared to the rest of the trial blocks. However, block 14 remained as a control block. At the end of the 2007 season both block 12 and 14 had the least fruit damage. In fact, Blocks 8, 9, 10, 12, 13 and 14, which were in the same vicinity, each had less damage individually than the other blocks situated on the other side of the farm. This seems to suggest that there could have been some sort of a chain effect in which the moths move over from block to block while increasing in numbers over the farm as a whole. This also suggests that moths may move out of the blocks totally during the winter.

Since the moth numbers seem to be evenly low on average, we can not statistically prove that moth numbers were reduced as an effect of the Last Call alone. However, in **Figure 4** we see that if we compare moth numbers from two different farms, there is an indication that Last Call may have had an effect in reducing moth numbers on the trial farm as a whole. Here the average number of moths caught in all control blocks are compared to the average number of moths caught on a farm where no Last Call was used. The moth numbers were lower on the trial farm.

The overall percentage of damaged fruit as a result of litchi fruit moth was very low. The average of all treated blocks had a lower percentage of damage than the average of the control blocks. This was also seen in the previous season. However, it can not be statistically shown because there may be a spill over or chain effect caused by the Last Call as discussed previously. Further to that there are too many variables, such as block size, block altitude, distance from natural vegetation, etc. which clearly have an influence on the vulnerability of a particular orchard to litchi fruit moth attack.

In **Figure 5** we see that percentage damage is nearly the same on average when comparing treated and untreated blocks. In **Figure 6** we can see that this is the same when looking at individual blocks. However, the difference in LFM damage between problem blocks or treated and untreated blocks is more clearly visible in the 2006 season when moth numbers were higher.

CONCLUSIONS

The damage caused by the litchi fruit moth (*Cryptophlebia peltastica*) is much less when the moth population is much lower. Damage in control vs. treated blocks is more pronounced when moth numbers are high.

The data from two years study shows Last Call LFM™ application in treated blocks vs. control blocks has a slight effect on the percentage of infected fruit according to the present method of investigation. There may however be a spill over or chain effect on one particular farm which suggests then that the Last Call™ has a much greater effect than can currently be presented.

Last Call LFM™ can be used alone as a control for litchi fruit moth. There is no harm to beneficial insects.

The way forward is to test the efficacy and compare data from farms which use Last Call LFM™ and farms which do not. Further studies and product development must be done in determining whether the "attract and kill" or mating disruption effect is superior.

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