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Authentication

I declare this work was done under my supervision according to the procedures described herein and that this report is a true and accurate record of the results obtained.

Signature (project leader)……..

date……

J V Cross, East Malling Research, Date 30 October 2007

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Grower summary

SF 174b

Insecticides for control of light brown apple moth (LBAM) on cherry

Headline

- Despite reasonably high numbers of male moths in pheromone traps no light brown apple moth (LBAM) larvae developed on the plots, including the untreated controls,.
- The failure of population development was caused by a combination of weather and tree growth factors. The trial was therefore abandoned.

Background and expected deliverables

The light brown apple moth (LBAM), *Epiphyas postvittana*, is one the most important pests of apple and other tree fruits in Australia and New Zealand, where it has developed resistance to and is difficult to control with insecticides. Although present in SW England since 1936, a HDC funded pheromone trap survey by EMR in 2006 showed that LBAM is now common in apple, pear, plum and cherry orchards throughout the fruit growing areas of southern England. The pest is particularly abundant and damaging in cherry orchards, where few insecticides are applied other than those for cherry black fly. The efficacy of various insecticides for control of the pest on cherry and other tree fruits in the UK has not been evaluated. Few insecticides are approved for use on cherry and very few of them have significant activity against tortrix caterpillar pests. The aim of this study was to evaluate a range of insecticides to identify treatments suitable for use by growers.

Summary of the project and main conclusions

A replicated field experiment was done in 2007 to evaluate the efficacy of two sprays of cypermethrin (Toppel 10), methoxyfenozide (Runner), a coded product (being developed for control of caterpillar pests on apple), *Bacillus thuringiensis* (Dipel DF), indoxacarb (Steward) and chlorprifos (Lorsban WG) in comparison with an untreated control. Two sprays were applied on 2 and 17 August 2007. However, the trial was abandoned subsequently as no LBAM larvae developed on the plots, including the untreated controls, despite reasonably high numbers of male moths in

pheromone traps. The failure of population development was caused by a combination of weather and tree growth factors. A higher than average rainfall in May and June resulted in low numbers of adult LBAM at this time. When adult numbers increased susbequently in July and August, no fruits were present and there was almost no new leaf material on which females could lay eggs.

Financial benefits

No direct financial benefits to growers resulted from this trial because of the failure of the the LBAM to establish in the experimental plot.

Action points for growers

- Use pheromone traps to determine the flight times and population levels.
- Check fruit for levels of damage.
- Control is difficult with the limited number of insecticides approved for use on cherries at this point.

Science Section

Light brown apple moth insecticides on cherry 2007

Introduction

The light brown apple moth (LBAM), *Epiphyas postvittana*, is one the most important pests of apple and other tree fruits in Australia and New Zealand, where it has developed resistance to and is difficult to control with insecticides. No resistance of LBAM to pyrethroids has been observed. However, resistance to pesticides such as azinphos-methyl has occurred in LBAM in New Zealand and Australia. Azinphos-methyl resistant LBAM were also cross-resistant to phosmet, chlorpyrifos and carbaryl.

Although present in SW England since 1936, a HDC funded pheromone trap survey by EMR in 2006 showed that LBAM is now common in apple, pear, plum and cherry orchards throughout the fruit growing areas of southern England. The pest is particularly abundant and damaging in cherry orchards, where few insecticides are applied other than those for cherry black fly. Apart from pirimicarb (Aphox) and thiacloprid (Calypso), which are considered to be ineffective against caterpillar pests, only *Bacillus thuringiensis* (Bt) is approved for use for caterpillar control on cherry in the UK. Bt has a low efficacy against tortricid pests because of their cryptic lifestyle feeding in leaf rolls. Bt (Dipel), which already has an approval for caterpillar control on cherry post blossom, was included in this trial comparison. Treatments used included Toppel 10, Runner, a coded product (E2Y45), Steward and Lorsban WG. An untreated control was incorporated for comparison. The aim of this study was to evaluate the efficacy of candidate insecticides for control of light brown apple moth on cherry with the aim of identifying a safe and effective treatment for which a SOLA or approval can be obtained.

Methods and Materials

Treatments

The site was a small plot at East Malling Research (EMR) (rows 17 and 18 on WE 192), which consisted of two double rows of Colney fruiting cherry trees with Sylvia pollinators (Fig. 1). There were 6 m between the 2 row beds and 1.5 m between the rows in a bed. The trial was composed of 7 treatments including an untreated control (Table 1). Two applications (15 days apart) of each test product for control of LBAM larvae were applied (2 and 17 August). Female sex pheromone traps were used to time the sprays against the first generation of LBAM, when the eggs were starting to hatch, approximately 7-10 days after a significant pheromone trap catch was recorded (>10 moths/week). Two green delta traps were placed at either end of the plot, 10 trees in from the edge, on 27 March and the traps were monitored weekly.

Sprays were applied with a Birchmier B7014 motorised, air-assisted knapsack sprayer at a volume rate of 500 l/ha, ensuring uniform coverage of foliage and fruit. The sprayer was fitted with a pink micron flow restrictor. Pre-application calibration showed the sprayer had a flow rate of 7 ml/s so each tree was sprayed for 43.42 s (21.7 s/side) to deliver the required spray volume of 2.4 l/tree. The volume of spray remaining in the tank after application of each treatment was measured and the percentage accuracy of dose application calculated (% target dose applied = 100*((initial-final tank volume)/required application volume)). The dose applied was within 11% of that required. Note, the values are approximate because tank volumes were measured to the nearest 100 ml.

The EMR farm manager applied a spray programme of fungicides and early flower spray of Aphox against aphids. No chemicals active against caterpillars were used other than those for testing.

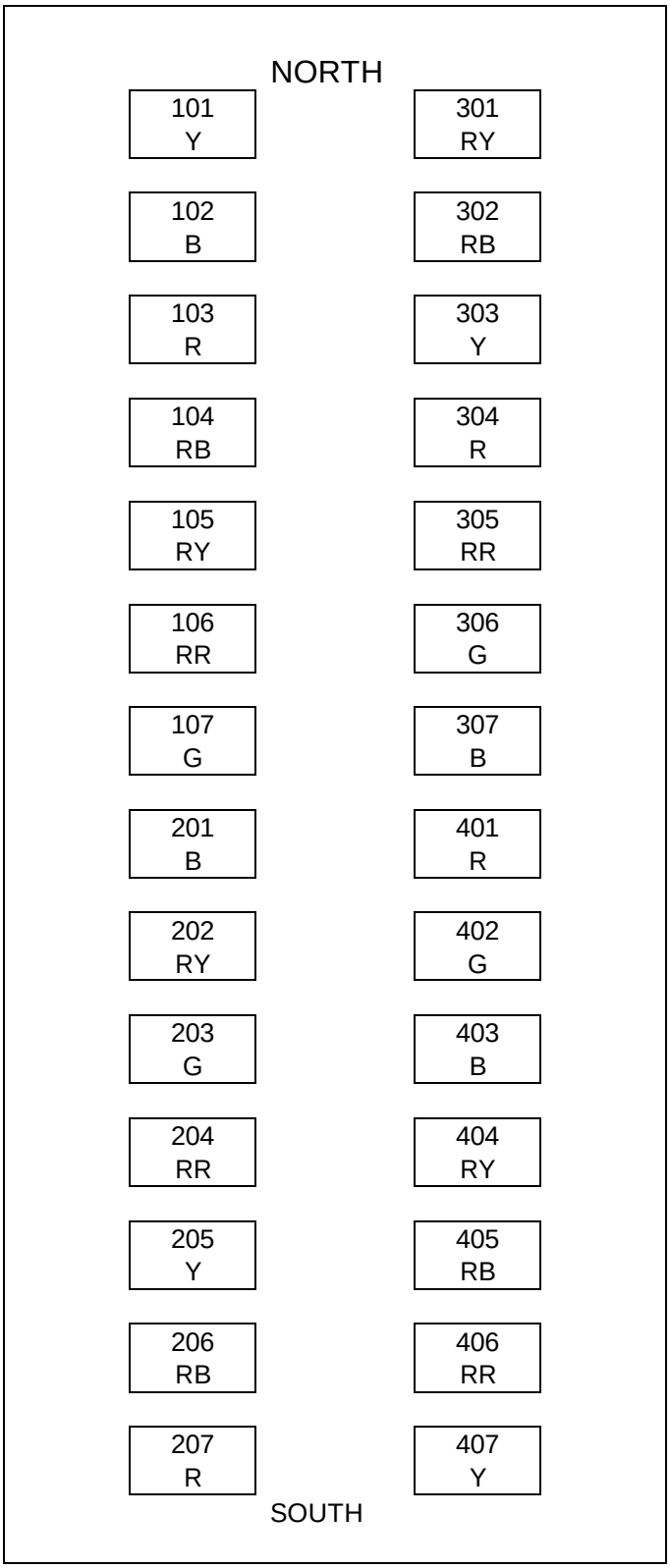
The experiment was a single small plot randomised complete block experimental design with 4 replicate plots of each treatment (Table 2). Plots consisted of 2 adjacent cherry trees in a row plus a guard tree on either side (Fig. 1). Pollinator trees were not included in the experiment.

Figure 1. Photograph of cherry plot used for trial (6 May 2007)

Table 1. Treatments applied to the cherry plot at East Malling Research on two occasions (02 and 17 August).

Trt No	Product	Active ingredient	Dose rate product (/ha)	Label spray volume (l/ha)	Justification of dose rate
1	Toppel 10	cypermethrin	280 ml	200	Dose used for tortrix caterpillars
2	Runner	methoxyfenozide	600 ml	200	Maximum dose for Codling moth on apple
3	EMR0001	coded	175 ml	200	Dose recommended for testing by the parent company
4	Dipel DF	*Bacillus thuringiensis*	0.75 kg	1000	SOLA recommendation for cherry
5	Steward	indoxacarb	1.70 kg	200	Recently used against Codling moth in a UK trial
6	Lorsban WG	chlorpyrifos	1.20 kg	250	Recommended for tortrix in apples (rate at pre blossom 0.6 kg/ha)
7	Untreated control	-	-	-	-

Table 2. Experimental plot design.



Wet and dry bulb temperature, and wind speed were recorded before and after spraying (Table 3). Full records for the trial duration were taken from the East Malling Meteorological station (Appendix, Figure 2).

Table 3. Meteorological conditions at the time of spray application.

	4 July		8 August	
	Start	End	Start	End
Time	08:10	10:15	08:20	10:25
Dry bulb ˚C	18	27	14	17
Wet bulb ˚C	15	17	13	14
RH %	84	58	95	84
Wind speed (km/h)	0	0	4	4
Cloud	hazy		hazy	

Assessments

The numbers of LBAM larvae on each plot was assessed 13 days after the first treatment and 27 days after the second treatment. Because it was unfeasible to identify caterpillar species from feeding damage, the foliage of each tree was searched (8 min/tree) for individual moth larvae, which could later be identified. Caterpillars were found by looking for rolled leaves or leaves bound together with silk.

Determination of the phytotoxic effects of the treatments was not a central aim of this work. However, plots were inspected for any visual signs of phytotoxicity from the treatments on each sampling occasion.

As only Bt and Calypso were approved for use on cherry the fruit on the trees used in this trial were not harvested.

Results

On 11 May it was observed that the cherry leaves had been attacked by larvae of the winter moth, *Operophtera brumata* (Linnaeus, 1758). Because of the extensive leaf damage there was concern that female LBAM may not lay eggs on the leaves, however, by the beginning of June there was new leaf growth at the growing tips of the trees.

The threshold of >10 moths per trap was not reached druing May, May or June (Fig. 2). This is believed to be due to the higher than average rainfall throughout May and June (Appendix, Fig. 3), which may have disrupted the moth's flight, preventing it being trapped in the pheromone traps.

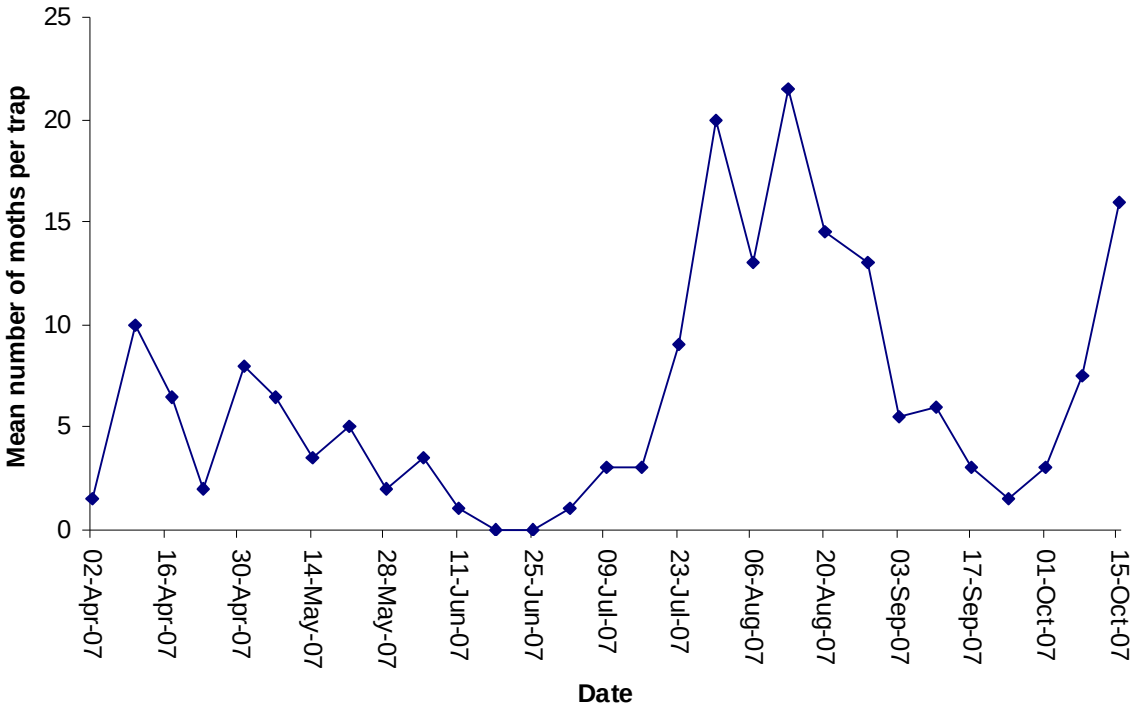


Figure 2. Phenology of male LBAM in the cherry plot (WE192) at East Malling Research

A pre-assessment on 2 August, after the first recording of above threshold number of moths, revealed that very few of the new leaves had been damaged by caterpillars. The site was assessed after the first spray applications (15 August) on 9 August, but very few moth caterpillars were found and so it was decided to leave the assessment until the day before the second spray application. On the first

assessment, some caterpillars were found, but these were not LBAM. Therefore, only two of the 4 blocks were assessed and the caterpillars reared through to adult to determine the species. The species of caterpillar identified were *Lyonetia clerkella*, *Coleophora hemerobiella* and *Diurnea flagella*, with no LBAM reared from the samples.

On the second assessment (13 September) all of the control trees were searched, but no LBAM larvae were found. This was probably because at this time the trees had stopped growing new leaves and so no suitable oviposition sites were available to the female moths.

No phytotoxic effects of any of the treatments found.

Due to a combination of factors this trial was abandoned as no LBAM larvae were found on the cherry trees despite reasonably high numbers of male moths in pheromone traps later in the growing season. The factors contributing to the unsuccessful colonisation of the trees included; the severe damage to tree foliage in early May by winter moth; a higher than average rainfall in May and June resulting in low numbers of flying adult LBAM; and the unavailablity of new leaf material for females moths to lay eggs once LBAM population had reach a maximum.

Future work

Because of the failure of the the LBAM to establish in the experimental plot it is advised that this trial is repeated in 2008.

Acknowledgements

We are grateful to the farm manager, Nigel Osborne, for managing the plot of cherry trees used in this trial.

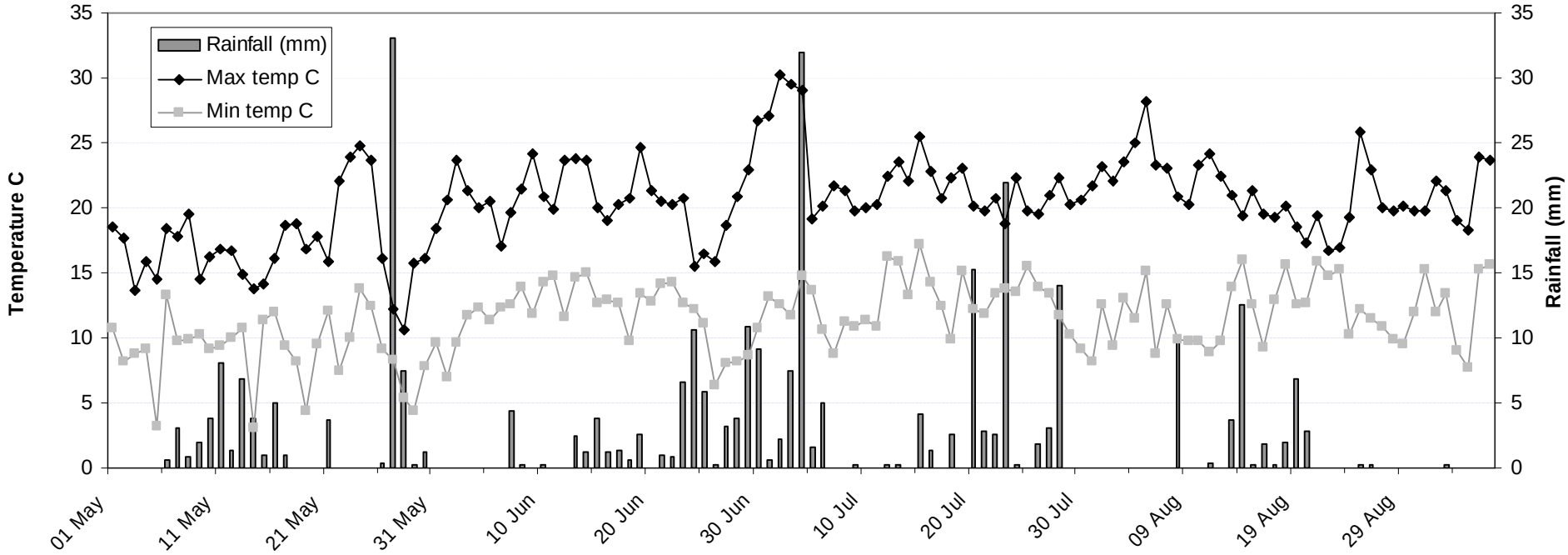


Figure 3. Daily maximum and minimum air temperature (˚C) and rainfall amount (mm) at East Malling Research in 2007