PIP – SUMMARY OF TRIALS

October 2014

Field trials for efficacy controlling false codling moth on avocado in Kenya

Abstract

False codling moth (FCM), *Cryptophlebia leucotreta*, is a lepidopteran pest that affects many fruits such as citrus, grapes and stone fruits. In these trials, the objective was to assess control of the pest on avocado, on which the false codling moth can be destructive.

In this trial, four commercial control products (RUNNER, RADIANT, CRYPTEX and GWN-9996), including some biologically based ones, were compared with a reference product, CORAGEN (chlorantraniloprol) on avocado grown at two sites near Thika in Kenya. There was also an untreated control, making six treatments.

The products were applied, using a knapsack sprayer, five times over a period of 28 days, in a randomised block trial which had five replicates. Assessment of efficacy was based on the larvae present in fruit and the presence of frass. Fruits on trees, harvested from trees and ones that had fallen to the ground, were examined and/or dissected.

All the treatments reduced the incidence of fresh frass (indicator of live larvae being present) as the trial progressed, compared with the untreated control, but the reduction took at least two weeks to manifest. Treatments reduced pest numbers (assessed by presence of frass) from 12 or 15 per tree in control plots (sites 1 and 2 respectively) down to 2 to 10. Not all these reductions were statistically significant, and the botanical insecticide GWN gave the weakest control, particularly at site 1, where there was only a 30% reduction in pest numbers compared with the untreated control, (which may have been because the recommended use of a surfactant was omitted)

Number of live larvae of FCM in fruits on the ground was greatly reduced by all treatments at both sites, compared with the untreated control. All treatments except the botanical pesticide GWN performed similarly in terms of live larvae in fruit. Even GWN reduced the number of live larvae in fallen fruit to around a third of the number in the untreated control. RADIANT and CORAGEN gave zero live larvae in harvested fruits at both sites, with the other products giving slightly lower effect.

All the products would be useful tools in an integrated pest management approach by reducing the number of live larvae in fallen fruit (a potential source of new infestation) and the observed frass. RUNNER, RADIANT and CORAGEN treatments resulted in no live larvae, so would be likely to achieve a degree of control that would be accepted by markets.

The table below gives a summary of the treatment products, active substances, manufacturer and rates used in the trial:

Commercial name *Active substance or biological agent* Company	Action and content of active substance	Product rate (ml/ 100 l of water)	Product use rate (l/ha)
RUNNER 240 SC *Methoxyfenozide* DOW	Mimics the moulting hormone 240 g/l	60 ml	0.60
RADIANT 120 SC *Spinetoram* DOW	Micro-organism-derived insecticide 120 g/l	42 ml	0.42
CRYPTEX *Virus 1 Granulovirus* Andermatt	Lethal insect virus 4 x 1012 GV/ha	33 ml	0.20 – 0.33
PLANT 1 GWN9996 *liquid plant extracts* Ecoflora (from Gowan)	Botanical insecticide Liquid formulation	100 ml	1 plus adjuvant[1] – Silwet Gold
Untreated control	0	0	0
CORAGEN *Chlorantraniliprole SC* DuPont (The reference product)	New MoA, kills by over-stimulating insect muscles 200 g/l	20 ml	0.2

[1] Silwet Gold is a surfactant to help spreading and penetration

Trial details

1. Methods

There were two trial sites, planted with dwarf avocado trees (variety Pinkerton) averaging 1-2m in height. The trial used a randomised block design with five replicates of the seven treatments (including the untreated control).

The sprays were applied to six trees per plot, according to the manufacturers' recommendations, using a knapsack sprayer, at a volume application rate of 1000 l/ha. This gave a measured volume per tree of 2.4 litres. There was an untreated guard row between blocks to prevent inter-plot contamination by drifting spray.

Treatment sprays were applied six times with six or seven days between treatments, and the two sites were treated and assessed on the same days.

Note that in the case of GWN, the recommended adjuvant was omitted.

Damage assessment

Before the treatments started, number of pests was assessed using traps and by a visual inspection of fruits on trees to count the areas of visible frass.

Following treatments, assessments of the effectiveness of treatments were made weekly using several systems. Pest damage on fruits in situ on trees was recorded after counting the number of masses of fresh insect frass on fruits. Additionally, fallen fruits were dissected to determine the number of larvae and whether they were alive. Ten fruits were selected randomly and picked on four middle trees in each plot 35 days after the first treatment. Phytotoxicity was assessed weekly, and recorded as a percentage of leaf area affected. The growth stage went from BBCH 705 to BBCH 800 over the period of the trial. Before treatments commenced, there were an average of 6 FCM frass points per tree.

2. Results

No treatments produced any observable phytotoxicity. Figures 1 to 4 show the numbers of dead and live larvae in fruits on the ground at the two trial sites over the period up to 35 days after the first of the six sprays.

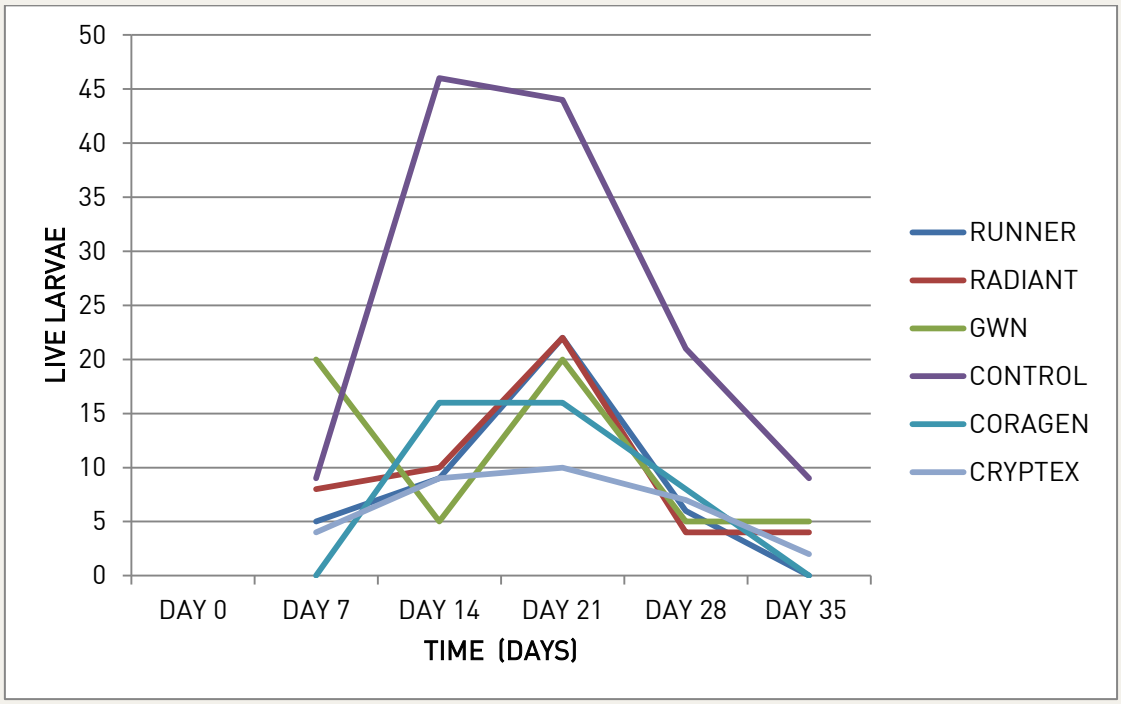

Figure 1: Numbers of live larvae on fruits on the ground over the trial period in Kihara 1 (site 1)

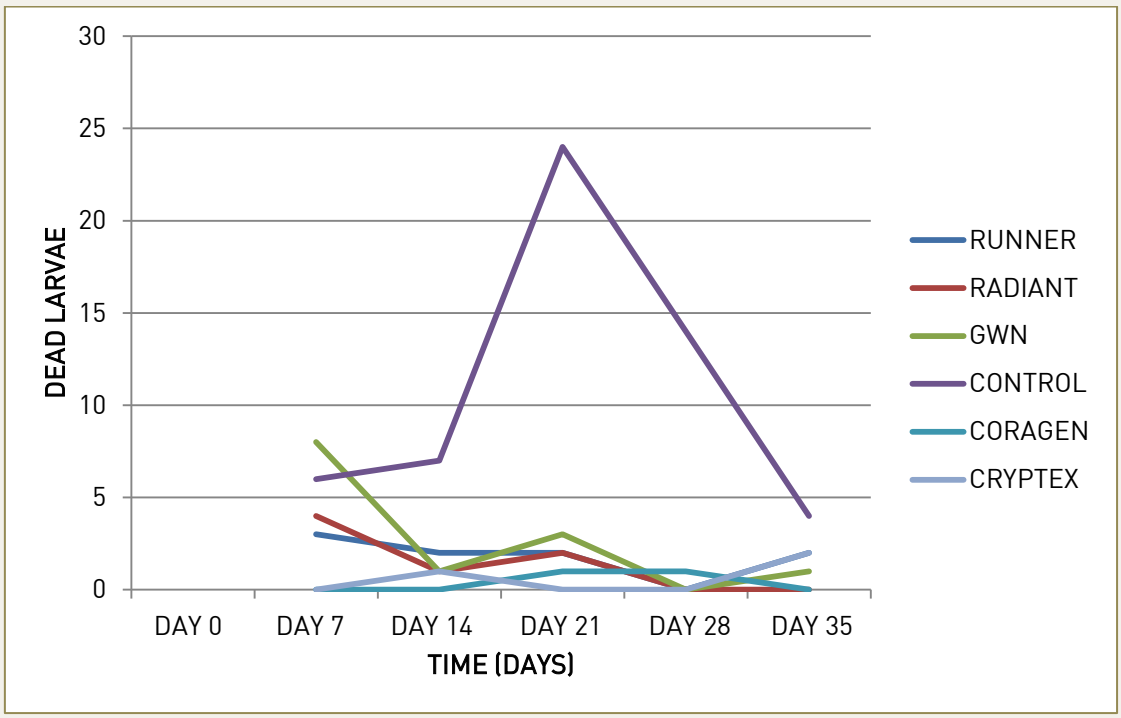

Figure 2: Numbers of dead larvae on fruits on the ground over the trial period in Kihara 1 (site 1)

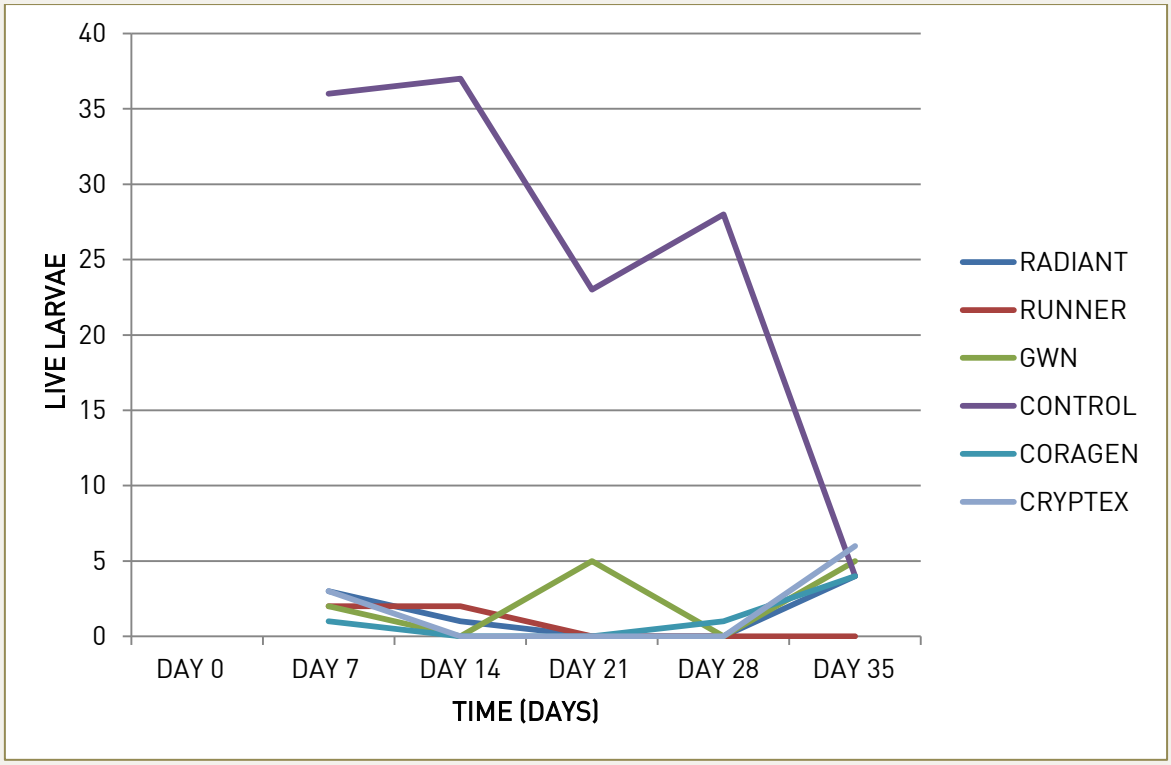

Figure 3: Numbers of live larvae on fruits on the ground over the trial period for site 2 (Kihara 3)

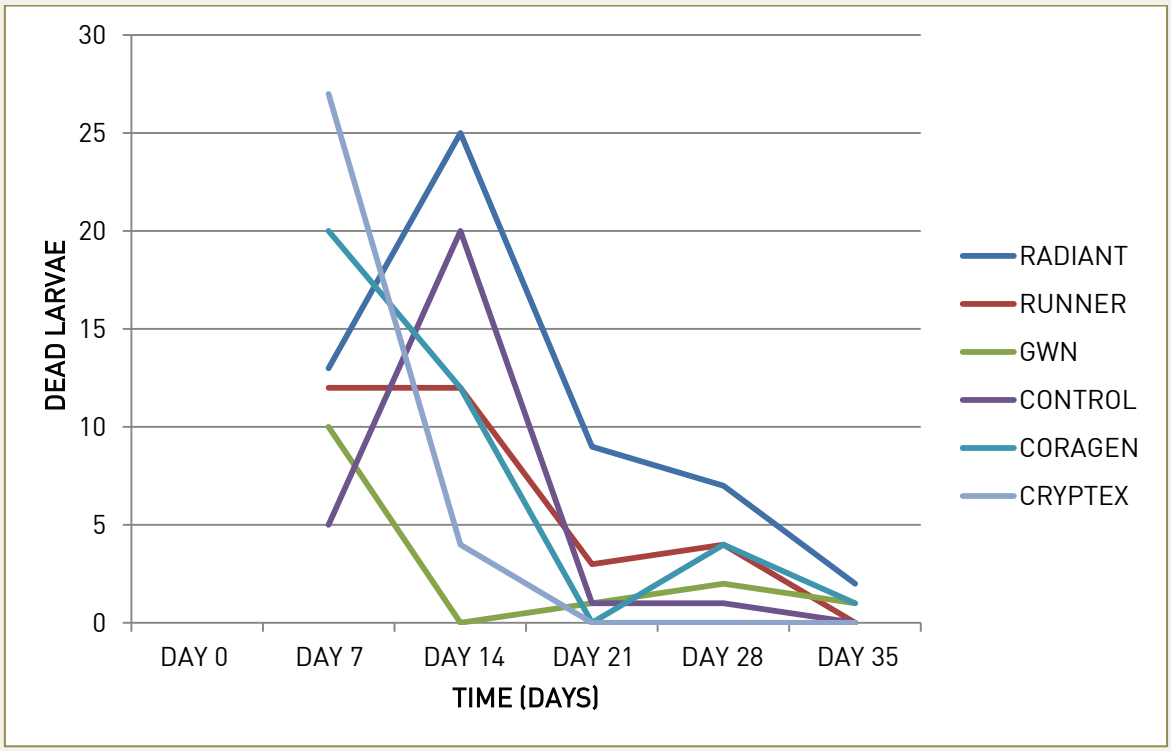

Figure 4: Numbers of dead larvae on fruits on the ground over the trial period for site 2 (Kihara 3)

The tables below summarise the number of new frass observations for the six treated plots and the untreated control over the period up to 35 days after the first of the six sprays.

Difference between treatments with the same letter (a,b) are not statistically significant.

Site 1 – Mean number of new fresh False Codling Moth frass per tree

Treatments	DAY 0	DAY 7	DAY 14	DAY 21	DAY 28	DAY 35
RUNNER 240 SC	9.00a	11.80a	11.60ab	9.60a	6.30a	3.10a
RADIANT 120 SC	13.05a	15.05a	10.60ab	12.80a	8.90a	6.55a
CORAGEN	7.75a	11.50a	8.70a	10.20a	8.30a	4.20a
CRYPTEX	9.50a	21.80a	12.50ab	13.85a	10.75a	5.70a
GWN-9996	8.15a	15.90a	15.15ab	16.65a	12.45a	10.1ab
CONTROL	10.55a	21.15a	18.6ab	27.80b	21.70b	15.30b
p	0.653	0.322	0.047	←.001	←.001	0.004

Site 2 - Mean number of new fresh False Codling Moth frass per tree

Treatments	DAY 0	DAY 7	DAY 14	DAY 21	DAY 28	DAY 35
RUNNER 240 SC	7.75a	19.3a	7.80a	9.25a	6.00a	3.3a
RADIANT 120 SC	6.90a	10.55a	7.95a	9.8a	5.15a	2.55a
CORAGEN	9.80a	18.4a	12.05a	12.75a	4.80a	3.35a
CRYPTEX	8.95a	16.0a	10.00a	15.65a	8.35a	3.75a
GWN -9996	6.70a	14.25a	10.40a	10.45a	8.15a	4.60a
CONTROL	8.05a	24.30a	18.80a	31.0b	22.2b	12.75a
p	0.813	0.326	0.146	←.001	←.001	0.104

The tables below summarise percentage of dead and live larvae for the six treated plots and the untreated control over the period up to 35 days after the first of the six sprays.

Difference between treatments with the same letter (a,b) are not statistically significant.

Site 1 - Percentage of dead and live larva.

Treatments	Fruits with dead larvae (%)	Fruits with live larvae (%)
RUNNER 240 SC	2.25a	1.25a
RADIANT 120 SC	10.08a	0.00a
CORAGEN	2.50a	0.00a
CRYPTEX	5.33a	2.50a
GWN - 9996	5.56a	9.31a
CONTROL	2.08a	27.84b
p	0.315	←.001

Site 2 - Percentage of dead and live larva.

Treatments	Fruits with dead larvae (%)	Fruits with live larvae (%)
RUNNER 240 SC	0.00a	0.00a
RADIANT 120 SC	3.75a	0.00a
CORAGEN	3.33a	0.00a
CRYPTEX	1.00a	0.00a
GWN -9996	10.56a	2.50a
CONTROL	5.71a	8.125b
p	0.227	←.001

3. Discussion and conclusion

Number of live larvae of FCM in fruits on the ground was greatly reduced by all treatments at both sites, compared with the untreated control. All treatments except the botanical pesticide GWN performed similarly in terms of live larvae in fruit, but there were variations in the number of dead larvae. Even GWN reduced the number of live larvae to around a third of the number in the untreated control. RADIANT and CORAGEN gave zero live larvae in harvested fruits at both sites. Results for RUNNER, CORAGEN, CRYPTEX varied between sites but reduced the live larvae by at least 85% compared to the untreated control.

All the treatments reduced the incidence of fresh frass as the trial progressed, compared with the untreated control. They reduced pest numbers (assessed by presence of frass) from 12 or 15 per tree (sites 1 and 2 respectively) down to 2 to 10. Not all these reductions were statistically significant, and the botanical insecticide GWN gave the weakest control, particularly at site 1 where there was only a 30% reduction in pest numbers compared with the untreated control.

In terms of live larvae, the important parameter for trade in avocado, the reference product RUNNER, and the three test products RADIANT, CORAGEN and CRYPTEX, gave full control. The exception was GWN which performed less well, and fruit had some remaining live larvae. Further work would be needed to determine whether the performance would have been better if the adjuvant had been added to the spray.

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PIP is funded by the European Union.
This publication has been produced with the assistance of the European Union.
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