

EVALUATION OF SELECTED CHEMISTRY FOR DECONTAMINATION OF SOLENOPSIS MEALYBUG ON MACHINERY

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Summary

In a trial undertaken to determine the efficacy of selected chemistry for the control of *Solenopsis mealybug* on cotton picking machinery, Pulse[®] Penetrant provided close to complete control of all lifestages targeted. The remaining treatments provided significantly lower levels of control and were considered unsuitable for minimising the spread of the mealybug. For example, Farmcleanse[®] at 10% v/v provided the next highest level of control at 61.6% overall mortality. The mortality effect varied depending on the lifestages, with adult mortality lower than that of nymphs for all treatments except Pulse[®].

Introduction

The *Solenopsis mealybug* (*Phenacoccus solenopsis*) (Tinsley) has, in 2009-2010 been identified for the first time in Australian cotton crops (IPPC 2010). The outbreak in the Emerald Irrigation Area is currently confined to a number of fields and farms, and minimising spread of this pest is a priority for the local growers and the cotton industry more broadly. Assisted spread, particularly by people and machinery, is acknowledged as a key means of long distance movement of this pest. To minimise the spread of the pest, particularly by machinery, the cotton industry needs a method by which they can confidently decontaminate machinery that has been used in infested fields before moving to 'clean' farms and fields. An effective cleaning protocol is particularly important for contract pickers who move between farms, and then move south to other cotton-growing regions as the season progresses.

The decontamination of machinery is currently achieved through the use of air, to remove plant material and soil, and then coverage with Farmcleanse[®] to kill disease spores that may be adhering to the equipment. It was important to assess the efficacy of the current cleaning protocols, and evaluate additional treatments that may further reduce the risk of transporting mealybugs on machinery.

This report documents the results of a laboratory trial conducted on mealybugs collected in Emerald at 'Kerry Downs' (23° 30'51"S, 148° 06'21"E) to identify effective treatments for decontaminating farm machinery to minimise the movement of *Solenopsis mealybug*.

Materials and Methods

The experiment involved seven treatments (Table 1), each replicated eight times.

Each replicate consisted of a terminal of a mature cotton plant heavily infested with mealybugs. The plant material and mealybugs were collected in the field on 22 February, 2010. Each replicate was made up of an individual 10 cm length of stem with a minimum of 100 mealybugs. In the field, stems were placed into sealed polystyrene boxes and returned to the laboratory where they were treated.

Solutions of each chemical tested were made up as per the dilutions in Table 1. The chemical was sprayed onto the cut stem to the point of runoff with a hand sprayer, ensuring full coverage of the

mealybugs. Each stem was then air dried before being placed individually into a 15 cm x 4 cm ventilated glass bioassay vials (Scholz 1994).

A preliminary assessment of mortality and/or survival was made at 24 h. After the initial assessment the trial material was transported from Emerald to Toowoomba DEEDI laboratories and maintained in a constant temperature room at 25 °C ± 2 °C, 60% RH.

The final assessment of product effect on mealybugs was made over 2 days, between 60 and 84 hrs. The final assessment was destructive with all mealybugs removed from the vials and examined under a microscope to determine the number of dead and alive in each of three categories; adults, first instar nymphs and 2nd-3rd instar nymphs.

Table 1. Treatments and dilutions evaluated against *Solenopsis mealybug*.

Treatments	Active ingredient & Registering company	Trial concentration	Quantity of products for 1 L solution
Control	tap water only		1000 mL water
Pulse [®] Penetrant	1020 g/L polyether modified polysiloxane NuFarm Australia Ltd	@ 0.2% v/v concentration	2 mL + 998 mL water
Pulse [®] Penetrant	1020 g/L polyether modified polysiloxane NuFarm Australia Pty Ltd	@ 0.5% v/v	5 mL + 995 mL water
Canopy [®]	792 g/L paraffinic oil Caltex Australia Pty Ltd	@ 1% v/v concentration	10 mL + 990 mL water
Farmcleanse [®]	detergent-degreaser Castrol Petroleum Australia Pty Ltd	@ 2% v/v concentration	20 mL + 980 mL water
Farmcleanse [®]	detergent-degreaser Castrol Petroleum Australia Pty Ltd	@ 10% v/v concentration	100 mL + 900 mL water
CT14 Gutsy Degreaser	Degreaser Applied Australia Pty Ltd	@ 10% v/v concentration	100 mL + 900 mL water

Data were analysed by ANOVA (GenStat v. 9.2), and differences in means compared by LSD at 5%. Analysis of data collected at 60 and 84 hours showed no significant difference in the levels of mortality ($P>0.05$) and this data was pooled for final analysis.

Summary statistics only are provided for the preliminary assessment made at 24 hours.

Results and Discussion

The preliminary assessment of mortality and survival made at 24 hours indicated that there were marked differences in the immediate impact of the different treatments. Most obvious was the high mortality caused by both Pulse[®] treatments (Table 2). Observations when the treatments were applied were that the Pulse[®] treatment had an immediate effect on the mealybugs, dissolving the waxy coating (R. Lloyd pers. Comm.).

At the final assessment, Pulse[®] treatments showed significantly higher mortality of adults and nymphs than any of the other treatments at both the 0.2% and 0.5% concentrations. There was no significant difference between the two Pulse[®] treatments (Tables 2-5).

Table 2. Summary percentage mortality (1st, 2nd-3rd, and adult) of *Solenopsis mealybug* calculated as (100* no. dead/total no.) at 12 and 84 hours after treatment. Means followed by the same letter are not significantly different (P > 0.05). Numbers in brackets is total number of individuals in the treatment.

Treatment	Percentage mortality at 24 hours	Percentage mortality at 84 hours
Control	0.9 ± 0.3	11.9 a (2672)
Farmcleanse [®] 2%	4.8 ± 0.9	26.9 b (2253)
Canopy [®] 1%	4.2 ± 2.3	28.9 b (1323)
Degreaser 10%	9.6 ± 2.6	31.9 b (2236)
Farmcleanse [®] 10%	65.6 ± 10.4	61.6 c (1740)
Pulse [®] 0.2%	90.1 ± 3.6	92.2 d (1798)
Pulse [®] 0.5%	99.8 ± 0.1	99.7 d (1542)
LSD		12.2

Table 3. Percentage mortality of first instar *Solenopsis mealybug* nymphs (crawlers) calculated as (100* no. dead/total no.) at 84 hours after treatment. Means followed by the same letter are not significantly different (P > 0.05). Numbers in brackets is total number of individuals in the treatment.

Treatment	Percentage mortality at 84 hours
Control	18.1 a (1445)
Degreaser 10%	22.5 a (1344)
Farmcleanse [®] 2%	23.9 a (1072)
Canopy [®] 1%	35.3 a (706)
Farmcleanse [®] 10%	56.6 b (734)
Pulse [®] 0.2%	82.6 c (465)
Pulse [®] 0.5%	97.9 c (439)
LSD	19.6

Table 4. Percentage mortality of 2nd-3rd instar *Solenopsis mealybug* nymphs calculated as (100* no. dead/total no.) at 84 hours after treatment. Means followed by the same letter are not significantly different (P > 0.05). Numbers in brackets is total number of individuals in the treatment.

Treatment	Percentage mortality at 84 hours
Control	12.7 a (731)
Canopy [®] 1%	33.1 b (384)
Farmcleanse [®] 2%	35.4 b (743)
Degreaser 10%	55.2 c (544)
Farmcleanse [®] 10%	72.7 d (661)
Pulse [®] 0.2%	97.5 e (831)
Pulse [®] 0.5%	100 e (801)
LSD	14.5

Table 5. Percentage mortality of adult *Solenopsis mealybug* calculated as (100* no. dead/total no.) at 84 hours after treatment. Means followed by the same letter are not significantly different (P > 0.05). Numbers in brackets is total number of individuals in the treatment.

Treatment	Percentage mortality at 84 hours
Control	1.6 a (496)
Canopy [®] 1%	12.3 a (233)
Farmcleanse [®] 2%	13.3 a (438)
Degreaser 10%	31.8 b (348)
Farmcleanse [®] 10%	51.6 c (345)
Pulse [®] 0.2%	92.3 d (495)
Pulse [®] 0.5%	100 d (302)
LSD	15.5

Conclusions

To minimise the transport of *Solenopsis mealybug* on farm equipment, a rapid-acting disinfestation treatment is required. Because early instar nymphs are highly mobile and extremely small (1-2 mm), it would be difficult to determine whether conventional cleaning with air and water had removed them effectively from machinery by visual inspection. The application of Pulse[®] Penetrant to farm machinery has the potential to control 90-100% of all nymphs and adults it contacts, and provides an effective option for minimising the movement of mealybug on machinery. Good coverage of surfaces will be important to achieve the high levels of control seen in this trial.

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