

## Toxicity of insecticides against cotton mealybug *Phenacoccus solenopsis* (Tinsley) in flower crops

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### Abstract

Coccids (Scales and mealy bugs) have attained serious pest status on a wide range of host plants. The coccids are persistent in nature, their small size makes them difficult to detect and identify in the field and during quarantine inspection. The toxicity studies indicated that profenophos 50 EC 2ml/lit, methyl parathion 50 EC 2ml/lit fish oil rosin soap 20g/lit, imidacloprid 70 WS 0.4 ml/lit, acephate 75 SP 2g/lit and dimethoate 30 EC 2 ml/lit were highly toxic to *Phenacoccus solenopsis* and the efficacy persisted up to 10 days under field condition. *Beauveria bassiana* was found to be moderately effective at 10 days after treatment.

**Keywords:** Bio-efficacy of insecticides, cotton, mealybug, flower crops

### Introduction

Mealybugs (coccids) belong to the insect order homoptera and the super family coccoidea. They cause direct damage by way of feeding and in addition they also inject toxic saliva, excrete honey dew paving way for the growth of sooty mould fungus giving an ugly look resulting in poor quality of the produce. It also causes yellowing of leaves and malformation of affected portions due to salivary infection. They also cause indirect damage by way of spreading many viral diseases by acting as vector. The presence of red ants causes the nuisance while harvesting fruits/nuts in mango, coconut, citrus, Cotton, Ornamentals, flower and medicinal crops etc. The honey dew also causes the sooty mould due to capnodium growth and it reduces the photosynthesis.

The coccids are persistent in nature, their small size make them difficult to detect and identify in the field. Some scale insects are serious plant pests are usually either polyphagous, there can be notoriously difficult to detect during quarantine inspection. However, at times mealy bug infestation may occur within the vegetative shoot apex and may be extremely difficult to detect. This ability of mealybugs to form dense colonies particularly with in the shoot apex often makes chemical control of this pest quite difficult.

Among the various coccids *Phenacoccus solenopsis* (solenopsis mealybug) cause a severe damage by reducing the photosynthesis of the plant due to honeydew secretion and sooty mould attack in Cotton, Gingelly, Sun flower, Flower and Medicinal crops.

### Material and Methods

Crawler is the most susceptible stage at which coccids can easily be controlled. The field experiments were conducted

in randomized block design to evaluate the efficacy of certain newer insecticides against important coccids like *Phenacoccus solenopsis*, *C. indicus*, *P. nigra* and *C. insolita* on hibiscus at Tamil Nadu Agricultural University, Coimbatore. Each host plant was sprayed with recommended dose of chemical and there were three replications. Pre and post treatment counts were taken on 1, 3, 5, 7 and 10 days after spray.

The treatments details were:

Treatment	Name of the chemical	Doses (g or ml / litre of water)
1.	Thiomethoxam 20 WG	0.4
2.	Imidacloprid 70 WS	0.4
3.	Triazophos 40 EC	2.5
4.	FORS (Fish Oil Rosin Soap)	20
5.	Dimethoate 30 EC	2
6.	Profenophos 50 EC	2
7.	Methyl parathion 50 EC	2
8.	Acephate 75 SP	2
9.	<i>Beauveria bassiana</i> (2x10 <sup>8</sup> ml)	5
10.	Untreated control	-

### Results and Discussion

The results of toxicity studies on the efficacy of different insecticides/ entomopathogen against *P. solenopsis* Tinsley are presented in the Table 1. The insecticides profenophos and methyl parathion were found to be toxic and caused cent per cent mortality in one day after treatment while imidacloprid, fish oil rosin soap and dimethoate caused cent per cent mortality two days after treatment. All the insecticides were found to be effective on 10 days. *Beauveria* was found to be moderately effective and caused 77 per cent mortality 10 days after treatment.

Toxicity studies indicated that all the systemic insecticides and fish oil rosin soap were found to be toxic and caused cent per cent mortality in 24 - 48 hrs depending upon the insect species. In case of *P. solenopsis* and *C. insolita methyl* parathion and profenophos caused cent per cent mortality one day after treatment. The effectiveness may be due to the high penetrative reaction of the chemical while FORS and imidocloprid caused cent per cent mortality in two days after treatment which may be due to the asphyxiation and systemic reaction of the insecticides. Among different insecticides, profenophos 50 % EC (@ 1250 ml / ha) was reported to be highly effective against the *Phenacoccus* spp. Though the pest has been managed by the insecticides, it can possess a threat to cotton cultivation in the future as cotton plants continue to have very low population of mealybug. Four sprays of insecticides (acephate 75 % WSP @ 2000 g / ha; profenophos 50 % EC @ 1250 ml / ha; monocrotophos 36 % SL + DDVP 50 % EC (@ 625 ml + 375 ml / ha are recommended for the management of this pest with good results (Dhawan, 2007) [5]. Saeed *et al.* (2007) [7] reported that recommended application rates of methomyl, profenofos and chlorpyrifos provided the best control of *Phenacoccus gossypiphilous*: the lethal time studies proved their efficiency for better and timely control of this sporadic pest. It might be due to the

good penetrative reaction of the chemical. In case of soft scales, the mortality started three days after treatment and this might be due to thick waxy coating or hard covering around the body which prevented the penetrative reaction of the chemical. Suresh and Mohanasundaram (1996) [8] reported that all the systemic insecticides were effective and caused about cent percent mortality. Josephraj Kumar *et al.* (2002) [6] reported that the efficacy of biorationals against mussel scale, neem formulations 0.5 per cent and fish oil insecticidal soap (3%) when applied four times at fortnight intervals and sprayings of either dimethoate 0.05 per cent or monocrotophos 0.05 per cent at fortnightly intervals after the harvest of berries effectively controlled black pepper mussel scale. Muthukrishnan *et al.* (2005) reported that buprofezin at 1125 ml/ha in controlling the grape vine mealy bug effectively. *Beauveria* caused 70 per cent mortality of *P. solenopsis* and *C. insolita* in 10 days after treatment. The delayed reaction may be due to the poor penetration of the fungus. While Crane and Mossler (2006) [3] reported *Beauveria bassiana* caused 90 per cent mortality against *Paracoccus marginatus* during the summer month which might be due to the higher temperature and relative humidity which favour for the fungus growth and the difference in efficacy may be due to species variation.

**Table 1:** Toxicity of insecticides against *Phenacoccus solenopsis* Tinsley on *Hibiscus rosa sinensis*

S. No	Treatments	Dose (g or ml/lit)	PTC (Nos.)	Percentage mortality *				
				1 DAT	2 DAT	3 DAT	7 DAT	10 DAT
1	Thiomethoxam 20 WG	0.4	44.67	81.33 (64.44) <sup>b</sup>	97.87 (81.81) <sup>a</sup>	100.00 (89.10) <sup>a</sup>	Nil	Nil
2	Imidacloprid 70 WS	0.4	47.00	96.12 (78.64) <sup>a</sup>	100.00 (89.10) <sup>a</sup>	Nil	Nil	Nil
3	Triazophos 40 EC	2.5	44.33	65.15 (53.82) <sup>c</sup>	91.95 (72.59) <sup>b</sup>	97.51 (80.92) <sup>a</sup>	Nil	Nil
4	FORS	20	47.00	97.89 (81.65) <sup>a</sup>	100.00 (89.10) <sup>a</sup>	Nil	Nil	Nil
5	Dimethoate 30 EC	2	43.33	97.98 (81.83) <sup>a</sup>	100.00 (89.10) <sup>a</sup>	Nil	Nil	Nil
6	Profenophos 50 EC	2	42.33	100.00 (89.10) <sup>a</sup>	Nil	Nil	Nil	Nil
7	Methyl parathion 50 EC	2	47.00	100.00 (89.10) <sup>a</sup>	Nil	Nil	Nil	Nil
8	Acephate 75 SP	2	43.33	81.35 (64.42) <sup>b</sup>	99.36 (85.41) <sup>a</sup>	100.00 (89.10) <sup>a</sup>	Nil	Nil
9	<i>Beauveria bassiana</i> (2x10 <sup>8</sup> /ml)	5	48.67	8.85 (17.30) <sup>d</sup>	15.19 (22.93) <sup>c</sup>	24.14 (29.43) <sup>b</sup>	66.74 (54.78) <sup>a</sup>	76.54 (61.03) <sup>a</sup>
10	Untreated control		44.33	0.00 (0.19) <sup>d</sup>	0.00 (0.19) <sup>d</sup>	0.00 (0.19) <sup>c</sup>	0.00 (0.19) <sup>b</sup>	0.00 (0.19) <sup>b</sup>
CD Value (0.05)		-	-	3.2531	2.5207	1.7562	2.2991	1.8712

Pre-treatment count (PTC)

Days after treatment (DAT)

\* Figures in parantheses are arc sin transformed values. Mean followed by same letter (s) in a column are not significantly different by DMRT (P=0.05)

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