

## SHORT COMMUNICATION

# BIO-EFFICACY OF INSECTICIDES AGAINST *CERATOVACUNA LANIGERA* ZEHNTNER AND SELECTIVITY TO *DIPHA APHIDIVORA* MEYRICK IN SUGARCANE

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## Abstract

Selected insecticides were evaluated for effectiveness against the sugarcane woolly aphid, *Ceratovacuna lanigera* Zehntner (Homoptera: Aphididae) and safety to the predator *Dipha aphidivora* Meyrick (Lepidoptera: Pyralidae). Observations of aphid and predator mortality at three, seven and 15 days after spraying showed that thiamethoxam 25 WG @ 0.005% was highly effective against the aphid with the highest yield followed by acetamiprid 20 SP @ 0.004% which were relatively safe to *Dipha* larvae. Buprofezin 25 SC @ 0.025% recorded the highest population of *Dipha* and carbosulfan 25 EC @ 0.05% registered the lowest population three days after spraying.

**Key words:** Sugarcane, woolly aphid, insecticides, bio-efficacy, safety, *Dipha aphidivora*, cane yield

## Introduction

Among the wide diversity of crops cultivated in India, food crops occupy a major portion of the land area, while sugarcane (*Saccharum officinarum* L.) and fibre crops occupy relatively lesser acreage. In spite of low acreage, sugarcane commands greater significance due to its remarkable contribution to national economy. One of the major constraints in maintaining sustainable production is losses due to insect pests, as sugarcane is known to be attacked by as many as 212 insect pests and 76 non-insect pests in India right from germination

to harvest. These pests cause enormous losses both in productivity as well as recovery of sugar. Sugarcane woolly aphid (SWA), *Ceratovacuna lanigera* Zehntner (Homoptera: Aphididae) has been a serious pest of the crop since June 2002 in southern India. Both nymphs and adults desap the leaves ventrally resulting in yellowing and drying of leaves from tip downward along the margin in some instances. Heavy honeydew deposition on the upper surface of lower leaves results in prolific growth of sooty mould and blackening of green foliage. Due to continuous sap sucking, the crop becomes stunted leading to loss in cane and sugar yield parameters (Gupta and Goswami 1995; Lingappa et al. 2003; Patil et al. 2003; Chakravarthy and Thyagaraj 2005; Mukunthan et al. 2008). In the field, SWA is attacked by several coccinellid, syrphid and neuropteran predators, and hymenopteran parasitoids (Joshi and Virakthamath 2004).

*Dipha aphidivora* Meyrick (Lepidoptera: Pyralidae) is one of the most potential predators of sugarcane woolly aphid. A study was undertaken to evaluate the effectiveness of insecticides to sugarcane woolly aphid and their safety to *D. aphidivora*. The field-testing of insecticides was undertaken at Sugarcane Research Station, Melalathur, Tamil Nadu, during 2010-2011. The variety Co 86032 was planted under paired row system in a randomized block design comprising nine treatments in three replications with a plot size of 4x8 m. The treatments evaluated were thiamethoxam 25 WG @ 0.005%, imidacloprid 17.8 SL @ 0.00534%, acetamiprid 20 SP @ 0.004%, thiacloprid 240 SC @ 0.0096%, fipronil 5 SC @ 0.05%, buprofezin 25 SC @ 0.025%, carbosulfan 25 EC @ 0.05% and methyl demeton 25 EC @ 0.05% with an untreated check.

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The treatments were imposed at eight months age with a foot operated sprayer. In each plot, five plants with SWA infestation were selected and labeled. In each plant, five leaves were selected for recording aphid numbers. The total number of woolly aphids on 2.5x2.5 cm<sup>2</sup> (1in<sup>2</sup>) area of top, middle and bottom portions of leaves was counted and recorded before and after imposing treatments to compute mean aphid mortality percentage. Likewise, total number of *Dipha* larvae on the sampled leaves were recorded and expressed as numbers per leaf. The observations on mortality of sugarcane woolly aphid and *Dipha* were recorded at three, seven and 15 days after spraying (DAS). At the time of harvest, cane yield and commercial cane sugar (%) were recorded along with cane population and sugar yield was worked out. The data obtained were analyzed statistically following the methods of Panse and Sukhatme (1985).

The pre-treatment mean aphid numbers from 25 leaves per plot showed no significant differences among the treatments. Aphid numbers were in the range of 46.2 to 49.92 per square inch area in various treatments. At three DAS, thiamethoxam 25 WG @ 0.005% recorded the highest mortality of SWA followed by acetamiprid 20 SP @ 0.004% (Table 1). At seven DAS too, thiamethoxam 25 WG recorded the highest mortality followed by acetamiprid 20 SP and imidacloprid 17.8 SL @ 0.00534%. The effectiveness of the insecticides was maintained up to 15 DAS. Later, the recurrence of SWA was less than 5% intensity in treatments. Among the remaining insecticides, the lowest mortality of the aphid was observed in fipronil 5 SC @ 0.05% while the remaining insecticides occupied intermediate values. Regarding the predator, the pre-treatment count varied from 0.72 to 0.96 per leaf. Buprofezin 25 SC @ 0.025%

**Table 1.** Effect of insecticides on woolly aphid, *Dipha aphidivora* and yield of sugarcane

Treatments	% aphid mortality			No. of <i>Dipha</i> / leaf <sup>2</sup>	Yield parameters		
	3 DAS <sup>1</sup>	7 DAS	15 DAS		3 DAS	CCS%	Cane yield (t/ha)
Thiamethoxam 25 WG @ 0.005%	95.19(78.79) <sup>3</sup>	99.20(85.87)	94.79(78.23)	0.80(0.87) <sup>4</sup>	13.03	104.17	13.57
Imidacloprid 17.8 SL @ 0.00534%	93.64(76.10)	98.32(82.70)	92.89(75.20)	0.68(0.80)	13.03	101.85	13.27
Acetamiprid 20 SP @ 0.004%	94.69(77.75)	98.69(83.66)	93.87(76.58)	0.68(0.80)	13.05	102.43	13.37
Thiacloprid 240 SC @ 0.0096%	88.93(70.82)	94.71(76.73)	88.26(70.23)	0.60(0.74)	13.00	101.44	13.19
Fipronil 5 SC @ 0.05%	84.25(66.76)	89.08(70.71)	84.33(66.84)	0.76(0.85)	12.98	93.75	12.17
Buprofezin 25 SC @ 0.025%	86.72(68.82)	90.86(72.41)	85.79(68.05)	0.80(0.87)	12.95	92.19	11.94
Carbosulfan 25 EC @ 0.05%	91.21(73.14)	95.60(77.92)	90.26(72.19)	0.52(0.68)	12.92	95.67	12.36
Methyl demeton 25 EC @ 0.05%	91.43(73.38)	96.02(78.53)	90.74(72.69)	0.60(0.71)	13.01	96.06	12.50
Untreated check	0.00	0.00	0.00	0.80(0.87)	11.70	78.85	9.23
SEM	0.80	0.58	0.74	0.02	0.00	0.17	0.05
CD (P=0.05)	2.42	1.77	2.26	0.05	NS <sup>5</sup>	0.52	0.14

<sup>1</sup> Days after spraying; <sup>2</sup> Predator disappeared after 3 DAS; Figures in parentheses are <sup>3</sup>arcsin and <sup>3</sup>(x+0.5)<sup>0.5</sup> transformed values; <sup>5</sup> not significant

recorded the highest population of *Dipha* at three DAS and carbosulfan 25 EC @ 0.05% registered the lowest population. At seven DAS, the population of predator larvae vanished due to the non-availability of host in the insecticide treated plots. However, in the untreated check, the predator population showed an increasing trend from three DAS to 15 DAS (0.80 to 1.00 larvae / leaf). Cane yield was the highest in thiamethoxam applied plots followed by acetamiprid and imidacloprid which was on par with thiacloprid. CCS% did not show significant differences among the treatments whereas sugar yield was higher in all the treatments than in the control due to higher cane yield in treatments.

The efficacy and toxicity of the insecticides evaluated against the pest and the predator showed that thiamethoxam 0.005%, imidacloprid 0.00534%, acetamiprid 0.004%, methyl demeton @ 0.05% and thiacloprid 240 SC @ 0.0096% were more effective against sugarcane woolly aphid and relatively safer to *D. aphidivora* than the remaining insecticides. In earlier studies of Vijayaraghavan and Regupathy (2005), Galende et al. (2005), Jadhav et al. (2006) and Kadu et al. (2009) too thiamethoxam 0.005% was more effective against the aphid followed by imidacloprid 0.003% and acetamiprid 0.004%. Kulkarni (2003) observed that methyl demeton was more suitable in view of least toxicity to the predator, low cost and effectiveness against the aphid. In another study (Ravi et al. 2007), dimethoate 0.051%, imidacloprid 0.0059%, phosphamidon 0.02%, methyl demeton 0.032%, thiamethoxam 0.0067% and acephate 0.075% were effective against the aphid and moderately toxic to *D. aphidivora*. Thus, the insecticides, viz. thiamethoxam, imidacloprid, acetamiprid, methyl demeton and thiacloprid could be selectively used in the management of sugarcane woolly aphid with minimal interference with the predator population.

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