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Management of Citrus psylla (*Diaphorina Citri* Kuwayama) Using Bio-Rational Insecticides.

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ABSTRACT

Asian citrus psylla (ACP), *Diaphorina citri* Kuwayama is a Homopteran insect pest, feeds on the phloem of citrus spp. and other related Rutaceous plants. Huanglongbing (HLB), better known as citrus greening, the deadly disease is being transmitted by this psyllid. The insecticidal evaluation is being carried out on three years aged sweet orange (Sathgudi) plants at Citrus research Station, Tirupati during 2011 and 2012, with seven treatments replicated three times. The treatments were imposed during peak pest infestation period (December – March). All the treatments recorded low ACP population than control irrespective of the year and days after treatment. However during both the years novaluron 10EC (0.005%) recorded highest (80%) pest control at 7DAS. This was on par with azadirachtin (1%) and dimethoate 30EC (0.06%, standard check). At 14DAS also the same chemicals have shown superior performance with >70% pest control. The effectiveness of the insecticides were in the order of novaluron > azadirachtin > dimethoate > Verticillium lecanii > neem oil > abamectin.

INTRODUCTION

Asian citrus psylla, *Diaphorina citri* Kuwayama (ACP) is one of the most serious pests of citrus. Besides causing direct damage, it is an efficient vector of the bacterium, *Liberobacter asiaticum* which causes deadly greening disease. Apart from citrus, psylla also attacks curry leaf plant (*Murraya koenigii* Unn.), orange jasmine, *M paniculata* (L.) and jackfruit, *Artocarpus heterophyllus* Lamarck. The pest completes 9-10 or even up to 16 overlapping generations in a year. Bhagat and Nehru [1] reported that 12 complete and 13 partial generations of psylla on *Citrus sinensis* in a year from Jammu region.

Adults overwinter on both mature and young citrus new flush, whereas nymphs develop only on new flush. Nymphs and adults damages citrus by depleting sap from the just emerged shoots and buds resulting in curling of the leaves and drying of shoots [7]. It also causes damage by excreting honeydew, which allows the growth of sooty mold [3]. It's fifth instar nymphs act as the vector of the greening bacterium which accelerates the decline. Management of this psylla is utmost important in vegetatively propagated plant species especially sweet orange. Many insecticides were tried against this pest and found effective also. Two to three sprays of monocrotophos/dimethoate/thiodemeton at 10-15 days interval or soil application with aldicarb/dimethoate @ 16ml a.i. per tree or trunk treatment with monocrotophos (azodrin) were found to be effective against citrus psylla [5]. Foliar insecticides thimethoxam, fenprothrin and systemic insecticide imidacloprid provided effective control of ACP [2]. However, this paper reviews eco-friendly insecticides to develop effective control strategies for the management of ACP on young citrus trees.

MATERIAL AND METHODS

The experiment was conducted in a randomised block design in sweet orange orchard at Citrus research Station, Tirupati during 2011 and 2012. The treatments were imposed on three years aged sweet orange cv. Sathgudi plants in an area of 0.5 acres with 6m x 6m spacing between the rows and within the rows. There were eight treatments, replicated thrice @ three plants per replication. The insecticides used were abamectin 1.9EC (0.0007%), novaluron 10EC (0.005%), petroleum spray oil (5.9ml/L), neem oil (3%), azadirachtin 1% (0.04%), *Verticillium lecanii* 2x10⁸ cfu (4g/L), dimethoate 30EC (as standard) (0.06%) and water spray treatment (control) was kept for comparison.

During the experimental period no disease and pest management measures were taken up in the experimental field. The insecticides were applied using the hand compression Knapsack sprayer. Two sprays were given at 15 days interval during peak infestation period (December and March) in both the years. Three litres of spray fluid was used per tree. The data on number of psyllid nymphs per 5cm. twig with new flush were collected randomly in four directions (North, south, east and west) of the plant, on 3rd, 7th and 14 days after spraying (DAS). Later data were converted into percent pest reduction over control using the conversion formula and then analyzed using ANOVA procedure.

RESULTS AND DISCUSSION

Table 1: Showing the effect of bio-rational insecticides against citrus psylla (*Diaphorina citri*) in sweet orange

Treatments	Per cent reduction of the pest over control								
	3 DAS*			7 DAS			14 DAS		
	2011	2012	Pooled mean	2011	2012	Pooled mean	2011	2012	Pooled mean
T ₁ . Abamectin 1.9EC (0.0007%)	81.67 (39.98)	80.7 (63.93)	80.85 (64.04)	94.57 (46.11)	93.2 (74.88)	93.86 (75.66)	42.27 (24.33)	55.8 (48.33)	49.13 (44.50)
T ₂ . Novaluron 10EC (0.005%)	86 (40.94)	80.1 (63.50)	88.167 (69.87)	82.70 (39.61)	93.1 (74.77)	87.93 (69.67)	80.67 (38.55)	83.6 (66.11)	82.15 (65.00)
T ₃ . Petroleum spray oil (5.9ml/L)	57.50 (29.61)	51.2 (45.68)	54.517 (47.59)	78.50 (37.460)	57.6 (49.37)	68.05 (55.58)	52 (27.70)	64.3 (53.30)	58.26 (49.75)
T ₄ . Neem oil (3%)	75.33 (36.17)	80.4 (63.72)	78.017 (62.03)	54.47 (28.560)	88.9 (70.53)	71.86 (57.96)	40.17 (23.58)	75.8 (60.53)	58.15 (49.69)
T ₅ . Azadirachtin 1% (0.04%)	94.33 (46.10)	95.2 (77.34)	94.63 (76.60)	97.93 (50.16)	95.8 (78.17)	95.16 (77.30)	62.67 (31.47)	76.1 (60.73)	71.41 (57.68)
T ₆ . <i>Verticillium lecanii</i> 2x10 ⁸ cfu (4g/L)	62.33 (31.36)	83.10 (65.72)	73.73 (59.16)	94.03 (46.03)	90.1 (71.66)	90.48 (72.03)	70.53 (34.53)	81.2 (64.30)	68.13 (55.63)
T ₇ . Dimethoate 30EC (as standard) (0.06%)	98.33 (51.42)	97 (80.02)	96.80 (79.69)	96.77 (47.85)	93.7 (75.46)	94.71 (76.71)	75.17 (36.16)	80.3 (63.65)	77.75 (61.85)
T ₈ . Control (water spray)	0	2.3 (6.93)	1.13 (6.11)	4.21 (11.84)	0	2.06 (8.26)	0	0	0
CV	5.00%	2.7%	7.0%	4.31%	4.3%	11.7%	3.68%	5.1%	12.7%
CD@ 5%	10.526	3.438	5.796	9.803	5.753	10.356	6.868	5.694	8.684

* Days after sowing Figures in the parenthesis are arc sin transformed values

The pooled analysis of the two years indicated that all the treatments are superior over control in ACP reduction. However, at 3DAS >90% pest reduction was recorded in the treatments T₅ (azadirachtin) and T₇ (dimethoate) and >80% pest control was achieved in T₁ (abamectin) and T₂ (novaluron) (Table 1). At 7 DAS >90% pest reduction was recorded in the treatments T₁ (abamectin), T₅ (azadirachtin), T₆ (*Verticillium lecanii*) and T₇ (dimethoate) and >80% pest control was achieved in T₁ (abamectin) and T₂ (novaluron). However, the treatments novaluron 10EC (0.005%) recorded highest (82.1%) pest control at 14DAS. This was on par with azadirachtin (1%) and dimethoate 30EC (0.06%, standard check). The effectiveness of the insecticides were in the ordered of novaluron > azadirachtin > dimethoate > *Verticillium lecanii* > neem oil > Petroleum spray oil > abamectin. The study indicates that Novaluron 10EC (0.005%), azadirachtin 1% (0.04%) are the two best insecticides for the management of psylla in sweet orange.

Similar results were reported by V.U. Sonalkar et al. [6] who reported that the same chemicals were effective against psylla. However Rao et al. [4] reported that foliar spray with neonicotinoids like thiamethoxam and imidacloprid recorded significantly low population till 14 days after treatment.

The study confirms that out of the tested insecticides novaluron10EC (0.005%) and azadirachtin 1% (0.04%) stood as the best insecticides for reducing the psyllid infestation in sweet orange. Novaluron being an insect growth regulator and azadirachtin, a botanical insecticide are both effective for the successful management of psyllids in citrus ecosystem and eco-friendly, safe to the non- target beneficial insects.

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