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Short Communication

Bio-efficacy of synthetic chemicals, botanicals and microbial derivatives against scale insect *Coccus hesperidum* Linn. in arecanut

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Ignorance of plant protection in areca palms at early stages can cause considerable loss from the sucking pests, particularly, *Coccus hesperidum* Linn. (Hemiptera: Coccidae) during unfavorable weather conditions. In order to overcome this, replicated field trials at five different locations were conducted during 2008/2009 and 2009/2010. Synthetic chemicals (chlorpyriphos 20 EC at 2.5 ml/l, endosulfan 35 EC at 2 ml/l, bupfrofezin 25 SC at 1 ml/l and methomyl 40 SP at 2 g/l), Aazadirachtin 0.03% at 3 ml/ (botanical group) and spinosad 45 SC at 0.5 ml/l (microbial derivative) including an untreated check were imposed twice at an interval of 15 days. Treatmental effects were assessed five days after each spray from 2 cm^2 leaf area. Pooled results indicated that all the insecticide treatments were found to be significantly superior over untreated check control by recording the lowest population of scales. Spinosad and bupfrofezin were found to be significantly superior and were on par with methomyl by registering lowest number of scales. Methomyl was on par with ruling insecticide endosulfan and was significantly different from standard check chlorpyriphos with lesser population of scales. Azadirachtin recorded higher scale population than other insecticide treatments. Microbial derivative spinosad and bupfrofezin were found to be effective against arecanut scales than other treatments and can be used in managing arecanut scales.

Key words: Bio-efficacy, synthetic chemicals, botanicals, microbial derivative, *Coccus hesperidum,* arecanut.

INTRODUCTION

Arecanut is largely cultivated in the plains and foothills of Western Ghats and north eastern regions of India. Area and production in different states indicate that Karnataka, Kerala and Assam account for over 90%. The arecanut palm, *Areca catechu* L. (Aracaceae) has been an important commercial crop and is the source of arecanut commonly referred to as betelnut or supari in India. Since time memorial, it is being used in masticatory (chewing), religious and social ceremonies (Murthy, 1968). Due to lack of scientific knowledge and ignorance by the cultivators on agronomic aspects, pest and diseases, considerable crop losses were encountered in fields. An array of insect and non insect-pests infests all parts of the palm, such as stem, leaves, inflorescence, roots and nuts in one or other stage of the crop growth. As many as 102 insect and non-insect pests have been reported to be associated with arecanut palm (Nair and Daniel, 1982).

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Table 1. Effect of different insecticides on control of arecanut scales *Coccus hesperidum* Linn.(Coccidae: Hemimptera).

Treatment	Number of scales per 2 cm^2 leaf area in a plant								
	PTC			5 DAT					
				First spray			Second spray		
	2008	2009	pooled	2008	2009	pooled	2008	2009	pooled
Chlorpyriphos 20 EC 2.5 ml/l	15.21 (4.92)*	16.20(4.55)	15.90(4.05)	4.13 (2.53)	4.20 (2.48)	4.13 (2.16)	4.1 (20.9)	4.2 (2.12)	4.12(2.16)
Spinosad 45SC 0.5ml/l	15.11 (4.80)	16.20(4.59)	15.60(4.00)	1.53 (1.40)	1.2 (1.40)	1.31 (1.34)	1.6 (1.24)	1.6 (1.41)	1.6 (1.44)
Endosulfan 35 EC 2ml/l	15.43 (4.55)	16.12(4.32)	15.71(4.05)	4.4 (2.39)	4.2 (2.36)	4.3 (2.18)	4.2 (2.04)	1.8 (1.73)	3.0 (1.73)
Azadiarachtin 0.03% 4 ml/l	14.9 (4.33)	16.21(4.52)	15.21(4.03)	4.30 (2.50)	4.30 (2.52)	4.3 (2.19)	4.3 (2.37)	4.2 (2.17)	4.28(2.17)
Buprofezin 25SC 1ml/l	14.8 (4.27)	16.21(4.41)	15.50(4.03)	2.0 (1.58)	1.80 (1.92)	1.9 (1.54)	1.52 (1.46)	1.8 (1.84)	1.53(1.48)
Methomyl 40 SP 2g/l	16.1 (4.25)	16.31(4.38)	16.3 (4.09)	4.16 (2.34)	4.20 (2.39)	4.15 (2.16)	4.10 (2.10)	1.8 (1.85)	2.86(1.72)
Control Untreated check	16.2 (4.65)	16.40(4.49)	16.30(4.10)	16.20 (4.20)	10.40 (3.48)	13.10 (3.56)	16.21(4.71)	16.21(4.71)	16.21(4.14)
CV %	6.30	5.17	0.88	15.70	17.26	7.68	5.66	17.18	8.16
CD @ 5%	0.43	0.41	0.06	1.11	1.14	0.29	0.24	0.69	0.33

PTC= Pretreatment count, DAT= days after treatment * Figures in parenthesis are $\sqrt{x+0.5}$ transformed values.

Many species of scale insects infests the areca leaves. Among them, *Coccus hesperidum* Linn (coccidae: Hemiptera), a scale insect, is severe on undersurface of the leaves. Colonized feeding on under surface of the leaves by both nymphs and adults results in the production of yellow patches on the leaves, which under severe infestation, cover the entire leaf (Rao and Bavappa, 1961).

The honeydew secreted by this insect invites the sooty mould, which interfered with the photosynthesis of the palm. Heavy colonization in young seedlings results in severe blotching and drying of leaves (Daniel, 2003). Suggested neem formulations against foliage feeding *C. hesperidum,* such as nimbicidine and mulineem (Daniel, 2003) are in vogue and needs efficient molecules for the management of scales in arecanut plantation.

MATERIALS AND METHODS

A multi location field trial in three districts (five locations) was conducted for two consecutive seasons during 2008/2009 to 2009/2010 in randomized block design with seven treatments and three replications. The treatments which were replicated thrice are as follows: 1) chlorpyriphos 20 EC 2.5 ml/l, 2) spinosad 45SC 0.5 ml/l (microbial group), 3) endosulfan 35 EC 2 ml/l, 4) azadirachtin 0.03% 3 ml/l (botanical group), 5) buprofezin 25 SC 1ml/l, 6) methomyl 40 SP 2g/l and untreated check 7) control. Two insecticidal sprays were given at an interval of 15 days. The spray fluid was applied to the lower surface of leaves at the rate of 500 l/ha with a knapsack sprayer.

Ten plants were randomly selected in each plot by tying with luggage labels. A day before spraying, that is, pretreatment count (PTC) and five 5 days after spraying treatment, observations on number of scales per 2 cm^2 leaf area on top, bottom and middle leaves of selected plants were recorded. The efficacy was computed as reduction in number of scales compared to untreated check control. The data on the (average of top, bottom and middle leaf of each plant) mean of three replications were considered for statistical analysis. Data were square root transformed and analyzed statistically.

RESULTS AND DISCUSSION

The results with respect to Table 1 were significant, indicating differential efficacy of the treatments imposed. Pooled data of two years in all the locations showed significant treatmental differences for scales population in areca leaves. Number of scales/2 cm^2 leaf/plant, and least number of scales (1.48 and 1.44 scales/ 2 cm^2 leaf area/plant) were observed in the second spray on the areca palm treated with bupfrofezin and spinosad respectively and are were found to be significantly superior over rest of the treatments. The level of scales population in standard

check methomyl (1.72 scales/ 2 cm^2 leaf area/plant) was on par with spinosad, bupfrofezin and endosulfan. However, the plant based azadirachtin displayed moderate level of control (2.17 scales/2 cm^2 leaf area/plant) and was significantly different from the unsprayed control which recorded the highest population of 4.14scales/ 2 cm^2 leaf area/plant.

The reduction in scales population was due to the efficacy of newer molecules, such as bupfrofezin and spinosad. Literature on these molecules (bupfrofezin and spinosad) against scales was meager. However, minimum population of scales observed in azadirachtin treated plots was in confirmation with the results reported earlier by Daniel (2003) and Nair and Menon (1963).

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