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Bio-efficacy of chemicals on management of mealybugs in marigold (*Tagetes* spp. L)

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Abstract

A field trial was undertaken at the experimental field of Department of Floriculture and Landscaping, College of Agriculture, OUAT to evaluate the efficacy of different chemicals against mealybugs. The crop was raised during rabi, 2015-16 and the experiment was designed in a RBD with nine treatments replicated thrice with normal agronomic practices recommended for the crop. On appearance of the pest different treatments were imposed with a hand compression sprayer using 500 litres of spray solutions per hectare. Observations on the number of mealybugs/plant were recorded one day before (DBS) and at 5, 10 and 15 days after the chemical spray (DAS). The mealybug incidence recorded the lowest with Thiamethoxam 0.5g/l registering 100.00% reduction over control even after 15 DAS. The combination product Propargite 50%+ Bifenthrin 5%, tolfenpyrad and bifenthrin were the next best effective treatments in reducing the number of mealybugs/ plant (6.33- 8.67). Whereas propargite, dicofol, sulphur and spiromesifen were not effective with 2.25- 12.48 per cent reduction in mealybug population over control at 15 DAS. In the present evaluation Thiamethoxam gave superior control of mealybugs over with the insecticidal effect of Propargite 50%+ Bifenthrin 5%, tolfenpyrad and bifenthrin in controlling mealybugs which is well documented. Therefore, Thiamethoxam 25WG @ 0.5g/l may be recommended for the best control of mealybugs.

Keywords: Chemicals, days after spraying, efficacy, marigold, randomised block design

Introduction

Marigold (*Tagetes* sp.) is a native of Mexico and South America and belongs to family Asteraceae (Bhattacharjee and De, 2010)^[1]. It was introduced into India during 16th century by the Portuguese. The total area and production of Marigold in India is 55.89 thousand ha and 511.31 thousand MT respectively. Karnataka occupies the highest area under marigold production of around 9.10 thousand hectare whereas Madhya Pradesh occupies highest production of 85.07 thousand MT. On an around Odisha occupies 2.68 thousand ha area under marigold with a production of 24.58 thousand MT. The genus *Tagetes* has 33 species (Shyamal, 2014)^[2] out of which the African Marigold (*Tagetes erecta*) is commercially grown in India for the purpose of making garlands, religious offerings, decoration purposes, bedding purposes. Marigold has anti-bacterial, anti-inflammatory, antioxidant, as well as a mild antiseptic (Gopi *et al.*, 2012)^[3]. Petals steeped in hot water to make a tea is commonly used to treat menstrual cramps, indigestion, ulcers. Due to increase in the atmospheric temperature & dry period during 2015 severe attack of mealybugs were reported in marigold crop at Bhubaneswar. In the present study an attempt has been made to evaluate various newer chemicals for testing their efficacy against the mealybugs infesting marigold.

Materials and Methods

A field trial was undertaken at the experimental field of Department of Floriculture and Landscaping, College of Agriculture, Odisha University of Agriculture and Technology to evaluate the efficacy of different chemicals against the pest. The experiment site comes under the eighteenth agro-climatic region of the country i.e. Eastern Coastal Plain and is termed as Sub-humid characterised by moist climate with mild winter. The experiment was designed in a RBD with nine treatments replicated thrice. The crop was raised with normal agronomic practices recommended for the crop during rabi, 2015-16 except chemical insecticide Application. On appearance of the pest different treatments were imposed with a hand compression sprayer using 500 litres of spray solutions per hectare. Observations on the number of mealybugs/plant were recorded one day before (DBS) and at 5, 10 and 15 days after the chemical spray (DAS). The data was subjected to transformation following Gomez and Gomez (1984)^[4] to arrive at a meaningful conclusion.

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Table 1: Bio-efficacy of different chemicals against mealybugs infesting marigold

Treatment No.	Treatments	Dose (ml/lit or g/l)	No. of mealybugs/ plant (Rabi, 2015-16)				Percent reduction over control
			1DBS	5DAS	10DAS	15DAS	
T ₁	Sulphur 80 WP	5g/l of water	15.67 (4.02)	15.67 (4.02)	25.67 (5.11)	25.67 (5.11)	12.48
T ₂	Dicofol 18 EC	5ml/l	14.67 (3.89)	14.67 (3.89)	26.33 (5.18)	26.33 (5.18)	10.23
T ₃	Propargite 57 EC	2ml/l	15.33 (3.98)	15.33 (3.98)	24.67 (5.02)	28.33 (5.37)	3.41
T ₄	Propargite 50% + Bifenthrin 5% SE	2.5ml/l	15.00 (3.94)	3.33 (1.96)	3.33 (1.96)	8.67 (3.03)	70.43
T ₅	Tolfenpyrad 15 EC	2ml/l	16.33 (4.10)	1.33 (1.35)	3.33 (1.96)	6.33 (2.61)	78.42
T ₆	Spiromesifen 240 SC	1ml/l	14.33m(3.85)	14.33 (3.85)	25.67 (5.11)	28.67 (5.40)	2.25
T ₇	Bifenthrin 10 EC	1ml/l	14.00 (3.81)	1.67 (1.47)	3.67 (2.04)	6.67 (2.68)	77.26
T ₈	Thiamethoxam 25 WG	0.5g/l	15.67 (4.02)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	100.00
T ₉	Untreated control	Only water spray	16.33 (4.10)	16.33 (4.10)	21.67 (4.71)	29.33(5.46)	-
SE (m) = ±			(0.45)	(0.42)	(0.23)	(0.21)	-
CD (P=0.05)				NS	(1.26)	(0.68)	(0.63)
CV (%)			-	(11.38)	(9.67)	(10.80)	

Figures in the parentheses are (x+0.5) square root transformed values. DBS – Days before spraying, DAS = Days after spraying.

Results and Discussion

The results revealed that at 5 DAS, the population of mealybugs/ plant (14.33- 15.67) in the treatments T₁ (Sulphur), T₂ (Dicofol), T₃ (Propargite) and T₆ (Spiromesifen) was on par with the untreated control (16.33). The treatments T₈ (Thiamethoxam), T₇ (Bifenthrin), T₅ (Tolfenpyrad) and the combination chemical Propargite 50%+ Bifenthrin 5% (T₄) showed their superiority over other chemicals evaluated and reduced the mealybug population per plant (0.33-3.33). At 10th DAS similar results as 5th DAS was observed with respect to efficacy of Sulphur (T₁), Dicofol (T₂), Propargite (T₃) and Spiromesifen (T₆) in reducing mealybug population (24.67- 26.33) in comparison to untreated control (21.67), all of which were statistically at par. Among rest of the treatments, thiamethoxam (T₈) recorded its superiority, being the best in reducing mealy bug population per plant (0.00). Next to follow were the treatments Bifenthrin (T₇), Tolfenpyrad (T₅) and Propargite 50% + Bifenthrin 5%(T₄) which were at par (3.33- 3.67 mealy bugs per plant). Even after 15 days after chemical application, Thiamethoxam 25 WG (T₈) @ 0.5g/ l expressed its superiority in giving 100% mortality of the mealybugs in comparison to all other chemical treatments and control (29.33 mealy bugs/ plant). The next best treatment Tolfenpyrad 15 EC (T₅) @ 2 ml/ l, Bifenthrin 10 EC (T₇) @ 1 ml/ l and Propargite 50% + Bifenthrin 5% SE (T₄) @ 2.5 ml/l registering 6.33 – 8.67 number of mealybugs/ plant. In these treatments, 70.43 – 78.42% reduction in the number of mealybugs /plant over control at 15 DAS was observed. Other chemical treatments did not control mealybugs and had population ranging from 25.67 – 28.67 mealybugs/ plant. which was at par with untreated control (29.33). The per cent reduction in mealy bug number per plant in these treatments ranged from 2.25 – 12.48 over control at 15 days. Frank (2010)^[3] suggested the use of abamectin, acephate, acetamiprid, buprofezin, Dinotefuran, flonicamid, horticultural oil, imidacloprid, insecticidal soap, pymetrozine, pyriproxyfen and thiamethoxam for the control of mealybugs in ornamentals and turf. The evaluation of various chemicals for controlling mealybugs infesting marigold revealed that Thiamethoxam 25 WG @ 0.5 g/ l gave excellent control of the pest compared to all other chemicals. It gave 100% control of the pest even after 15 days of chemical spray. Browsing of literature on the effectiveness of Thiamethoxam in controlling mealybugs revealed no results in marigold. However, in papaya maximum mortality of 3rd instar nymphs of papaya mealybug was recorded with Thiamethoxam (Patel *et al.* 2014) ^[7]. The chemical control of the mealybug, with aminocarb and methomyl was most effective on citrus (Furness 1977) ^[2]. Nagagouda *et al.* (2015) ^[6] tested the

bioefficacy of buprofezin 70% DF against sucking pests of *Bt* cotton.

Conclusion

Mealybug incidence recorded lowest with Thiamethoxam registering 100% reduction. It concluded that Thiamethoxam gave superior control of mealybugs over with the insecticidal effect of Propargite 50%+ Bifenthrin 5%, tolpenpyrad and bifenthrin in controlling mealybugs which is well documented. Thus Thiamethoxam 25WG @ 0.5g/ l may be recommended for the best control of mealybugs.

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