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Ch Raja Goud
Department of Entomology, College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

K Manasa
Department of Entomology, College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

Corresponding Author:
Ch Raja Goud
Department of Entomology, College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

Bio-efficacy of selected acaricides against red spider mite, *Tetranychus urticae* Koch in Brinjal

Ch Raja Goud and K Manasa

Abstract
To evaluate the effectiveness of different doses of miticides against brinjal mite, an experiment was conducted in the field of college of horticulture, Rajendranagar, Hyderabad during the season of kharif-rabi, 2019-20. Different doses selected acaricides evaluated against brinjal mite. The spiromesifen 22.9 SC @ 192 g a.i./ha found effective against mite with lowest number of mites /leaf (1.38) and at par with propargite 57 EC @ 1.5 ml/lit with 1.5 number of mites per leaf (4 cm^2). The next best treatment was abamectin 1.9 EC @ 1 ml/lit which was recorded 1.64 number of mites per leaf (4 cm^2) and it is also on par with dicofol 18.5 EC @ 1.5 ml/llit of water 1.65 number of mites per leaf (4 cm^2). All the acaricidal treatments under present study had significant impact on population of spiders.

Keywords: Spiromesifen, acaricides, *Tetranychus urticae*, brinjal, mite

Introduction
Brinjal (*Solanum melongena* Linnaeus) is considered as a "King of vegetables" originated from India, where a wide range of wild types and land races occur (Thompson and Kelly, 1957) [10]. India is the second largest producer of vegetables in the world next to China. The total area under brinjal in India is about 7.29 lakh hectares which produces 126.16 lakh tonnes brinjal fruits (Anonymous, 2018a) [1]. In Gujarat, the total area under brinjal is 0.74 lakh hectares with annual production of 14.86 lakh tonnes (Anonymous, 2018b) [2]. Brinjal crop suffers severely due to the attack of various insect pests which reduces its yield and quality of fruits. Nayar *et al*., (1995) [7] recorded 53 insects attacking on brinjal. Of which shoot and fruit borer, *Leucinodes orbonalis* Guenee; jassid, *Amrasca biguttula biguttula* (Ishida); whitefly, *Bemisia tabaci* Gennadius; aphid, *Aphis gossypii* Glover and non-insect pests like mites especially two spotted spider mite, *Tetranychus urticae* Koch are the main bottle necks in brinjal productivity. Among non-insect pests, mites are considerable notorious pests and gaining tremendous importance in recent years owing to their devastating nature and damage potential.
Basu and Pramanik (1968) [3] ranked red spider mite as a major threat of brinjal crop next to shoot and fruit borer. Altogether, 23 species of mite pests have been reported infesting the crop from different parts of the world (Dhooria and Bindra, 1977) [4]. These mites inflict heavy damage to brinjal plant by sucking sap from under surface of leaves resulting in white speckles which coalesce and produced large patches. As the population increases, mites web profusely covering the entire foliage on all sides resulting in poor growth of the crop. In some cases, total failure of the crop has been reported. In case of severe infestation, adults form clusters at the tip of heavily infested plants, form ballooning threads and wait for wind to blow off the plant for dispersal.

Materials and Methods
Field experiment was conducted during kharif-rabi seasons of 2019-20 to assess the bio-efficacy of selected acaricides in a Randomized Block Design (RBD) at College of Horticulture, Rajendranagar, Hyderabad. For the purpose, brinjal variety Doli-5 was transplanted in 2nd week of August at a spacing of 90 x 60 cm having plot size 4.5 x 4.8 m. All the standard agronomical package of practices recommended for the state except plant protection was followed for raising the crop. There were total five treatments replicated four times. The first spray application was made at the initiation of pest and second was applied at 10 days interval. The spray volume was used @ 500 L/ha and it was adjusted according to the crop stage.

The foliar spray application was done by using knapsack sprayer with hollow cone nozzle. Plot wise yield of brinjal fruits was recorded during each picking and finally converted into tonnes per ha.

For recording observations of mite, five plants were randomly selected and tagged in each net plot. The population of mite was recorded on 4.0 cm^2 leaf area of three leaves selected randomly from top, middle and bottom canopy of the selected plants prior and after 3, 7 and 10 days of each spray. The data were statistically analyzed using square root transformation. Population of spiders was recorded before and after 7 and 10 days of each spray from five randomly selected plants. Fruit yield at each picking from each net plot area and finally converted into tonnes per ha.

Results and Discussion

Data on mite population recorded prior and 3, 7 and 10 days after both the sprays in different treatments during kharif-rabi, 2019-20 are given in Table 1. The data indicated that the mite population was uniformly distributed in all the experimental plots as it evident from the observations recorded before imposing of acaricidal spray. The mite population recorded at 3 days after first spray (DAS) indicated that both the doses of tested product as well as marketed product of spiromesifen 22.9% SC @ 192 g a.i./ha remained at par with propargite 57 EC @ 1.5 ml/lit with 1.5 number of mites per leaf (4 cm^2). The next best treatment was abamectin 1.9 EC @ 1 ml/lit which was recorded 1.64 number of mites per leaf (4 cm^2) and it is also on par with dicofol 18.5 EC @ 1.5 ml/llit of water 1.65 number of mites per leaf (4 cm^2). However, in untreated control the lowest population of mites i.e. 3.07 number of mites per leaf (4 cm^2). The present study is in conformity with the finding of Sekh *et al.,* (2007) [9], spiromesifen 240 SC (Oberon) @ 0.7 ml /l registered an excellent control of two spotted spider mite on brinjal, coupled with significant increase in fruit yield. Fanigliulo *et al.,* (2010) [5] observed that spiromesifen @ 45 and 60 g/hl both were very effective in control of mite on *Capsicum annuum* L. as well as there were no phenomena of phytotoxicity nor on leaves nor on flowers and fruits in none of the treatments and highlighted the lack of harmful effects on predators and on parasitoids of insects and mites. Kavya *et al.,* (2015) [6] who reported that spiromesifen reduced the overall mite population more significantly along with significant increase in yield and it was very safe to important natural enemies in brinjal crop. Pathipati *et al.,* (2017) recorded less population of mite in the treatment of spiromesifen 22.9 SL. As per the report of Varghese and Mathew (2013) [11], spiromesifen 100 g a.i./ha found effective in reducing chilli mite population. It was found the safest insecticide against natural enemies *viz*., predatory mites, coccinellid beetles and spiders. In conclusion, the tested product spiromesifen 22.9 SC @ 192 g a.i./ha found most effective against mite, *Tetranychus urticae* Koch in brinjal.

Table 1: Bioefficacy of selected acaricides against red spider mite in brinjal

Treatments	Before spray	Number of mites/ leaf (4 cm^2)								
		1st spray (DAS)			Pooled	2nd spray (DAS)			Pooled	Pooled over periods and sprays
		3	7	10		3	7	10		
T_1: Abamectin 1.9 EC @ 1 ml/lit	2.42	1.36a	1.61a	2.03a	1.67ab	1.36a	1.65a	1.84a	1.62b	1.64b
	(5.36)	(1.35)	(2.09)	(3.62)	(2.29)	(1.35)	(2.22)	(2.89)	(2.12)	(2.19)
T_2: Spiromesifen 22.9 SC @ 192 g a.i./ha	2.23	1.22a	1.38a	1.61a	1.41a	1.07a	1.49a	1.53a	1.36a	1.38a
	(4.47)	(0.99)	(1.40)	(2.09)	(1.49)	(0.64)	(1.72)	(1.84)	(1.35)	(1.40)
T_3: Dicofol 18.5 EC @ 1.5 ml/lit	2.34	1.46a	1.63a	2.04a	1.71b	1.32a	1.64a	1.84a	1.60ab	1.65b
	(4.89)	(1.63)	(2.16)	(3.66)	(2.42)	(1.24)	(2.19)	(2.89)	(2.06)	(2.22)
T_4: Proporgite 57 EC @ 1.5 ml/lit	2.67	1.31a	1.49a	1.71a	1.50ab	1.23a	1.50a	1.78a	1.50ab	1.50ab
	(6.63)	(1.22)	(1.72)	(2.42)	(1.75)	(1.01)	(1.75)	(2.67)	(1.75)	(1.75)
T_5: Untreated control	2.65	3.11b	2.93b	3.14b	3.06c	3.04b	3.25b	2.95b	3.08c	3.07c
	(6.52)	(9.17)	(8.08)	(9.36)	(8.86)	(8.74)	(10.06)	(8.20)	(8.99)	(8.92)
S.Em. +	0.33	0.17	0.14	0.20	0.10	0.12	0.14	0.18	0.09	0.08
C. D. at 5% T	NS	0.52	0.44	0.61	0.27	0.38	0.43	0.56	0.25	0.23
	26.49	19.75	15.88	18.76	18.28	15.16	14.70	18.39	16.41	16.09

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