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COMPARATIVE EFFICACY OF BIO-RATIONALES AND NEWER PESTICIDES AGAINST YELLOW MITE, *POLYPHAGOTAR SONEMUS LATUS* (BANKS) ON CAPSICUM UNDER SHADE NET HOUSE

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ABSTRACT

Eleven bio-rationales and newer pesticides *viz*., spiromesifen, propargite, fipronil, emamectin benzoate, acephate, indoxacarb, novaluron, imidacloprid, spinosad, azadirachtin and NSKE were evaluated against the yellow mite, *Polyphagotarsonemus latus* (Banks) on capsicum under shade net house conditions. The results revealed that during both the seasons of trial, all the insecticides treatments significantly reduce the mite populations over the untreated control at 1, 3, 7 and 15 days after sprays. Among different treatments tested, spiromesifen 22.9 SC @ one ml/l caused maximum reduction in population of mites with 86.08, 87.65, 93.09 and 88.31, 89.22, 92.89 per cent reduction at 3 days after first, second and third spray during 2014 and 2015, respectively. It was found at par with propergite 57 EC @ two ml/l except third spray both the year. Spiromesifen also caused maximum per cent mortality of mites ranged from 67.50 to 82.67, 84.58 to 91.37, 68.33 to 74.68 and 70.12 to 79.50, 81.59 to 90.73, 69.03 to 76.23 at 1, 7 and 15 days after spray during 2014 and, 2015, respectively On the basis of pooled and overall efficacy, the maximum reduction in mite population was recorded in the plots treated with spiromesifen 0.0229 per cent (80.95%), followed by propergite 0.114 per cent (75.17%), emamectin benzoate 0.002 per cent (74.09%) and fipronil 0.005 per cent (68.94%). Study revealed that spiromesifen 22.9 SC @ one ml/l proved best followed by propergite 57 EC @ two ml/l for management of yellow mite in shade net house conditions.

INTRODUCTION

Capsicum (*Capsicum annum* L.) family- Solannaceae which is also known as sweet pepper, bell pepper or green pepper is one of the most popular and highly remunerative vegetable crops grown in most parts of the world, *viz.,* China, Spain, Mexico, Romania, Yugoslavia, Bulgaria, USA, India, Europe, Central and South America are the major countries producing capsicum. In India, capsicum is extensively cultivated in Andhra Pradesh, Karnataka, Maharashtra, Tamilnadu, Himachal Pradesh, and hilly areas of Uttar Pradesh. Nutritionally, it is rich in vitamins particularly vitamins A and vitamins C. It is a cool season crop but it can be grown round the year using protected structures. Protected cultivation is the most intensive method of crop production and provides protection to crop plant from adverse environment condition (Sood *et al*., 2015). The protected environment also provide stable and congenial micro-climate which is favorable for the multiplication of insect pests which in turn become of the limiting factors for the successful crop production under protected environment (Kaur *et al.,* 2010). Often, the natural enemies that keep pests under control outside are not present under protected environment. For these reasons, pest situations often develop in the indoor environment more rapidly and with greater severity than outdoors. Often the productivity of capsicum is very low due to several limiting factors. Among them, insect pests cause severe losses. Capsicum is attacked by several insect and mite pests from seedling to fruiting stage. About 35 species of insect and mite pests reported (Vos and frinking 1998, Sorenson 2005, Berke *et al*., 2003) under Punjab conditions pose severe problems. Sunitha (2007) has also revealed the occurrence of aphids, thrips and mites as major pests in capsicum. Reddy (2005) reported that chilli mite, *P latus* and thrips, *Scrirtothrips dorsalis* as major pest infesting sweet pepper both under protected and open field conditions. Meena *et al*. (2013) reported the chilli mite as important pest infesting chilli in Rajasthan. The yellow or broad mite, *Polyphagotarsonemus latus* (Banks) is fast emerging as major pest of capsicum and chilli in Rajasthan. Feeding of these mites caused downward curling of leaves, elongation of petioles on older leaves and clustering of tender leaves at the tip of the branches. The growth of plant is arrested and the entire plants look like a leaf curl plant. It is multiply in large numbers under controlled temperature, relative humidity and due to developing of resistance against pesticides there by leading to significant crop loss. This has been well documented in protected flower crops such as rose, carnation, chrysanthemum etc. Mites cause about 53 per cent damage on rose plants (Dhooria, 1999). However, in other related crops like chilli yellow mite, *P. latus* is the major pest causing yield loss up to 96.4 per cent in North Karnataka (Borah, 1987) and 34.14 per cent in West Bengal (Ahmed *et al*., 1987) under open field conditions. No sincere attempt has been made in the past to evaluate the efficacy of newer insecticides against yellow mite under shade net house conditions in Rajasthan.

There is continual need for application of new acaricides with noval biochemical mode of action, but their use to be optimized in order to prevent or delay the evolution of resistance and prolong their life span (Deskeyser, 2005). Due to their short life cycle and high fecundity, frequent acaricides application is needed to suppress them, which lead development of resistance to pesticide (Kumar *et al*., 2014). Looking to the severity of damage due to yellow mite on capsicum crop, it is found essential and urgent need to know efficacy of yellow mite under shade net house. Considering the economic importance of pest, the study was conducted to test the efficacy of bio-rationales and newer insecticides molecules against yellow mite under shed net house conditions.

MATERIALS AND METHODS

The experiment was conducted for two consecutive years during summer 2014 and summer 2015 under shade net house at Hi-Tech Horticulture farm, Rajasthan Agriculture Research Institute (Sri Karan Narendra Agriculture University, Jobner) Durgapura, Jaipur, (Rajasthan). The experiment was laid out in a Randomized Block Design with 12 treatments and three replications including untreated check. Thirty day old seedling of capsicum variety PSO 26 were transplanted in each treatments with plot size 3.5 X 1.0 m, keeping row to row and plant to plant distance of 0.50 m and 0.40 m. Eleven bio-rationales and newer pesticides of different chemistry *viz*., spiromesifen 22.9 SC @ one ml/l, emamectin benzoate 5 SG @ 0.4gm/l, acephate 75 SP @ one gm/l, indoxacarb 14.5 SC @ 0.8ml/l, propergite 57 EC @ two ml/l, fipronil 5 SC @ one ml/l, novaluron 10 EC one ml/l , imidacloprid 17.8 SL @ 0.33 ml/l, Azadirachtin 0.15 EC @ two ml/l, NSKE 5% and spinosad 45 SC 0.3 ml/l were evaluated for the management of yellow mite in the field. Three consecutive sprays were applied at twenty day interval, starting from sufficient pest buildup. Treatments were imposed by using pre calibrated Knapsack sprayer @ 500-600 liters sprays solution/ha depending on stage of the crop. Care was taken to check the drift of insecticides by putting polythene sheet screen around each plot at the time of spraying. The population of mites (Nymphs and Adults) was recorded at one day before spraying and 1, 3, 7, and 15 days after each spray. The population of yellow mite was recorded by counting both nymphs and adults from three leaves representing top, middle and bottom portion of each tagged plats were plucked randomly and kept in separate polythene bags, which was properly labeled and brought to the laboratory for observing in binocular. The population of mites was recorded as mites per three leaves.

The per cent reduction in the population of mites were worked out and data were subjected to analysis of variance after making necessary transformation whenever required (Gomez and Gomez 1984) for 2014 and 2015 separately and pooled. The percentage reduction in population will be calculated using formula given by Henderson and Tilton (1955) which is modification of Abbott's (1925) formula.

Per cent reduction in population = $\{1-(T_a \times C_b / T_b \times C_a)\ 100\}$
Where,

T_a = Number of insect after treatment in treated plot

T_b = Number of insect before treatment in treated plot

C_a = Number of insect in untreated check after treatment

C_b = Number of insect in untreated check before treatment

RESULTS AND DISCUSSION

Eleven bio-rationales and newer pesticides *viz*., spiromesifen, propargite, fipronil, emamectin benzoate, acephate, indoxacarb, novaluron, imidacloprid, spinosad, azadirachtin and NSKE were evaluated against the yellow mite, *Polyphagotarsonemus latus* (Banks) on capsicum under shade net house conditions**.** The observations were taken one day before first spray on mite population in all the treatments including untreated check revealed non-significant among them in both the years. Analysis of variance shows that treatment application had significant effect on the mortality of yellow mite over the untreated control in all application during both the years. However, the significant difference existed among them. The data on percentage mortality obtained after each sprays are summarized in table 1, 2 and pooled data for two years are depicted in table 3. The trend of relative efficacy of various treatments has been described below on the basis of pooled data**.**

The observations on mortality of *P latus* recorded at one day after first spray revealed that spiromesifen 0.0229 per cent showed significantly the highest mortality (68.81%) and it was on par with the treatment of propergite 0.114 per cent (68.05 %), emamectin benzoate 0.002 per cent (66.76%) and fipronil 0.005 per cent (64.90%), whereas, the novaluron 0.01 per cent recorded significantly the lowest mortality (23.07%). In second application, spiromesifen 0.0229 per cent was again found to be the most effective followed by propergite 0.114 per cent. The treatment of fipronil and emamectin benzoate showed effective reduction of yellow mite. In third application spiromesifen 0.0229 per cent was also found to be the most effective followed by emamectin benzoate, propergite and fipronil. More or less similar finding were recorded by the various workers *viz*., Varghese and Mathew (2013); Pathipatil *et al*. (2012) and Reddy *et al*. (2014) .

After three day of first application, among the treatments

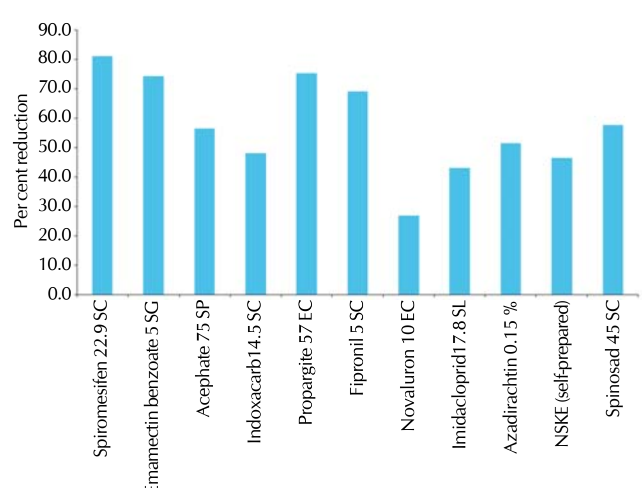

Figure 1: Overall efficacy of bio-rationels and newer pesticides against yellow mite

Table 1: Comparative efficacy of bio-rationales and newer pesticides against yellow mite, *Polyphagotarsonemus latus* (Banks) on capsicum during 2014

S. No.	Treatments	Conc. (%)	Mean reduction (%) in yellow mite population days after											
			First spray				Second spray				Third spray			
			1 DAS	3 DAS	7 DAS	15 DAS	1 DAS	3 DAS	7 DAS	15 DAS	1 DAS	3 DAS	7 DAS	15 DAS
1	Spiromesifen	0.0229	67.5	86.08	84.58	68.33	77.20	87.65	85.68	74.68	82.67	93.09	91.37	70.07
	22.9 SC		(55.29)*	(68.31)	(67.06)	(55.78)	(61.49)	(70.21)	(67.77)	(59.79)	(65.82)	(74.77)	(72.94)	(56.87)
2	Emamectin	0.002	64.96	78.60	77.34	61.84	64.62	79.40	77.36	70.52	70.71	87.83	84.81	64.88
	benzoate 5 SG		(53.74)	(62.62)	(61.79)	(51.89)	(53.51)	(63.66)	(62.46)	(57.12)	(57.28)	(69.60)	(67.08)	(53.69)
3	Acephate	0.075	43.57	55.27	55.65	45.57	53.55	60.20	62.44	50.16	48.19	59.17	63.60	57.95
	75 SP		(41.30)	(48.03)	(48.25)	(42.46)	(47.04)	(50.89)	(52.22)	(45.09)	(43.96)	(50.29)	(52.90)	(49.59)
4	Indoxacarb	0.0116	39.88	48.25	48.39	37.97	41.98	53.29	55.22	42.79	41.72	55.13	50.25	49.55
	14.5 SC		(39.16)	(44.00)	(44.06)	(37.88)	(40.38)	(46.89)	(48.00)	(40.84)	(40.22)	(48.18)	(52.90)	(44.74)
5	Propargite	0.114	66.71	80.89	78.85	63.36	73.82	84.43	79.92	68.04	70.75	86.83	83.56	62.01
	57 EC		(54.77)	(64.28)	(62.70)	(52.76)	(59.32)	(66.82)	(63.40)	(55.75)	(57.27)	(68.73)	(66.09)	(51.97)
6	Fipronil 5 SC	0.005	62.86	73.05	61.52	53.61	64.53	77.69	75.27	60.92	66.33	78.88	73.64	59.39
			(52.46)	(58.76)	(51.68)	(47.08)	(53.46)	(61.84)	(60.28)	(51.32)	(54.54)	(62.65)	(59.12)	(50.43)
7	Novaluron 10EC	0.01	20.06	35.18	29.89	20.31	21.59	28.00	27.44	21.81	19.97	31.83	27.40	24.32
			(26.60)	(36.38)	(33.14)	(26.76)	(27.63)	(31.71)	(31.58)	(27.82)	(26.09)	(34.25)	(31.47)	(29.37)
8	Imidacloprid	0.0058	34.53	45.53	38.40	38.28	36.48	45.23	58.16	40.94	38.18	50.93	46.49	38.53
	17.8 SL		(35.92)	(42.38)	(38.28)	(38.17)	(37.03)	(42.24)	(49.70)	(39.76)	(38.14)	(45.53)	(42.95)	(38.27)
9	Azadirachtin	0.0003	40.12	54.71	54.21	43.91	47.36	51.62	58.03	45.8	42.79	52.85	53.68	46.48
	0.15%		(39.30)	(47.70)	(47.42)	(41.49)	(43.49)	(45.93)	(49.63)	(42.58)	(40.84)	(46.64)	(47.11)	(42.98)
10	NSKE	5	35.39	47.92	52.44	42.47	37.79	48.53	53.52	41.53	35.92	50.51	46.49	43.48
	(self-prepared)		(36.38)	(43.80)	(46.40)	(40.64)	(37.93)	(44.15)	(47.02)	(40.12)	(36.78)	(45.29)	(42.95)	(41.23)
11	Spinosad	0.0135	45.54	56.79	58.92	50.51	47.25	63.32	65.17	55.99	49.65	62.88	69.12	55.40
	45 SC		(42.43)	(48.93)	(50.14)	(45.29)	(43.42)	(52.73)	(53.84)	(48.44)	(44.80)	(52.47)	(56.25)	(48.11)
12	Untreated check		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	SEm±		-1.55	-1.65	-1.52	-1.51	-1.38	-2.12	-2.19	-1.44	-1.87	-1.33	-1.77	-1.54
	CD (P=0.05)		-4.55	-4.85	-4.47	-4.43	-4.06	-6.22	-6.41	-4.22	-5.48	-3.91	-5.19	-4.53

* Figures in parentheses are arc sin transformed values; DAS: Days after spray

spiromesifen 0.0229 per cent inflicted the highest per cent mortality (87.20 %) of the mites and it was on par with the treatment of propergite 0.114 per cent (83.17%) followed by emamectin benzoate 0.002 per cent (79.59%), and fipronil 0.005 per cent (74.36%), whereas, the novaluron 0.01 per cent recorded significantly the lowest mortality (35.85%). In second application, the maximum reduction was also recorded in plots treated with spiromesifen 0.0229 per cent (88.44%) and it was on par with the treatment of propergite 0.114 per cent (85.90%) followed by fipronil 0.005 per cent (81.71 %) and emamectin benzoate 0.002 per cent (80.86%). Rest of treatments also fined similar trend in mortality of mites. In third application, the maximum reduction in mite population was recorded in the plots treated with spiromesifen 0.0229 per cent (92.99%) followed by propergite 0.114 per cent (86.66%) & emamectin benzoate 0.002 per cent (86.72%). Among the other treatments, fipronil remained next best treatment which recorded 76.34 per cent mortality. The lowest mortality was also found in novaluron 0.01 per cent. After three days of treatment application most of pesticides, showed highest efficacy. Studies conducted by Chakrabarti and Sarkar (2014) revealed that propergite proved effective for having reduction of chilli mite after three days of pesticidal application support the present findings. Pathipatil *et al.* (2012) revealed that abamectin and propergite proved superior in reducing yellow mite in chilli support present findings.

After seven days of first pesticidal application, the most effective reduction was recorded in the plots treated with spiromesifen 0.0229 per cent (83.09%). Next best treatments were showed propergite 0.114 per cent (76.97%) and emamectin benzoate 0.002 per cent (76.54%). Among the other treatments, fipronil and spinosad remained next best treatment which recorded 67.09 and 61.81 per cent mortality, respectively, whereas, the novaluron 0.01 per cent recorded significantly the lowest mortality (30.83%) of mite. An almost similar trend of mortality of mites was found in all applications. After seven day of treatments application showed similar efficacy compare to three day after treatment application. The present finding are in agreement to that of Varghese and Mathew (2013) who reported that significantly lower population of chilli mites was recorded in spiromesifen followed by propergite after seven days of these pesticides.

After fifteen days of first application among the treatments spiromesifen 0.0229 per cent inflicted the highest per cent mortality (69.55 %) of the mites followed by emamectin benzoate 0.002 per cent (64.61%) and propergite 0.114 per cent (64.15%). Among the other treatments, fipronil and spinosad remained next best treatment which recorded 58.52 and 53.57 per cent mortality, respectively, whereas, the novaluron 0.01 per cent recorded significantly the lowest mortality (22.19%) of mite. In second application, the maximum reduction was also recorded in plots treated with spiromesifen 0.0229 per cent (75.46%) and it was on par with the treatment of emmamectin benzoate 0.002 per cent (71.20%) however, propergite 0.114 per cent was found at par with emmamectin benzoate. An almost similar trend of mortality of mites was found in third applications. Present findings are in agreement to that of Varghese and Mathew (2013) who reported that significantly lower population of chilli mites was recorded in spiromesifen. Pathipatil *et al.* (2012) revealed that abamectin showed effective reduction of chilli mite support present findings.

On the basis of pooled and overall efficacy, the maximum reduction in mite population was recorded in the plots treated with spiromesifen at 0.0229 per cent (80.95%), followed by propergite 0.114 per cent (75.17%), emamectin benzoate

Table 2: Comparative efficacy of bio-rationales and newer pesticides against yellow mite, *Polyphagotarsonemus latus* (Banks) on capsicum during 2015

S. No.	Treatments	Conc. (%)	Mean reduction (%) in yellow mite population days after											
			First spray				Second spray				Third spray			
			1 DAS	3 DAS	7 DAS	15 DAS	1 DAS	3 DAS	7 DAS	15 DAS	1 DAS	3 DAS	7 DAS	15 DAS
1	Spiromesifen	0.0229	70.12	88.31	81.59	70.77	78.98	89.22	86.42	76.23	79.5	92.89	90.73	69.03
	22.9 SC		(56.87)*	(70.07)	-64.82	(57.31)	(62.74)	(71.25)	(68.41)	(60.86)	(63.21)	(74.55)	(72.30)	(56.23)
2	Emamectin	0.002	68.55	80.58	75.74	67.38	68.95	82.32	77.96	71.87	71.08	85.60	81.26	63.90
	benzoate 5 SG		(55.98)	(63.98)	-60.87	(55.17)	(56.14)	(65.52)	(62.38)	(58.01)	(57.50)	(67.77)	(64.43)	(53.09)
3	Acephate	0.075	49.77	61.21	62.89	50.75	58.98	65.79	66.07	55.39	48.72	58.32	61.21	56.81
	75 SP		(44.87)	(51.49)	-52.47	(45.43)	(50.19)	(54.21)	(54.38)	(48.10)	(44.27)	(49.80)	(51.49)	(48.93)
4	Indoxacarb	0.0116	41.27	45.63	51.4	43.97	47.19	57.91	58.27	47.18	42.31	50.19	50.51	48.18
	14.5 SC		(39.96)	(42.49)	-45.8	(41.53)	(43.39)	(49.55)	(49.76)	(43.38)	(40.57)	(45.10)	(45.28)	(43.95)
5	Propargite	0.114	69.38	85.45	75.09	64.93	74.08	87.36	83.17	67.09	68.61	86.48	82.37	60.76
	57 EC		(56.42)	(67.59)	-60.37	(53.72)	(59.40)	(69.18)	(65.91)	(55.00)	(55.94)	(68.44)	(65.21)	(51.23)
6	Fipronil 5 SC	0.005	66.93	75.67	72.65	63.43	75.78	85.73	79.22	69.22	63.81	73.79	65.91	54.67
			(54.92)	(60.46)	-58.47	(52.80)	(60.96)	(68.21)	(63.45)	(56.31)	(53.02)	(59.31)	(54.38)	(47.69)
7	Novaluron 10 EC	0.01	26.07	36.52	31.76	24.06	22.77	33.56	29.19	21.63	23.49	34.74	30.68	22.80
			(30.68)	(37.16)	-34.29	(29.32)	(28.45)	(35.40)	(32.69)	(27.58)	(28.83)	(36.09)	(33.59)	(28.48)
8	Imidacloprid	0.0058	40.79	44.68	52.29	39.43	47.07	48.31	60.65	40.04	34.36	45.87	36.44	30.54
	17.8 SL		(39.67)	(41.70)	-46.31	(38.79)	(43.32)	(44.02)	(51.15)	(38.97)	(35.84)	(42.52)	(36.89)	(33.42)
9	Azadirachtin	0.0003	48.87	56.34	66.29	53.99	51.88	57.38	59.29	53.16	43.33	55.67	50.49	44.88
	0.15%		(44.35)	(48.65)	-54.55	(47.29)	(46.08)	(49.24)	(50.38)	(46.81)	(41.16)	(48.26)	(45.28)	(42.04)
10	NSKE	5	47.16	49.48	61.05	47.00	41.30	51.65	53.74	44.06	36.51	49.34	50.49	42.04
	(self-prepared)		(43.36)	(44.70)	-51.39	(43.28)	(39.97)	(45.95)	(47.15)	(41.58)	(37.16)	(44.62)	(45.28)	(40.40)
11	Spinosad	0.0135	46.29	58.24	64.7	56.63	51.73	67.13	68.91	59.17	48.06	60.37	65.62	52.15
	45 SC		(42.87)	(49.80)	-53.56	(48.81)	(46.00)	(55.03)	(56.14)	(50.30)	(43.89)	(51.00)	(54.12)	(46.24)
12	Untreated check		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	SEm±		-1.41	-2.06	-2.04	-1.44	-1.68	-1.92	-2	-1.79	-1.46	-2	-2.12	-1.54
	CD (P=0.05)		-4.15	-6.05	-5.99	-4.21	-4.93	-5.63	-5.87	-5.24	-4.28	-5.86	-6.22	-4.5

* Figures in parentheses are arc sin transformed values; DAS: Days after spray

Table 3: Comparative efficacy of bio-rationales and newer pesticides against yellow mite, *Polyphagotarsonemus latus* (Banks) on capsicum (pooled of 2014 and 2015).

S. No.	Treatments	Conc. (%)	Mean reduction (%) in yellow mite population days after											
			First spray				Second spray				Third spray			
			1 DAS	3 DAS	7 DAS	15 DAS	1 DAS	3 DAS	7 DAS	15 DAS	1 DAS	3 DAS	7 DAS	15 DAS
1	Spiromesifen	0.0229	68.81	87.20	83.09	69.55	78.09	88.44	86.05	75.46	81.09	92.99	91.05	69.55
	22.9 SC		(56.08)*	(69.19)	(65.94)	(56.55)	(62.12)	(70.73)	(68.09)	(60.33)	(64.52)	(74.66)	(72.62)	(56.55)
2	Emamectin	0.002	66.76	79.59	76.54	64.61	66.79	80.86	77.66	71.20	70.90	86.72	83.04	64.39
	benzoate 5 SG		(54.86)	(63.30)	(61.33)	(53.53)	(54.83)	(64.59)	(62.42)	(57.57)	(57.39)	(68.69)	(65.76)	(53.39)
3	Acephate	0.075	46.67	58.24	59.27	48.16	56.27	63.00	64.26	52.78	48.46	58.75	62.41	57.38
	75 SP		(43.09)	(49.76)	(50.36)	(43.95)	(48.62)	(52.55)	(53.30)	(46.60)	(44.12)	(50.05)	(52.20)	(49.26)
4	Indoxacarb	0.0116	40.58	46.94	49.90	40.97	44.59	55.60	56.75	44.99	42.02	52.66	50.38	48.87
	14.5 SC		(39.56)	(43.25)	(44.93)	(39.71)	(41.89)	(48.22)	(48.88)	(42.11)	(40.40)	(46.64)	(49.09)	(44.35)
5	Propargite	0.114	68.05	83.17	76.97	64.15	73.95	85.90	81.55	67.57	69.68	86.66	82.97	61.39
	57 EC		(55.60)	(65.94)	(61.54)	(53.24)	(59.36)	(68.00)	(64.66)	(55.38)	(56.61)	(68.59)	(65.65)	(51.60)
6	Fipronil 5 SC	0.005	64.90	74.36	67.09	58.52	70.16	81.71	77.25	65.07	65.07	76.34	69.78	57.03
			(53.69)	(59.61)	(55.08)	(49.94)	(57.21)	(65.03)	(61.87)	(53.82)	(53.78)	(60.98)	(56.75)	(49.06)
7	Novaluron 10 EC	0.01	23.07	35.85	30.83	22.19	22.18	30.78	28.32	21.72	21.73	33.29	29.04	23.56
			(28.64)	(36.67)	(33.72)	(28.04)	(28.04)	(28.56)	(32.14)	(27.70)	(27.46)	(35.17)	(32.53)	(28.93)
8	Imidacloprid	0.0058	37.66	45.11	45.35	38.86	41.78	46.77	59.41	40.49	36.27	48.40	41.47	34.54
	17.8 SL		(37.80)	(42.04)	(42.30)	(38.48)	(40.18)	(43.13)	(50.43)	(39.37)	(36.99)	(44.03)	(39.92)	(35.85)
9	Azadirachtin	0.0003	44.50	55.53	60.25	48.95	49.62	54.50	58.66	49.48	43.06	54.26	52.09	45.68
	0.15%		(41.83)	(48.18)	(50.99)	(44.39)	(44.79)	(47.59)	(50.01)	(44.70)	(41.00)	(47.45)	(46.20)	(42.51)
10	NSKE	5	41.28	48.70	56.75	44.74	39.55	50.09	53.63	42.80	36.22	49.93	48.49	42.76
	(self-prepared)		(39.87)	(44.25)	(48.90)	(41.96)	(38.95)	(45.05)	(47.09)	(40.85)	(36.97)	(44.96)	(44.12)	(40.82)
11	Spinosad	0.0135	45.92	57.52	61.81	53.57	49.49	65.23	67.04	57.58	48.86	61.63	67.37	53.78
	45 SC		(42.65)	(49.37)	(51.85)	(47.05)	(44.71)	(53.88)	(54.99)	(49.37)	(44.35)	(51.74)	(55.19)	(47.18)
12	Untreated check		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	SEm±		-1.05	-1.32	-1.27	-1.04	-1.09	-1.43	-1.48	-1.15	-1.19	-1.2	-1.38	-1.09
	CD (P=0.05)		-2.99	-3.77	-3.63	-2.97	-3.1	-4.08	-4.22	-3.27	-3.38	-3.42	-3.94	-3.1

* Figures in parentheses are arc sin transformed values.DAS: Days after spray

0.002 per cent (74.09%) and fipronil 0.005 per cent (68.94%). Among the other treatments, spinosad 0.135 per cent and acephate 0.075 per cent remained next best treatment which recorded 57.5 and 56.3 per cent mortality, respectively, whereas, the novaluron 0.01 per cent recorded significantly the lowest mortality (26.9 %) of mite. The present findings are in agreement to that of Halder *et al*. (2015) who reported that effective reduction in mite population was obtained in treatment of spiromesifen and fipronil. The efficacy of spiromesifen in reducing mite in india was reported by Kavitha *et al*. (2006), Nagaraj *et al*. (2007), Reddy and Latha (2013), Alam *et al*., 2014 and Sood *et al*., 2015.

In conclusion the present study showed that newer pesticides spiromesifen can be recommended for effective management of mite under shade net house conditions, whereas. propergite, emamectin benzoate and fipronil also recommended for effective reduction of mite

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