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Research Paper

MANAGEMENT OF *Tetranychus urticae* KOCH (ACARINA: TETRANYCHIDAE) ON CARNATION UNDER POLYHOUSE CONDITION

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Abstract

Experiments were conducted in farmer polyhouse in Shivamogga district, Karnataka during summer season of 2016 using carnation variety Pingu to test the bio-efficacy of new acaricides against two spotted spider mite, *Tetranychus urticae* Koch. All the acaricidal treatments were significantly superior to untreated control in checking the mite population under polyhouse conditions. The present study indicated that the treatment of propargite 57 EC recording significantly highest mite reduction over all other treatments. The next best treatment was diafenthiuron 50 WP. The order of moderate effective treatments was wettable sulphur, dicofol 18.5 EC, fenpyroximate 5 EC, fenazaquin 10 EC, garlic extract + onion extract 5%, garlic extract 5% and onion extract 5%.

Key words: Carnation, Pingu, Bio-efficacy, acaricides, *polyhouse*, two spotted spider mite, *Tetranychus urticae* and propargite 57 EC.

INTRODUCTION

Carnation (*Dianthus caryophyllus* L.) is one of the most important cut flowers in the world. It is also known as divine flower, clove pink, gilly flowers *etc.* The genus name *Dianthus* means flower of zeus or divine. It belongs to the family Caryophyllaceae. Centre of origin for carnation is Mediterranean region.

Cultivation of carnation on commercial scale for domestic and export purpose is relatively recent in India. This crop is being cultivated under polyhouse conditions (controlled environmental conditions), mainly in Karnataka (Bangalore, Belgaum), Tamil Nadu (Coimbatore), New Delhi, Maharashtra (Nasik, Pune), Himachal Pradesh (Solan, Simla, Palampur) and Jammu (Srinagar), besides few other places like Uttar Pradesh, Punjab *etc.*

In India annual production of carnation is 6 metric tones. Maximum production of carnation in India is in state of Himachala Pradesh 2.75 metric tones followed by Uttarakand 1.25 metric tones. In Karnataka production of carnation is 0.69 metric tones (Anon., 2015).

Major pests infecting carnations are mites (*Tetranychus urticae* Koch), thrips (*Taeniothrips dianthi*) and bud borer (*Helicoverpa armigera*). Amongst these pests, two

spotted spider mite (*Tetranychus urticae*) is the most serious pest of carnation in polyhouse. It is being recorded worldwide infecting more than 150 different field and ornamental plants. The pest occurrence is regular on carnation plant and has become serious menance (Jhansi and Mohan, 1997). Mites usually colonize under surface of leaves and in severe condition, they were found on all parts of plant. They prefer nitrogen rich young leaves, but in well established colonies, older leaves become heavily infected.

Both nymph and adult feeds with chelicerate type of mouthparts which modified to pierce and suck the cell sap from epidermis of leaves. Depending on the thickness of the leaf, spongy mesophyll cells and sometimes most cells in the lowest palisade layer are damaged. This behavior leads to the characteristic of light yellow spots, speckled, stippling appearance of leaves. Because of chloroplasts in the leaves are gradually destroyed as the feeding potential of mites increases which results into reduction in photosynthesis activity, decreased transpiration and closed stomata. When chloroplasts are sucked out, a chlorotic spot forms at each feeding site. Leaf browning may occur due to heavy infestation of mite which results in damage to mesophyll cell. Large colonies of *T. urticae* produce very fine webbing around the leaves and flowers in which they feed and goes toward the top of plants where they tend to congregrate. Moreover, the small size, fast development rate and high reproductive potential makes it difficult to control them. Further major problem associated with their control is development of resistance to acaricides. Heavy incidence of mites mostly observed from February to May when hot and dry conditions prevail.

MATERIAL AND METHODS

Some newer acaricides along with conventional ones with recommended concentration for their efficacy against red spider mite, *T. urticae* on carnation.

DETAIL OF THE EXPERIMENT

A trial was laid out in polyhouse, at Abbalagere village with under mentioned specification. The treatments were applied coinciding with profuse build up of red spider mite (*T. urticae*) during summer season.

1. Season and year : Summer, 2016
2. Design : Randomized Complete Block Design (RCBD)
3. Crop : Carnation
4. Replication : Three
5. Row to row distance : 15 cm
6. Plant to plant distance : 15 cm
7. Variety : Pingu
8. Treatments : 10 (Treatment details are represented in table 1)

Table 1. Treatment details

Sl. No.	Treatments	Chemical name	Dose (ml) in per litre of water
1	T_1	Fenazaquin 10 EC	2ml/l
2	T_2	Dicofol 18.5 EC	2.5ml/l
3	T_3	Fenpyroximate 5 EC	1ml/l
4	T_4	Propargite 57 EC	2ml/ l
5	T_5	Diafenthiuron 50 WP	1g/l
6	T_6	Garlic extract 5%	5ml/l
7	T_7	Onion extract 5%	5ml/l
8	T_8	Garlic extract + Onion extract 5%	5ml/l
9	T_9	Wettable sulphur	4g /l
10	T_{10}	Control (Water spray)	

Application of treatment

First spray was done at the initiation of mite infestation. The treatment emulsions were sprayed on carnation plants with knapsack sprayer (15 liter capacity) to the extent of slight run off. The sprayer was washed thoroughly prior to the application of each treatment. Second spray was done at 15 days after first spray.

Sampling and method of observation

To evaluate the effect of foliar spray of various treatments on the population of mites, mite counts were made on ten randomly selected plants tagged from each net plot. Three random leaves representing top, middle and lower canopy from each of the previously marked ten plants per replication were plucked and held in separate properly labeled polyethylene bags and brought to the laboratory for counting mite population (live) under binocular microscope. The two spotted spider mite density (all embryonic stages together) was recorded from whole leaf. A pre-treatment counts a day before and post- treatment count 1, 3, 7 and 14 days after application of treatment (DAT) were recorded. The mites responding to touch of brush were considered alive. The data so obtained on mite counts (canopy- wise and leaf surface) were summed up and converted to per leaf. The per cent reduction due to acaricidal treatment was calculated on each observation. The data so obtained were statistically analysed after transformation so as to evaluate effectiveness of acaricides against phytophagous mite (*T. urticae*).

RESULTS AND DISCUSSION

The field experiment were conducted to evaluate the effectiveness of different chemical pesticides against *T. urticae* during February – March 2016. The acaricides tested for the their bioefficacy against T. urticae under polyhouse conditions revealed that all the acaricidal treatments were significantly superior to untreated control in checking the mite population under polyhouse conditions. The present study indicated that the treatment of propargite 57 EC recording significantly highest mite reduction (65.35 per cent) over all other treatments. The next best treatment was diafenthiuron 50 WP (59.91 per cent). Further, moderate effective treatments was wettable sulphur (55.13 per cent) and dicofol 18.5 EC (51.03 per cent) which were statistically at par with each other. The treatments of fenpyroximate 5 EC (48.74 per cent) and fenazaquin 10 EC (42.35 per cent) were statistically at par to each other. The treatment of garlic extract + onion extract 5% (34.54 per cent) was at par with garlic extract 5% (29.84 per cent).

Table 2. Pool data of the first and second spray of acaricides molecules against red spider mite, *T. urticae*

Tr. No.	Treatments	Dosage	No. of mites										Mean	Percent reduction over control
			I Spray					II Spray						
			1 DBFS	1 DAFS	3 DAFS	7DAFS	14DAFS	1 DBSS	1 DASS	3DASS	7DASS	14DASS		
T_1	.Fenazaquin 10 EC	2ml/l	62.64 (7.90)	36.69 $(6.01)^{cde}$	34.14 $(5.82)^{bcd}$	42.93 $(6.50)^{cd}$	47.78 $(6.85)^{cd}$	59.84 (7.72)	36.95 $(6.06)^{cde}$	33.38 $(5.76)^{cd}$	44.56 $(6.65)^{cde}$	51.97 $(7.19)^{bcde}$	41.05 $(6.35)^{cd}$	42.35
T_2	Dicofol 18.5 EC	2.5ml/l	61.69 (7.84)	30.06 $(5.43)^{efg}$	27.91 $(5.24)^{de}$	36.01 $(5.91)^{de}$	39.96 $(6.20)^{de}$	62.32 (7.8)	31.70 $(5.61)^{def}$	28.01 $(5.26)^{def}$	37.00 $(6.05)^{ef}$	48.29 $(6.92)^{cdef}$	34.87 $(5.86)^{def}$	51.03
T_3	Fenpyroximate 5 EC	1ml/l	60.99 (7.79)	32.77 $(5.70)^{def}$	30.04 $(5.41)^{cde}$	38.08 $(6.14)^{de}$	42.18 $(6.44)^{de}$	59.95 (7.74)	33.49 $(5.78)^{de}$	30.15 $(5.47)^{de}$	40.64 $(6.35)^{de}$	44.66 $(6.64)^{defg}$	36.50 $(6.02)^{de}$	48.74
T_4	Propargite 57 EC	2ml/ l	61.09 (7.80)	22.73 $(4.75)^{g}$	18.18 $(4.26)^{f}$	25.25 $(4.98)^{f}$	28.74 $(5.29)^{f}$	61.89 (7.86)	21.57 $(4.64)^{g}$	18.62 $(4.30)^{g}$	27.20 $(5.19)^{g}$	35.08 $(5.85)^{g}$	24.67 $(4.93)^{g}$	65.35
T_5	Diafenthiuron 50 WP	1g/l	62.34 (7.88)	26.12 $(5.11)^{fg}$	23.81 $(4.85)^{ef}$	30.18 $(5.44)^{ef}$	34.46 $(5.80)^{ef}$	61.97 (7.86)	24.63 $(4.95)^{fg}$	21.55 $(4.62)^{fg}$	30.30 $(5.48)^{fg}$	37.30 $(6.05)^{fg}$	28.54 $(5.33)^{fg}$	59.91
T_6	Garlic extract 5%	5ml/l	61.40 (7.83)	44.18 $(6.64\ )^{bc}$	42.74 $(6.52)^{b}$	53.53 $(7.28)^{bc}$	58.58 $(7.60)^{bc}$	58.54 (7.64)	43.96 $(6.60)^{bc}$	42.02 $(6.47)^{b}$	52.78 $(7.24)^{bc}$	61.97 $(7.86)^{bc}$	49.96 $(6.98)^{bc}$	29.84
T_7	Onion extract 5%	5ml/l	61.21 (7.82)	48.76 $(6.97)^{b}$	45.96 $(6.76)^{b}$	56.74 $(7.50)^{b}$	61.31 $(7.80)^{b}$	57.42 (7.57)	49.99 $(7.04)^{b}$	45.88 $(6.74)^{b}$	59.69 $(7.71)^{b}$	67.08 $(8.18)^{ab}$	54.42 $(7.36)^{b}$	23.57
T_8	Garlic extract + Onion extract 5%	5ml/	62.01 (7.86)	41.11 $(6.40)^{bcd}$	40.05 $(6.32)^{bc}$	49.88 $(7.03)^{bc}$	55.35 $(7.4)^{bc}$	60.68 (7.78)	40.52 $(6.35)^{bcd}$	38.30 $(6.18)^{bc}$	49.81 $(7.03)^{bcd}$	57.90 $(7.59)^{bcd}$	46.61 $(6.78)^{bc}$	34.54
T_9	Wettable sulphur	4g /l	62.64 (7.9)	28.47 $(5.32)^{efg}$	25.31 $(5.01)^{def}$	32.59 $(5.66)^{ef}$	38.55 $(6.17)^{de}$	61.69 (7.84)	28.57 $(5.34)^{efg}$	24.63 $(4.95)^{efg}$	34.82 $(5.88)^{efg}$	42.64 $(6.51)^{efg}$	31.95 $(5.59)^{eg}$	55.13
T_{10}	Control (Water spray)		62.49 (7.89)	65.38 $(8.08)^{a}$	69.45 $(8.33)^{a}$	73.91 $(8.59)^{a}$	75.28 $(8.66)^{a}$	59.53 (7.70)	65.34 $(8.08)^{a}$	71.24 $(8.43)^{a}$	73.46 $(\ 8.56)^{a}$	75.56 $(8.68)^{a}$	71.21 $(8.63)^{a}$	
	F test			**	**	**	**		**	**	**	**	**	
	S Em ±			0.37	0.45	0.40	0.32		0.36	0.32	0.40	0.51	0.33	
	CD @ 0.01		-	1.057	1.29	1.15	0.91	-	1.046	0.92	1.1 7	1.47	0.965	
	CV (%)		5.28	7.43	9.39	7.53	5.71	5.325	7.35	6.77	7.54	8.76	6. 42	

Observations: 10 plants per treatment; Figures in parenthesis are √X+0.5 are transformed values; Means followed by same letters do not differ significantly by DMRT (P=0.05); DBFS - Days before first spray, DASS-Days after second spray

However, the treatment of onion extract 5% (23.57 per cent) recorded significantly lower mite population (Table 1).

The present investigation was in close agreement with the Naik et *al.* (2005) who reported that, dicofol showed their efficacy as standard check exhibiting good and moderate mode of action *viz*., ovicidal, nymphicidal and adulticidal. Moreover, the treatment of fenpyroximate showed quick knockdown effect on brinjal in glasshouse.

Similarly Singh and Choudhary (2008) who reported that the that propargite 0.05 per cent 400 ml/ha was most effective with 86.42 per cent reduction of okra mite population. Diafenthiuron 0.055 per cent also gave effective control of *T. urticae*. Similar result in respect of effectiveness of diafenthiuron 50 SC and 50 WP both at 450 g $a.i.h^{-1}$ recorded the highest mean reduction of mite population after first and second round of spraying by Bhaskaran *et al.,* (2007). Patel *et al.,* (2009) revealed that diafenthiuron at lower dose (0.125 %) was found effective in reducing *T. urticae* on rose. Singh *et al.,* (2006) reported that dimethoate 0.06 per cent found to be effective against *T. urticae* on rose. Dicofol 0.05 per cent proved to be the most effective causing 70.56 to 91.85 per cent reduction of mites in bhendi and 66.99 to 99.20 per cent reduction in brinjal both under field and pot culture conditions by Ramaraju (2004). Again Jhansi and Sridhar (2002) who reported that dicofol 5 % WP at 3 g/lt is very effective (15.04 % mite survival) even after 14 days after spraying which is at par with dicofol 18.5% EC at 2.5 ml/lt against *T. urticae* on rose in polyhouse.

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