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THE COMPARATIVE EFFICACY OF CERTAIN CHEMICAL AND BOTANICAL ACARICIDESAGAINST *TETRANYCHUS URTICAE* ON ASHWAGANDHA

Priyanka Goyal
Department of Zoology, B.B.D. Govt. P.G. College, Chimanpura, Jaipur, India.

ABSTRACT: Comparative efficacy of certain chemical and botanical acaricides against the two-spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) major pests occurred on Ashwagandha was studied at B.B.D. Govt. P.G. College, Chimanpura, Jaipur during cropping year 2012-2013 and 2013-2014. Eight pesticides were evaluated against *T. urticae* infesting ashwagandha, out of which Fenazagnite (.05%) was found to be the most effective in the present study where Propargite (.05%) was recorded to be at par in effectiveness with Fenazagnite and NSKE was found to be most effective among the plant extracts and was at par with the treatment of Azadirachtin.

KEYWORDS: Tetranychus urticae, Ashwagandha, mite incidence, post treatment population.

INTRODUCTION

The two spotted spider mite (TSSM) *Tetranychus urticae* Koch (Acarina: Tetranychidae) is a major pest of *Withania somnifera* (L.) Dunal, commonly known as Ashwagandha, high value medicinal plant in traditional systems of medicine for centuries[9,15,22]. The rapid developmental rate and high reproductive potential of *T. urticae* allows them to achieve damaging population levels very quickly, so in order to control the population of *T. urticae* most fields are treated with acaricides such as Clofentezine, Hexythiazox, Fenbutain oxide and Tetradifon t[2,13]. There are naturally available cheaper botanical pesticides such as Pyrrolizidine alkaloids (PAs) extracted from *Lithospermum canescens* (Pietrosiuk *et al.*, 2003), *Ocimum sanctum*, Taxus needle extracts[3,4], Neem cake, Neem extracts [6,12,17], NSKE foliar spray[18]. Therefore, economic agriculture suggests that there is an urgent need to develop an effective control measures.

MATERIALS AND METHODS

Present study was conducted at B.B.D. Govt. P.G. College, Chimanpura to determine the comparative efficacy of certain chemical and botanical acaricides against the two-spotted spider mite, *Tetranychus urticae* of major pests occurred on Ashwagandha during the cropping year 2012-2013 and 2013-2014.

General Details of Experiment:

Sowing period : August 2012 to April 2013 and August 2013 to April 2014.

Design : Randomized Block Design

Replications : 3

Totals no. of plots : 27

Size of plot : 2m x 1.6m

Spacing : 20cm x 7.5 cm

Treatments : 9 (including untreated check)

as below:

T0	Name of Pesticides	Concentration
T1	Karanj seed extract (KSK)	5.0
T2	Calotropis leaf extract	5.0
T3	Neem seed kernel extract (NSKE)	5.0
T4	Datura leaf extract	5.0
T5	Azadirachtin	5.0
T6	Ethion 50 EC	0.05
T7	Propargite 57 EC	0.05
T8	Fenazagnite 10EC	0.05
T9	Untreated check	-

Evaluation of Chemicals against the Mite:

The treatment spray was done in the evening hours on the crop with the help of foot sprayer, when the mite population was sufficiently built up. First, one spray was applied, but due to the need arises, second spray was given. The population count of mite incidence were taken one day before and seven, ten and twenty days after the treatment (post treatment population). For finding out the efficacy of pesticides, the percent reduction in mite incidence, based on leaf curling, were subjected to ANOVA after transforming them to angular values. The percent reduction in different treatments was calculated by the formula given by Henderson and Tilton (1955).

$$\text{Percentage reduction} = 1 - \left\{ \frac{T_a \times C_b}{T_b \times C_a} \right\} \times 100$$

Where,

T_a = Number of mites after treatment.

T_b = Number of mites before treatment.

C_a = Number of mites in untreated control after treatment.

RESULTS AND DISCUSSION

Comparative efficacy of certain pesticides against *Tetranychus urticae* infesting Ashwagandha plants already established in the herbal garden of B.B.D. Govt College, Chimanpura, were carried out during cropping year 2012- 2013 and 2013-14. The observations on bioefficacy of certain pesticides against *T. urticae* were recorded after first spray and after second spray and the data obtained are presented here.

Table 1: Bioefficacy of commonly used pesticides against *Tetranychus urticae* on ashwagandha during the cropping year 2012-13

Treatments	Mean mite incidence before treatment	After first spray			After second spray		
		7 DAS	10 DAS	20 DAS	7 DAS	10 DAS	20 DAS
Karanj seed extract (KSK)	1.323 (1.113)*	62.460 (52.223)	70.156 (56.893)	79.680 (63.197)	38.053 (38.050)	32.266 (34.570)	58.370 (49.837)
Calotropis leaf extract	1.330 (1.113)*	63.556 (52.883)	70.416 (57.063)	79.906 (63.367)	38.713 (38.467)	32.623 (34.817)	59.606 (50.537)
Neem seed kernal extract (NSKE)	1.327 (1.12)*	64.610 (53.517)	71.726 (57.887)	80.646 (63.923)	39.036 (38.650)	33.310 (35.240)	62.733 (52.377)
Datura leaf extract	1.317 (1.117)*	63.057 (52.580)	70.090 (56.853)	79.713 (63.220)	38.003 (38.047)	32.990 (35.057)	58.843 (50.117)
Azadirachtin	1.323 (1.117)*	64.360 (53.363)	71.100 (57.503)	80.290 (63.623)	38.923 (38.590)	33.143 (35.127)	60.960 (51.337)
Ethion 50 EC	1.33 (1.117)*	68.886 (56.113)	76.156 (60.800)	85.426 (67.567)	39.760 (39.077)	33.606 (35.413)	66.380 (54.587)
Propargite 57 EC	1.323 (1.113)*	68.536 (55.887)	75.676 (60.443)	84.730 (67.027)	42.563 (40.723)	39.686 (39.050)	71.826 (57.933)
Fenazagnite 10EC	1.310 (1.113)*	68.310 (55.760)	75.430 (60.290)	85.203 (67.373)	42.233 (40.510)	41.200 (39.950)	74.300 (59.560)
Untreated	1.333 (1.117)*	-	-	-	-	-	-
SEM±	(0.0023)	(0.288)	(0.225)	(0.201)	(0.701)	(1.19)	(0.637)
CD at 5%	NS	(0.873)	(0.684)	(0.608)	NS	(3.619)	(1.93)

DAS = Days after spray

values in parentheses are angular transformed values, *= values are under root transformed values.

Table 2: Bioefficacy of commonly used pesticides against *Tetranychus urticae* on ashwagandha during the cropping year 2013-14

Treatments	Mean mite incidence before treatment	After first spray			After second spray		
		7 DAS	10 DAS	20 DAS	7 DAS	10 DAS	20 DAS
Karanj seed extract (KSK)	1.450 (1.203)*	42.003 (40.410)	61.766 (51.803)	73.466 (58.997)	44.536 (41.857)	57.890 (49.567)	70.73 (57.257)
Calotropis leaf extract	1.457 (1.203)*	43.446 (41.240)	62.240 (52.103)	74.590 (59.720)	45.710 (42.533)	58.053 (49.623)	71.296 (57.610)
Neem seed kernal extract (NSKE)	1.453 (1.203)*	46.360 (42.913)	63.770 (53.013)	75.910 (60.623)	46.093 (42.740)	58.720 (50.033)	72.006 (58.060)
Datura leaf extract	1.450 (1.203)*	42.303 (40.567)	61.320 (51.550)	73.546 (59.040)	43.820 (41.437)	58.173 (49.700)	71.163 (57.527)
Azadirachtin	1.460 (1.203)*	44.346 (41.743)	63.190 (52.677)	75.170 (60.113)	45.793 (42.593)	58.526 (49.913)	71.716 (57.883)
Ethion 50 EC	1.460 (1.137)*	52.930 (46.700)	69.360 (56.393)	80.846 (64.040)	50.726 (45.423)	62.136 (52.020)	80.266 (63.630)
Propargite 57 EC	1.453 (1.137)*	50.916 (45.517)	68.076 (55.617)	80.493 (63.797)	54.356 (47.527)	64.066 (53.170)	81.636 (64.627)
Fenazagnite 10EC	1.463 (1.137)*	50.900 (45.517)	67.736 (55.390)	80.526 (63.820)	52.050 (46.183)	66.996 (54.937)	84.773 (67.050)
Untreated	1.463 (1.137)*	-	-	-	-	-	-
SEM±	(0.0351)	(0.294)	(0.204)	(0.18)	(0.444)	(0.307)	(0.438)
CD at 5%	NS	(0.891)	(0.618)	(0.557)	(1.343)	(0.932)	(1.328)

DAS = Days after spray

values in parentheses are angular transformed values, *= values are under root transformed values.

Table 3: Bioefficacy of commonly used pesticides against *Tetranychus urticae* on ashwagandha pooled mean of the cropping year 2012-13 and 2013-14

Treatments	After first spray			After second spray		
	7 DAS	10 DAS	20 DAS	7 DAS	10 DAS	20 DAS
Karanj seed extract (KSK)	52.232 (46.317)	65.961 (54.348)	76.573 (61.097)	41.295 (39.953)	45.078 (42.068)	64.55 (53.547)
Calotropis leaf extract	53.501 (47.062)	66.328 (54.583)	77.248 (61.543)	42.212 (40.500)	45.338 (42.222)	65.451 (54.073)
Neem seed kernal extract (NSKE)	55.485 (48.215)	67.748 (55.450)	78.278 (62.273)	42.565 (40.695)	46.015 (42.637)	67.369 (55.218)
Datura leaf extract	52.680 (46.574)	65.705 (54.202)	76.630 (61.130)	40.912 (39.742)	45.582 (42.378)	65.003 (53.822)
Azadirachtin	54.353 (47.553)	67.145 (55.090)	77.730 (61.868)	42.358 (40.592)	45.835 (42.520)	66.338 (54.610)
Ethion 50 EC	60.908 (51.407)	72.758 (58.600)	83.136 (65.803)	45.243 (42.250)	47.871 (43.717)	73.323 (59.108)
Propargite 57 EC	59.726 (50.702)	71.876 (58.030)	82.612 (65.412)	48.460 (44.125)	51.876 (46.110)	76.731 (61.280)
Fenazagnite 10EC	59.605 (50.638)	71.583 (57.840)	82.865 (65.597)	47.142 (43.347)	54.098 (47.443)	79.536 (63.305)
SEM±	(0.381)	(0.242)	(0.226)	(0.706)	(0.968)	(0.636)
CD at 5%	(1.094)	(0.695)	(0.648)	(2.026)	(2.779)	(1.827)

DAS = Days after spray

values in parentheses are angular transformed values, *= values are under root transformed values.

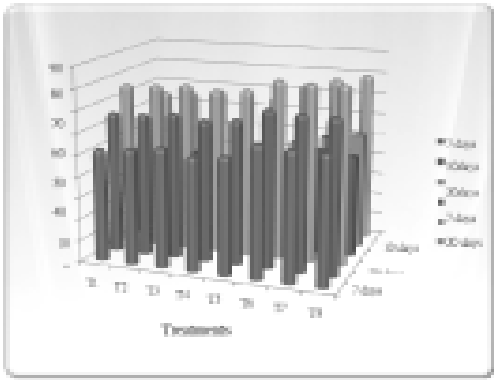

Fig.: Bioefficacy of commonly used pesticides against *Tetranychusurticae* on ashwagandha pooled mean of the cropping year 2012-13 and 2013-14.

Out of eight pesticides evaluated against *T. urticae* infesting ashwagandha, Fenazagnite (.05%) was found to be the most effective in the present study. Propargite (.05%) was found to be at par in effectiveness with Fenazagnite which is in agreement with Agrawal[1]. The next best pesticide was observerd as Dicofol.. Yadav *et al.*[23] studied the efficacy of some insecticide/acaricides against *T. urticae* on brinjal crop at Pili Kothi farm, T.D. College, Jaunpur. The highest average mortality recorded in Dicofol (18.5 EC) was 92.53 percent followed by Dicofol (5 WP) (87.14%), Propargite (86.66%), Abamectin (81.06%), Ethion (77.18%), Phosalone (76.39%), Fenpropathrin (70.59%) and Endosulfan (72.83%). Least mortality was observed in Sulphur (37.18%). Ramaraju (2004) studied the bioefficacy of different acaricides and TNAU neem oils against *T. urticae* on bhindi and found Dicofol 0.05% as the most effective causing 70.56 to 91.85 per cent reduction of mites.In the present study, NSKE was found to be most effective among the plant extracts and was at par with the treatment of Azadirachtin. The present finding is in agreement with Jhala *et al.*[8] who studied various plant extracts for their ovicidal and adulticidal action against red spider mite, *T. cinnabarinus* on okra and found NSKE 5% (W/V) most effective against the mite causing 71.4% mortality. Likewise, Sandnya *et al*. also reported that NSKE (5%) proved to be the best of the treatments conductedso far in maintaining the lower levels of larval population as the population continuously decreased from 1.07 to 0.716 in 14 days as compared to control. Whereas, Kumaran *et al.*[10] also reported that Azadirachtin 1% (Neemazal) was effective against *T. urticae* and recorded the highest per cent reduction of 70.16 and 70.95 over the untreated check in first and second season,respectively. The present findings are in partially confirmation with Singh *et al.*, (2004) who tested the efficacy of Dicofol (0.02%), Propargite (0.08, 0.11 and 0.17%), Monocrotophos (0.05%)and NSKE (5%) against mite *T. cinnabarinus* infesting okra. NSKE and Monocrotophos reduced the population significantly as compared to untreated control but was less effective than Dicofol and Propargite. Whereas, Mani *et al.*[11] reported that acaricides and botanical pesticides were found effective against two spotted spider mite on okra crop and could significantly reduce the mite population. The maximum mortality (89.5%) of adult two spotted spider mite occurred when treated

with Dicofol 18.5%. In case of botanical pesticides, Azadirachtin gave good response and caused up to 50% mortality.Neem extracts are repellant and antifeedant effect on pests[6,12,17]. Srinivasa and Sugeetha[19] conducted a field experiment to evaluate the bioefficacy of certain botanicals/ acaricides against *T. urticae* on okra. Yathiraj and Jagadish[24] tested some plant extracts *viz., Azadirachta indica, Clerodendron inermae, Duranta repens, Eucalyptus globules Leucas aspera* and *Vitex negundo* for their suitability in integrated management of *T.urticae* Singh *et al.*[18] tested the efficacy of Dicofol (0.02%), Propargite (0.08, 0.11 and 0.17%), Monocrotophos (0.05%) and NSKE (5%) against mite, *T. cinnabarinus* infesting okra. Minimum mortality was observed with Propargite 0.17 and 0.11% (49.1 and 53.3 7/3 leaves) and Dicofol (56.7/3 leaves) at seven days after treatment. However, NSKE and Monocrotophos reduced the population significantly as compared to untreated control but was less effective than Dicofol and Propargite. Kumaran *et al.*[10] reported that Azadirachtin 1% (Neemazal) was effective against *T. urticae* and recorded the highest per cent reduction of 70.16 and 70.95 over the untreated check in first and second season respectively. Vinoth Kumar *et al.*[21] evaluated the effect of organic sources of nutrients in combination with foliar application of entomopathogenic fungi and certain botanical pesticides against *T. urticae*.

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