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BIOEFFICACY OF SYNTHETIC BIOPESTICIDES FOR MANAGEMENT OF SAFFLOWER APHID, U. COMPOSITAE

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Abstracts: *The present investigation was conducted in rabi 2014-15 at experimental farm, College of Agriculture, Pune to evaluate the efficacy of biopesticides viz., Metarrhiziumanisopliae @ 1 x 10^8 cfu/ml, Verticilliumlecanii @ 1 x 10^8 cfu/ml, Hingenbet Fruit Extract @ 5 %, Neem Seed Kernel Extract @ 5%, Karange Oil @ 1 % and Ritha Fruit Extract @ 5 % against safflower aphid, Uroleuconcompositae. The infestation of aphid, U. compositae was effectively checked due to spray of Metarhiziumanisopliae (1x10^8cfu/ml) was found to be best treatment which was at par with Verticilliumlecanii (1x10^8cfu/ml) @ 2.5/ha. Next best treatment in the order of statistical significance was Neem Seed Kernel Extract@ 5%, and Hingenbet Fruit Extract @5% which was followed by Karanj oil. Considering the safety of biopesticides to field prevailing predatory coccinellids, almost all were regarded as safe. None of the biopesticides exhibited phytotoxicity to plants. Thus use of biopesticides can form cost effective and biosafetyoption for safflower aphid, Uroleuconcompositae management.*

Keywords: *Bioefficacy, synthetic pesticides, safflower aphid.*

Introduction

Safflower (*Carthamustinctorius*L.)is the most important *rabi*oilseed crop widely grown in India. The cropped area during year 2013-14 under the country reported to be 349.2 thousand ha and with seed production of 128.3 thousand tonnes with an average productivity of 367kg / ha; amongst, Maharashtra state contributed to be 72 per cent (Anonymous, 2014). Although India being the largest producer of safflower in the world, its field productivity per hectare seems to be very low.One of the major limiting factors for the low productivity due to field infestation of the insect pests (80 species). Amongst, the most notorious one is the safflower aphid, *Uroleuconcompositae*that causes yield losses to the extent of 20 to 55 per cent in Maharashtra (Ghorpade, 1995). Both nymphs and adults of the aphid suck the cell sap constantly from leaves and tender shoots of plant, as a result plant becomes yellow and dries in case of severe infestation. Besides, both nymphs and adults excrete honeydew like substance on leaves on which black sooty mould develops and adversely affect the crop physiology intervening plant photosynthetic activity.

Among the various strategies adopted to combat this pest, synthetic insecticides are the first line of defence. Thus the use of biopesticides in agricultural crops isquitlimited.But considering the biosafety of natural enemies, pest resurgence, balance of nature and economics, use of biopesticides is the only strategy. Therefore the efforts has been made in the present investigation to evaluate the efficacy of the biopesticides against safflower aphid, *Uroleuconcompositae*. The biopesticides constituted four botanicals viz., Hingen bet fruit extract @ 87.5 kg / ha, Neem seed kernel extract @ 2.5 kg / ha, Karanjoil @ 1 lit / ha and Ritha fruit extract @ 25 kg / ha; two myco-insecticdes viz., Metarhiziumanisopliae (1x10^8cfu/ml) and Verticilliumlecanii (1x10^8cfu/ml) @ 2.5 and 2.5 kg / ha.

Materials and Methods

A field experiment was conducted at experimental farm, College of Agriculture, Pune to evaluate the efficacy of neo-nicotinoids, organophosphate and IGR against safflower aphid, *Uroleuconcompositae* using SSF-658 cultivar of safflower comprising seven treatments and three replications in randomized block design during the *Rabi* season

during November 2014 to March 2015. The treatments under the constituted four botanicals viz., Hingen bet fruit extract @ 87.5 kg / ha, Neem seed kernel extract @ 2.5 kg / ha, Karanj oil @ 1 lit / ha and Ritha fruit extract @ 25 kg /ha; two myco-insecticdes viz., Metarhiziumanisopliae ($1x10^8$cfu/ml) and Verticilliumlecaniiand the untreated check. Initially, the test treatments were applied when precount population exceeded ETL 38-45 aphids / 5 cm apical twig (Akashe*et al.*1997) on the crop. Five plants were randomly selected and tagged plants to record the observations. The pre treatment counts of surviving aphids occurring on 5 cm apical twig were recorded a day before spray application and post-count populations were recorded at 3rd, 7th and 10th day after each of the spray schedules. The mean coccinellid population count was taken simultaneously with regular observation. The experimental data on population of the aphid and predatory coccinellids were first transformed to their corresponding square root of (X + 0.5) values and then statistically analyzed as a randomized block design (Panse and Sukhatme, 1967).

Table 1: Bioefficacy of biopesticides against *U. compositae*, after first spray

SN	Treatments	Dose	Mean surviving aphid population (5 cm apical twig)				
			Precount	DAS			Mean
				3	7	10	
1	*M. anisopliae*(1 x10^8cfu/ml)	5 g	49.87 (7.10)	45.44 (6.78)	26.40 (5.19)	11.93 (3.53)	27.92 (5.17)
2	*V. lecanii*(1 x10^8 cfu/ml)	5 g	51.73 (7.23)	47.63 (6.94)	27.25 (5.26)	12.45 (3.60)	29.11 (5.27)
3	Hinganbet fruit extract	5 %	54.13 (7.39)	32.44 (5.74)	29.68 (5.49)	37.74 (6.18)	33.29 (5.80)
4	NSE	5 %	52.07 (7.43)	31.34 (5.64)	28.57 (5.39)	36.18 (6.01)	32.03 (5.68)
5	Karanj oil	1 %	53.07 (7.32)	32.05 (5.71)	29.16 (5.45)	37.13 (6.13)	32.78 (5.76)
6	Ritha fruit Extract	5 %	53.79 (7.37)	32.51 (5.75)	31.39 (5.65)	36.98 (6.12)	33.63 (5.84)
7	Untreated Check	—	52.47 (7.28)	55.82 (7.50)	59.01 (7.71)	63.18 (7.98)	59.34 (7.73)
SEm ±			**0.04**	**0.05**	**0.04**	**0.05**	**0.07**
CD at 5%			**NS**	**0.16**	**0.11**	**0.15**	**0.21**
Figure in parenthesis are square root of (X+0.5) transformed values							

Table 2: Bioefficacy of biopesticides against*U. compositae*, after second spray

SN	Treatments	Dose	Mean surviving aphid population (5 cm apical twig)			
			DAS			Mean
			3	7	10	
1	*M. anisopliae*(1 x10^8cfu/ml)	5 g	24.59 (5.01)	11.62 (3.48)	4.85 (2.31)	13.69 (3.60)
2	*V. lecanii*(1 x10^8 cfu/ml)	5 g	25.16 (5.07)	12.59 (3.62)	6.08 (2.56)	14.61 (3.75)
3	Hinganbet fruit extract	5 %	16.13 (4.08)	24.49 (5.00)	39.63 (6.33)	26.75 (5.14)
4	NSE	5 %	15.27 (3.97)	22.87 (4.83)	37.91 (6.20)	25.35 (5.00)
5	Karanj oil	1 %	18.05 (4.31)	25.37 (5.09)	41.09 (6.45)	28.17 (5.28)
6	Ritha fruit Extract	5 %	20.22 (4.55)	27.71 (5.31)	42.33 (6.54)	30.09 (5.47)

7	Untreated Check	–	68.32 (8.30)	73.76 (8.62)	76.22 (8.76)	72.77 (8.56)
SEm ±			**0.04**	**0.07**	**0.08**	**0.09**
CD at 5%			**0.13**	**0.22**	**0.25**	**0.28**
Figure in parenthesis are square root of (X+0.5) transformed values						

Table 3: Bioefficacy of biopesticides against *U. compositae*, after third spray

SN	Treatments	Dose	Mean surviving aphid population (5 cm apical twig)			
			DAS			Mean
			3	7	10	
1	*M. anisopliae*(1 x10^8 cfu/ml)	5 g	22.97 (4.84)	9.91 (3.38)	3.65 (2.04)	12.18 (3.42)
2	*V. lecanii*(1 x10^8 cfu/ml)	5 g	24.13 (4.96)	11.21 (3.57)	4.68 (2.27)	13.34 (3.60)
3	Hinganbet fruit extract	5 %	14.02 (3.81)	23.34 (4.88)	29.45 (5.47)	22.27 (4.72)
4	NSE	5 %	12.59 (3.62)	21.87 (4.73)	28.30 (5.37)	20.92 (4.57)
5	Karanj oil	1 %	15.33 (3.98)	24.61 (5.01)	32.26 (5.72)	24.06 (4.90)
6	Ritha fruit Extract	5 %	17.47 (4.24)	26.11 (5.16)	33.59 (5.84)	25.72 (5.08)
7	Untreated Check	–	78.49 (8.89)	81.04 (9.03)	77.09 (8.81)	78.87 (8.91)
SEm ±			**0.07**	**0.08**	**0.04**	**0.07**
CD at 5%			**0.22**	**0.25**	**0.13**	**0.23**
Figure in parenthesis are square root of (X+0.5) transformed values						

Table 4: Overall bioefficacy of biopesticides against safflower aphids, *U. compositae*

SN	Treatments	Dose	Mean surviving aphid population (5 cm apical twig)			
			DAS			Mean
			3	7	10	
1	*M. anisopliae*(1 x10^8 cfu/ml)	5 g	31.00 (5.54)	15.98 (4.02)	6.81 (2.63)	17.93 (4.06)
2	*V. lecanii*(1 x10^8 cfu/ml)	5 g	32.31 (5.66)	17.02 (4.15)	7.74 (2.81)	19.02 (4.21)
3	Hinganbet fruit extract	5 %	20.86 (4.54)	25.90 (5.12)	35.61 (5.95)	27.46 (5.20)
4	NSE	5 %	19.73 (4.41)	24.44 (4.98)	34.13 (5.90)	26.10 (5.10)
5	Karanj oil	1 %	21.81 (4.67)	26.38 (5.18)	36.83 (6.10)	28.34 (5.32)
6	Ritha fruit Extract	5 %	23.40 (4.85)	28.40 (5.37)	37.63 (6.17)	29.81 (5.46)
7	Untreated Check	–	67.54 (8.23)	71.27 (8.45)	72.16 (8.52)	70.32 (8.40)
SEm ±			**0.05**	**0.06**	**0.06**	**0.07**
CD at 5%			**0.15**	**0.19**	**0.19**	**0.21**
Figure in parenthesis are square root of (X+0.5) transformed values						

Table 6: Influence of biopesticide on the abundance of predatory coccinellid grubs

SN	Treatments	Dose (g/ml/lit)	Mean Surviving coccinellids per plant (Recorded after each spray schedule)				
			Precount	Spray			Mean
				1st	2nd	3rd	
1	*M. anisopliae*(1x10^{8}cfu/ml)	5 g	3.85 (2.08)	4.47 (2.14)	4.22 (2.17)	4.31 (2.19)	4.33 (2.17)
2	*V. lecanii*(1x10^8 cfu/ml)	5 g	3.49 (1.99)	4.04 (2.03)	4.12 (2.15)	4.36 (2.09)	4.17 (2.09)
3	Hinganbet fruit extract	5 %	4.26 (2.18)	3.71 (2.05)	3.28 (1.94)	3.86 (2.09)	3.62 (2.03)
4	NSE	5 %	3.79 (2.07)	3.48 (1.99)	3.62 (2.03)	3.54 (2.11)	3.55 (2.04)
5	Karanj oil	1 %	3.44 (1.99)	3.56 (1.29)	3.02 (1.31)	3.17 (1.25)	3.25 (1.28)
6	RithafruitExtract	5 %	3.94 (2.11)	3.24 (1.93)	3.36 (1.96)	3.13 (1.91)	3.24 (1.93)
7	UntreatedCheck	–	3.67 (2.04)	5.36 (2.43)	5.91 (2.53)	5.16 (2.38)	5.48 (2.45)
SEm ±			**0.05**	**0.05**	**0.04**	**0.03**	**0.04**
CD at 5%			**NS**	**NS**	**NS**	**NS**	**NS**
Figure in parenthesis are square root of (X+0.5) transformed values							

Results and Discuission

The performance of test treatments after first spray based on the mean indicated that treatment with *M. anisopliae*(27.92) was found to be most effective and was at par with *V. Lecanii*(29.11). Next best treatment in the order of statistical significance was NSKE (32.03) which was on par Karanj oil (32.78), Hinganbet fruit extract (33.29) and Ritha fruit extract (33.63) which were statistically in similar range. (Table 1).

The performance of test treatments after second spray based on the mean indicated that treatment with *M. anisopliae*(13.69) was found to be most effective and was at par with *V. Lecanii*(14.61). Next best treatment in the order of statistical significance was NSKE (25.35) which was on par with Hinganbet fruit extract (26.75) and Karanj oil (28.17), followed byRitha fruit extract (30.09) (Table 2).

The performance of test treatments after third spray based on the mean indicated that treatment with *M. anisopliae*(12.18) was found to be most effective and was at par with *V. Lecanii*(13.34). Next best treatment in the order of statistical significance was NSKE (20.92) which was on par with Hinganbet fruit extract (22.27) followed by Karanj oil (24.06) and Ritha fruit extract (25.72) (Table 3).

The overall performance of test treatments based on the mean indicated that treatment with *M. anisopliae* (17.93) was found to be most effective and was at par with *V. Lecanii*(19.02). Next best treatment in the order of statistical significance was NSKE (26.10) which was on par with Hinganbet fruit extract (227.46) followed by Karanj oil (28.34) and Ritha fruit extract (29.81) (Table 4)

The findings of the investigation in respect of overall influence of test biopesticides on the population of predatorycoccinellids in safflower ecosystem based on mean population data revealed that the untreated check The population recorded after each the spray schedules in untreated checkwhich was found statistically in similar range suggesting biopesticides were relatively safe to field prevailingpredatorycoccinellids (Table 5).

Among the biopesticides, *Metarhiziumanisopliae* (1x10^{8}cfu/ml) found to be significantly superior in reducing aphid population. Next promising treatments in the descending order were *V. lecanii*, NSKE, Hingenbet fruit extract, Karanj oil and Ritha fruit extract. The findings in respect of NSKE are in agreement with that reported by the aforesaid

workers. Perusal of literature reveals that there is a paucity of literature on the test aphid species in respect of remaining treatments under the studies.

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