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Bio-efficacy of newer insecticides against safflower aphid, (*Uroleucon compositae* Theobald)

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Abstract
The investigations on chemical management of safflower Aphids, (*Uroleucon compositae* Theobald) on safflower under were conducted on research farm of Oilseed research station Latur, VNMKV, Parbhani during *Rabi* 2016-17. The oil from neem 0.030 percent, *Verticillium leuconi* 0.075 percent resulted incidence of aphid population. And both the treatments are at par with each other. The lowest average aphid population was recorded due to the treatment with Imidacloprid 17.8 SL @ 0.035% followed by pymetrizine 50% WG @ 0.03%, thiamethaxam 25% WG @ 0.005% and Dimethoate 30% EC @ 0.0386%.

Keywords: Aphid, safflower

Introduction
Safflower (*Carthamus tinctorius* L.) commonly known as *kardi* is one of the important Rabi oilseed crops of the country. It is well adapted to dry regions and is the member of family compositae. Safflower has been grown in India since immemorial and is mentioned as *kusumba* in ancient scriptures. Presently in India it is most commonly known as *kardi* in Marathi and *kusum* in Hindi. There are 36 species in the genus *Carthamus*, found in many Parts of world namely Asia, Africa, and mediterrian regions out of these only *Carthamus tinctorious* (L.) (2n =24) is cultivated in India.
India has rich diversity of annual oilseed crops on account of diverse agro-ecological conditions. Nine annual oilseeds, which include seven edible oilseeds, *viz*., groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower and Niger and two non-edible crops, *viz*., castor and linseed, are grown in country. Safflower is a multipurpose crop rich in vitamin A, iron, phosphorus and calcium. The use of this crop is as vegetable and edible oil for human being and as drying oil and dye for trade. Safflower oil which is sold as saffola, is considered to be more preferred oil due to rich poly unsaturated fatty acid (73-79% lenoleic), which help in reducing the blood cholesterol level. The oil is mainly used as edible oil. It is also used in manufacture of paints, varnishes and linoleum. India is in first place in terms of area and production in the world with an area 138 lack ha and production 41 lakh tonnes with productivity 434 kg/ha (2016-2017). Safflower is mainly grown in Maharashtra, Karnataka to some extent in Gujarat and parts of Andhra Pradesh, Madhya Pradesh, Orissa, Bihar (Indu and Singh, 2012) [5]. In India, Maharashtra is highest producer of safflower (63%) from the largest growing area (67%) followed by Karnataka with 32% in production and 275 lakh ha in area (Jadhav *et al*., 2012) [4].
Farmer are presently using organophosphatic insecticide Dimethoate 30 EC @ 0.03% neonicotinoid insecticide Imidacloprid 17.8 SL @ 0.0356% for its control Scanty information was available on management of aphid by newer molecule of botanicals. Keeping this in view a study on bio efficacy of various botanicals and synthetic insecticide against the pest was undertaken under field condition.

Material and Methods
In order to study the bio efficacy of different insecticide against aphid, *U. compositae* The field experiment with Safflower crop using variety Co-1 in *Rabi* 2016 was conducted at Oilseeds Research Station, Latur (Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani) (MS)-India.
The Experiment was conducted in a randomized block design (RBD) with seven treatments including untreated control with three replications. Safflower crop was sown on 25 October,

2016 in a gross plot of 4.00 m x 4.50 m maintaining net plot of 3.4 m x 3.9 m. The row to row distance of 45 cm and plant to plant distance of 20 cm was maintained. The dose of fertilizer at the rate of 25 kg N, 50 kg P and 00 kg K per hectare was given at the time of sowing. The crop was grown under protective irrigation. The details of the insecticides used are presented in Table 1.

Table 1: Details of insecticides used in the experiment for bio-efficacy

Sr No.	Common name	Trade name and formulation
1	*Verticillium lecanii*	Verti star 1.15% WG
2	Neem oil	Azadirachatin 0.03% EC
3	Dimethoate	Rogor 30% EC
4	Imidacloprid	Confidor 17.8% SL
5	Pymetrezine	Endavor 50% WG
6	Thiamethaxam	Evident 25% WG

Result

First spray

The pertained data on aphid population showed non-significant differences among different treatments indicating even distribution of the pest.

The data presented in Table No. 2 revealed significant differences among various test insecticide with respect to aphid population.

One day after first spray significantly minimum aphid population (4.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @ 0.03%, thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium leccanii* 1.15% WG @ 0.0075% both the treatment are at par each other. Highest numbers of aphid / 5 cm twigs (107.00 aphids) were observed in untreated control.

Similarly, At three day after first spray significantaly minimum aphid population (2.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @ 0.03%, thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the treatment were with at par each other. Highest numbers of aphids / 5 cm twig (108.67 aphids) were observed in untreated control.

Table 2: Effect of different insecticides on the population of aphids in safflower (First spray)

Treatments	Mean population of Aphids per twig					
	1 day before Spraying	Days after spraying				
		1	3	7	10	14
Neem oil 0.030 percent	90.33 (9.52)*	62.00 (7.83)	59.00 (7.63)	61.00 (7.76)	65.67 (8.07)	75.67 (8.67)
Verticillium lecanii 0.075 percent	99.00 (9.96)	63.67 (7.96)	60.00 (7.77)	62.67 (7.90)	67.67 (8.21)	78.00 (8.82)
Dimethoate 0.0396 percent	90.00 (9.50)	40.00 (6.36)	37.00 (6.11)	39.00 (6.28)	44.00 (6.66)	54.00 (7.38)
Pymetrizene 0.03 percent.	118.00 (10.88)	14.00 (3.79)	11.00 (3.36)	13.00 (3.65)	18.00 (4.29)	28.06 (5.33)
Imidacloprid 0.0356 percent	104.33 (10.24)	4.00 (2.11)	2.00 (1.47)	4.00 (2.08)	5.00 (2.32)	16.06 (3.93)
Thiamethoxam 0.05 percent	105.33 (10.19)	24.33 (4.96)	21.36 (4.64)	23.33 (4.85)	28.33 (5.35)	38.33 (6.22)
Untreated Control	99.67 (10.00)	107.00 (10.36)	108.67 (10.44)	112.00 (10.16)	115.07 (10.17)	135.67 (11.66)
S.E. ±	0.484	0.286	0.384	0.340	0.320	0.275
C.D. at 5%	NS	0.866	1.166	1.033	0.971	0.833
C.V. (%)	8.789	7.982	11.24	9.572	8.496	6.402

At seventh day after first spray significantly minimum aphid population (4.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @0.03%, thiamethoxam 25% WG @0.005% and dimethoate 30% EC @ 0.0386% the next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecani* 1.15% WG @ 0.0075% both the treatment were at par each other highest number of aphids / 5 cm twig (112.00 aphid) were observed in untreated control.

Similarly, At ten day after first spray significantly minimum aphid population (5.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50%WG @ 0.03% thiamethoxam 25% WG @0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the treatments were with at par each other. Highest numbers of aphids / 5 cm twig (115.07aphid) were observed in untreated control.

Discussion

More or less similar result at fourteen days after first spray, significantly minimum aphid population (16.06/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50%WG @0.03% thiamethoxam25% WG @0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the treatment are at par each other. Highest numbers of aphid / 5 cm twig (135.67aphid) were observed in untreated control.

Second spray

The pertained data on aphid population showed non-significant differences among different treatments indicating even distribution of the pest.

The data presented in Table No.3 revealed significant differences among various test insecticide with respect to aphid population.

At one day after second spray significantly minimum aphid population (9.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @ 0.03% thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii*1.15% WG @ 0.0075% both the treatment are at par each other. Highest numbers of aphid / 5 cm twig (111.67aphid) were observed in untreated control.

Similarly, At three day after second spray significantly minimum aphid population (2.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @ 0.03% thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the treatments are at par each other. Highest numbers of aphid / 5 cm twig (107.67aphid) were observed in untreated control.

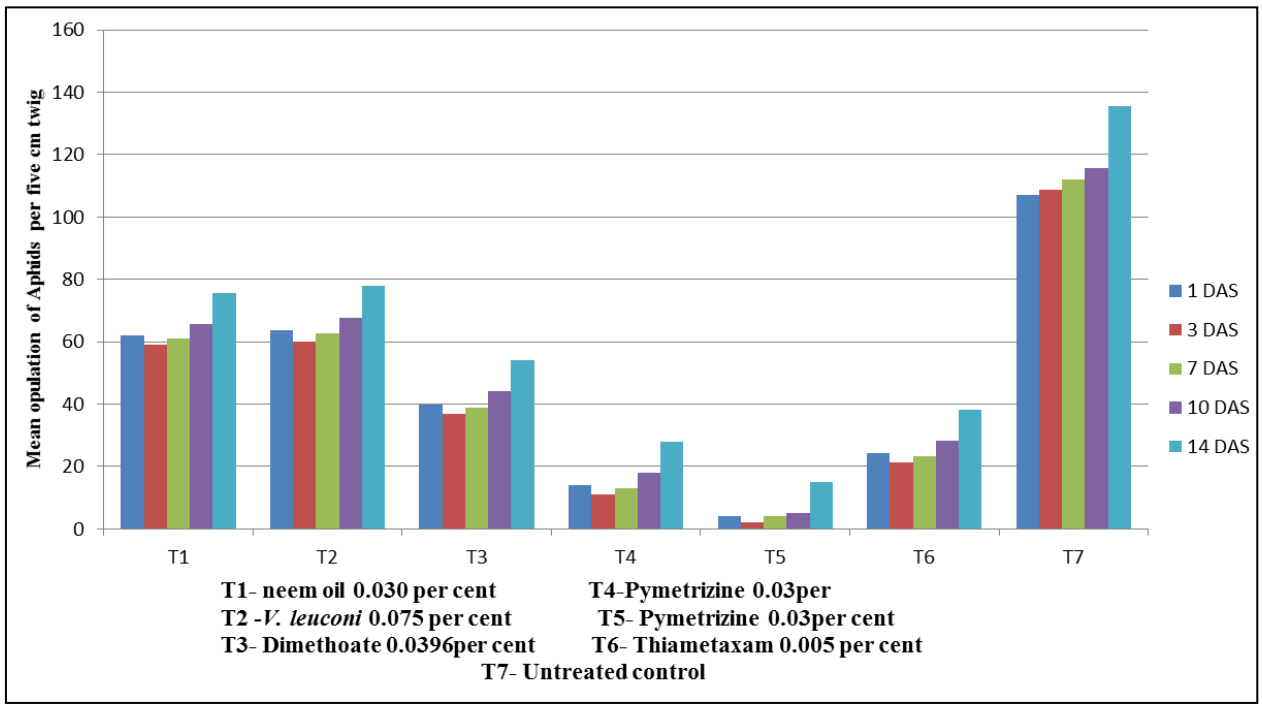

Fig 1: Effect of different insecticides on population on Aphid in Safflower (first spray)

Table 3: Effect of different insecticides on the population of safflower aphid in safflower (Second spray)

Treatments	Mean population of Aphid/twig					
	1 day before Spraying	Days after spraying				
		1	3	7	10	14
Neem oil 0.030 percent	75.67 (8.67)	67.00 (8.25)	58.00 (7.56)	65.33 (8.04)	67.67 (8.19)	72.00 (8.45)
Verticillium lecanii 0.075 percent	78.00 (8.82)	68.67 (8.27)	59.61 (7.70)	67.00 (8.17)	69.67 (8.33)	74.33 (8.61)
Dimethoate 0.0396 percent	54.00 (7.38)	45.00 (6.74)	36.00 (6.03)	43.33 (6.61)	46.00 (6.81)	51.00 (7.17)
Pymetrizene 0.03 percent	28.06 (5.33)	19.00 (4.40)	10.00 (3.20)	16.67 (4.12)	20.00 (4.52)	25.67 (5.10)
Imidacloprid 0.0356 percent	16.06 (3.93)	9.00 (3.08)	2.00 (1.56)	8.00 (2.90)	7.00 (2.72)	11.67 (3.48)
Thiamethoxam 0.05 percent	38.33 (6.22)	29.33 (5.44)	20.33 (4.53)	20.67 (5.58)	30.33 (5.53)	35.00 (5.97)
Untreated Control	136.67 (11.66)	111.67 (10.69)	107.67 (10.14)	117.00 (10.83)	117.67 (10.86)	117.67 (10.86)
S.E. ±	0.275	0.271	0.322	0.331	0.306	0.283
C.D. at 5%	NS	0.821	0.977	1.003	0.927	0.858
C.V. (%)	6.402	7.031	9.524	8.668	7.890	6.910

At seven day after second spray significantly minimum aphid population (8.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @ 0.03% thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the treatment are at par each other. Highest numbers of aphid / 5 cm twig (117.00 aphids) were observed in untreated control.

Similarly, at ten day after second spray significantly minimum aphid population (7.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50%WG @ 0.03% thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the

treatments are at par each other. Highest numbers of aphid / 5 cm twig (117.67 aphids) were observed in untreated control.
At fourteen day after second spray significantly minimum aphid population (11.67.00/twig) was recorded from the plot treated with imidacloprid 17.8 SL @ 0.0356% followed by pymetrizine 50% WG @ 0.03% thiamethoxam 25% WG @ 0.005% and dimethoate 30% EC @ 0.0386%. The next best treatments were neem oil 0.030% @ 300 ppm and *Verticillium lecanii* 1.15% WG @ 0.0075% both the treatment are at par each other. Highest numbers of aphid / 5 cm twig (117.67 aphids) were observed in untreated control.

Discussion

Earlier work, Akashe *et al*. (2009) stated that, imidacloprid @ 0.0045% found most effective against Safflower aphid where significance efficacy of treatment imidacloprid @ 0.0045% was found effective for reduction of *Uroleucon compositae* population. Similarly, Akashe *et al*. (2008) result observed that, there was significant efficacy of treatments imidacloprid @ 0.004% and Dimethoate @ 0.03% for reduction of *Uroleucon compositae* population. Akashe *et al*. (2013) reported that higher efficacy of imidacloprid @ 0.0045% and thiamethoxam @ 0.005% and acetamiprid 0.004% and neem oil against Safflower aphid the above finding reported by the worker strongly support present study.

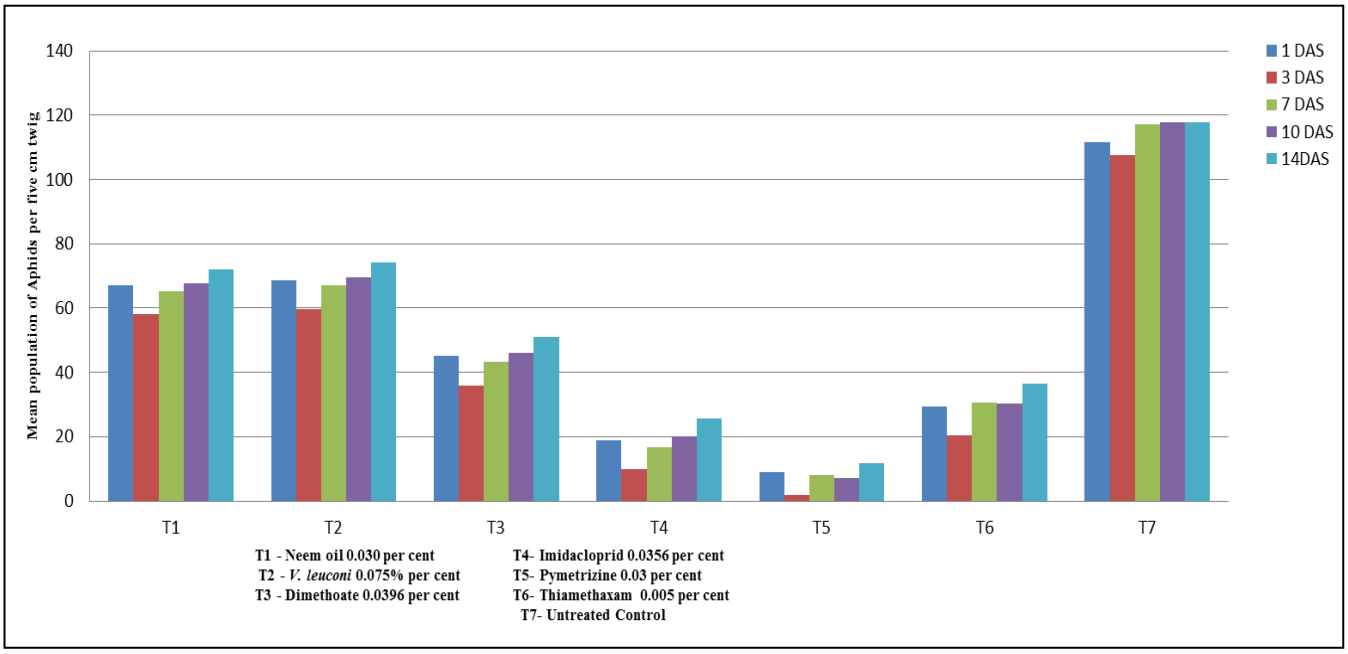

Fig 2: Effect of different insecticides on population of Aphids on safflower (second spray)

Conclusion

It is revealed from the experiment that all the insecticidal treatment imidacloprid 0.0356%, pymetrizine 0.03%, thiamethoxam 0.05%, dimethoate 0.0396%, neem oil 300 ppm, *Verticillium leccanii* 0.0075%, evaluated against aphid were superior in reducing the aphid population over control.

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