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Research Note

Efficiency of *Endaphis aphidimyza* (Shivpuje and Raodeo) (Cecidomyiidae: Diptera) against aphids on growth attributes and yields of safflower

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ABSTRACT: Safflower, *Carthamus tinctorius* L. is an important oil-seed crop of Marathwada region of Maharashtra containing 78% linoleic acid, which is reported to reduce cholesterol level in the blood. This crop is being heavily infested by safflower aphids, *Uroleucon sonchi* (L.), *Uroleucon compositae* (Theo.) and *Uroleucon gobonis* (Mat.). *Endaphis aphidimyza* (Shivpuje and Raodeo) is an endoparasitoid of *Uroleucon* spp. on safflower. The larvae feed by sucking body content of host and completes their all-larval instars. The present work was carried out in Agricultural Research Farm of Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya (MGCGV), Chitrakoot, District Satna (MP) during *rabi* season of 2008-2009 and 2009-2010. Safflower cultivar PBNS-40 was sown in random block design, different parameters of plant growth and yield were recorded. Release of 694444 number of females per ha recorded good plant height, primary and secondary branches, yield, seed weight, and highest number of seeds per capitulum at the aphid population of below 50 per plant.

KEY WORDS: Endoparasitoid, Cecidomyiid, *Carthamus tinctorious*, growth attributes, yield

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Safflower, *Carthamus tinctorious* (Linn.) with an oil content of 32% is an important oilseed crop of *rabi* season cultivated under rain fed condition. The safflower oil has therapeutic value in reducing blood cholesterol level, dilate arteries, reduces hypertension and increases blood flow. It is also used in infant foods and liquid nutrition formulations (Anonymous, 2003). Aphids, *Uroleucon sonchi* (Linn.), *Uroleucon compositae* (Theo.), *Uroleucon carthami* (Linn.) and *Uroleucon gobonis* (Mat.) infest the crop right from vegetative to pod stage. The maximum damage to the safflower crop is noticed at the flowering stage. Yield loss varying from 35% to 56% (Bhumannavar *et al.,* 1979; Painkra *et al.,* 2003); 55% to 60% (Suryawanshi and Pawar, 1980) and 55.9% to 67.7% (Basavangound *et al.,* 1981) were attributed to the aphid infestation. Insecticides like dimethoate, phosphamidon, thiamethoxam, and acetamiprid had been recommended for the control of *Uroleucon* spp. (Dange *et al.,* 1997; Neharkar *et al.*, 2003; Jeevankamal, 2002 and Baburao, 2008). However, considering the biosafety of these insecticides to the pollinators, natural enemies, human being and environmental safety to the crop-eco-system (Zheng and Wang, 1987; Melendez *et al*., 1990; Shukla *et al.,* 1990, 1994 and Chandra *et al.,* 2009) alternatives are being worked out.

Biological control is a safe method of managing *Uroleucon* spp. below the economic threshold level and aphidophagous endoparasitoid, *Endaphis aphidimyza* (Cecidomidae: Diptera) was recorded by Shivpuje and Raodeo (1985) in India. Grover and Vasantika (1988) studied the biology and concluded that *E. aphidimyza* could be used as a biological control agent of *Uroleucon* spp. Upto 46% parasitization of *E. aphidimyza* was observed by earlier workers (Shivpuje and Raodeo, 1985; Grover *et al.,* 1991; Narangalkar *et al.,* 1992; Zanwar and Jadhav, 2003). Present study deals with the efficiency of *E. aphidimyza* against *Uroleucon* spp. on safflower crop.

The experiments were laid and conducted at Agriculture Farm, Rajaula, M.G.C.G.V., Chitrakoot, Satna to study the efficiency of *E. aphidimyza* against *Uroleucon* spp. on the attributes and seed yield of safflower crop. The experiment was designed in factorial randomized block design with nine treatments and three replications including control. Safflower variety

PBNS- 40 was sown in *rabi* season of 2009 and 2010 and all the recommended agronomic practices were adopted to raise a the crop. The plot size was 5.00m x 3.15m with a space of 0.20m between plants. The experiment consisted of two levels of aphid population (less than 50 and more than 50 aphids per plant) and four releases of *E. aphidimyza* @115740, 231481, 462963 and 694444 female *E. aphidimyza* per hectare. Three middle rows of each plot were covered by the 1.8m x 1.2m (2.16m^2) organdy net. The mated female flies were released as per treatment combinations i.e. **T_0** – Control**,** **T_1** – A_1N_1, **T_2** – A_1N_2, **T_3** – A_1N_3, **T_4** – A_1N_4, **T_5** – A_2N_1, **T_6** – A_2N_2, **T_7** – A_2N_3, **T_8** – A_2N_4 (whereas, **A_1** – less than 50 aphids per plant, **A_2** – more than 50 aphids per plant, N1, N2, N3 and N4 - corresponded to release of 115740, 231481, 462963 and 694444 female *E. aphidimyza* per hectare, respectively. Five plants were randomly tagged from each treatment, data of plant growth attributes (plant height (cm), number of primary branches, number of secondary branches, number of capitula per plant, number of seeds per capitulum, weight of 100 seed (g) and seed yield (kg/ha) were observed. The data was analyzed statistically and valid conclusions were drawn after applying test of significance as suggested by Panse and Sukhatme, 1965.

Data of Table 1 indicates that the maximum plant height 149.29 cm was observed in T_4 (A_1N_4) treatment while minimum plant height was recorded (69.39 cm) from the control. Significant maximum number of primary branches per plant (23.00) and secondary branches (95.46) were recorded in T_4 (A_1N_4) treatment. The lowest number of secondary branches (3.60) per plant were in control plot.

Table 1. Efficiency of *Endaphis aphidimyza* against aphids on growth attributes and yield of safflower crop

Treatments	Effect of the releasing of female *E. aphidimyza* flies in plant growth attributes and seed yield safflower crop						
	Plant height per plant (cm)	No. of primary branches per plant	No. of secondary branches per plant	No. of capitula per plant	No. of seeds per capitulum	Weight of 100 seed (g)	Seed yield (kg/ha)
T_0 (Control)	69.39	3.06	3.60	3.60	4.80	2.05	510.80
T_1 (A_1N_1)	101.85	5.26	7.80	11.00	11.86	3.20	770.06
T_2 (A_1N_2)	102.78	7.46	12.00	19.13	14.26	4.31	1033.95
T_3 (A_1N_3)	122.23	13.60	59.00	72.60	24.00	5.66	1281.32
T_4 (A_1N_4)	149.29	23.00	95.46	118.46	31.26	6.94	1418.21
T_5 (A_2N_1)	71.36	2.86	5.20	8.06	8.40	2.95	611.10
T_6 (A_2N_2)	84.01	4.00	8.13	12.13	9.13	3.73	742.53
T_7 (A_2N_3)	116.76	9.20	19.73	28.93	12.33	4.01	1046.30
T_8 (A_2N_4)	125.59	15.00	35.33	50.53	15.88	4.51	1183.62
S.E (d) for A	2.12	0.23	0.51	0.72	0.41	0.19	27.66
C.D. (P = 0.05) for A	4.48	0.49	1.09	1.52	0.87	0.41	58.64
S.E (d) for N	2.99	0.33	0.72	1.01	0.58	0.27	39.12
C.D. (P = 0.05) for N	6.34	0.70	1.54	2.16	1.24	0.58	82.94
S.E (d) for AxN	4.23	0.47	1.03	1.44	0.83	0.39	55.33
C.D. (P = 0.05) for AxN	8.97	0.99	2.18	3.05	1.75	0.83	117.29
S.E (d) for Control Vs Treatment	3.17	0.35	0.77	1.08	0.62	0.29	41.49
C.D. (P = 0.05) for Control Vs Treatment	6.72	0.74	1.64	2.29	1.31	0.62	87.95

A- Aphid's population, N- Number of female *E. aphidimyza* flies

The maximum capitula (118.46 per plant) were observed in T_4 (A_1N_4) treatment in comparison to the control (3.60 capitula per plant). The maximum number of seeds per capitulum (31.26) was observed in T_4 (A_1N_4) treated plot. The lowest seeds per capitulum (4.80) were recorded from the control plot. The maximum weight of 100 seed (6.94g) was observed in T_4 (A_1N_4) treated plot while lowest weight of 100 seed (2.05g) was noted in untreated plot.

The greatest seed yield (1418.21 kg/ha) was also obtained in T_4 (A_1N_4) treatment and the lowest seed yield (510 kg/ha) was obtained from the untreated plot. Efficiency of any bio-agent against aphids on growth attributes and seed yield of safflower was not reported earlier, hence, this is the first attempt to assess the efficiency of *E. aphidimyza* against aphids on growth attributes and yield of safflower.

Dange *et al*. (1997) and Neharkar *et al*. (2003) recorded the maximum plant height, number of primary branches, number of secondary branches, number of capitula per plant, number of seeds per capitulum and weight of 100 seed from the plots treated with dimethoate 0.03% and phosphamidon 0.02% respectively, while Jeevankamal (2002) and Baburao (2008) obtained highest number of capitula per plant, number of seeds per capitulum, and seed weight from the thiamethoxam 0.005% and acetamiprid 0.004% treated plots respectively. Charati and Pawar (1998) recorded maximum seed yield (405 kg/ha) in MIPC 50% WP @ 0.07% treated plots, whereas, Mallapur *et al*. (2001) reported the highest seed yield (1470 kg/ha) treated with dimethoate (30 EC). Neharkar *et al*. (2003) noted 1428 kg/ha highest seed yield from dimethoate (0.03%) treated plots, while Baburao (2008) obtained maximum seed yield (1555 kg/ha) from thiamethoxam (0.005%) treated plots method. The results of present investigations are slightly lesser than the chemical treatments reported, and could be attributed to high incidence of *Uroleucon* spp. in certain months. The results showed prospects of using *E. aphidimyza* as an efficient biocontrol agent for the management of *Uroleucon* spp. on safflower.

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