Short Communication

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Population dynamics of lepidopteran pests on Egyptian clover and bioefficacy of reduced risk insecticides for their management

G. K. Taggar*[1] and Ramesh Arora[2]

[1]Department of Plant Breeding & Genetics, [2]Department of Entomology, Punjab Agricultural University, Ludhiana- 141 004, India
*Corresponding author e-mail: gauravtaggar@pau.edu
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Abstract

Population dynamics of *Helicoverpa armigera* (Hubner) and *Trichoplusia orichalcea* infesting Egyptian clover showed peak population of *H. armigera* on April 30 in var. BL-10 and *T. orichalcea* on April 9 in var. BL-42. The bio-efficacy of reduced risk insecticides *viz*., chlorantraniliprole 18.5 SL @ 125 ml/ha and flubendiamide 480 SC @ 100 ml/ha significantly reduced *T. orichalcea* and *H. armigera* at 2nd and 7th days of spray and recorded higher seed yield.

Keywords: Egyptian clover, *Helicoverpa armigera*, Population dynamics, *Trichoplusia orichalcea*

Helicoverpa armigera Hubn. (Noctuidae: Lepidoptera) is a key pest on the seed production of Egyptian clover (Arora and Dhawan, 2010). Management of this pest led to a gain of 12.3-29.5 per cent in the seed yield of various Egyptian clover genotypes (Arora, 2012). The larvae feed mostly on apical portion of the inflorescence and destroy it partially or wholly and can reduce seed crop yield drastically (Arora and Dhawan, 2010). Besides *H. armigera*, cabbage semilooper, *Trichoplusia orichalcea* Fabr. has also appeared as an another important lepidopteran pest causing damage to the tune of 25-50 per cent in Egyptian clover (Dhaliwal, 1998).

Two field experiments were conducted during the rabi 2012-13 at the Forage Research Farm, PAU, Ludhiana. The population dynamics of *H. armigera* and *T. orichalcea* were studied during the flowering and fruiting stage of BL-10, BL-1 and BL-42 varieties of Egyptian clover. All the three varieties were raised with the recommended package of practices in unreplicated blocks of 10m x 10m (Anonymous, 2012). Weekly observations on pest population per meter row length were recorded from three randomly selected spots in each block. The bioefficacy trial comprised of var. BL-10 was sown in a randomized block design with ten treatments including untreated control and replicated thrice with a net plot size of 15 m2. Foliar sprays of chlorantraniliprole 18.5 SL @ 62.5 ml, 92.5 ml and 125 ml/ha, flubendiamide 480 SC @ 50, 75 and 100 ml/ha and novaluron 10 EC @ 187.5, 250 and 312.5 ml/ha were evaluated against *H. armigera* and *T. orichalcea* along with an untreated control. After the last cutting, the crop was regularly observed for the infestation of both the lepidopteran pests at 3-4 day intervals. On the appearance of the pest, the crop was subjected to insecticidal spray. The spray was conducted in the evening hours using 250 l/ha of spray fluid with the help of a manually operated knapsack sprayer. The pre and post treatment larval population of both the pests were recorded by counting the number of larvae per meter row length. The observations before spray, 2nd and 7th days after spray were taken at three randomly selected spots in each treatment. The crop was harvested plot-wise and seed yield was recorded after threshing and cleaning. An avoidable loss in the seed yield due to *H. armigera* was worked out following Pradhan (1964) and net returns were also computed on per hectare basis. The data was pooled and analysed statistically.

The studies on population dynamics of both the lepidopteran insect pests during the flowering and fruiting phase of three different varieties of Egyptian clover revealed that population of *T. orichalcea* gradually increased during the second and third week of April with a peak on April 9th on var. BL-42 (Fig. 1). Thereafter, the population started declining on all the varieties of Egyptian clover and found almost nil in the third week of May. However, in case of *H. armigera*, the population started to rise in the month of April on all the three varieties (Fig. 2). The highest population of *H. armigera* was recorded during April 30th on var. BL-10. Thereafter, the pest population showed a declining trend on all the varieties. Arora *et al*. (2011) studied the population dynamics and seed yield losses by *H. armigera* on popular genotypes of forage legumes, particularly Egyptian clover and observed that *H. armigera*

Table 1. Bioefficacy of reduced risk insecticides against lepidopteran pests of Egyptian clover

Treatment	Dose per ha	Mean no. of *H. armigera* larvae per meter row length			Mean no. of *T. orichalcea* larvae per meter row length			Seed yield (kg/ha)	Avoidable losses (%)	*Net returns over control (Rs/ha)
		BS	2 DAS	7 DAS	BS	2 DAS	7 DAS			
Chorantraniliprole 18.5 SC	62.5 ml	3.00	2.66 (1.91)	1.66 (1.62)	4.66	3.33 (2.07)	2.33 (1.82)	718	51.1	72,297
Chorantraniliprole 18.5 SC	92.5 ml	3.00	1.66 (1.62)	1.00 (1.41)	5.00	2.33 (1.82)	1.33 (1.52)	767	54.2	81,683
Chorantraniliprole 18.5 SC	125 ml	3.00	0.33 (1.13)	0.00 (1.00)	4.66	0.00 (1.00)	0.00 (1.00)	906	61.3	1,09,044
Flubendiamide 480 SC	50 ml	4.00	3.00 (2.00)	2.00 (1.73)	5.00	4.33 (2.30)	3.33 (2.07)	667	47.4	62,200
Flubendiamide 480 SC	75 ml	3.66	2.00 (1.73)	1.66 (1.62)	5.00	2.00 (1.73)	1.33 (1.52)	740	52.6	76,425
Flubendiamide 480 SC	100 ml	3.00	0.33 (1.13)	0.00 (1.00)	5.33	0.33 (1.13)	0.00 (1.00)	849	58.2	97,850
Novaluron 10 EC	187.5 ml	3.00	2.66 (1.91)	1.66 (1.60)	5.00	3.00 (2.00)	1.66 (1.62)	553	36.6	39,426
Novaluron 10 EC	250 ml	3.33	2.33 (1.82)	1.00 (1.38)	4.66	2.00 (1.71)	1.33 (1.52)	640	45.2	56,585
Novaluron 10 EC	312.5 ml	3.33	0.33 (1.13)	0.33 (1.13)	5.00	0.66 (1.27)	0.33 (1.13)	713	50.8	72,255
Untreated control	-	3.33	4.66 (2.37)	5.33 (2.51)	5.33	6.33 (2.70)	7.33 (2.87)	351	-	-
CD (5%)		NS	(0.30)	(0.33)	NS	(0.29)	(0.28)	119	-	-

Figures in parentheses are the transformed n+1 values; BS: Before spray; DAS: Days after spray; NS: Non-significant

*Price of insecticides (Rs/lit.): Chorantraniliprole 18.5 SC @ 13,650, Flubendiamide 480 SC @ 15000/-, Novaluron 10 EC @ 3860/-
Market price of Egyptian clover seed: Rs. 200/kg; Daily paid wages: Rs.250/- per day

build up started in 16th standard meteorological week (SMW) and reached at its peak in 19th SMW, and declined to the lowest level in 25th SMW.

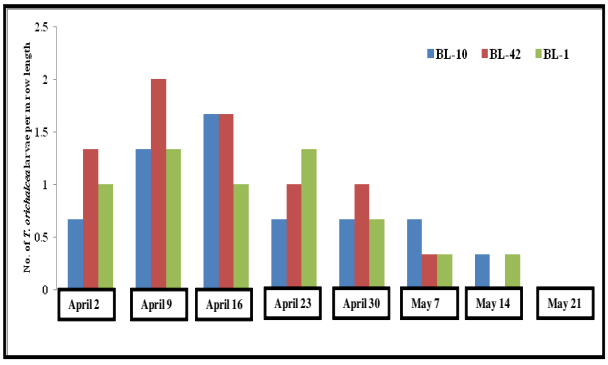

Fig. 1. Population dynamics of *T. orichalea* on different varieties of Egyptian clover

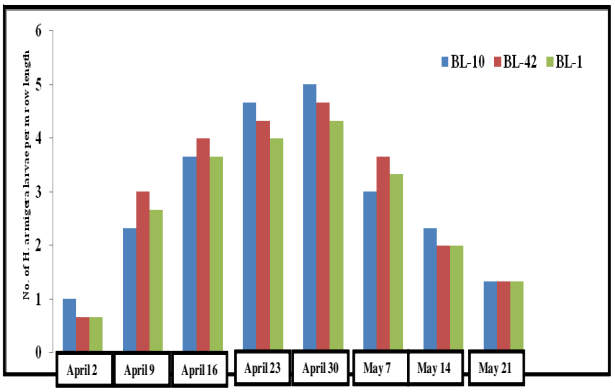

Fig. 2. Population dynamics of *H. armigera* on different varieties of Egyptian clover

A perusal of data in table 1 indicates significant variation in the larval population of both the lepidopteran pests during the post-treatment periods at 2nd and 7th DAS. All the insecticides significantly reduced the population of both the pests as compared to untreated control. The results revealed that chlorantraniliprole 18.5 SL @ 125 ml/ha, flubendiamide 480 SC @ 100 ml/ha and novaluron 10 EC @ 312.5 ml/ha recorded lowest number of *T. orichalcea* as well as *H. armigera* larvae per m row length both at 2nd and 7th days after spray (Table 1). The highest seed yield 906.6 kg/ha was obtained in chlorantraniliprole 18.5 SL @ 125 ml/ha followed by flubendiamide 480 SC @ 100 ml/ha (839.9 kg/ha). The avoidable yield losses prevented by the application of insecticidal treatments ranged from 36.6 to 61.3 per cent, the highest being in the treatment comprising chlorantraniliprole 18.5 SL @ 125 ml/ha (61.3%), followed by 58.2 per cent in flubendiamide 480 SC @ 100 ml/ha (58.2%). Dhaliwal and Sidhu (1990) reported seed yield losses in Egyptian clover up to 70-80 per cent. Arora *et al*. (2011) reported that the avoidable yield losses were highest in Egyptian clover genotypes BL 10 (72.51 - 74.52%) followed by BL 42 (69.53-71.83%). Treatment comprising chlorantraniliprole 18.5 SL @ 125 ml/ha gave the highest net returns of Rs. 1,09,044/- per ha, followed by flubendiamide 480 SC @ 100 ml/ha (Rs 97,850/- per ha).

Chlorantraniliprole has proved to be very effective against *H. armigera* in cotton (Prasad and Rao, 2010), tomato (Kuhar *et al*., 2010). Flubendiamide has been reported to be highly effective against *H. armigera* infesting chillies (Tatagar *et al*., 2009), tomato (Ameta and Bunker, 2007) and pigeonpea (Ameta e*t al*., 2011). Similar results were also obtained by Lakshminarayana and Rajashri (2006) who reported that flubendiamide 20 WG was highly effective against, *H. armigera* on cotton. Masanori *et al*. (2005) reported that flubendiamide is highly effective against lepidopteran insects. The selectivity of both of these new molecules to non-target arthropods and helping in conservation natural parasitoids, predators and pollinators, make them an excellent component of the integrated pest management (IPM) programmes.

It is concluded that chlorantraniliprole 18.5 SL @ 125 ml/ha and flubendiamide 480 SC @ 100 ml/ha recorded higher seed yield, net returns as well as prevented avoidable losses due to both the lepidopteran pests in Egyptian clover as compared to other treatments, indicating their overall superiority.

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