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Efficacy of Synthetic Pheromone for the Control of *Helicoverpa armigera* in Tomato

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Abstract: Pheromone traps against American Bollworm (*Helicoverpa armigera*, Lepidoptera: Noctuidae) were installed at 01 m from the ground in tomato (*Lycopersicun esculentum*, Solanaceae). First moth, in the field was appeared during 04th and 03rd weeks of transplantations each year (1995-96) respectively. Maximum mean number of moths (11 and 09) were captured during 11th and 08th weeks of transplantations, when the average temperatures were 28.38 and 26.30°C, each year respectively. A total mean number of 63 and 45 moths were captured during the two years of study respectively. The adult pest remained in the field till the crop was uprooted. The study strongly recommends the use of pheromones than pesticides against the said pest in tomato.

Key words: *H. armigera*, tomato, pheromone traps

Introduction

Tomato (*L. esculentum*) is the most famous horticultural crop, grown over an area of 6350 ha and produces 100261 tons/annum, in the province of Balochistan, Pakistan. About 15789 kg ha^{-1} is the maximum yielding capacity of the crop in the province (Anonymous, 1998-99). *H. armigera* (American Bollworm, ABW) is a serious pest of the crop (Bouchard *et al.*, 1992; Alaux 1995; Lal and Lal, 1996; Pinto *et al.*, 1997). By controlling this pest the growing capacity of the crop could be maximized. Pesticides are the only measures used for the control of the insect pests by the farmers of Balochistan (Malik *et al.*, 2002a). The moth has already got some resistance against pesticides (Alaux, 1995). Sauphanor and Delorme (1996) suggested that the insect resistance could be avoided by the limited use and replacement of pesticides with other control measures. Malik and Ali (2002) reported pheromone traps as a good tool to monitor and control lepidopterous pests. Knight (1995) found pheromone traps more economical than other controlling techniques. Farmers of Balochistan are mostly illiterate (Shah *et al.*, 2002) and have no idea of pest monitoring and use of alternate techniques to replace pesticides for the control of insect pests. Keeping in view, the study was designed to evaluate the efficacy of the synthetic pheromone to determine the population dynamics and control of *H. armigera* in tomato.

Materials and Methods

The study was conducted during 1995-96 in a private tomato farm, Sheikh Mandah, Quetta, Balochistan, Pakistan. The farm was of 0.81 ha. and was surrounded by apple (*Pyrus malus*), apricot (*Prunus armeniaca*), peach (*Pyrus persica*) and plum (*Prunus domestica*) orchards. The orchards were regularly sprayed by pesticides. No or negligible rainfall was recorded during 1995 while an average of 9.28 mm rainfall was observed during 1996. Meteorological data was obtained by the Meteorological Station, Agriculture Research Institute, Quetta. Ridges, 01 meter wide, 30 cm high and 75 cm apart were well prepared in April during each year (1995-96). Fertilizer and farm yard manure were applied before transplantations. Tomato variety Roma was transplanted (at 4-6 leaves stage) on both sides of the ridges at a distance of 30 cm on 22nd April and 15th April each year respectively. Since Roma is a dwarf variety thus no supporting structure was required. The crop was irrigated after each 10 days by tube-well. After a week of transplantation five green coloured plastic traps (on each corner and one in the center of the field) each with a pheromone capsule (of unknown formulation) were installed at 01 m from the ground. The capsules were replaced after every 30 days (Malik and Ali, 2002) till the crop was uprooted on 29th August each year. Data for the moth captured was collected weekly. Means for the number of moths captured/week/05 traps were calculated.

Results and Discussion

First moth appeared in the field in 04th and 03rd weeks of transplantations, during 1995-96 respectively (Table 1). Maximum mean number of moths (11 and 09) were captured during 11th (01/07 to 07/07) and 08th (03/06 to 09/06) weeks of transplantations, when the average

Table 1: Mean number of ABW captured at Sheikh Mandah, Quetta, Balochistan, Pakistan during 1995-96

1995			1996		
Dates	[1]Temperature (°C)	[2]Population (Mean No.)	Dates	Temperature (°C)	Population (Mean No.)
22/04 to 28/04	18.46	--	15/04 to 21/04	17.80	--
29/04 to 05/05	17.78	00	22/04 to 28/04	20.12	00
06/05 to 12/05	23.94	00	29/04 to 05/05	17.08	01
13/05 to 19/05	21.64	01	06/05 to 12/05	19.63	02
20/05 to 26/05	18.81	02	13/05 to 19/05	20.16	02
27/05 to 02/06	20.85	05	20/05 to 26/05	20.68	06
03/06 to 09/06	23.33	08	27/05 to 02/06	23.33	08
10/06 to 16/06	26.38	10	03/06 to 09/06	26.30	09
17/06 to 23/06	27.35	02	10/06 to 16/06	25.78	06
24/06 to 30/06	26.25	03	17/06 to 23/06	23.58	02
01/07 to 07/07	28.38	11	24/06 to 30/06	26.07	05
08/07 to 14/07	29.68	07	01/07 to 07/07	25.83	01
15/07 to 21/07	26.22	09	08/07 to 14/07	26.86	01
22/07 to 28/07	24.76	02	15/07 to 21/07	25.24	01
29/07 to 04/08	27.31	03	22/07 to 28/07	27.11	00
----------	-----	--	29/07 to 04/08	27.56	01
	Total	63		Total	45

[1]Temperature is the average of seven days readings. 2: Mean number of moths (captured during a week) were calculated from all the pheromone traps (n=05) installed in farm and were rounded to the nearest whole number.

temperatures were 28.38 and 26.30°C, each year respectively. A total mean number of 63 and 45 moths were captured during the two years of study respectively. Apple is a good host of the said pest (Malik *et al.,* 2002b) and the experimental field was surrounded by apple which might be the reason of this heavy population in tomato. Low infestation was observed during 1996 than 1995. Temperature has direct relations with insect development and distribution (Sharma and Chaudhary, 1988; Marco *et al*., 1997; Malik, 2001). High temperature was observed in late spring and summer, during 1995 (Table 1). The presence of adult moths, in the field, was observed till the end of the crop (04 August 1995-96) which means that the moth could have more generations, depending on the availability of the host. Baloch (1989) reported 4-7 generations of the pest in a year. ABW is a polyphagous insect pest (Baloch, 1989; Baloch *et al.,* 2000a). *H. armigera* prefers cotton than other hosts (Baloch *et al.,* 2000b). No cotton is grown in the up lands of Balochistan. Further studies to discover other hosts in the valley are suggested. The population of the moth was greater at the corners than in the central areas of the field, that confirms the lazy movement of the pest (Malik *et al*., 2002b). Humidity is usually higher in the center of the cultivated field which effects to the availability of oxygen adversely. Adequate amount of oxygen is necessary to live. High humidity has adverse effects on the bio activities of *H. armigera* (Sharma and Chaudhary, 1988). The results of this study strongly suggest the use of pheromones than pesticides to control the said pest in the crop. Pesticides affect the efficiency of the pheromones (Malik and Ali, 2002) and also cause insects resistance (Alaux 1995; Sauphanor and Delorme 1996).

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