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Pheromone Technology for the Control of *Helicoverpa armigera* in Okra

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Abstract: Pheromone traps against American Bollworm (*Helicoverpa armigera*, Lepidoptera: Noctuidae) were installed at 1.5 m from the ground in okra (*Abelmoschus esculentus* L.). First moth, in the field, was appeared during 7th and 6th weeks of traps installation each year 1995 and 1996, respectively. Maximum mean numbers of moths (11th and 7th) were captured during 9th and 7th weeks of traps installation, when the average temperatures were 28.38 and 25.78°C each year, respectively. A total mean number of 24 and 17 moths were captured during the two years of study respectively. The adult pest remained in the field till 11th and 4th August 1995 and 1996, respectively. The study strongly recommends the use of pheromones over pesticides against the said pest in okra.

Key words: Pheromone, Okra, *Helicoverpa armigera*, *Abelmoschus esculentus*, Pakistan

Introduction

The province of Balochistan is well known for the production of fruits in Pakistan. For the last few years the vegetable industry is prospering in the province. Okra, ladyfinger (*Abelmoschus esculentus* L.) belongs to the family Malvaceae (Malik, 1994; Khan *et al.*, 2002). After tomatoes and potatoes, Okra is the third most cultivated vegetable in the province. The crop is grown over an area of 3414 ha and produces 38640 tons per season in Balochistan. Quetta division is most famous for the production of this vegetable, which provides 14400 tons per season. The growing capacity of the province is 11318 Kg ha⁻¹ (Anonymous, 1998-99). *H. armigera* (American Bollworm, ABW) is a polyphagous insect pest which has more than 100 plant hosts (Baloch, 1989; Baloch *et al.*, 2000a; Hazara *et al.*, 2000; Malik *et al.*, 2002b,c). It is a major pest of cotton in Pakistan (Baloch, 1989) and has already got a major pest status in apple (Malik *et al.*, 2002b) and tomato (Malik *et al.*, 2002c) in Balochistan. Balochistan is that province of Pakistan where literacy rate is very low (Shah *et al.*, 2002; Malik *et al.*, 2002 c,d). Farmers of the province mainly use pesticides against insect pests (Malik and Ali, 2002; Malik *et al.*, 2002 b,c). The moth has already got some resistance against pesticides (Alaux, 1995; Lal and Lal, 1996). Sauphanor and Delorme (1996) suggested that the insect resistance could be avoided by limited use and replacement of pesticides with other control measures. Malik *et al.* (2002a,b) reported Pheromone traps as a good tool to monitor and control *H. armigera*.

Keeping in view this study was carried out to evaluate the efficacy of the synthetic pheromone to determine the population dynamics and control of *H. armigera* in okra.

Materials and Methods

The study was conducted during 1995-96 in a private vegetable and fruit farm, beside Kach Road, Quetta, Balochistan, Pakistan. The vegetable field was 0.81 ha and was surrounded by apple (*Pyrus malus*), apricot (*Prunus armeniaca*) and peach (*Pyrus persica*) trees. 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 of 30 cm wide, 75 cm apart and 30 cm high were well prepared in April during each year (1995-96). Fertilizer and Farm Yard Manure were applied before transplantations. Okra variety Subz-Pari was planted in 30 cm apart holes on 25th April and 20th April each year respectively. The crop was regularly irrigated after each 7 to 10 days by tube-well. After two and one weeks (each year respectively) 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 1.5 m from the ground. The capsules were replaced after every 30 days (Malik and Ali, 2002) till the crop was uprooted on 20th and 16th August each year, respectively. Data for the moth captured was collected weekly. Statistical Means for the number of moths' captured/week/05 traps were calculated for further discussion.

Results and Discussion

Table 1 represents the mean number of ABW captured during 1995-96. First moth appeared in 7th and 6th weeks of traps installation, during 1995-96, respectively. Maximum mean numbers of moths (11 and 7) was

Table 1: Mean number of ABW captured Weekly, Beside Kach Road, Quetta, Balochistan, Pakistan during 1995-96

1995			1996		
Dates	¹ Temperature (°C)	² Population (Mean No.)	Dates	Temperature (°C)	Population (Mean No.)
06/05 to 12/05	23.94	00	29/04 to 05/05	17.08	00
13/05 to 19/05	21.64	00	06/05 to 12/05	19.63	00
20/05 to 26/05	18.81	00	13/05 to 19/05	20.16	00
27/05 to 02/06	20.85	00	20/05 to 26/05	20.68	00
03/06 to 09/06	23.33	00	27/05 to 02/06	23.33	00
10/06 to 16/06	26.38	00	03/06 to 09/06	26.30	03
17/06 to 23/06	27.35	02	10/06 to 16/06	25.78	07
24/06 to 30/06	26.25	03	17/06 to 23/06	23.58	01
01/07 to 07/07	28.38	11	24/06 to 30/06	26.07	02
08/07 to 14/07	29.68	02	01/07 to 07/07	25.83	01
15/07 to 21/07	26.22	02	08/07 to 14/07	26.86	01
22/07 to 28/07	24.76	01	15/07 to 21/07	25.24	01
29/07 to 04/08	27.31	01	22/07 to 28/07	27.11	00
05/08 to 11/08	27.11	02	29/07 to 04/08	27.56	01
12/08 to 18/08	27.69	00	05/08 to 11/08	25.69	00
19/08 to 20/08	27.23	00	12/08 to 16/08	27.48	00
Mean	Total	24	Mean	Total	17

¹Temperature is the average of 24 hours (Maximum and Minimum) through out the week. ²Mean numbers of moths (captured during a week) were calculated from all the pheromone traps (n=05) installed in the farm and were rounded to the nearest whole number.

captured during 9th (01-07-1995 to 07-07-1995) and 7th (10-06-1996 to 16-06-1996) weeks of transplantations, when the average temperatures were 28.38 and 25.78 °C, respectively. A total mean number of 24 and 17 moths were captured during the two years of the study respectively. Apple (Malik *et al.*, 2002b) and tomato (Malik *et al.*, 2002c) are the good hosts of the said pest. The experimental field was surrounded by apple and tomato fields, which might effect on the infestation in Okra field. 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 11th and 4th August 1995 and 96, respectively, 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.*, 2000 a). *H. armigera* prefers cotton than other hosts (Baloch *et al.*, 2000 b). 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.*, 2002 b). 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 bioactivities 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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