STUDIES ON INSECT POPULATIONS IN RELATION TO TURIA PHENOLOGY

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Abstract

The study is aimed at providing data for better pest management stratiges.

The results of this study in respect of population dynamics of insects in relation to Turia crop indicate that the population fluctuations of winged and wingless *aphids* were prominent with over lapping generations. *Alate aphids* appeared on the crop at the age of 39 days. However, *non–alate* morphs appeared 10 days later (59 days after sowing). Both morphs were present on the crop up to harvest. White fly appeared on the crop at the age of 39 days and remained up to the age of 64 days. Pest had no major population peaks on the crop. Lady bird beetle and black beetle appeared as a group of important aphid predators at the age of 53 days; both predatory species were present for 15 days only.

Introduction

Oil seeds occupy an important position in the economy of our country. Turia is an important oil seed crop of Sindh and Punjab provinces of Pakistan. Turia is grown in winter season, and in highly profitable crop. Like with other crops, the insect pest problem in Turia is as old as the crop itself. This problem is getting more complicated due to disturbances in the agro–ecosystem caused by the human activities in order to meet the need of the growing human population. This crop has been reported to be attacked by many types of insect pests such as aphids Prasad and Phadke (1980), white fly Patil and Pokharkar (1979), etc. Unfortunately very little

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information is available on the pest succession and population behavior in the Turia agroecosystem in the Sindh province of Pakistan. This prompted the authors to conduct the preliminary studies on the insect population in relation to Turia phenology.

Materials and Methods

Turia crop (S-9 Variety) was planted on 10 acres at the Experimental Field at Latif Farm of Sindh Agriculture University, Tandojam. Crop was sown on 20 November 1989 by drilling method. The distance of 18 inches from row to row and 6 inches from plant to plant was maintained. Crop received usual agricultural practices such as thinning and proper irrigation. The land was kept fallow during summer season and was not sown for last two years on same places of land.

Observations were taken when the crop reached the age of 30 days (3-6 leaves). Observations were taken twice in a week. For each observation 50 plants were selected at random from each treatement and 5 leaves per plant were examined for the infestation of aphid and white fly. Whereas predatory beetle population was assessed by sweeping method.

For each insect species, population data was analyzed statistically on IBM-PC compatible microcomputer with Microsoft Package developed by Ecosoft, Inc., Indianapolis, USA.

Results and Discussion

Figure 1 presents the succession and sequence of occurrence of Turia pests and their beetle predators during the winter of 1989 and the quantitative data of the population build up is given in Table 1.

Aphid, *Lipaphis erysimi* (Kalt)

Initial infestation with winged morphs of the aphid occured at an early seedling phase when the crop was 39 days old. Population build-up was not rapid and starting population of 0.07 aphid per leaf increased to the peak of 7.87 insects per leaf at 77 days age. There were no major population fluctuations of winged immigrants. Winged aphid also migrated from one plant to another and appeared as the main source of pest dispersal.

Wingless morphs, the off springs of winged forms, appeared on the crop at the age of 59 days, i.e. 10 days after the initial infestation by winged morphs. The population pattern revealed the maximum pest population of 50.66 aphids per leaf when the crop was 74 days old. This population build up took 35 days and must have involved several overlapping generations. Similar finding were reported by Singh and Siddhu (1958), Prasad and Phadke (1980) and Ghosh and Mitra (1983) from India.

Alate and non-alate morphs were present up to harvest. The cluster of wingless aphid fed on the under side of the leaves as well as on the upper side at early stage. When the leaves become hard they feed on growing tips and newly opened leaves, stem and flowers. Inter-plant population dispersal took place by alate individuals that were developed in the field. Proportion of alate morphs was higher on older plant parts, that is, stem, leaves and fruits than the young ones. However, higher proportion of alate morphs on the tender parts of the plants during the early seedling stage was due to the settling of the immigrant alate viviparous females. Similar findings have been reported by Ghosh (1980) from India.

As aphid is a major pest, its attack was severe. Aphids were also found no weeds. For example, Naro, Jhill present in the Turia field, although not assessed quantitatively.

White fly, *Bemesia tabaci*

White flies made their appearance at the crop age of 39 days and continued their presence for 23 days, that is, up to the crop age of 62 days. From the population build up pattern given in Table 1 it is depicted that this pest was of minor significance. White fly has also been reported as pest of Turia crop Patil and Pokharkar (1979). However, this author has not mentioned its potential as a pest.

Predatory beetles

The ladybird beetle *Coccinella sepetempunctata* L. and black beetle *Scymnus spp.* started their appearance on the crop at the age of 53 days and were present on the crop for two weeks only. *Coccinella septempuctata* has been reported by Srivastava et al. (1978) and Pandey et al. (1984) as predator of *Lipaphis erysimi* K. in India.

Population analysis

Population data was analysed by simple logistic model given in equation a Southwood (1978).

$$Nt_i = Nt_O eRT \quad \ldots\ldots\ldots\ldots \quad (a)$$

Where Nt_i is the number of insects at time interval i, Nt_O is the number of insects at time interval zero (The first observations), e is the base of natural logarithm, R the rate of increase and T is the time elapsed in days. The above equation was rearranged to give equation b.

$$\ln Nt_i = a\ln Nt_O + bRT \quad n \quad r \quad s \quad \ldots\ldots\ldots\ldots \quad (b)$$

Where now in Nt_i the natural log of insect populations at time interval i, Nt_O is the intercept of y on natural log insect population, R the slope of the curve and T the time in days. n is the number of observations used in calculation, r the correlation coefficient and s the standard deviation from regression. Regression equation of insects is given in Table 2. This equation holds true for single species models with Deevey's type II growth response Deevey, (1947).

Equation 1, gives good r value of 0.907 and 0.099 for the slope of line. This logistic growth pattern confirms Deevey (1947) type–II growth pattern of aphid population. Equation 2, gives highest (r) 9.896 means the best regression equation with the slope of line as 0.181. This is due to high intrinsic rate of increase combined with short duration of life cycle and minimum migration due to sedentary habit. Similarly, the (r) 0.896 for winged aphid is comparable with wingless aphid. Rapid increase in winged aphid population could be due to immigrant adults. Once settled on the crop, the winged forms also are sedentary when may have landed on the suitable host. Population growth was depicted by the slope of line (0.142). White fly growth response was third in line to yield the best fit to the equation (r=0.798). However, population growth rate was slow with 0.034 value for slope of line.

Above insects gave good fit to the regression equations and these equations could be improved further by adding more data obtained during subsequent seasons. This may help in improved pest forecasting which is primary base of pest management strategies. Remaining two insects namely ladybird beetle and black beetle did not give good correlation. This could be due to mobile nature, host un-specificity etc. flat population growth curve may also indicate the K-selected growth response of these insects.

Table 1

Population fluctuation of Turia pests and their predators during winter 1989-90*.

DAS**	Pests			Peradtors	
	Alate Aphid	Non-Alate Aphid	White fly	Lady beetle	Black beetle
39	0.07±0.01		0.66±0.47		
42	0.31±0.12		0.66±0.47		
45	0.71±0.32		0.33±0.47		
53	1.20±0.31		0.00±0.00	0.66±0.47	1.66±0.47
56	1.20±0.16		0.33±0.47	2.66±0.94	1.00±0.81
59	3.64±2.73	5.57±1.82	0.33±0.47	0.00±0.00	1.00±0.81
62	2.25±0.17	8.90±0.85	0.03±0.41	1.33±0.47	2.00±0.81
65	2.10±0.28	6.46±1.97		1.00±0.81	0.33±0.47
68	5.88±3.14	37.77±13.42		0.33±0.47	1.00±0.81
71	6.83±3.14	46.16±13.26			
74	2.75±0.27	50.66±5.76			
77	7.87±0.69	47.88±0.87			
80	2.81±0.15	42.33±3.41			
83	1.45±0.12	27.11±3.62			
86	1.35±0.08	29.11±3.15			
89	0.36±0.11	6.44±0.31			
92	0.43±0.07	5.05±1.51			
95	0.07±0.01	2.50±0.23			
98	0.07±0.04	2.30±0.44			
101	0.10±0.04	1.12±0.08			
104	0.07±0.05	0.45±0.21			
107	0.04±0.04	0.17±0.05			

*Number of insects per leaf. Values represent mean±standard deviation.

**DAS = Days After Sowing. Crop was sownn on 20-11-1989.

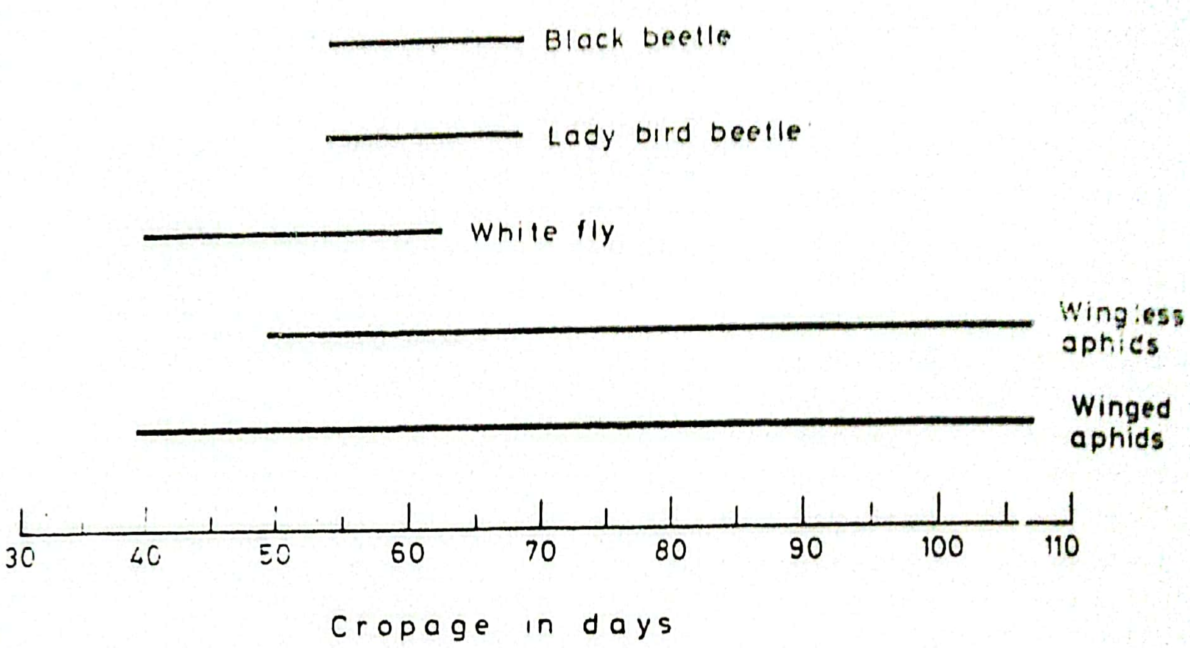
Table 2

Population growth equation of insects associated with Turia.

		n	r	s
1.	Winged aphid			
	ln Nt = ln − 5.379+0.099 Days	12	0.907	0.607
2.	Wingless aphid			
	ln Nt = ln −6.628+0.142 Days	7	0.896	0.498

3.	White fly ln Nt = ln -0.824+0.034 Days	7	0.798	0.254
4.	Ladybird beetle ln Nt = ln -10.09-0.160 Days	6	0.441	0.049
5.	Black beetle ln Nt = ln 2.992-0.049 Days	6	0.441	0.049

FIG.1. SEQUENCE OCCURRENCE OF INSECTS ON TURIA CROP.



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