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DISTRIBUTION OF ZYGINIDIA QUYUMI ON WHEAT IN PUNJAB (PAKISTAN) BY LOCATION. DAY–TIMINGS AND TEMPERATURE*

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Abstract. Recent workers have pointed out the economic significance of *Z. quyumi* as a pest of wheat in Punjab (Pakistan). The present work reports the activity and distribution of *Z. quyumi* with temperature, and day timings in the most heavily infested areas of the province. It is concluded that the leafhopper is equally active with minor fluctuations from morning to evening, at temperature 80°F or above. The distribution is not much different in the fore or after-noons in any of these areas.

Zyginidia quyumi (Ahmed) is an important leafhopper pest of wheat and maize in central and northern parts of Pakistan. The biology and life history of the species was investigated by Jabbar and Ahmed.[2] In view of economic significance of *Z. quyumi,* the present work was initiated to study the ecological factors affecting the ditribution of the species in the most seriously affected areas i.e. Jhang, Faisalabad and Sahiwal districts of the Punjab (Pakistan). Results of about 2500 samples have been analysed to show the effects of geographical locations, day timings and temperature on the distribution and activity level of *Z. quyumi* on wheat, all of Mexipak variety.

Materials and Methods

Population samples were collected thrice from early, middle and late stages of wheat crop from 26 randomly picked up locations in the three districts, in the months of February to April. Collections of leafhoppers were made by following the method of Ahmed and Jabbar.[1] To make the sampling uniform, each of the 26 randomly selected points was designated as a locality and the surrounding 5 or 6 areas as its sub-localities (Fig. 1).

Insects samples were collected at the rate of 6 samples per sub-locality by following paths of 'S' and inverted 'S'. All samples were studied in the laboratory.

Results

Population studies for variance by temperature during forenoon and afternoon (Table 1) of *Z. quyumi* on wheat in the three districts shows that the highest averages were mostly in the afternoons. The first five samples with largest average number of leafhoppers i.e. 53.25, 44.08, 40.46, 38.24 and 37.49 were collected at temperatures above 80°F.

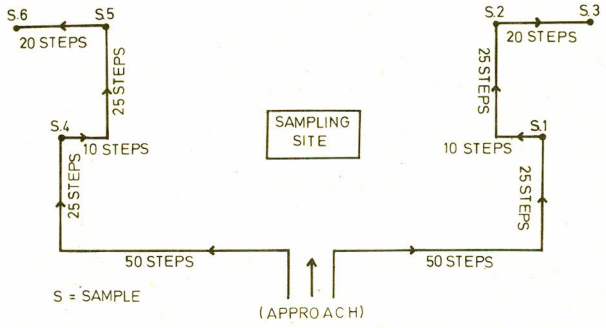

Fig. 1. Sampling design.

The standard deviation (S.D.) shows that the average number of catches are subject to variance even in the same temperature range. In general at temperature 80°F or above, the crop harboured fairly large number of leafhoppers in all the districts. Lowest average catches were made at temperatures below 70°F irrespective of fore and afternoon. Sexes do not appear to be affected in their average by any particular temperature or day timings..

The bivariate values of insect population on wheat in three districts during the day and by temperature and fore and afternoon have been shown in Tables 2 and 3. They show that the population of *Z. quyumi* on wheat in the forenoon and afternoon has very low correlation of 0.01, 0.07, and 0.0097 in Jhang, Faisalabad and Sahiwal districts respectively. The correlation of temperature during fore and afternoon is also very low (0.08) in the Jhang district, while there is a mild correlation of 0.24 and 0.20 respectively for districts Faisalabad and Sahiwal.

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TABLE 1. AVERAGE OF *Zyginidia quyumi* BY TEMPERATURE DURING FORENOON AND AFTERNOON.

Districts	Time	Temperature °F upto 70	71-80	81-90	91-100	101-above
Jhang	Mean Forenoon	5.45	16.05	4.06	7.17	2.86
	S.D.	4.93	24.34	7.19	10.29	6.92
	Mean Afternoon	2.12	00.89	6.98	17.77	3;75
	S.D.	2.49	1.74	15.47	35.44	8.06
Faisalabad	Mean Forenoon	2.44	31.62	34.03	38.24	3.00
	S.D.	2.44	49.88	47.91	58.46	0.00
	Mean Afternoon	0.91	6.84	37.49	28.67	22.88
	S.D.	1.41	20.26	56.06	41.63	32.21
Sahiwal	Mean Forenoon	—	29.71	22.63	44.08	40.46
	S.D.	—	41.31	37.38	53.50	53.09
	Mean Afternoon	—	34.51	17.04	33.92	53.25
	S.D.	—	52.48	28.22	42.42	54.45

TABLE 2. BIVARIATE TABLE OF *Z. quyumi* BY TIME DURING FORENOON AND AFTERNOON ON WHEAT.

No. of Leafhoppers	Jhang F̈	Jhang Ä	Jhang Total	Faisalabad F̈	Faisalabad Ä	Faisalabad Total	Sahiwal F̈	Sahiwal Ä	Sahiwal Total
0	101	160	261	48	172	220	54	44	98
1-5	104	105	209	154	190	344	92	217	309
5-10	36	31	67	58	82	140	73	107	180
11-15	21	19	40	25	46	71	46	74	120
16-20	11	14	25	16	41	57	42	42	84
21-25	7	9	16	12	24	36	28	42	70
26-50	17	13	30	45	63	108	53	110	163
51-100	5	5	10	35	44	79	37	88	125
101-200	1	6	7	57	69	126	56	89	145
Total	303	362	665	450	731	1181	481	813	1294

F̈ = Forenoon, Ä = Afternoon

The point biserial correlations have been computed for three districts.

$$r_{pb(Jhang)} = \frac{\bar{X} - \bar{X}}{\frac{2}{\delta x}} / \frac{p}{q} = \frac{8.27 - 8.05}{19.03} / \frac{0.54}{0.46} = 0.0125 = 0.01$$

$$r_{pb(Faisalabad)} = \frac{\bar{X} - \bar{X}}{\frac{2}{\delta x}} / \frac{p}{q} = \frac{26.03 - 28.49}{46.30} / \frac{0.62}{0.38} = 0.068 = 0.07$$

$$r_{pb(Sahiwal)} = \frac{\bar{X} - \bar{X}}{\frac{2}{\delta x}} / \frac{p}{q} = \frac{34.60 - 34.05}{46.43} / \frac{0.6}{0.4} = 0.0097$$

TABLE 3. BIVARIATE TABLE OF *Z. quyumi* BY TEMPERATURE DURING FORENOON AND AFTERNOON ON WHEAT.

Temperature °F	Districts								
	Jhang			Faisalabad			Sahiwal		
	F	A	Total	F	A	Total	F	A	Total
60-70	11	17	28	16	23	39	—	—	—
71 80	84	61	145	131	138	269	60	77	137
81-90	130	157	287	221	246	467	196	264	460
91-100	46	95	141	76	247	323	167	215	382
101-110	32	32	64	6	77	83	58	257	315
Total	303	362	665	450	731	1181	481	813	1294

F = Forenoon, A = Afternoon

The point biserial correlations have been computed for the three districts.

$$r_{pb(Jhang)} = \frac{\bar{X} - \bar{X}}{\frac{2}{\delta x}} / \frac{p}{q} = \frac{86.77 - 86.02}{9.87} / \frac{0.54}{0.46} = 0.0823 = 0.08$$

$$r_{pb(Faisalabad)} = \frac{\bar{X} - \bar{X}}{\frac{2}{\delta x}} / \frac{p}{q} = \frac{87.97 - 86.20}{9.49} / \frac{0.62}{0.38} = 0.2374 = 0.24$$

$$r_{pb(Sahiwal)} = \frac{\bar{X} - \bar{X}}{\frac{2}{\delta x}} / \frac{p}{q} = \frac{93.02 - 91.76}{9.58} / \frac{0.6}{0.4} = 0.1648 = 0.20$$

The means of catches as summarised in Table 4 indicate that the leafhoppers are active with fluctuations throughout the day. The two largest average catches were however made before 10 a.m. and between 2 and 4 p.m.

Discussion

It is evident from the data given in Tables 1 to 4 on the distribution and abundance of *Z. quyumi* on wheat, that the leafhoppers in general occur in large

TABLE 4. AVERAGES OF *Z.quyumi* ON WHEAT BY DAY TIMINGS.

Time			Jhang	Faisalabad	Sahiwal
Before	10	a.m.	8.9	25.7	40.3
10 –	12	a.m.	7.5	34.7	29.1
12 –	2	p.m.	11.3	33.3	30.9
2 –	4	p.m.	7.5	16.6	39.3
After	4	p.m.	2.4	33.6	36.2

numbers on the crop in districts Jhang, Faisalabad and Sahiwal, when the normal environmental temperatures exceed 80°F. The results of data also indicate that with minor fluctuations the leafhoppers are active in such conditions on the crop throughout the day. This contention is also supported by the field population data given by Jabbar *et. al.*[3] of the relative population of *Z. quyumi* with respect to temperature-age of wheat. It is also known that starting from later half of March the normal day temperatures in central Punjab are always 80°F or above. In these circumstances it can be concluded that the wheat crop remains under heavy attack of leafhopper *Z.quyumi* from late March to shortly before harvest time, and so is liable to receive serious damage. Control measures should therefore be adopted before middle of March, when the leafhoppers are not abundant on wheat.

References

1. M. Ahmed and Abdul Jabbar, Pak. J. Sci. Res., 29, 1 - 2 (1976), (in press).
2. A.Jabbar and M. Ahmed, Pak. J. Sci. Res., 27, 1 – 4, 127 (1975).
3. A. Jabbar M. Ahmed and K. Samad, Population Fluctuation of *Zyginidia quyumi* (Ahmed) on wheat in Punjab- Pakistan (1977). (in press)