APHID DYNAMICS IN WHEAT AS AFFECTED BY WEATHER AND CROP PLANTING TIME

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ABSTRACT

A study was conducted at Wheat Research Institute, AARI, Faisalabad, Pakistan during 2004-05 and 2005-06 to understand dynamics of aphid infestation as affected by weather and wheat sowing time. Daily aphid count was taken by placing yellow water trays at appropriate places in wheat fields (cv. Inqalab-91) starting from first January during 2004-05 and 2005-06. Natural aphid infestation was also recorded in wheat sown at six planting dates at 15 days interval from October 25 to January 10 during the year 2005-2006. The results revealed that aphid count was low in January due to low temperature but it started increasing in February during both years. It increased to highest level in mid March and dropped sharply in beginning of April. The infestation was high in 2004-05 but considerably low in 2005-06 due to heavy rains. Apparently weather, other than rains and temperature, had little effect on aphid infestation. Infestation kept increasing till mid March and then started declining. In all plantings, aphid infestation dropped after mid March. Early planting in November had, however, markedly low infestation.

KEYWORDS: *Triticum aestivum;* Sitobion, Schizaphis; Rhopolosiphum; population densities; climate; sowing time; Pakistan.

INTRODUCTION

Wheat aphids have assumed scary proportion in wheat cultivation in Pakistan for last two decades (8). The dominant species in Punjab are *Sitobion avenae* F., *Schizaphis graminum* Rond, *Rhopalosiphum rufiabdominalis* Sasaki and *Rhopalosiphum maidis* Fitch that damage wheat crop (12). *Macrosiphum granarium* (F.) caused 100 percent losses in grain production in Pakistan during 1987 where attack was very severe (1). Maximum aphid population was recorded during February to March (2, 3, 4, 5, 6) at various places in Pakistan. Aphid population increased gradually during January in early and timely sown crop and during mid February in late sown crop. Aphid population increased exponentially from end of February to end of March and declined from end of March to beginning of April in case of crop planted at various dates (9). Growing early maturing varieties could reduce aphid attack

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(7). Wheat sowing at various dates played an important role in increasing or decreasing aphid population. Late sown wheat suffered maximum from aphid infestation (8.88/tiller) as compared to early sown crop (2.33 and 3.28 aphids/tiller) (2). Late sown wheat crop may be badly damaged if cool weather continues till end of March (10).

The present studies were undertaken to determine role of abiotic factors in fluctuating alate aphid's density in wheat and find out appropriate time for wheat sowing to reduce aphid damage without chemical control.

MATERIALS AND METHODS

These studies were carried out at Wheat Research Institute, AARI, Faisalabad, Pakistan during 2004-05 and 2005-06. Aphids were collected by using three trays each measuring 59 x 46 x 75 cm, painted with yellow colour inside. These trays were placed at three spots, two and half feet (75 cm) above the ground level on wooden stands at a distance of 100 feet from each other. Data on alate aphids trapped in trays were recorded daily from 9-11 a.m. from each spot. Weather data (maximum/minimum temperature, RH, rainfall and wind velocity of coinciding dates) were also collected from meteorological observatory of the Institute. The data were correlated with aphid density and analysed each year.

The crop (cv. Inqalab-91) was sown on six different dates at 15 days interval starting from October 25 to January 10, in RCBD with three replications. Plot size was 5 x 1.62 meter. The data regarding aphid population were recorded by observing ten randomly selected tillers from each plot at eight days interval starting February 16 to March 28, 2005. The selected tillers were clipped off with pair of scissors. The number of aphids on each tiller was counted by dropping them on a white paper sheet with a camel hair brush. The data so collected were analyzed.

RESULTS AND DISCUSSION

The results (Table 1) revealed that aphid population reached at maximum level (1821.90 aphids/tray) during second week of March, 2004. Aphid counts were higher during 2004 as compared to those of 2005. Aphid started appearance in January and gradually increased afterwards. In both years, population increased upto 2nd week of March and declined thereafter. Similar findings have been reported earlier (13). Temperature ranging from 12.92 to 32.65^{o}C during 2004 and 2005 proved favourable for aphid growth and these results are also supported by Chander (11) who found 7.7 to 32.2^{o}C as favourable for green bug growth. Maximum temperature of day and night

Table 1. Average population of wheat aphid per tray and weather data of coinciding dates.

Month	Week	Temperature (ºC)		Average R.H. (%)	Rainfall (mm).	Wind velocity (km/hour)	Aphid pop (per day/tray
		Maximum	Minimum				
				2004			
January	1	17.78	4.73	69.18	0.00	1.50	3.89
	2	23.35	7.35	57.28	0.00	1.69	3.71
	3	18.56	9.32	81.37	11.90	1.87	3.29
	4	16.83	6.55	81.37	11.90	1.87	3.29
February	1	18.45	4.38	67.87	0.00	2.57	1.46
	2	22.30	8.06	63.30	10.00	2.50	5.05
	3	25.45	10.38	66.21	0.00	2.57	52.09
	4	29.09	12.12	58.92	0.00	3.00	125.90
March	1	30.11	11.33	55.05	0.00	2.57	179.88
	2	32.65	16.66	53.50	0.00	1.94	1821.90
	3	38.92	17.72	43.19	0.00	2.78	12.96
	4	37.96	12.52	40.93	0.00	2.06	62.00
April	1	37.97	16.21	69.25	0.00	2.78	12.96
	2	44.12	24.27	41.42	0.00	2.94	1.33
				2005			
January	1	18.12	5.87	76.71	6.8	1.64	0.43
	2	20.47	4.32	71.62	0.00	1.37	1.79
	3	17.14	3.66	73.37	2.60	2.12	2.04
	4	16.64	3.74	73.88	7.40	1.14	8.24
February	1	18.81	7.10	70.78	9.40	1.14	8.24
	2	15.72	10.10	83.64	19.60	1.78	10.05
	3	16.91	6.04	69.14	14.50	2.64	7.67
	4	20.20	8.30	61.78	0.00	1.36	24.33
March	1	25.27	12.92	69.93	2.0	1.57	104.33
	2	27.13	12.78	68.06	28.50	1.37	322.83
	3	25.70	7.48	72.57	40.0	2.87	144.45
	4	28.29	14.36	48.31	0.00	2.12	20.63
April	1	34.03	16.01	76.71	0.00	2.43	18.62

during season had positive and non-significant correlation with aphid population density. Relative humidity had negative and non-significant correlation with aphid population. Rainfall had negative and non-significant correlation (-0.208) during 2004 but negative and significant correlation (-0.617*) with aphid population during 2005 (Table 2). In case of wind

Table 2. Correlation coefficients between aphid and weather factors in wheat.

Year	Temperature (ºC)		Relative humidity (%)	Rainfall (mm)	Wind velocity
2004	0.246	0.343	-0.150	-0.208	-0.168
2005	0.439	0.408	-0.121	-0.617*	-0.139

velocity, correlation with aphid population was negative but non-significant.

These results partially agree to those of some others (6). In 2004 and 2005 despite considerable temperature difference, pattern of aphid infestation was same. Infestation kept increasing till mid March and started declining afterwords (Fig.1). Sowing dates had significant effect on average aphid population during both years of study. Early sowing i.e. October 25 to November 25 received less aphid attack i.e. 4.10 to 4.90 and 7.8 to 7.9 aphids per tiller in 2005-06, respectively. Maximum aphid attack was observed in case of sowings of December 10 (7.87/tiller) and December 25 (12.03/tiller) during 2004-05, respectively.

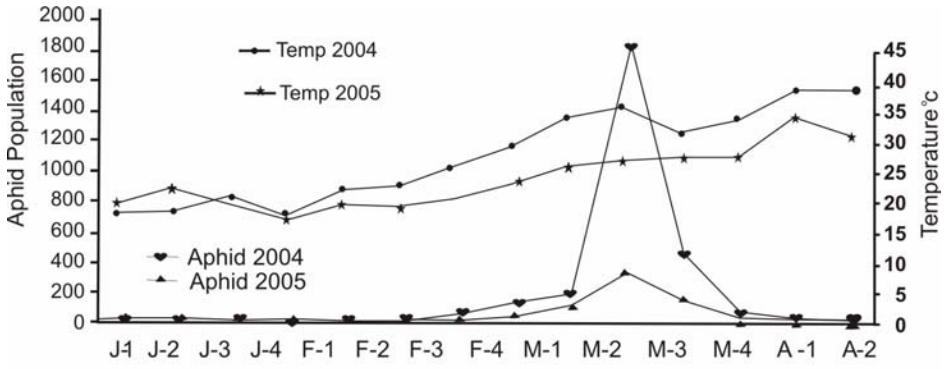

Fig.1 Aphid dynamics in relation to temperature 2004 & 2005.

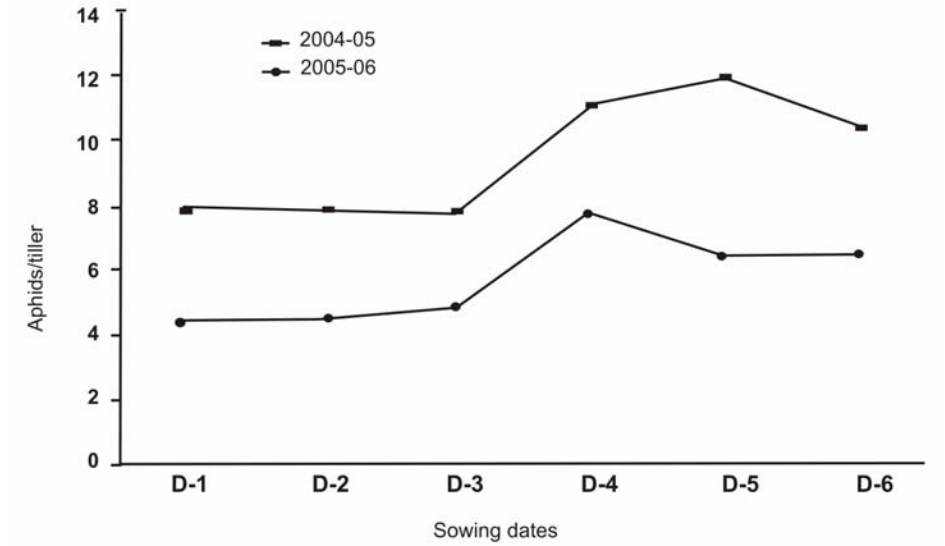

Fig.2 Sowing date effects on aphid population in wheat.

Table 3. Average aphid population per tiller on wheat crop.

Sowing dates	Average aphid population/tiller	
	2004-05	2005-06
October, 25	4.10a	7.90a
November, 10	4.53a	7.90a
November, 15	4.90b	7.80a
December, 10	7.87d	11.20b
December, 25	6.61c	12.03c
January, 10	6.61c	10.60b
LSD 5%	0.33	0.69

These results completely coincide with previous workers (2, 7, 8, 9, 10) who reported that early maturing and early sown wheat crop can avert aphid attack and no severe damage occurs. It has also been reported earlier that aphid infestation continued to increase upto mid March and dropped afterwards (9). Early planting in November had, however, markedly low infestations while late planting showed higher infestation (Table 3 Fig. 2).

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