

POPULATION OF APHIDS ON DIFFERENT VARIETIES/LINES OF WHEAT AND THEIR EFFECT ON YIELD AND THOUSANDS GRAIN WEIGHT

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ABSTRACT

An experiment was conducted at Agricultural Research Institute, Tarnab, Peshawar, Pakistan during 2009- 2010 to study the population trend of wheat aphids on different varieties/ lines of wheat and their effect on the yield and thousands grain weight. Aphids attack started in first week of January, increased during February and March, peaked on 13th March, and then declined afterwards till complete disappearance till 6th April. The overall mean number of aphids per plant was higher on wheat line PR-1 (42.20 aphids per plant), which was followed by Khber-87 (32.57 aphids per plant), Pirsabak -2005 (29.36 aphids per plant), KT-2004 (KT-09) (21.22 aphids per plant), NRL 0302 (Barsat-09) (20.29 aphids per plant), Saleem-2000 (19.92 aphids per plant), Pirsabak-2008 (15.71 aphids per plant), PR-2 (13.34 aphids per plant) and Pirsabak- 2004 (12.89 aphids per plant). Wheat yield was highest for Pirsabak 2004 (3048 kg ha⁻¹) lowest for PR-1(2243 kg ha⁻¹). Pirsabak 2004 yield higher grain weight then all the other wheat lines.

Key Words: *Triticum aestivum* L, aphids, population trend, yield and thousand grain weight.

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is a nutritious, convenient, economical source, and a source of the basic dietary product – breads which is consumed by more than 70 % of the human population. This cereal is grown on 23 % of global cultivated area and is of the great importance in bread, diet, farmaceutic and other industry, but also important product of international trade on world wide market (Istvan, 2006). Wheat is a staple food in Pakistan. It was grown on 8414 million hectares producing 21749 million tons of grain with a yield of 2585 kg per hectare (MINFAL, 2008-2009). The aphids (Aphididae: Homoptera) are important sucking pests of various field crops, fruits and vegetables and are commonly called as plant lice. Their population has been increasing for last few years and had attained the status of a regular pest in Pakistan (Aheer *et al.*, 2008). Wheat is one of the most important staple food crops of Pakistan and is attacked severely by the aphids which affect the produce adversely (Mohyuddin, 1981). Wheat aphids are world wide in distribution (Bospue-perez, 2000). (Shah *et al.*, 2006) reported the Bird cherry oat aphid (*Rhopalosiphum padi*), the English grain aphid (*Sitobion avenae*) and the green bug (*Schizaphis graminum*) are the major wheat aphids species in North West Frontier province of Pakistan. (Qamar2001) also identified *Rhopalosiphum padi*, *Sitobion avenae* and *Schizaphis graminum* as three major wheat aphids' species in North West Frontier province of Pakistan. Aphids cause direct damage by feeding deeply within the leaf whorl and inject a toxin in the plant which destroy the chloroplast membrane and indirect damage by transmission of several plant viruses (barley yellow dwarf Luteo virus) and by developing molds on their honey dews. BYDV-PAV is spread worldwide and its most significant transmitter is the aphid (Bukvayova *et al.*, 2006, Rossing *et al.*, 1994, Marzocchi and Nicoli, 1991). The experiment was conducted to study the population trend of wheat aphids on different wheat varieties/lines and investigate the yield reduction in thousands grain weight due to aphids.

MATERIALS AND METHODS

This study was conducted at the research farm of Entomology Section of Agricultural Research Institute, Tarnab, Peshawar, Khyber Pakhtunkhwa during 2009-2010.

The following nine wheat varieties/lines tested against aphid's infestation during 2009-2010.

Treatments/ Variety/line	
T1	Pirsabak 2004
T2	Pirsabak 2005
T3	Pirsabak 2008
T4	KT 2004 (KT 2009)
T5	Khyber-87
T6	PR-1
T7	PR -2
T8	NRL 0320 (Barsat 09)
T9	Saleem 2000

The varieties/lines were sown on 19th November, 2009 using statistical design RCBD with 9 treatments and replicated 3 times. Each plot size was 28.98 m² and 60 cm buffer area was maintained between the plots and

also among the blocks. Varieties/lines were sown in straight rows and the row to row distance was 30 cm. Standard agronomic practices were applied to all the plots equally.

Population Dynamics

Wheat aphid's infestation was recorded on weekly basis. For recording the aphid's population five wheat plants/plot were randomly selected and counting of aphids per plant on leaves, stem and in later stage also on spike was done visually in the field. The average number of aphids/plant for each variety/line was calculated. The data were subjected to statistical analysis using MStat C Package and the means were separated with LSD at $P=0.05$.

Yield Losses Estimation and Thousand Grain Weight

On reaching maturity the wheat varieties/lines were harvested on 12.5.2010. Each plot was harvested and threshed separately to obtained yield/plot. Random wheat grain samples were taken from each plot for counting thousand grains and these grains were weight separately on electric balance. The data were subjected to statistical analysis using M.State.C Pakage and the means were separated with LSD at $P=0.05$.

RESULTS AND DISCUSSION

Fig. 1-10 shows the population trend of wheat aphids on different varieties/lines during 2009-2010. Aphids attack was started in first week of January and was increased during February and March and reached to the peak on 13th March, and then the population went down and eliminated completely on all the nine varieties/lines till 6th April.

Maximum number of aphids per plant (160.3) was recorded on the 13th March on variety Pirsabak 2005 and lowest on PR-2 (35.7 aphids per plant) was recorded. We received the peak population of aphids on 13th March (2nd weak of March), Aheer *et al.* (2006) and Muhammad *et al.* (2005) reported the peak aphids population on 23rd March (third weak March), Similarly Aslam *et al.* (2004) observed the peak aphids population on 16th March (third weak March). Farooq and Nasir (2001) reported peak aphid's population during the mid March and Shuhail *et al.* (2001) reported peak aphid's population on 2nd April. We find out that the aphids population became zero on 6th April, Aslam *et al.* (2004) also recorded that aphids on all the tested wheat varieties was totally eliminated on 6th April But, Shuhail *et al.* (2001) reported that wheat aphids population became zero on 17th April. This observed difference in the date of peak level and zero population may be due to the difference in the weather factors of different locations. Aheer *et al.* (2007) also confirmed that combination of all abiotic factors (Temperature, Humidity and rainfall) contribute a significant role in aphids population fluctuation on wheat.

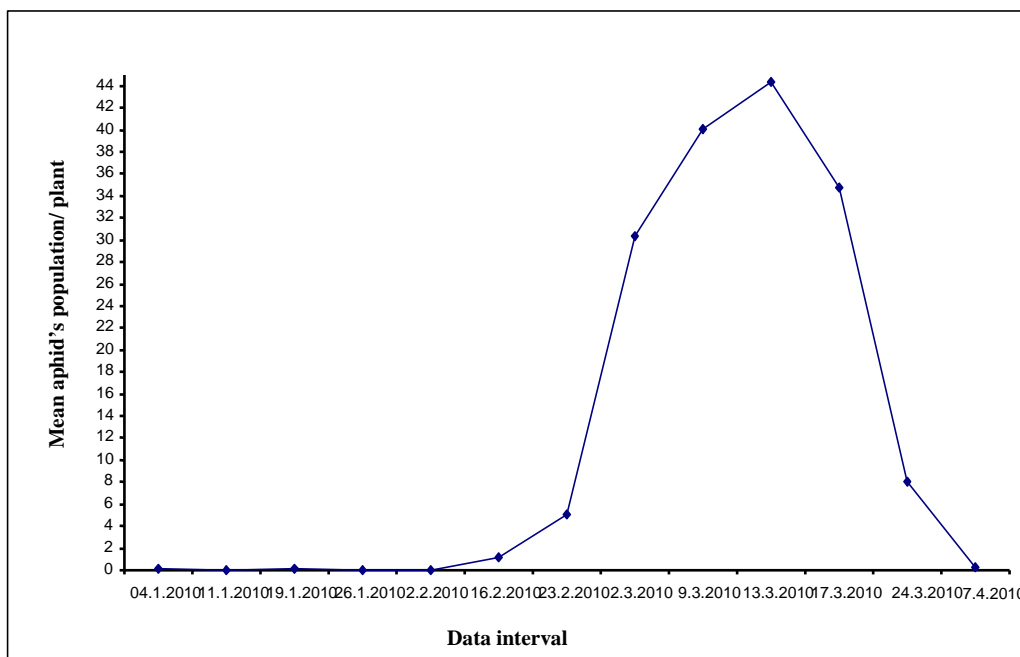


Fig. 1. Population trend of wheat aphids on different varieties/lines of wheat during

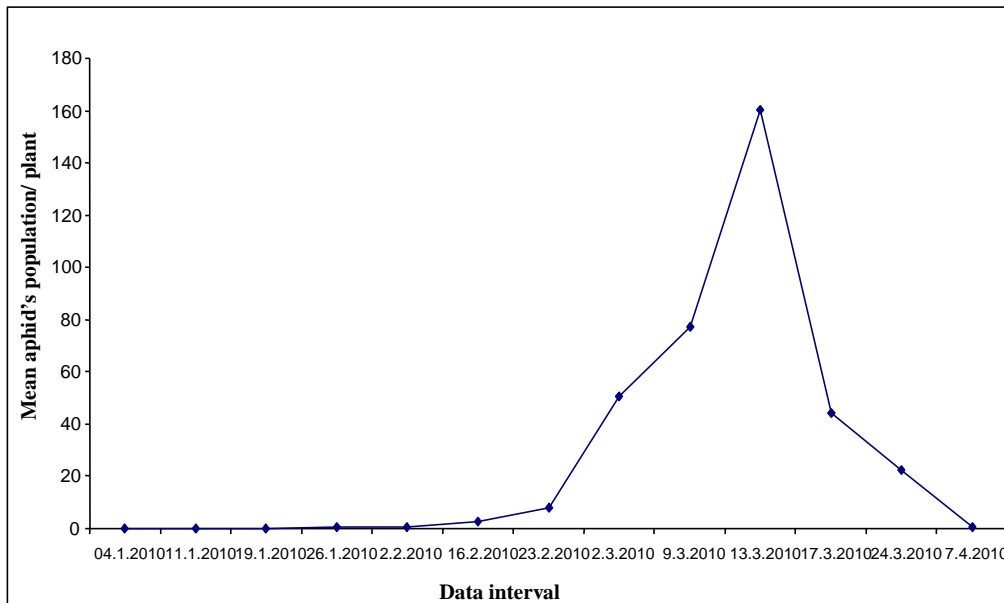


Fig. 2. Population trend of wheat aphids on Pirsabak 2005 during 2009-2010

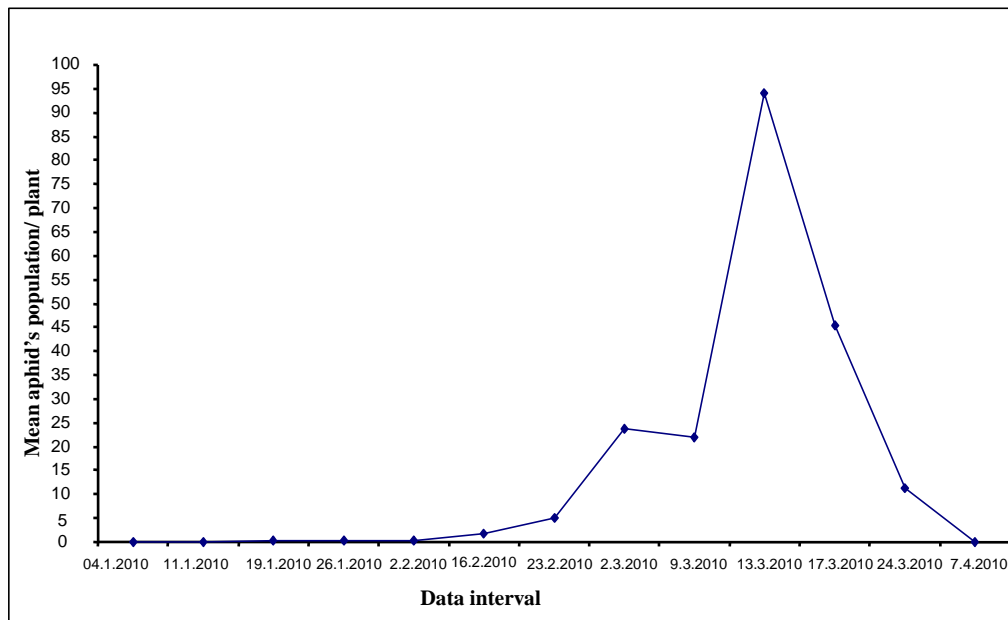


Fig. 3. Population trend of wheat on Pirsabak 2008 during 2009-2010

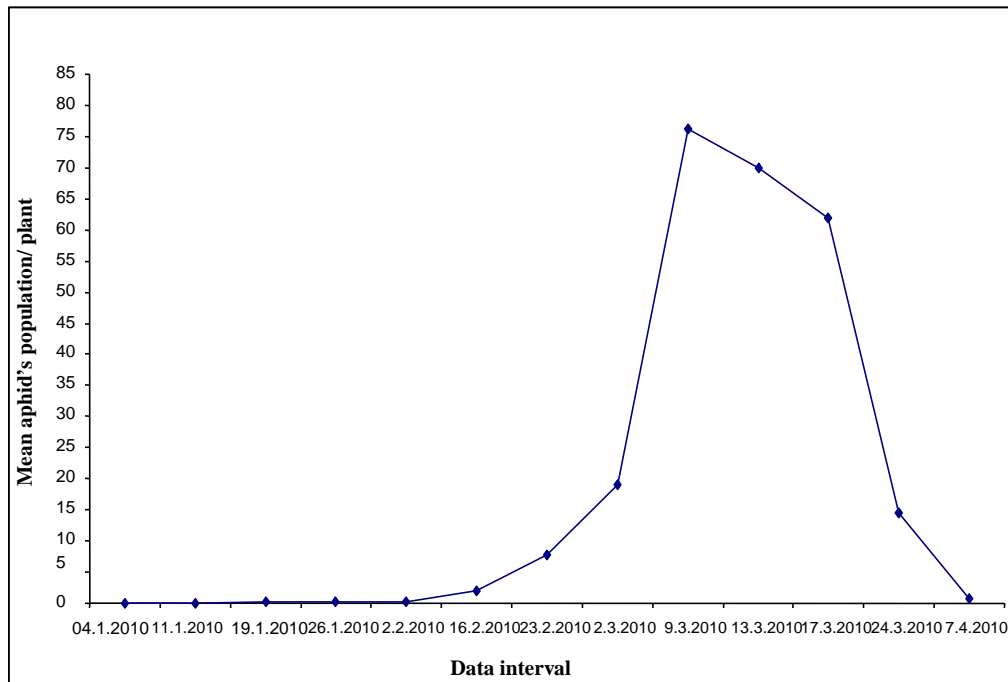


Fig. 4. Population trend of wheat aphids on KT-2009 during 2009-2010

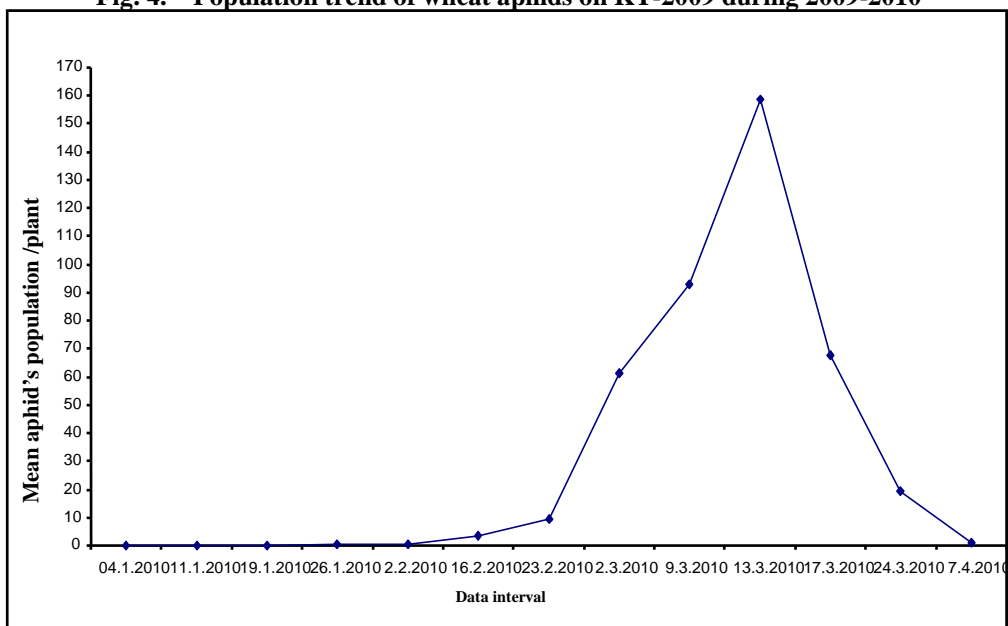


Fig. 5. Population trend of wheat aphids on Khyber-87 during 2009-2010

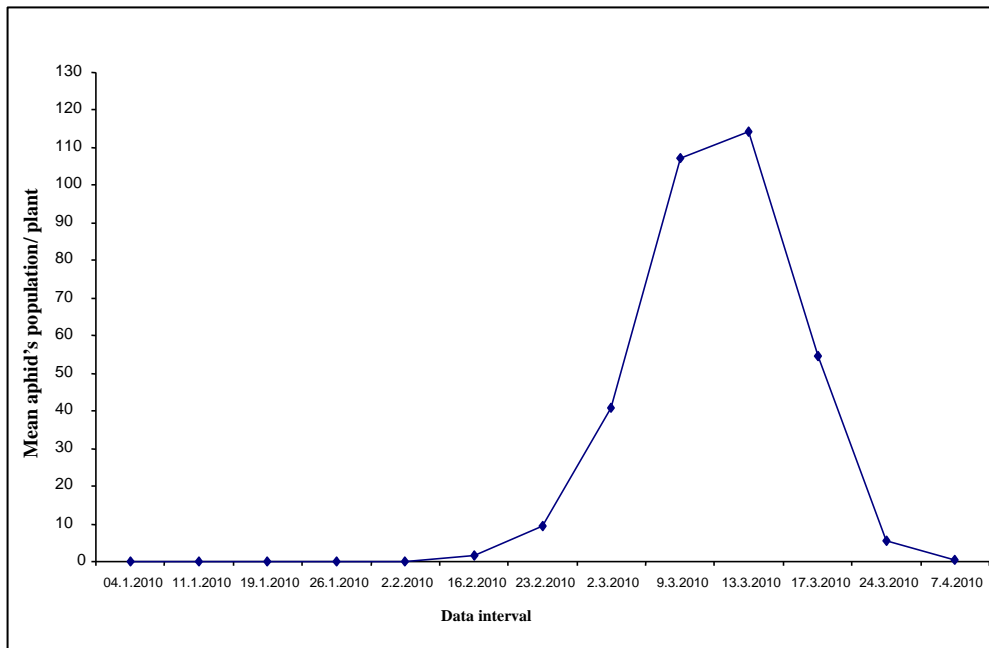


Fig. 6. Population trend of wheat aphids on PR-1 during 2009-2010

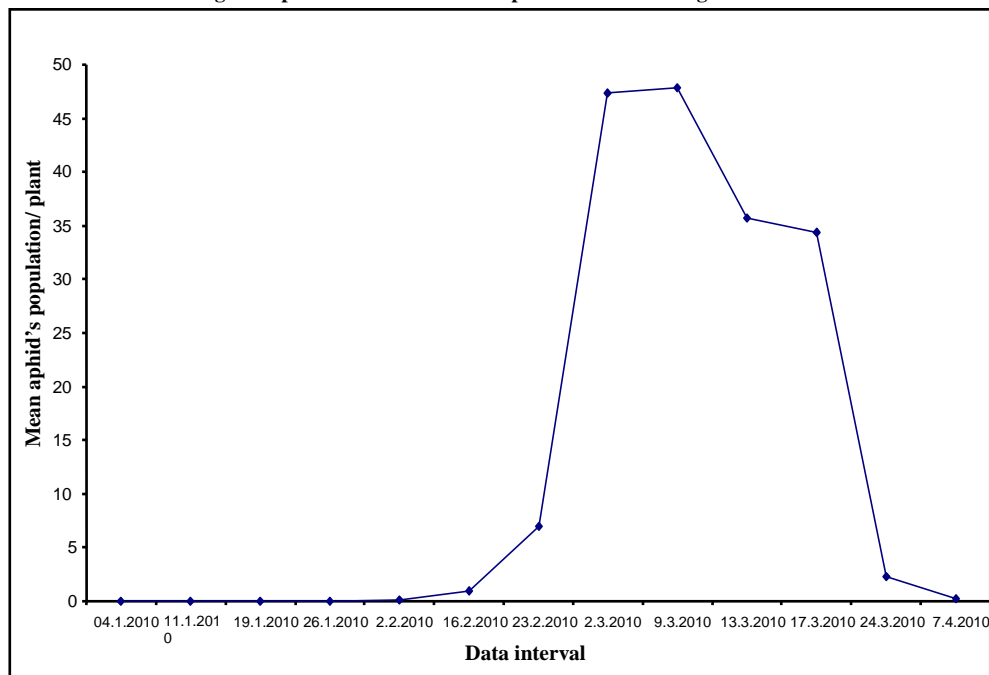


Fig. 7. Population trend of wheat aphids on PR-2 during 2009-2010

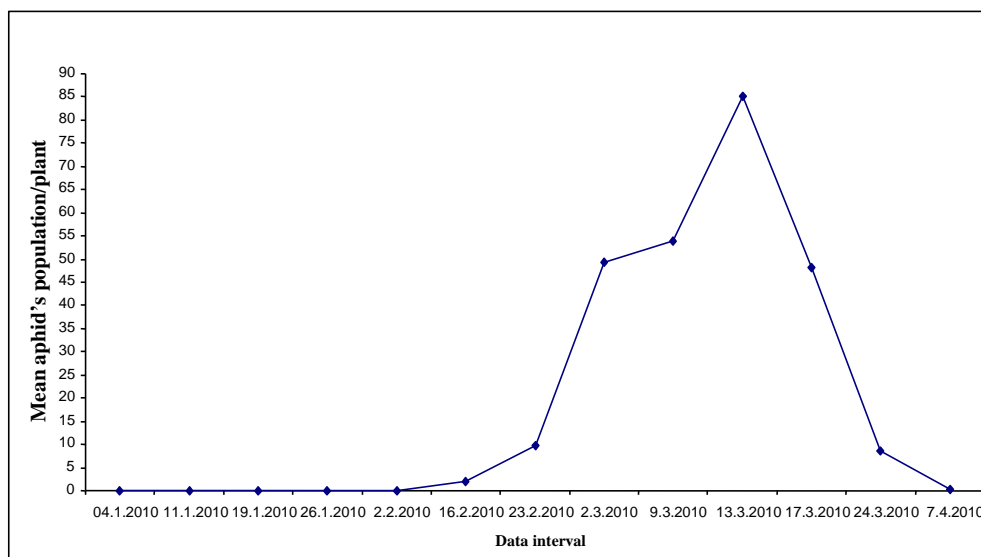


Fig. 8. Population trend of wheat aphids on Barsat-09 during 2009-2010

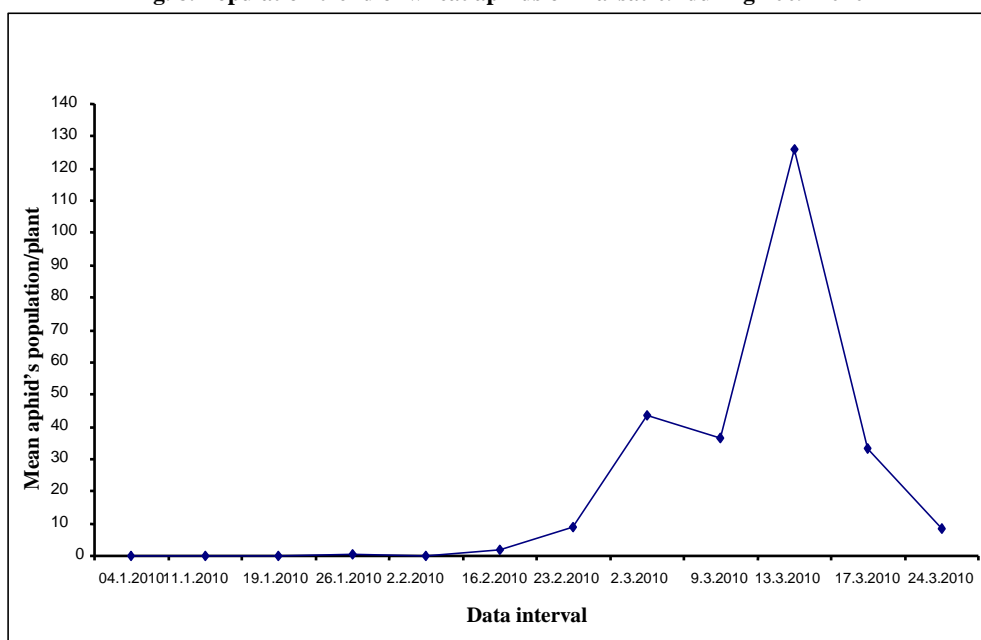


Fig. 9. Population trend of wheat aphids on Saleem-2000 during 2009-2010

Table I Yield in kg/ ha and thousands grain weight / plot of different wheat varieties/lines during 2009-2010

Varieties / Line	Kg /hat	Thousand grain weight
Pirsabak 2004	3048 a	31.26 abc
Pirsabak 2005	2933 a	32.96 ab
Pirsabak 2008	2991 a	28.58 c
KT-2004 (KT-2009)	2473 ab	32.26 abc
Khyber- 87	2991 a	29.35 bc
PR-1	2243 b	30.40 abc
PR-2 NRL 0320	2646 ab	33.47 a
(Barsat 09)	2876 a	30.53 abc
Saleem 2000 LSD	2588 ab	32.08 abc
	611.6776	3.954

Means sharing the same letters are non significant at 0.05 alpha level

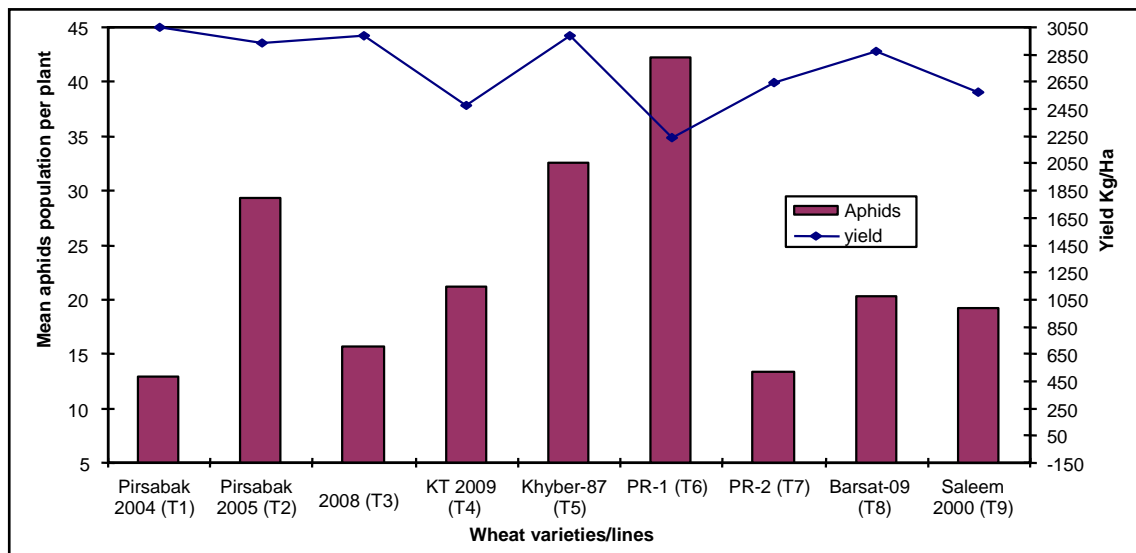


Fig. 10. Mean aphid's population per plant on different varieties / lines of wheat during 2009-2010

Fig. 10 shows the relationship of overall means of aphids population per plant and grain yield in Kg ha^{-1} . The overall mean number of aphids per plant was higher on wheat line PR-1 (42.20) which shows the lowest grain yield of 2243 Kg ha^{-1} , while lowest aphids per plant (12.89) and highest grain yield of 3048 Kg ha^{-1} were recorded on Pirsabak-2004. Aslam *et al.* (2004) also tested twelve wheat varieties/lines against aphids and reported that aphids attacked all these varieties/lines. Aphids attack was lowest on variety Inqalab-91 while highest on wheat line PND-1. Li *et al.* (1998) also found that there was significant difference among wheat lines against mixed population of aphids.

Maximum grain yield of 3048 Kg ha^{-1} was achieved from Pirsabak 2004 and minimum from PR-1 (2243 Kg ha^{-1}). The grain yield among Pirsabak, 2008, 2005, 2004, Khyber-87 and (Barsat-09) was non-significantly different from one another but was significantly different from PR-2, Sleem 2000 and (KT-09). Maximum weight (33.34 grams/1000 grain) was recorded for line PR-2 and minimum (28.58 grams/1000 grains) for Pirsabak 2008. Thousands grain weight among (KT-09), Saleem 2000, Pirsabak 2004, Barsat-09 and PR-1 was non-significantly different but different from PR-2, Pirsabak 2005, Khyber-87 and Pirsabak 2008.

Yield of wheat and population of aphids were inversely proportional i.e. Pirsabak 2004 had highest yield 3048 kg ha^{-1} and more thousand grain weight and lowest aphids population as compared to PR-1 had lowest yield 2243 kg ha^{-1} and less thousands grain weight and highest aphids population. But the statistical analysis shows that this difference is non-significance. Riazuddin *et al.* (2004) tested 20 wheat lines against the attack of aphids and found overall 3.22% decrease in thousand grain weight in all entries. But the mean thousand grain weight between treated and untreated plot against aphids attack were non-significantly different.

CONCLUSION AND RECOMMENDATIONS

The population of wheat aphids should be regularly monitored on different varieties/lines. Aphid's tolerant/resistant cultivars/varieties should be grown for reducing losses. Environmental friendly pesticides shall be applied against aphids on wheat.

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