*Pak. J. Weed Sci. Res. 13(3-4): 209-217, 2007*

# IMPACT OF WEEDING ON WHITEFLY, *Bemisia tabaci* (Genn.) POPULATION ON OKRA CROP

**Abdul Ghani Lanjar[1] and Hakim Ali Sahito**

## ABSTRACT

*Studies on the impact of weeding on population of whitefly, Bemisia tabaci (Genn.) on okra crop were carried out at Private Farm near Kandiaro, district Naushahro Feroze during November, 2004 to February, 2005. Seeds of Subzpari variety were sown on 10th November, 2004 in RCBD having 4 treatments and 5 replications. The treatments were Complete weeding, Dicotyledonous weeds removed, Monocotyledonous weeds removed and Weedy check. Whitefly population was recorded on weekly basis on okra and weed species as well. Results showed that whitefly appeared on all species of weeds and main crop as well. The most preferred weeds were Cyperus rotundus and Portulaca oleracea followed by Polygonum plebejum, Trianthema monogyna, Cynodon dactylon, Digera arvensis, and Corchorus antichorus with the population of 1.09 ± 0.06, 1.08 ± 1.11, 0.93 ± 0.07, 0.87 ± 0.05, 0.86 ± 0.05, 0.78 ± 0.06 and 0.53 ± 0.58 per plant, respectively. The maximum per leaf population (14.92±2.68) was recorded in the weedy check plots followed by Monocotyledonous weeds removed (8.48 ± 1.86), Dicotyledonous weeds removed (6.59 ± 1.50) and All weeds removed (4.57 ± 1.05). Analysis of variance showed significant differences in population among the treatments. However, non-significant differences were recorded among the populations on C. rotundus and P. oleracea, P. plebejum and C. dactylon and T. monogyna and D. arvensis.*

**Key words:** *Bemisia tabacci,* weed species, dicot weeds, monocot weeds.

## INTRODUCTION

Okra, *Abelmoschus esculentus* L., family Malvaceae is a main Kharif vegetable of Pakistan. The people eat it with a great interest. The origin of this vegetable is considered as Africa and Asia. Okra is a

[1] Sindh Agriculture University Tando Jam, Sindh, Pakistan.

good source of vitamins, minerals, salts and has a good caloric value. The edible portion contains 89.8, 0.8, 0.2, 7.4 and 1.8 percent water, protein, fat, carbohydrate and ash, respectively. It has 175 calories per pound. It is one of the cash crops of Sindh (Khoso, 1992).

So many insect pests from sowing up to harvesting attack okra plants. The most destructive insect pests are whitefly, thrips, jassids, aphids, spotted bollworm, American bollworm etc. Among these insect pests the whitefly is the injurious one which destroys the okra plant by sucking the sap from the leaves and transmitting certain viral diseases (Atwal, 1994).

Whitefly is a highly polyphagous and has been recorded on a wide range of cultivated and wild plants. However, the magnitude of infestation and the nature of extent of injury vary with plant species, seasons and localities. (Greathead, 1986) enlisted 506 plant species belonging to 74 plant families while many families are represented by a single species that serves as host of *Bemisia tabaci*. There are as many as 99 species in Leguminosae at the other extreme. It is pointed out that 50% of the total number of host plants belongs to only five families, namely, Leguminosae, Compositae, Solanaceae, Malvaceae and Euphorbiaceae. It is widely distributed throughout the northern and western regions of Indo-Pak continent damaging many different cash crops i.e. cotton, brinjal, sweet potato, alfa alfa, cucurbits, etc. (Brown and Nelson, 1986) seasonal migration of whitefly indicated that the first adult of the year to emerge around mid January, usually on weeds such as *Convolvulus arvensis* and *Euphorbia* spp., or cultivated plants such as *Brassica* spp., (Basu, 1995). Van Gent (1982) reported that various host plants and weeds harbor *B. tabaci* population around the year proved as source of infestation for cotton crop. *B. tabaci* appears over winters between cropping seasons as actively developing population on winter weeds such as cheese weed and sow thistle from October to March, in the spring, *Helianthus annuus* and *Convolvulus arvensis* (Coudriet, *et al*. 1986).

There are so many weed species, which serve as alternate host to *B. tabaci* around the year and provide better media for keeping the population of whitefly sustained throughout the year. Subsequently, easy migration of the fly takes place from weeds – crop – weed that causes severe losses by the fly to the main crops.

Keeping the importance of weeds into focus, as alternate host of *B. tabaci* an experiment was conducted to observe the impact of

weeding on population of whitefly on okra crop. This will help the growers to manage the whitefly on the main crops.

## MATERIALS AND METHODS

An experiment was conducted to determine the impact of weeding on population of the whitefly, *B. tabaci* on okra crop at experimental field of the Private Farm near Kandiaro, District Naushahro Feroze, during autumn season 2004.

The seeds of Subzpari variety of okra were sown on 18$^{th}$ November in a randomized complete block design having four treatments and five replications. The sub-plot size was maintained 14x12 feet. The plant to plant and row to row distance was maintained at 22.5 and 60 cm, respectively. The details of treatments were as under:

**$T_1$ =** All weeds removed.
**$T_2$ =** Only Dicotyledonous weeds removed.
**$T_3$ =** Only Monocotyledonous weeds removed.
**$T_4$ =** Weedy check- No weeding practiced.

In the plots where required, weeds were manually removed every other day. Other agronomic practices were carried out as and when required, as per recommended practices for the okra crop.

### Whitefly Population on Weeds

The whitefly population on different species of weeds was recorded by selecting 10 plants of each weed species from their respective treatments. However, the plants of each species were selected from each treatment by the same movement as okra leaves were examined. Each plant of each weed species was thoroughly examined for whitefly population.

### Whitefly Population on Okra Crop

The whitefly population was recorded once a week from germination till the harvesting of the crop. Whitefly population was recorded by examining randomly selected 25 leaves from each sub plots. The leaves of node 2, 3, 4, 6 and 7 of different plant were examined. The selection of the leaves on different plants was made by cross movement (moving from one corner to the apposite corner) in each sub plot. Adult population of whitefly was recorded only.

The data thus obtained were subjected to statistical analysis such as analysis of variance among the treatments and the comparison of means by LSD test.

## RESULTS AND DISCUSSION

During the studies on effect of weeding on population of *B. tabaci* on okra crop different weed species were grown in the field of okra crop. The weed species were Dicot and Monocot groups of plants, these are listed as under:

i. *Trianthema monogyna*, horse purslane vern. Waho
ii. *Digeria arvensis*, false amaranth vern. Lulur
iii. *Cyperus rotundus*, purple nutsedge vern kabbah
iv. *Portulaca oleracea*, common purslane vern. Lonak
v. *Cynodon dactylon,* Bermuda grass vern. chhabbar
vi. *Polygonum plebejum*, knot weed vern. kheiroala
vii. *Corchorus antichorus,* vern. bhauphali,
viii. *Convolvulus arvensis* field bindweed vern. naro f

### Whitefly population on weeds

Some of the above weeds were germinated simultaneously to okra plants and some of them one or two weeks later, therefore the observations on occurrence of *B. tabaci* on weeds were taken simultaneously to okra plant.

The data presented in Fig.-1 showed the occurrence of *B. tabaci* on the weeds. The population of *B. tabaci* appeared on all weeds from germination till their maturity i-e. 3$^{rd}$ week of November 2004 to 1$^{st}$ week of February 2005. Two peaks in the population of whitefly were recorded on all weeds, 1$^{st}$ peak during 3rd week of December 2004 and 2$^{nd}$ peak in 3$^{rd}$ week of January 2005.

The over all means showed that Lonak and kabbah harboured maximum population 1.09 ± 0.06 and 1.08 ± 1.11, respectively, followed by kheiroala 0.98 ± 0.06, chhabbar 0.93 ±0.07, Naro 0.87 ± 0.05, waho 0.86 ± 0.05, lulur 0.78 ± 0.06 and bhaupahali 0.53 ± 0.58.

Analysis of variance showed highly significant differences ($P<0.01$) among populations of whitefly appearing on different weed species. However, LSD test showed non-significant differences between kabbah and lonak, kheiroala and chhabbar and waho and lulur, respectively.

**Whitefly on okra crop**

The data in Fig. 2 reveals the population of *B.tabaci* on okra crop. Whitefly appeared on treatments right from germination till harvesting of the crop. During study period two peaks were recorded. 1st peak was recorded during 2nd week of December 2004 and 2nd peak during 1st week of January 2005. The whitefly population recorded during 1st peak was 20.37 ± 2.88 per leaf in $T_4$ plots (None of the weeds removed) followed by $T_3$ = 16.18 ± 2.99, (only Dicotyledonous weeds removed), $T_2$ = 13.75 ± 2.16 only monocotyledonous weeds removed) and $T_1$= 11.77 ± 1.77 (all weeds removed).

Similar trend of population was observed during 2nd peak. The highest population 13.94 ± 2.28 per leaf was recorded in the plots where no weeding was practiced followed by 11.12 ± 1.81 where dicotyledonous weeding was practiced, 9.24 ± 1.51 where Monocotyledon weeding was practiced and 7.4 ± 1.18 where weeding was totally practiced. The over all means showed that maximum population 9.05 ± 1.56 was recorded in the plots where none of the weeds were removed and minimum population 5.13 ± 1.56 was recorded in the plots where all the weeds were removed.

Analysis of variance showed significant differences in the population of *B.tabaci* in all treatments. The mean comparison showed that all treatments varied significantly at ($P < 0.05$).

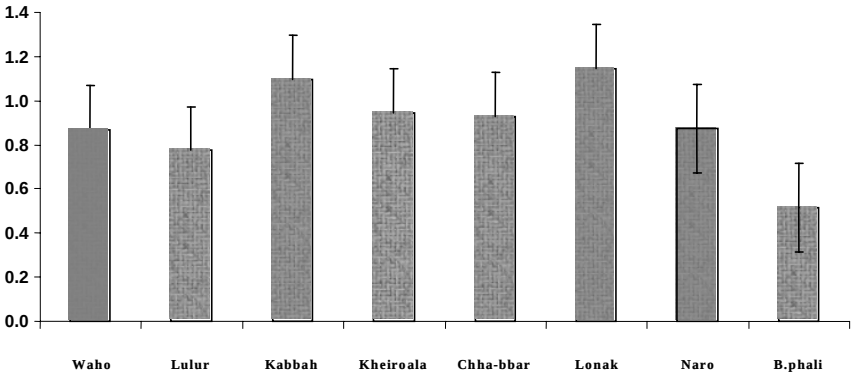


**Fig.-1. Mean population of *B. tabaci* per leaf on okra with different weeding practices during November, 2004 to February 2005.**

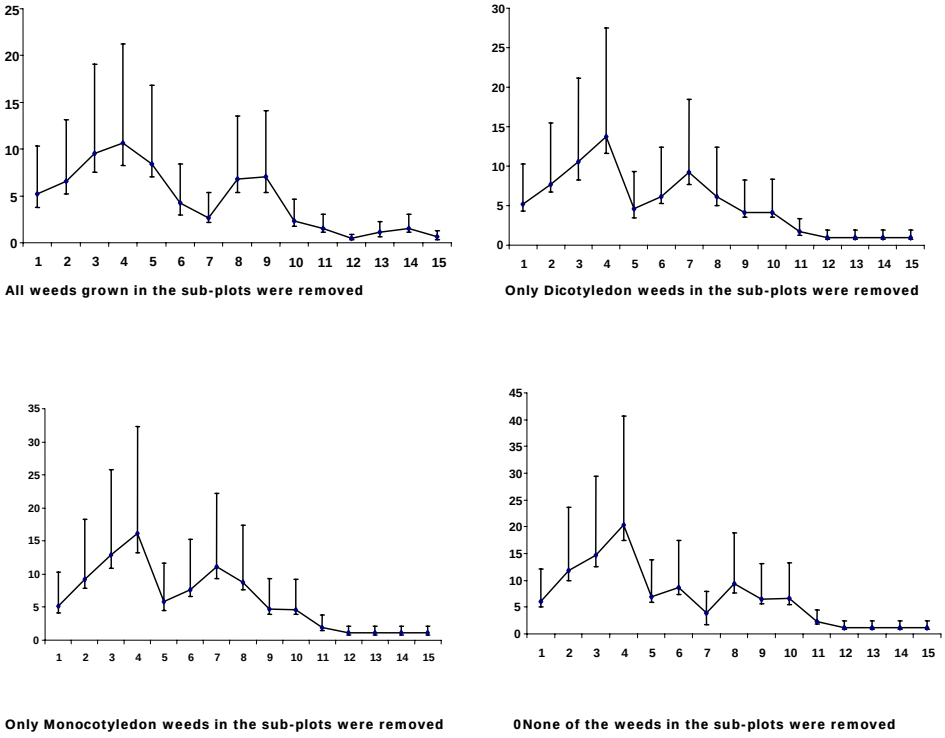


**Fig.-2. Mean population of *B. tabaci* per leaf on okra with different weeding practices during November 2004 to February 2005.**

The results of the experiment revealed that whitefly appeared on okra after germination till maturity of the crop. However, during cropping season fluctuation in population was also recorded and two peaks were recorded during cropping season. The result is in agreement with those of Aslam and Gebars (1995) who reported that the most preferred hosts in a vegetable field were tomato cucumber, pepper and okra. They mentioned 2 highest populations on okra in a cropping season. El-Khayat, *et al*. (1994) reported that among summer host okra was least-preferred crop. Othman *et al*. (2002) reported that members of Malvaccae family are the most preferred by *B*. *tabaci*. Our findings are at variance from El-Khayat, *et al*. (1994). We recorded eight species of weeds i.e. Waho (*T. monogyna*), Lulur (*D.arvensis*), Kabbah (*C. rotundus*), Lonak (*P. oleracea*), Chabbar (*C.dactylon*), Kheirola (*P. plebejum)*, Bhauphali, *C. antichorus* and

Naro *C.arvensis* in the field of okra crop. All these weeds were found harbouring whitefly population.

The population of whitefly recorded on them from their germination till maturity is supported from the work of Attique, *et al*. (2003) who reported 46 weed species as host of whitefly during winter and spring. They also reported that maximum population of whitefly was observed on *T. monogyna*, *D. arvensis*, *C. dactylon* and *P. plebejum* alongwith some other weed species. In present studies, the highest population density of whitefly was recorded on *C. rotundus* and *P. plebejum* and lowest on *C. antichorus.* It was in agreement with those Sampedro- Romero, *et al*. (2002) and Othman, *et al*. (2002); who reported high density of whiteflies population on *Portulaca oleracea* and *Cyperus rotundus.* Singh, *et al*. (2002) reported some weed species as alternate host of whitefly in okra field.

The results on impact of weeding on the population build up on okra showed that minimum population of whitefly was recorded in the plots where total weeding was practiced and maximum population was recorded in the plot where no weeding was done. The results are in agreement to those of Monsef and Kashkooli (1978) they found that *B. tabaci* had 10-11 generations a year. It over wintered as larvae, pupae or adults; at the end of February, with increasing temperatures, over wintering pupae gave rise to adults and these flew to weeds, later migrating to cotton. Cultural practices such as alternating planting dates, crop rotation and weed residue disposal can play a significant role in integrated pest management system targeting whiteflies (Hilji, *et al*. 2001). Hilji (2000) also suggested destruction of weeds as a potential practice for developing integrated management schemes to control *B*. *tabaci*. Medina- Balderas, *et al*. (2002) disagree with our results and state that the presence of weeds favoured the presence of parasitoids, reduced the population density of *B*. *tabaci* and incidence of virus. They also reported that the presence of weeds decreased the crop yield because of competition for resources which is also a huge draw back of pressure of weeds in a crop field. Jiang, *et al*. (2004) reported 5 weed species susceptible to TYLCSV which was duly transmitted by *B*. *tabaci*. Marten, *et al*. (2004) reported that during summer *B*. *tabaci* was found on vegetable crops, ornamentals and some weeds in the open field and green house.

## CONCLUSIONS

On the basis of the results presented, it could be concluded that:

1. All weeds harboured whitefly population and were serving as alternate host.
2. Population of whitefly fluctuated concurrently on weeds as on the main crop Okra).
3. Weeding discourages the population buildup of whitefly on okra crop hence management of weeds is recommended.

## REFERENCES CITED

Atwal, S.N. 1994. Agricultural pests of India and Sout Eash Asia. Kalyani Publishers New Delhi, India. Pp. 529.

Attique, M.R., R. Muhammad and A. Gaffar. 2003. Role of weed hosts in the population buildup of *Bemisia tabaci* (Genn.) (Aleyrodidae: Homoptera) and its carry over to cotton. Pak J. Zool. 35 (2): 91 – 94.

Aslam, M.and F Gebara. 1995. Host plant preference of vegetables by cotton whitefly, *Bemisia tabaci* (Genn.). Pak J. Zool. 27 (3): 269-272.

Basu, A.N. 1995. *Bemisia tabaci* (Gennedius) crop pest and principal whitefly vector of plant viruses. West view press, Boulder. San Francisco, Oxford. Pp. 183.

Brown, J.K. and M.R. Nelson. 1986. Characterization of watermelon curly mottle virus, a geminivirus distiact from squash leaf curl virus. Ann. Appl. Biol. 15 (2): 243 – 252.

Coudriet, D.L., D.E. Meyerdrik, N. Prabhaker, and A.N. Kishaba. 1986. Bionomic of sweet potato whitefly (Homoptera: Aleyrodidae) on weed hosts in Imperial Valley, California. Environ. Entomol. 15 : 1179 – 1183.

El-Khayat, E. F., A. M. El-Sayed, F. F. Shalaby and S. A. Hady. 1994. Infestation rates with *Bemisia tabaci* (Genn.) to different summer and winter vegetable crop plants. Annals Agric. Sci., Moshtohor 32 (1): 577-594.

Greathead, A.H. 1986. Host plants. In *Bemisia tabaci*: a literature survey on the cotton whitefly with an annotated bibliography AH Greathead, MJW Cock - CAB International Institute, Ascot, U.K.

Hilje, L. 2000. Cultural practices for managing *Bemisia tabaci*. Prácticas agrícolas para el manejo de *Bemisia tabaci*. Manejo Integrado de Plagas 56: 22 – 30.

Hilje, L., H.S. Costa and P.A. Stansly. 2001. Cultural practices for managing *Bemisia tabaci* and associated viral diseases. Crop Prot. 20 (9): 801 – 812.

Jiang, Y. X., C. Blas, I. D. de, Bedford, G. Nombela and M. Muniz. 2004. Effects of *Bemisia tabaci* biotype on the transmission of tomato yellow leaf curl Sardinia virus (TYLCSV-ES) between tomato common weeds. Spanish J. Agric. Res. 2 (1):115-119.

Khoso, A.W. 1992. Growing vegetable in Sindh. 1st ed. Department of Agronomy. S.A.U. Tando Jam, pp. 115 – 118.

Marten, T., M. Imala and A. K. Budin. 2004. Results of the three-year monitoring of tobacco whitefly, *Bemisia tabaci* (Gennadius), (Homoptera: Aleyrodidae) in Croatia. Agri. Sci. and Prof. Rev. 10(1): 43-48.

Medina-Balderas, S., L.D. Ortega Arenas, H. Gonzalez Hernandez and J.A. Villanueva Jimenez. 2002. Influence of weeds on the whitefly virus parasitoids complex in veracruz, Mexio, Manejo Integrado de Plagas y Agroecologia 65: 75 – 81.

Monsef, A. A. and A. Kashkooli. 1978. The cotton whitefly *Bemisia tabaci* Genn. and its control in the Province of Fars. Entomologie et Phytopathologie Appliquees 46(1/2): 66-77.

Othman, A. K. M., O. S. Shuaib and M. H. A. Sattar. 2002. Survey for host plants of whitefly, *Bemisia tabaci* (Gnn.) in Abyan and Tuban Delta at southern coastal plain. Univ: of Aden J. Natural and Appl. Sci. 6 (3): 497-504.

Sampedro-Romero, J., M. Gonzalez Bez, N. Perez Betancourt and E. Perez Espinosa. 2002. Geminivirus-hosting weeds in common bean *Phaseolus vulgaris* fields. Manejo Integrado de Plagas y Agroecologia 66: 36 – 38.

Singh, J., A.S. Sohi, H.S. Mann and S.P. Kapur. 1994. Studies on whitefly, *Bemisia tabaci* (Genn.) transmitted cotton leaf curl disease in Punjab. J. Insect Sci. 7 (2): 194 – 198.

Van Gant, R.V. 1982. Investigation on parasites as a component of integrated pest control of whitefly in cotton. FAO/UNEP Jezira Res. Stn. Agri. Res. Crop. Wad. Medani Sudan. Working Paper No. 8, 39p.