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Impact of IPM and Traditional Practices on Okra Plant, Sucking Complex and Beneficial Insects

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Abstract:

The study on population variation of sucking complex on okra crop with IPM practiced and traditionally practiced was carried out under National IPM Programme PARC at Tando Allahyar during spring season of 2006. Okra crop was sown in Plot "A" (for IPM practices) and "B" (farmer's practices) on 19-02-2006. IPM practices such as, use of neem oil extract, ginger extract, tobacco extract, sugar crystals and detergent (soap + surf) were applied at different time intervals. While, Plot "B" was sprayed with Thiodon + Confidor, Thiodon + Match and Thiodon at different time intervals by the farmer his own. Observation on plant phenology, population of insect pests, predators and yield were carried out at weekly intervals. The results revealed that overall mean of height, branches, leaves, squares, flowers

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and fruits was 19.40 ± 2.65, 2.34 ± 0.3554, 9.78 ± 0.95, 4.41 ± 0.48, 2.13 ± 0.55, 2.66 ± 0.58 in IPM plot and 21.63 ± 2.9608, 1.83 ± 0.3158, 9.55 ± 0.95, 4.13 ± 0.45, 1.61 ± 0.42, 1.61 ± 0.42 were recorded in farmer's plot, respectively. The result further revealed that overall mean population of whitefly, thrip, jassid, and aphid was 0.62 ± 0.10, 0.18 ± 0.0419, 0.37 ± 0.87, 0.20 ± 0.12 per plant in IPM plot and 0.95 ± 0.09, 0.37 ± 0.09, 3.52 ± 0.86, 0.18 ± 0.10 were recorded in farmer's plot respectively. The result further showed that, the overall mean population of spider, ants, chrysopa, mystery bug, lady bird beetle, mirid bug, and orius was 0.237 ± 0.0666. 0.397 ± 0.0867, 0.068 ± 0.0231, 0.077±0.0193, 0.188 ± 0.0507, 0.1018 ± 0.0163, 0.497 ± 0.1308 per plant in IPM plot and 0.061 ± 0.0174, 0.074 ± 0.0226, 0.02 ± 8.57, 0.021± 6.96, 0.087 ± 0.0302, 0.0035 ± 1.91, 0.102 ± 0.0249 were recorded in farmer's plot respectively. The result further showed that, the total yield 51.78 and 41.36 (Mean) was recorded in IPM and in farmer's plots respectively.

Key words: IPM practices, Okra, Sucking complex, beneficial insects

INTRODUCTION

Okra (*Abelmoschus esculentus* L) belongs to Malvaceae family. In Pakistan, the total area and production comes to 4764 hectares and 21906 m.tons. The world average production of okra during 2003-2005 was 11.0/billion pounds and Pakistan during 2005 was 2.4 cwt million (Anonymous 2005). The crop is attacked by a number of insect pests. (Kumar *et al.* 2004) reported jassid (*Amrasca devastans*), whitefly (*Bemisia tabaci*), thrip (*Thrips tabaci*), American bollworm (*Helicoverpa armigera*), spotted bollworm (*Earias* sp.) and pink bollworm (*Pectinophora gossypiella*) as major insect pests which cause economic loss to okra crop. (Dubey *et al.* 1999 & Kumawat *et al.* 2000) reported aphid, whitefly, jassid and thrip as major sucking insect pests. Among these sucking insects, whitefly is the most serious pest of okra plant throughout the world (Atwal

1993 & Basu 1995). To reduce the population of these noxious pests, pesticides have been used since long. Due to indiscriminate use of pesticides, the pest has developed resistance. Besides, that pesticides are hazardous to human health also reduces density of beneficial insects and soil microorganisms (Parveen & Dhandapani 2001). To avoid pesticides hazards various eco-friendly management practices can be used which including the appropriate timing of sowing, judicious use of fertilizers, use of resistant cultivars, physical control, botanical insecticides such as tobacco and neem seed extracts. (Ahmed *et al.* 1995; Cobbinah & Osei-Owusu 1996 & Kulat *et al.* 1997). (Gupta *et al.* 1999) evaluated the bio efficacy of neem products against *Earias* spp., *Pectinophora gossypiella* (Saunders) and *Helicoverpa armigera* Hubn. and their impact on whitefly, *Bemisia tabaci* (Genn.). (Singh & Kumar 2003) determined the efficacy of neem *Azadirachta indica* based pesticides against the jassid, aphid, white fly, lady bird beetle, *chrysopa*, *Diaeretiella rapae* and *Eretmocerus mundus.* (Zaki *et al.,* 1999; Geoghegan 2000 & Al-Eryan *et al.* 2001) reported ant spider o*rius*, mirid bug, mystery bug, *trichogramma*, e*ncarsia, brumus,* big eyed bug, assassian bug, damsel bug effective against sucking and chewing insect pest.

The present study was carried out to suppress the population of the noxious pests by applying various methods such as, use of bio pesticides (neem oil extract, ginger extract, tobacco extract etc) sugar crystals (to invite ants) and detergent (soap + surf) to reduce sucking pests population. The study was carried out at agro- ecological conditions of district Tando Allahyar through National IPM project of vegetables training of facilitator (vToF) on okra crop. The result of the present study is a step forward to better management of sucking insect pests of okra.

MATERIALS AND METHODS

The study on population variation of sucking complex on okra crop with IPM practices and traditionally practices was carried out under National IPM Programme, PARC at Tando Allahyar during spring season of 2006.

Okra crop was sown in two Plots viz. "A" (for IPM practices) and "B" (farmer's practices) in Feb. 2006. IPM practices such as use of neem oil extract, ginger extract, tobacco extract, sugar crystals and detergent (soap + surf) were applied at different time intervals. While, Plot "B" was sprayed with Thiodon + Confidor, Thiodon + Match and Thiodon at different time intervals by the farmer his own. Weekly counting of sucking complex was made by selecting 2 squares meter area which was considered as observation spot. In this way 5 spots were determined one from each corner and one from the centre of the each plot. Five plants from each spot were selected; six leaves from each plant were randomly examined. Data on phenology of selected plants were also recorded.Population of predators such as, spider, ant, *Chrysopa*, mystery bug, lady bird beetle, mirid bug and O*rius* were counted through sweeping and by examining the plants. Yields of both plots were also compared. Data thus obtained were subjected to statistical analysis i.e. Standard Error and T-test were computed to observe the difference between two plots.

RESULTS

Phenology of okra plant

The data on phonological variation between plants of IPM plot and Farmer's plot are presented as under:

Height, Branches, Leaves, squares, flowers and fruits

The (Fig.1) indicated that the height and No. of branches, leaves, squares, flowers and fruits were observed significantly higher in IPM plot than farmer's plot. The data showed that okra plants attended their maximum height 34.5 and 36.3 inches (T-value 2.2378) farmer plot respectively. The maximum No. of branches 4.48 and 4.16 (T-value 0.514) per plant in IPM and farmer's plot, respectively.

The maximum number of leaves 14.3 and 13.93 (T-value 0.2235) in IPM and farmer plots, respectively, in the 2nd week of June. The maximum no. of squares 6.86 and 6.42 per plant (T-value 0.2812) in IPM and farmer's plots, respectively, in the 2nd week of June. The maximum no. of flower 6.12 and 4.88 per plant (T-value 0.5206) in IPM and farmer's plot, respectively, in the 2nd week of June. Maximum no. of fruit bearing 6.62 and 4.88 (T-value 0.5647) in IPM and farmer's plots were recorded respectively in the 2nd week of June.

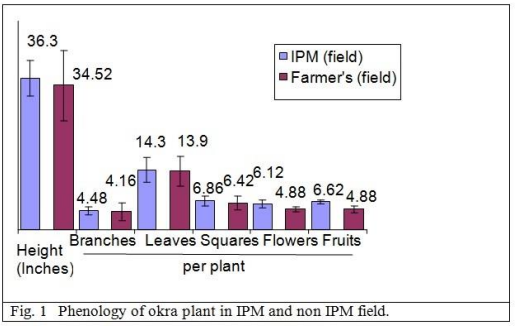

Fig. 1 Phenology of okra plant in IPM and non IPM field.

SUCKING INSECT PESTS ON OKRA

The sucking insect pests such as whitefly, jassid, thrip and aphid were recorded. Data in Fig. 2 shows that whitefly appeared on okra crop during 1st week of March. Peak activities of whitefly were recorded in 3rd week of April. During peak activities, the population of whitefly was 1.64 per leaf in IPM plot and 1.88 in farmer's plot. The overall mean 0.62 ± 0.10 and

0.95 ± 0.09 (T-value -0.3276) was recorded in IPM and farmer's plot, respectively.

Similarly, the thrip started their activities in 1st week of March. Their peak population 0.68 per leaf in IPM plot indicated their maximum activities at very initial stage of the crop after that the population of thrip remained low in the IPM plot throughout the cropping season. This showed that IPM practices had discouraged the activities of thrip. But the population pattern in farmer's plot was totally different. It remained low in no. until the 1st half of the crop and then increased gradually to 1.22 thrip per leaf in the 3rd week of June. The overall mean population 0.18 ± 0.04 and 0.37 ± 0.09 per leaf (T-value -0.1824) was recorded in IPM plot in farmer's plot, respectively. The sample T test showed significant difference in both plots.

Jassid appeared on okra crop from 2nd week of March and remained until the 4th week of June. Initially the population of jassid was low that increased gradually during the proceeding weeks. Maximum mean 11.4 jassid per leaf was recorded in 3rd week of June in IPM and 8.1 in farmer's plot, respectively. The overall mean population 0.37 ± 0.87 and 3.52 ± 0.86 per leaf (T-value 1.0388) was recorded in IPM and farmer's plot, respectively.

The maximum population of aphid was 1.96 mean per plot in 3rd week of March in IPM and 1.62 on 1st week of April in farmer's plot. The overall mean population 0.20 ± 0.12 and 0.18 ± 0.10 was recorded in IPM and farmer's plot, respectively. The sample T test showed significant difference between populations of aphid on both the plots (T-value 0.0212).

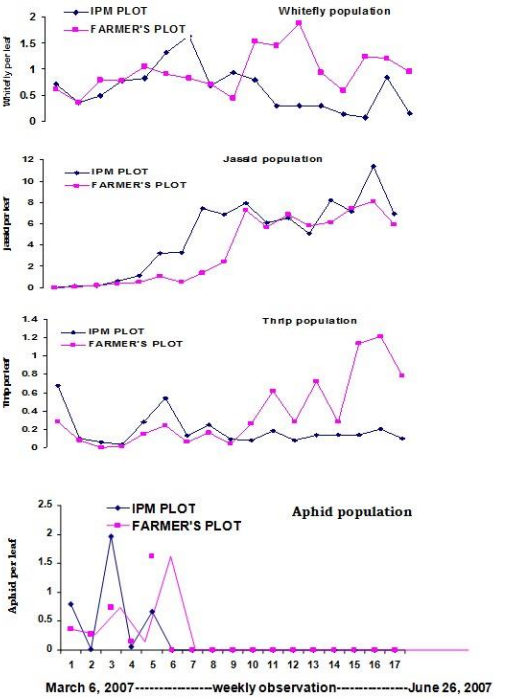

Fig. 2a. Population of various sucking pests on okra crop

BENEFECIAL INSECT ON OKRA

Data in Fig-2(b) shows that predator (insect and non insect) seemed active through out cropping season. The predators recorded were: spider, ants, *Chrysopa*, mystery bug, lady bird beetle, mirid bug, and *Orius* sp. Different species of spider were displayed activities from 1st week of March till 4th week of June. Their population was fluctuated throughout cropping season. However, the overall mean population 0.23 ± 0.06 and 0.06 ± 0.01 was recorded on IPM and farmer's plot, respectively. The sample T test showed difference 0.175 between two plots. The ants also played a vital role in minimizing the population of whitefly and aphid. Their population was very synergistic with the population of these insect pests. Their population was at

peak in the 4th week of June. The overall mean 0.39 ± 0.08 and 0.07 ± 0.02 was recorded in IPM and farmer's plots. Their greater population in IPM plot showed that the IPM practices used during cropping season encouraged their activities. The sample T test value 0.3229 showed significant difference in population of ants between two plots.

Chrysopa is a voracious feeder on aphid followed by jassid and whitefly. The activities of *Chrysopa* were recorded from 1st week of March till 4th week of June. Their maximum activities were recorded on 4th week of June. Their maximum population 0.38 per spot was recorded in IPM plot and 0.34 was recorded in farmer's plot. This clearly indicated that IPM practices promoted the activities of *Chrysopa* in the field and pesticides used in farmer's plot discouraged their activities. The overall mean 0.06± 0.02 and 0.02 ± 8.57 was recorded in IPM and farmer's plots. The sample T test value 0.0482 showed significant differences between the plots. Mystery bug was one of the predators which were also recorded as an active predator against sucking insect pests. In okra field these bugs activated against aphid, jassid. Its co-occurrence was recorded with these insect pests. However, maximum activities were recorded in 1st half of the cropping season. In later stages of the crop its population was more or less constant till the end of the crop. The overall mean 0.07±0.01 and 0.021± 6.96 indicated that it was in abundance in IPM plot as compared to farmer's plot. T value was computed 0.0559 between two plots. The 5th active predators were lady bird beetles; they were consistently occurred on both the plot. They were found hunting on aphid followed by jassid and whitefly. The population trend of lady bird beetle was irrespective followed to the population fluctuation of these insect pests. They were abundance in IPM plot as compared to farmer's plot. The reason of their abundance could be the injudicious use of pesticides by the farmer's and more availability of food in IPM plot. The overall

mean population 0.188 ± 0.05 and 0.087 ± 0.03 was recorded in IPM and farmer's plots, respectively. The T value 0.1018 computed between two plots. Among predators least activities of mirid bug were recorded. The mirid bug was activating from 4th week of April to the 1st week of June. The overall mean showed that IPM practices favored this predator as compared to the farmer's activities. The overall mean 0.10 ± 0.01 and 0.0035 ± 1.91 was recorded in IPM and farmer plots, respectively. T value 0.0341 was computed in IPM and farmer's plot respectively. The most active predator was *Orius* bug on haemolymph of different insect pests such as, 1st instars of lepidopteron, aphid, jassid, and whitefly. Sucking insects are the main food of *Orius* bug. Its activities were recorded from 2nd week of March to the 4th week of June. Three peaks in the population of *Orius* bug were recorded during cropping season. The overall mean population 0.497 ± 0.13 and 0.102 ± 0.02 was recorded in IPM and farmer's plots respectively. The T value between the plots was recorded 0.3953.

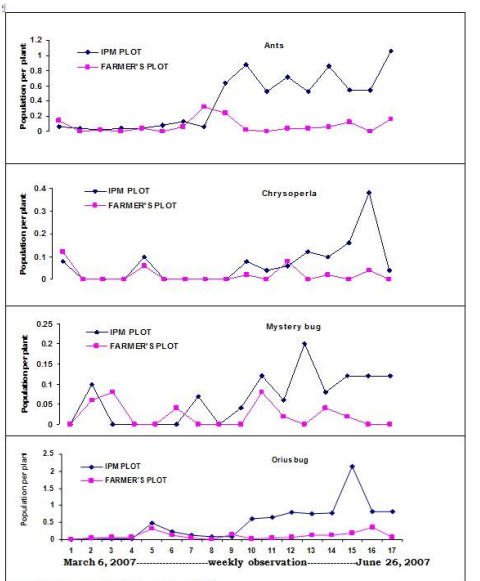

Fig. 2b. Predators activities in okra field

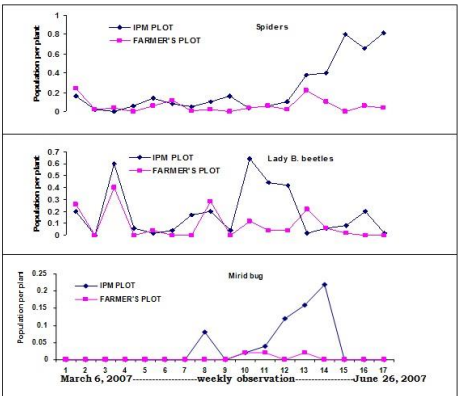

Fig. 2b. Predators activities in okra field

YIELD OF OKRA CROP

Data in Table-4 showed that there were 18 round of picking in each plot. The IPM plot yielded higher than farmer's plot. The overall mean yield 51.78±1.60 and 41.36±1.37 was in IPM and farmer's plots, respectively. The total yield of okra in IPM plot was recorded 984 Kg. which was 200 Kg. more than farmer's plot. It was due to proper application of irrigation, fertilizer, timely weeding and less pest attack in IPM plot.

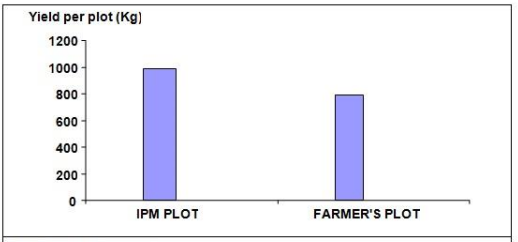

Fig. 3. Yield of okra crop

DISCUSSION

The results indicated that the plant height, Number of branches, leaves, squares, flowers and fruits per plant were

more in the IPM plot then farmer's plot. It was due to proper application of fertilizer, timely weeding, proper irrigation and use of bio-chemicals. The results are in agreement with those of (Bhargava *et al.* 2001; Kumar *et.al* 2004 & Odeleye *et al.* 2005) who reported that proper fertilization clearly differentiate between fruit weight, length and number of fruits per plant. Sucking insect pests, which occurred on okra crop, were: whitefly, jassid, thrip and aphid. (Oparaocha & Okigbo 2003) reported the appearance of thrip on *Hibiscus esculentus*, *Abelmoschus esculentus*. (Basu 1995 & Kumawat *et al.* 2000) investigated the seasonal incidence of jassid *Amrasca biguttula biguttula* and whitefly *Bemisia tabaci* populations on okra. However, less population of whitefly was recorded in IPM than in farmer's plot. It was due to regular use of bio-pesticides and promotion of predators in IPM plot. (Bhatti *et al.* 2005) determined the effects of cultural practices and weedicide on the population of jassid. (Ahmed *et al.* 1995; Gupta *et al.* 1999) reported no build up of whitefly *Bemisia tabaci*, jassid *Amrasca devastans* and thrips *Thrips tabaci* in neem treated fields. Much of its activity of aphid was recorded in farmer's plot. This was due to regular use of bio-pesticides. (Satar *et al.* 1999 & Al-Eryan *et al.* 2001) investigated the incidence of *Aphis gossypii* in okra fields. (Mudathir & Basedow 2004) mentioned that botanical pesticides significantly reduced the attack of *Aphis gossypii*, *Bemisia tabaci* on okra crop.

The predators spider, ants, *Chrysopa*, mystery bug, lady bird beetle, mirid bug, and *Orius* were recorded. (Zaki *et al.*1999 & Geoghegan 2000) reported *Chrysoperla carnea,* and *Coccinella undecimpunctata* and *Coccinella septempunctata*. (Praveen & Dhandapani 2001) reported *Chrysoperla* as potential predators on okra that achieved 100% reduction in *A. gossypii.*. (Singh & Brar 2004) reported that coccinellids are the most important predators; they prey upon large numbers of sucking pests like aphids, jassid, thrips, scales, mealy bugs,

Pyrilla, plant hoppers and white flies. (Gowri *et al.* 2002 & Rao & Raguraman 2005) reported that nine neem *Azadirachta indica* formulations were relatively safe to coccinellids. (Sardana *et al.* 2005) evaluated the impact of cultural + mechanical + bio-intensive module provided the optimum control of the pest and a large build-up of natural enemies.

IPM plot yielded higher than farmer's plot. It was due to proper application of irrigation, fertilizer, timely weeding and less pest attack in IPM plot. (Gandhi *et al.* 2006) also reported that application of neem product minimized the attack of insect pests and also improved the yield of okra.

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