EFFECT OF SELECTED INSECTICIDES ON DAMAGE COMPENSATION OF SUCKING PESTS IN COTTON

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***ABSTARCT*:** *The study was conducted to determine the effect of insecticides on population of sucking insect pests and yield compensation in cotton. The cotton variety Chris-134 was sown by dibbling method on furrows in a randomized complete block design with five replicates. Insecticides, Confidor, Mospilan, Deltaphos and Tracer were sprayed twice at the recommended doses. The observations on population of sucking complex i.e., thrips Scirtothrips dorsalis Hood, whitefly Bemisia tabaci Lind and jassid Amrasca devastans Dist. and their effect on height of plant, volume of cotton bolls, maturity percentage and yield were observed. Results revealed that significantly higher population/leaf of thrips was observed in control plot (1.47±0.12) whereas; the lowest number of thrips (0.95±0.12) was recorded in Tracer treated plots. Significantly the highest per leaf population of jassids was recorded in control (0.95±0.07) and Deltaphos (0.88±0.07) plots. Population of aphids was the lowest among sucking pests with no significant differences among treatments. The highest population of whitefly was observed in controlled plot followed by Tracer, Confidor, Mosplan and Deltaphos, respectively. Plant height in different treatments ranged between 93.26 cm to 112.66 cm and only significant difference was observed between Tracer (112.66±10.27) and Deltaphos (93.26±14.8). The volume of bolls ranged between 9.66 to 10.22 cm^3. Maximum (62.33%) and minimum (50.03%) boll opening was recorded in Mospilan and control treated plots, respectively. The highest yield of seed cotton (75.78 gm/plant) was recorded in plot treated with Confidor whereas, the lowest yield (56.86 gm/plant) was observed in control plots. The result revealed that the application of insecticides not only reduce the pest populations, but also increase the volume of bolls and cotton yield.*

Keywords: Cotton, insecticide, yield, sucking pests

INTRODUCTION

Cotton (*Gossypium hirsutum* L) is the most important fiber crop grown throughout the world and is one of the key economic factor in Pakistan's economy. Cotton is used as raw material in textile as well as in oil industries. It earns foreign exchange through export of raw cotton, cotton yarn, cloths, garments and other cotton made by-products. Cotton seed oil is used as edible oil, which makes about 80% of national oil production [1]. Cotton also provides raw material to domestic cotton industry comprising 503 textile mills, 1139 ginning factories and 5000 oil expelling units [2]. Cotton seedcake, an important by-product of cotton, is a valuable source of protein for ruminant cattle. In addition, 40% labour of our country is employed in cotton fields and cotton processing mills [2].

In Pakistan, nearly about 93 insects as well as mites have been reported to attack cotton crop [3]. Among these; seventeen species have been recorded as major insect pests of cotton crop [4]. The most destructive are sucking insect pests; thrips (*Thrips tabaci* Lind.), whitefly (*Bemisia tabaci* Genn.) and jassid (*Amrasca biguttula* Ishida) which cause damage up to 50% in the crop [5]. They suck the sap from the under surface of leaves which cause huge damage to the standing crops. These pests are being controlled by synthetic insecticides at large scale as insecticides are highly effective and have positive results in short period of time. The studies on efficacy of different insecticides against sucking insect pests have been conducted by investigators [6-9]. The present study was conducted to document sucking insect pest population and their effect on physiological characters, maturity time and yield of cotton crop.

MATERIALS AND METHODS

The present study was conducted at the Latif Farm, Sindh Agriculture University, and Tandojam. The experiment was laid out in a Randomized Completely Block Design (R.C.B.D.) with five treatments including control (check) and replicated three times. The plot layout was 19×5.5 m (104.5 m^2) with 1.5 m path between each replication. Cotton variety (CRIS -134) was sown on 22nd May, 2013 by dibbling method on the furrows. The distance between each plant was 30 cm, and row to row was 75cms. Two applications of Nitrophos fertilizer at recommended dose of 2 bags/acre were done, first during second irrigation and second at fruiting stage. The cultural practices i.e., irrigation, thinning and weeding were carried out from sowing till harvest as per recommendation.

Application of Insecticides

Four insecticides i.e., Confidor 20 SL, Mospilan 20 SP, Deltaphos 10+350 EC, and Tracer 240 SC, were sprayed at recommended doses with shoulder mounted knapsack sprayer. First spray of Confidor and Mospilan for sucking insect pests was carried out on 22nd June, 2013 and second spray was made on 21st July, 2013. The first spray of Deltaphos and Tracer for bollworms pests was applied on 22nd August 2013, whereas second spray of same insecticides was done on 14th September, 2013. Analysis of Variance (ANOVA) was performed to analyse the data, whereas Least Significant Difference (LSD) p= 0.05 was used to separate means with significant differences.

Observations on sucking insects: The observations on sucking insect pests such as aphid, *aphis gossypii;* Jassids, *Amrasca devastans;* thrips, *Scirtothrips dorsalis;* and whitefly, *Bemisia tabaci* were recorded at weekly interval one month after sowing of the crop. Observations were

recorded from five randomly selected plants per treatments and five leaves per plant, (one from top, two from middle and 2 from bottom portion).

Boll volume (boll diameter): Volume of cotton bolls was measured with the help of vernier calliper. Five plants were selected at random per treatment for measuring bolls volume. From every plant, five fully grown bolls were selected at random for recording bolls volume. The volume of bolls was calculated by multiplying length and breadth of bolls. The observation was recorded on 24th September, 2013.

Plant height: For recording the effect of artificial removal of leaves and fruiting bodies and application of insecticides on plant growth and height, observation on plant height was taken. Five plants were selected at random per treatment for recording the plant height. Observation was taken on 24th September, 2013, and plant height was recorded in cm.

Crop maturity: The crop maturity was observed by the openings of the bolls. The data was recorded on 9th October, 2013 for opening of bolls and yield of cotton. The total number of bolls and opened bolls were counted and percent opening of bolls was calculated. The data was collected from five plants per treatment, selected at random.

RESULTS

Population of sucking insect pests: The population of thrips was noted throughout the study period on all the treated plots (Figure 1A). Overall, the highest population of thrips (1.47±0.12) was recorded in control plots, whereas no significant difference was recorded among remaining treatments. During the study period, comparatively higher population of jassid was recorded in the control (0.95±0.07) and Deltaphos (0.88±0.07) treated plots (Figure 1B). Aphids population was the lowest in comparison to other sucking pests with no significant difference between various treatments (Figure 1C). Much diversified population of whitefly was observed in control and insecticides treated plots (Figure 1D). The highest population of whitefly (0.98±0.07) was observed in controlled plot followed by Tracer. No significant difference was recorded among Confidor, Mosplan and Deltaphos that showed no significant difference among them.

Effects of insecticides on Plant Height and Boll volume: The final plant height recorded in different treatments ranged between 93.26 cm to 112.66 cm (Figure 2A). The lowest plant height was recorded in Deltaphos (93.26±14.8) but the same was not significantly different from Mospilan treated plots. No significant difference was recorded among remaining treatments. Results on boll volume are given in Figure 2B where no significant difference was recorded between treatments. However, the boll volume among different treatments ranged between 9.66 cm^3 to 10.22 cm^3.

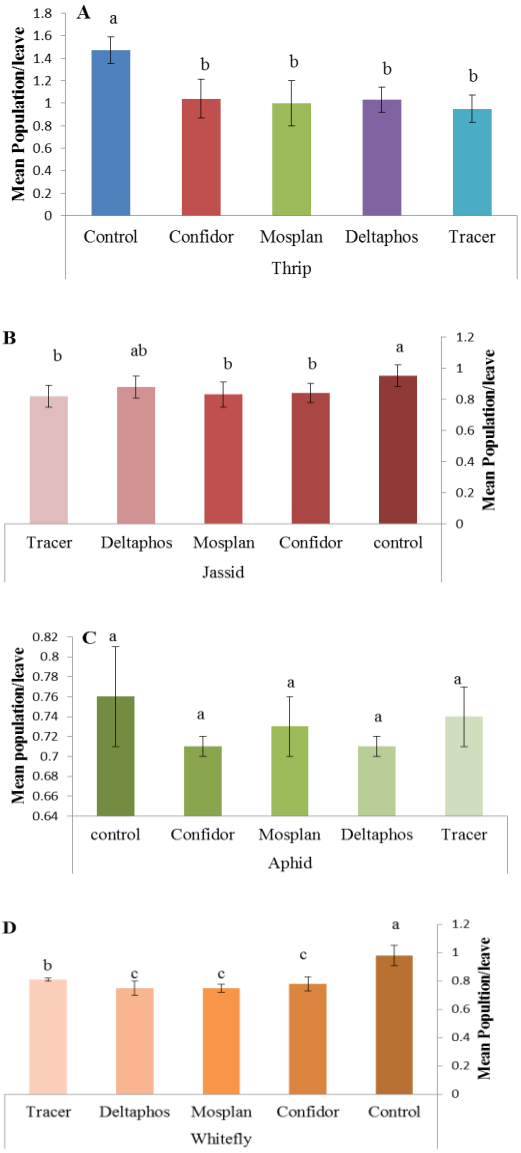

Figure 1: Mean population of sucking Pests A=Thrips, B=Jassid, C=Aphid, D= Whitefly

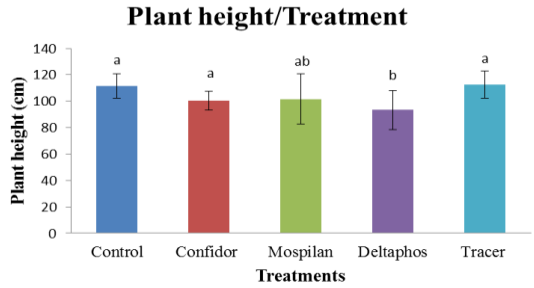

Figure 2: Comparison of Plant height

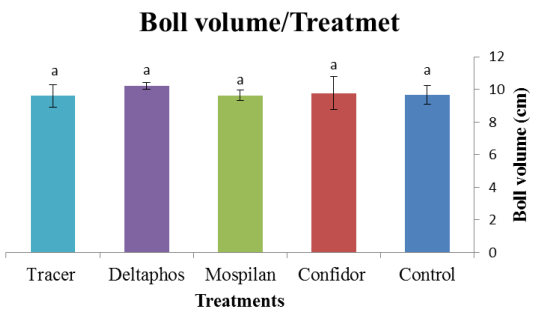

Figure 3: Comparison of Boll volume per treatment.

Crop maturity and yield: The maturity of the crop was determined with the opening of bolls from each treated plot. No significant difference was recorded among various treatments. However, at the time of final picking (154 days after sowing), maximum boll opening (62.33%) was recorded in Mospilan treated plot followed by Tracer (57.86%), Deltaphos (57.35%), Confidor (56.26%) and control (50.03%) plots (Figure 4A). Yield recorded in different treatments showed a significant difference with the highest yield of seed cotton (75.78 gms/plant) was recorded in plot treated with Confidor. The lowest yield (56.86 gms/plant) was observed from control plot.

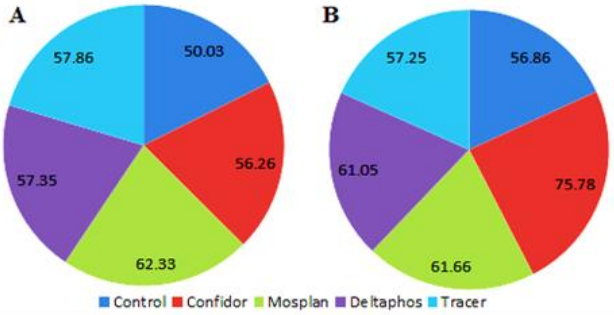

Figure 4: Crop maturity and yield of cotton
A= percentage of bolls opened, B= yield

DISCUSSION

In the present study, application of insecticides against insect sucking pests in cotton reduced pest damage as compared to control. Application of insecticides also resulted in enhanced crop maturity and yield compared to control plots. Similar results in a decrease in pest infestation were reported when imidacloprid was applied as a seed treatment against insect pests in cotton. An improvement in plant height, percent square retention, total squares, bloom counts and yield as compared to control was also recorded [10]. Studies on the effects of various insecticides on cumulative insect feeding and fruit initiation in cotton demonstrated that application of insecticides decreased the duration of feeding and increased fruit set [11]. It has been proved that insecticides affected plant growth, vigor and yield components [12]. Insecticides might influence plant nutrition and cytological and physiological characteristics. Improved plant growth through insecticide stimulation could influence the ability of the host plants to withstand phytophagous insects. Studies also showed that insecticide treated plots had significantly more bolls setting (29%), boll retention (ranged from 22 to 35%) as compared with non-treated plots (13-22%). Lint yield averaged 556 lbs/acre for insecticide treated and 284 lbs for non-treated plots [13-14].

CONCLUSION

Study results indicated that the least populations of sucking insect pests were recorded in insecticide sprayed plots as compared to the control treatment. The cotton plants were able to compensate the damage inflicted to it sucking pests. Moreover, positive effect of application of insecticides was also observed in plant physical characters.

REFERENCES

[1] Agha, H. K. Crop Production. Published by Pakistan Book foundation, Islamabad. PP. 6 (1994).

[2] Mehmood, N. T. Cotton leaf curl virus disease and its status in Pakistan. *Asian Journal of Plant Sciences*, *2*, 325-330 (1999).

[3] Yunus, M., & Yousuf, M. Insect and mite pests of cotton in Pakistan. *Pakistan Journal of Agriculture Sciences*, *16*(1-2), 67-71 (1979).

[4] Abbas, M.A. General Agriculture. Publ. Emporium, 2nd (Ed), Pak., pp: 352 (2001).

[5] Naqvi, K. M. Crop protection to boost up the cotton production. Seminar organized by ESSO, Fert. Co. Ltd., Pakistan. (1976).

[6] Saleem, M. A., Mustafa, K., & Hussain, R. Comparative efficacy of some insecticides against some sucking insect pests of CIM- 443 cotton. Pakistan *Journal of Entomol*ogy, *23*(1-2), 91-92 (2001).

[7] Aslam, M., Razzaq, M., Rana, S., & Faheem, M. Comparative efficacy of different insecticides against sucking pests of cotton. *Journal of Research Science*, *15*(1), 53-58 (2004).

[8] Khattak, M. K., Rashid, M., Hussain. S.A.S., & Islam, T. Comparative effect of neem (*Azadirachta indica*) oil, neem seed water extract and baythroid TM against whitefly, jassids, and thrips on cotton. *Pakistan Journal of Entomology*, *28*(1), 31-37 (2006).

[9] Shah, M. J., Ahmad, A., Hussain, M., Yousaf, M. M., & Ahmad, B. Efficacy of different insecticides against sucking insect pest complex on the growth and yield of mungbean (Vigna radiata L.) *Pakistan Journal of Entomology*, *29*(2), 83-85 (2007).

[10] Graham, C. T., Jenkins, J. N., & McCarty, Jr., J. C. Performance of GAUCHO seed treatment insecticide against early season cotton insect pests. Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, 2. : 917-918 (1995).

[11] Ruscoe, J. T., Andrews, G. L., & Phelps, J. B. Efficacy and duration of early season insecticide applications. Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, 2. : 955-956 (1996).

[12] Dale, D., & E.A. Heinrichs. Crop-insecticide interactions. Ecological agriculture and sustainable development: Volume 1. Proceedings of an International Conference on Ecological Agriculture: Towards Sustainable Development, Chandigarh, India, *1*, 314-340 (1997).

[13] Thaxton, P. M., El-Zik, K. M., Dusek, T. F., & Schaefer, K. Phenology and yield of MAR cotton genotypes with and without insecticide treatments. Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, *1*, 414-418 (1997).

[14] Mann, J. E., Turnipseed, S. G. Sullivan, M. J. Adler, P. H., Durant, J. A. & May O. L. Effects of early-season loss of flower buds on yield, quality, and maturity of cotton in South Carolina. *Journal of Economic Entomology*, *90*, (5), 1324-1331 (1997)