

## ROLE OF THRESHOLD SPRAY OF CHEMICAL INSECTICIDES ON SUCKING PESTS, PREDATOR AND YIELD OF COTTON

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### ABSTRACT

This study was conducted to know the effect of five chemical insecticides viz. Pillarthane 75 SP, Ninja 2.5 EC, Tundra 20 SP, Nitro 505 EC, and Actara 25 WG on the incidence of major sucking pests, predator and yield of cotton at three locations such as Dinajpur, Jessore and Gazipur of Bangladesh. Findings of the study indicated that the chemicals Tundra 20 @ 1 g / l, Nitro @ 3 ml / l and Actara @ 1 g / l water were more confident and prudent enough to suppress the incidence of cotton jassid, aphid and white fly which resulted higher amount of seed cotton yield. But these chemicals significantly reduced lady beetle abundance and application of Actara showed abrupt reduction.

**Key words:** Cotton, insecticide, pest, predator

### INTRODUCTION

Cotton is a very highly valued commercial crop and is prone to pest attack from germination to final picking. About 162 insect species attack on cotton of which 15 sucking and chewing insects are considered as major pest (Anonymous, 1999). The most destructive sucking pests of cotton in Bangladesh are jassid (*Amrasca biguttulla*), aphid (*Aphis gossypii*) and white fly (*Bemisia tabaci*). Jassid is commonly known as leaf hopper which sucks sap from the leaves and cause phytotoxic symptoms known as "hopper burn" (Narayan and Singh, 1994). Cotton aphids are commonly found at lower leaf surface on the terminal and other parts of cotton plants. They feed by sucking sap from phloem tissue. Severe infestations seriously stunt plants and reduce yields. White fly nymphs and adults suck sap usually from the under surface of the leaves and excrete honey dew causing contamination of the lint. Infested leaves reduce vigor, wilt and turn yellow (Bohmfolk *et al.*, 1996). Numerous beneficial insects such as predator and parasites can be found in cotton fields attacking pest species. The most common predator is the lady beetle (Anonymous, 1978). Crop protection with chemicals is desirable and unavoidable part of integrated pest management (Mohyuddin *et al.*, 1997). Even in the technological advanced countries, about 3% of market value of agricultural crops is spent on toxic chemicals and their application. In Pakistan, pesticides worth more than 10 billion rupees, out of which 70 to 80% are sprayed against cotton pests (Aslam *et al.*, 2004). Augmentation and conservation of natural enemies are of urgent need to reduce the pest population with the minimum disturbance of the environment. Hence, pest status, selection of right doses is a prime need for application of insecticides in the field. So, the present study was undertaken with five chemical insecticides to know their impact on the sucking pests, predator and yield of cotton.

### MATERIALS AND METHODS

**Cultivation of crop:** The experiment was conducted during August 2008 to March 2009 at three regional cotton research, training and seed multiplication farm namely Dinajpur, Jessore and Gazipur in Bangladesh. The Land was prepared at field condition by deep ploughing and harrowing followed by laddering. The field layout was done after final land preparation. The experiment was conducted in randomized complete block design with the cotton variety CB-10. The plot size was 10 × 10 m. The spacing between block-to-block and plot-to-plot were 1.5 and 1.0 m and respective footpath was 2.0 m. Seeds were sown on 1<sup>st</sup> week of August 2008 @ 15 kg /

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ha in a north-south row. The seeds were sown by hand keeping a distance of 45 cm from plant to plant and row-to-row distance was 90 cm. Necessary intercultural operations such as mulching, weeding, irrigation and application of fertilizer were done properly.

**Treatments and application:** Five chemical insecticides viz. Pillarthane 75 SP @ 3.5 g / l, Ninja 2.5 EC @ 3 ml / l, Tundra 20 SP @ 1 g / l, Nitro 505 EC @ 3 ml / l, and Actara 25 WG @ 1 g / l water were used in this experiment. Spraying was done by using a knapsack sprayer. All the insecticides were sprayed at the morning hour and whenever the damage of any pest appeared at the threshold level.

**Data collection:** Effects of the insecticides were assessed by the incidence (number of insect / plant) of pests, predator abundance (lady beetle) and yield of the crop. To estimate the incidence of pests and predator abundance, sampling was carried out from August to December 2008. It was done by weekly scouting taking 5 plants randomly from each replication. Plants were examined for jassid, aphid, whitefly and lady beetle. A scouting form was used during estimation of the pests and predator populations.

**Data analysis:** Data were analyzed by analysis of variance and the mean values were separated by Duncan's Multiple Range Test (DMRT).

## RESULTS

Figure 1 presents the effect of Pillarthane, Ninja, Tundra, Nitro and Actara on the incidence of cotton jassid at Dinajpur, Jessore and Gazipur station. Results showed that the insecticides had significant effect on the incidence of jassid at the three locations. The jassid incidence at Dinajpur, Jessore and Gazipur station varied from 1.25 to 2.10, 1.22 to 2.03 and 1.32 to 2.22 / plant, respectively. At Dinajpur and Gazipur stations, the insecticides Nitro and Pillarthane, respectively revealed significantly the lowest and highest incidence whereas, at Jessore station, Actara revealed the lowest incidence and Pillarthane and Ninja showed statistically highest but similar incidence.

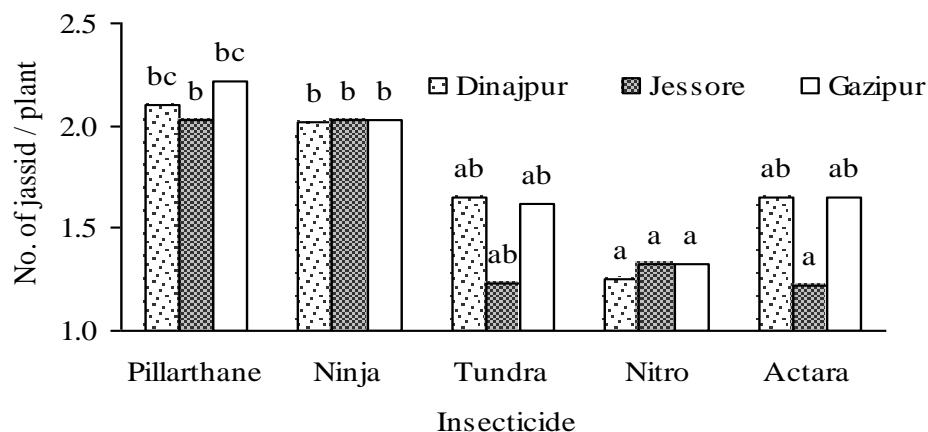


Figure 1. Effect of different insecticides on the incidence of jassid associated with cotton at three locations of Bangladesh. Bars with no common letter(s) are significantly different (DMRT,  $p \leq 0.05$ ).

The effects of Pillarthane, Ninja, Tundra, Nitro and Actara on the incidence of cotton aphid at Dinajpur, Jessore and Gazipur station are presented in Figure 2. Results from the DMRT showed that insecticides had significant effect on the incidence of aphid. The aphid incidence was found 1.17 to 1.88, 1.32 to 1.63, and 1.25 to 1.62 / plant at Dinajpur, Jessore and Gazipur station, respectively. The insecticides Pillarthane and Tundra showed significantly the highest (1.88 / plant) and lowest (1.20 / plant) incidence at Dinajpur station.

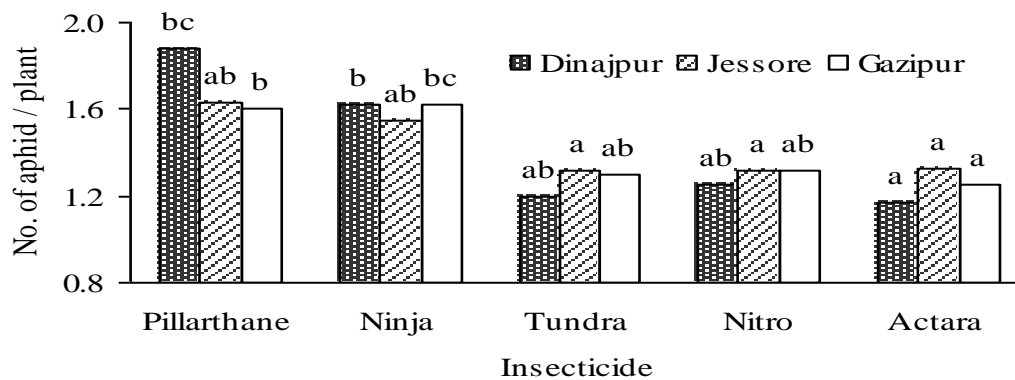


Figure 2. Effect of different insecticides on the incidence of aphid associated with cotton at three locations of Bangladesh. Bars with no common letter(s) are significantly different (DMRT,  $p \leq 0.05$ ).

The effects of Pillarthane, Ninja, Tundra, Nitro and Actara on cotton whitefly showed significant difference at Dinajpur, Jessore and Gazipur station. Whitefly incidences of these stations were found 2.75 to 3.70, 2.80 to 4.08 and 2.48 to 4.00 / plant, respectively (Figure 3). Ninja revealed significantly the highest incidence (4.08 / plant) at Jessore station and Tundra showed the lowest incidence (2.48 / plant) at Gazipur station.

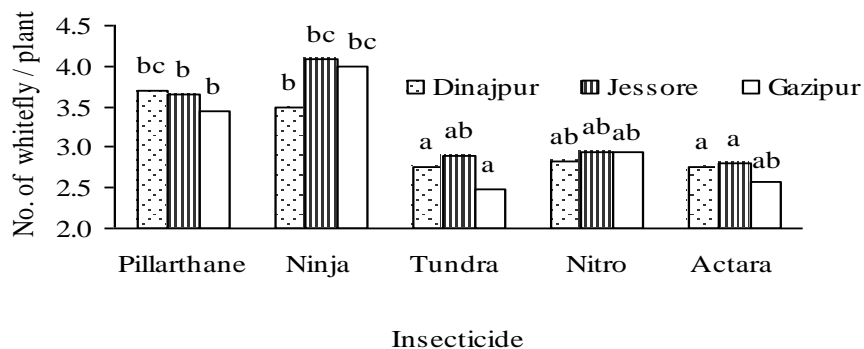


Figure 3. Effect of different insecticides on the incidence of whitefly associated with cotton at three locations of Bangladesh. Bars with no common letter(s) are significantly different (DMRT,  $p \leq 0.05$ ).

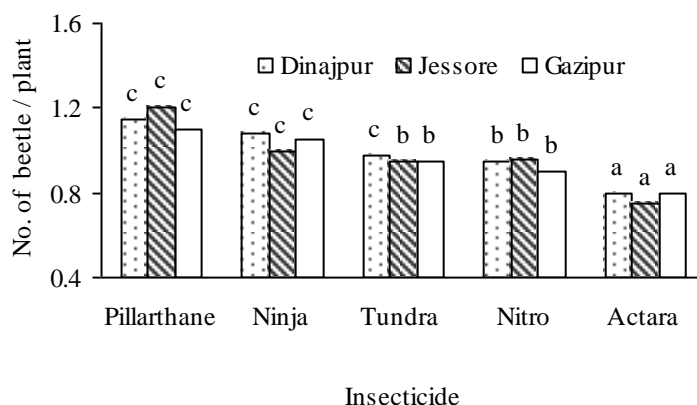


Figure 4. Effect of different insecticides on the incidence of lady beetle associated with cotton at three locations of Bangladesh. Bars with no common letter(s) are significantly different (DMRT,  $p \leq 0.05$ ).

Figure 4 shows that insecticides had significant effect on the lady beetle abundance. The observed lady beetle abundance varied from 0.80 to 1.15, 0.75 to 1.20 and 0.80 to 1.10 / plant at Dinajpur, Jessore and Gazipur station, respectively. The insecticides Pillarthane and Acatra showed the highest and lowest abundance at Jessore station.

The yield of seed cotton obtained from different locations significantly varied with the effect of the applied insecticides (Figure 5). Seed cotton yield ranged from 1550 to 1833, 1066 to 1286 and 1100 to 1295 kg / ha at Dinajpur, Jessore and Gazipur station, respectively. Actara and Pillarthane revealed the highest and lowest yield of seed cotton at Dinajpur and Jessore satation, respectively.

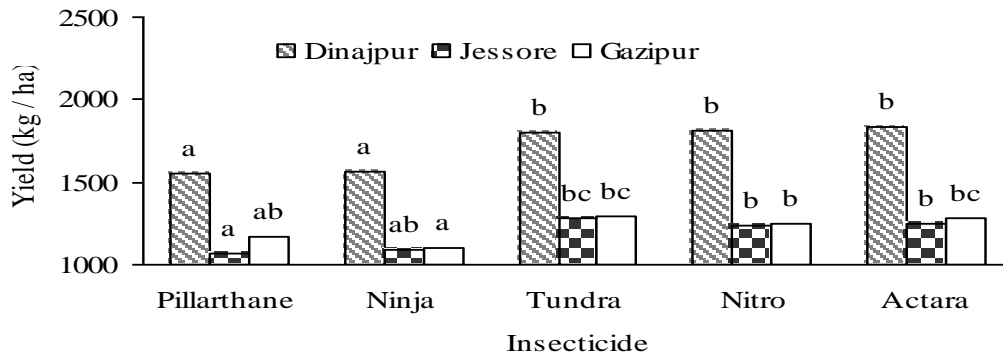


Figure 5. Effect of different insecticides on the yield of seed cotton at three locations of Bangladesh. Bars with no common letter(s) are significantly different (DMRT,  $p \leq 0.05$ ).

## DISCUSSION

Five chemical insecticides such as Pillarthane 75, Ninja 2.5 EC, Tundra 20 SP, Nitro 505 EC, and Actara 25 WG were sprayed at threshold level for controlling sucking pests of cotton at three locations of Bangladesh. The economic threshold level in different locations varied because of the ecological factors influencing on the incidence of pests and predators which significantly affect the yield. This study indicated that application of Tundra @ 1 g / l, Nitro @ 3 ml / l and Actara @ 1 g / l water significantly reduced the incidence of cotton jassid, aphid and white fly and produced significantly higher amount of seed cotton yield. However, their application abruptly reduced lady beetle abundance. Findings of the study indicated that Tundra, Nitro and Actara were confident and prudent enough to control the sucking pests of cotton but showed toxic effect on the predators. It might affect the behaviour and biology such as fecundity of the predators. There is a positive correlation between preys and pest populations (Wilson *et al.*, 1998). Toxicity of chemical highly influences this relationship by killing preys and predators. Nurindah and Bandra (1988) stated that the insecticides have some adverse effects on predator insects. The beneficial insect fauna were adversely affected when insecticides were applied to kill the cotton pests (Khattak *et al.*, 2004). To overcome this, threshold spray usually justifies the use of control measures (Ali and Karim, 1990). In this study, treatments were applied at the threshold level to avoid miss use of money and to safe natural enemies. As a result, lady beetles were abundant in the field. Therefore, the results of this study indicated that threshold sprays of Tundra @ 1 g / l, Nitro @ 3 ml / l and Actara @ 1 g / l water might be considered as economic tools for management of cotton sucking pests.

## REFERENCES

- Ali MI and Karim MA. 1990. Threshold sprays of insecticides: its advantages on conservation of arthropod predators and parasites in cotton ecosystem in Bangladesh. *Bangladesh J. Entomol.* 18: 17-22.
- Anonymous. 1978. *Fundamentals of applied entomology.* McMillan Publ. Co. 866 Third Avenue, New York. 341 p.

- Anonymous. 1999. Insecticide resistance management strategies for cotton pests. Directorate of Cotton Development, Mumbai, India. 26 p.
- Aslam M, Razaq M, Shah SA and Ahmad F. 2004. Comparative efficacy of different insecticides against sucking pests of cotton. *J. Res. Sci.* 15: 53-58.
- Bohmfolk GT, Frisbie RE, Sterling WL, Metzger RB and Knutson AE. 1996. Identification, biology and sampling of cotton insects. *Texas Agril. Exten. Serv. The Texas A & M Univ. Syst.* 933 p.
- Khattak MK, Khan SD, Khan L and Shah GS. 2004. Efficacy of various insecticides on the damage and incidence of cotton boll worms and beneficial fauna. *Pak. Entomol.* 26: 19-23.
- Mohyuddin AI, Jilani G, Khan AG, Hamza A, Ahmed I and Mahmood Z. 1997. Integrated pest management of major cotton pests by conservation, redistribution and augmentation of natural enemies. *Pak. J. Zool.* 29: 293-298.
- Narayan SS and Singh P. 1994. Resistance to *Heliothis* and other serious insect pests in *Gossypium* spp. *A Rev. J. Indian Soc. Cotton Impr.* 19: 10-24.
- Nurindah and Bandra SO. 1988. Studies on biological control of cotton pests. *Indian J. Crop Res.* 1: 59-83.
- Wilson LJ, Bauer LR and Lally DA. 1998. Effect of early season insecticide use on predators and outbreaks of spider mites (Acari: Trtranychidae) in cotton. *Bull. Entomol. Res.* 88: 477- 488.