

ABSTRACT

The present study was designed to record the diversity and ecology of major insect pests and their natural predators present in cotton crops of Southern Punjab, Pakistan. Two well-known cotton producing districts i.e. district Layyah and district Vehari were selected for this study from the cotton belt of Punjab, Pakistan. Sampling was done bi-weekly from July to October during 2018 and 2019. Sweep netting, visual counting, hand picking, wet finger method, beat sheets, aspirator and pitfall trapping methods were used for the collection of various pest species. Shannon-Wiener and Simpson indices were used to compute diversity while Menhinick and Margalef indices were used for the estimation of species richness. A total of 94343 individuals representing 43 species, 40 genera, 28 families, and 6 orders of pests were recorded. Family Aleyrodidae dominated over other pest families. *Bemisia tabaci* Gennadius, of family Aleyrodidae, was the dominant species with a 39.68% share among all pest species. The estimated species richness of all arthropod pest species belonging to both districts was about 94%. The densities of pests fluctuated with time. The highest population densities of sucking pests were observed in July and August while maximum population densities of chewing pests were observed in late September or early October each year. Population densities of Jassid, armyworm, and pink bollworm showed a strong negative correlation with temperature, humidity, and rainfall while thrips population density showed a positive correlation with these parameters.

For recording diversity and population dynamics of different predatory species in the cotton agroecosystems, sampling was done from May to October 2018 and 2019. Sampling was performed on fortnightly basis using pitfall traps, sweep netting, beat sheets, visual counting, aspirator, and hand-picking methods. A total of 22791 individuals (10684 spiders and 12107 non-spider predators) representing 59 species, (39 spiders and 20 non-spider arthropod species), 45 genera, 29 families, and 9 orders of predators were recorded. Collectively, Araneidae and Lycosidae families contributed 58.55% to the total spider catch. Similarly, the contribution of Chrysopidae and Coccinellidae families was 53.16% to the total non-spider arthropod count. *Neoscona theisi* Walckenaer, of family Araneidae

and *Chrysoperla carnea* Stephens, of Chrysopidae family, were the dominant species with 12.80% and 35.21% share among their respective groups (spiders and non-spider arthropod predators). The estimated species richness of spiders and non-spider arthropod predators was 93-95%. The densities of predators fluctuated with time; however, their peaks were observed during September and early October each year. The cluster analysis separated both districts and their selected sites. There was a non-significant association between humidity and rainfall with the active density of coccinellids, green lacewings, and spiders. The active densities of coccinellids and green lacewings also showed non-significant relation with the temperature. Higher densities of predatory fauna in cotton ecosystems showed that they may act as efficient biological control agents. However, this objective can only be achieved when we reduce all such practices in cotton agro-ecosystems which are harmful to beneficial arthropods.

Sucking pests are a major threat to agricultural ecosystems including cotton field crops which cause unbearable losses to the crop yield. Seasonal dynamics of major sucking insect pests including whitefly, jassid, thrips, and their natural arthropod predators i.e. green lacewings and spiders in cotton field plots were also recorded. The effects of surrounding field crops on pests' and predators' density were also recorded. For sampling and survey of insects, visual counting was found to be the most efficient method for recording the abundance of insects, trailed by net sweeping and tapping. Whitefly was the most dominant sucking pest found on the vegetative stage of cotton, followed by jassid and thrips. Fluctuated populations of predatory arthropods, spiders, and green lacewings were also recorded during the whole cropping season; however, the densities of pests and predators varied with crop phenology. Spiders' population was encouraging at both vegetative and flowering stages and also the same trend of jassid and whitefly were observed at both stages of the crop. Surrounding habitats showed a non-significant effect on population densities of insect pests and predators. For abiotic factors, the spiders showed a strong positive correlation with humidity and temperature. However, green lacewing was only positively correlated with humidity. While, the populations of whitefly, jassid, and thrips showed a non-significant correlation with both temperature and humidity. Overall, densities of sucking insect pests were found above the economic threshold level. The plant
