June 2016 Vol. 23 No. 2 59-64
Journal of Northeast Agricultural University (English Edition)

Abundance and Fluctuation in Spider Diversity in Citrus Fruits from Located in Vicinity of Faisalabad Pakistan

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Abstract: Spiders for the present study were collected from different fruit gardens (i.e. citrus) located at various localities (i.e., Tehsil Samundri, Jaranwala, Tandlianwala and Faisalabad) of District Faisalabad, Pakistan. Spiders belonging to six families and 33 species were captured from the two fruit gardens during the one year of this study. The citrus fruits garden was found to be best populated habitat as compared to other fruit garden. These sites were sampled by using pitfall traps; each month for five consecutive days from September 2010 to March 2011. As a result, 1 054 specimens were captured representing six families viz: lycosidae, thomosidae, gnaphosidae, saltisidae, araneidae and clubionidae. Lycosidae was more abundant, while clubionidae was less diverse during the study. Maximum population fluctuation among the spider specimens showed during the months from September and October, while the least abundance of spider specimens was reordered during June, November and December. Maximum taxonomic diversity was recorded from September to November, with the peak in September. It was concluded during these three months, when the citrus and guava gardens were attacked by the most of the pest insects. During the months of July and November diversity was moderate and mutually comparable, while in June and December, it was the least. This study contributed to the identification of spider diversity in the agro-ecosystem which could be used in the biological pest control.

Key words: diversity, spider, citrus, population, Pakistan, gardens

CLC number: S895 **Document code:** A **Article ID:** 1006-8104(2016)-02-0059-06

Introduction

In recent years, the exercise of insecticides in the agro ecosystem of Pakistan has increased by several folds. Being non selective non-target organism, such as the natural competitors, predators and parasites of the pest insects get also killed. The resulting ecological imbalance and appearance of resistant pest strains have necessitated more demanding and repeated use of insecticides (Ghafoor *et al*., 2011).

To minimize dependence on insecticides, scientists suggested conservation and the use of the natural manage forces to control pest population. Spiders fall in the category of natural forces, and form one of the ubiquitous groups of the predaceous organisms. Spider predates on the insect species in the entire natural ecosystem (Khan *et al*., 2015). It mainly predates on jassid (Khuhro *et al*., 2012a), *Bemisiatabaci*, *Amrascadevastans Thripstabaci Helicoverpaarmigera*

Received 18 November 2015
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(Mohsin *et al*., 2015), lepidopteron (Hooks *et al*., 2003) and leafhopper (Jeyaparvathi *et al*., 2013).

Citrus is the most important fruit of Pakistan in terms of area, production and export, contributing 50% of the total fruit production and 40% of the country's fruit export (Arif *et al*., 2005). The guava also has been cultivated and distributed by men, by birds, and sundry 4-footed animals for so long that its place of origin is uncertain, but it is believed to be an area extending from southern Mexico into or through Central America.

Citrus pests cause up to 30% decline in the yields in Punjab, Pakistan. In agro-ecosystems, uses of pesticides not only eliminate the populations of useful invertebrates, but also harm the population dynamics of predator-prey system. The situation will further get worse, if some timely effective and safe management strategies other than sole dependence on pesticide spray are not developed for management of citrus pests. Additionally, it is neither feasible nor economical to manage citrus pests only through spray. Biological control appears to be the most promising control actions against guava and citrus insect pests. Citrus pests have effectively been controlled in many parts of the world using natural predators like spiders and beetles (Capinera, 2008). Spiders are reported to be the most abundant natural predators in agro-ecosystems (Pearce and Zalucki, 2006; Tahir and Butt, 2008). Several studies have clearly indicated that spiders can considerably reduce citrus pests both in the laboratory and in the fields (Hoy *et al*., 2007; Xiao *et al*., 2007). Spider predation is not restricted to adult insects only, but includes the egg, larval and nymph stages as well (Harwood and Obrycki, 2007). The maximum araneid fauna is favored by the maximum temperature 42.8℃, relative humidity 61.4% and average rainfall of 40 mm in June, while the least are trapped at temperature 30.2℃, relative humidity 62.4% and 25 mm rainfall in October (Mohsin *et al*., 2012).

Unfortunately, the predatory potential of this predators is never exploited in the crops or agricultural for controlling the pests (Khuhro *et al*., 2012b). It is because of the fact that the researchers are unaware of the population densities, seasonal changes in their population and food preferences. Therefore, the present study was planned to study the seasonal changes in the population of the identified spider families in the citrus and guava fruit gardens in the District Faisalabad, Pakistan.

Materials and Methods

The spiders were collected from the fruit gardens (citrus and guava) of District Faisalabad. The sites of collection consisted of two habitats from each Tehsil i.e. Tehsil Samundri, Jaranwala, Tandlianwala and District Faisalabad from September 2010 to March 2011.

Sampling method

Pitfall traps contained 70% ethyl alcohol and kerosene oil as preservatives were used to sample the spider fauna from the fruit gardens (citrus and guava). The pitfall traps consisted of cylindrical glass jars (roughly 6 cm in diameter and 12 cm in height) buried in the soil to the ground level. Twenty pitfall traps were set along a straight imaginary line joining the two converse corners of each field. One of the four corners of each field was randomly selected. On the diagonal line, imaginary points located at 1 m apart were used for putting the pitfall traps. Twenty of these points were randomly selected and the traps were installed at these points. The ground floor of the fields covering an area of about one hectare would be sampled for spiders twice in each month for five days (i.e. for 120 h). The traps were operated for five consecutive days, each month from September 2010 to March 2011. The traps were checked each morning and evening to ensure that they were operational. All the traps were emptied after 5 days and contents were brought to the laboratory for preservation and subsequently for recording the numbers and the identification of spiders from each trapping session. Pitfall trap is shown in Fig. 1.