



DIVERSITY OF PREDATORY SPIDERS IN COTTON CROP WITH RELATION TO BIOLOGICAL CONTROL OF INSECT PESTS IN JAMNAGAR DISTRICT

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ABSTRACT

India is the second largest producer of cotton (*Gossypium herbaceum* L.) in the world contributing nearly 15 % of the global production. Cotton accounts for 30 % of the total Indian exports. A spider belongs to Phylum- Arthropoda, Class- Arachnida and Order- Araneae, carnivorous consumes a large number of preys and does not damage plants. Spiders have a wide creepy crawly range and accordingly can go about as natural control operators of insect pest in agro ecosystems. In the present study was carried out by qualitative and quantitative community population and structure of predatory spiders in cotton crop at different area of Jamnagar district such as Jamjodhpur, Kalavad, Lalpur and Khambhalia. In which total 11 families, 51 genera and 101 species was observed. It was classified into four groups, hunting spiders, ambushing, web building and miscellaneous based on their predatory behavior.

KEYWORDS: Predatory spiders, Insect pest, Cotton, Jamnagar district.

INTRODUCTION :

Cotton is currently the world's leading crop of plant fibre and is commercially cultivated in more than 50 countries in the temperate and tropical regions (Khadi et al 2010) with a total coverage of 34 million ha. where climatic conditions suit the natural growth requirements of cotton, which includes periods of hot and dry weather and adequate moisture obtained through irrigation. More than 150 countries are involved in import and export of cotton (Stella and James 1998). On around 96 lakh hectares under cultivation, India has the world's largest cotton field, contributing for one-fourth of the global agricultural field.

At present, the economic loss of cotton is due to plant diseases and insect pests in agricultural conditions. The loss can be 30 % - 50 % if no mechanism of prevention and control was taken. The loss around 80 % can be caused by a few plant diseases and insect pests. Since the pesticide has been invented, it serves a significant role in the prevention and control of plant and insect pest diseases, controls the destruction of plant diseases and insect pests effectively, and enhances crop production. Yet the ecological balance is disrupted and the ecosystem is polluted when pesticides are introduced in the long term and in large amounts. The prevention and control of plant diseases and crop insect pests, in specific cotton, must therefore be extensive, since plant diseases and cotton insect pests are extreme and the pesticide concentration is high (Anonymous 2010).

Spiders belong to order Araneae. That comes under class Arthropoda. Spiders are natural predator mainly feed on insects (Turn bull 1960). They are very skilled in capturing insects as food due to their keen sight and tactile organ. Their major role is to minimize insect's pest population in the

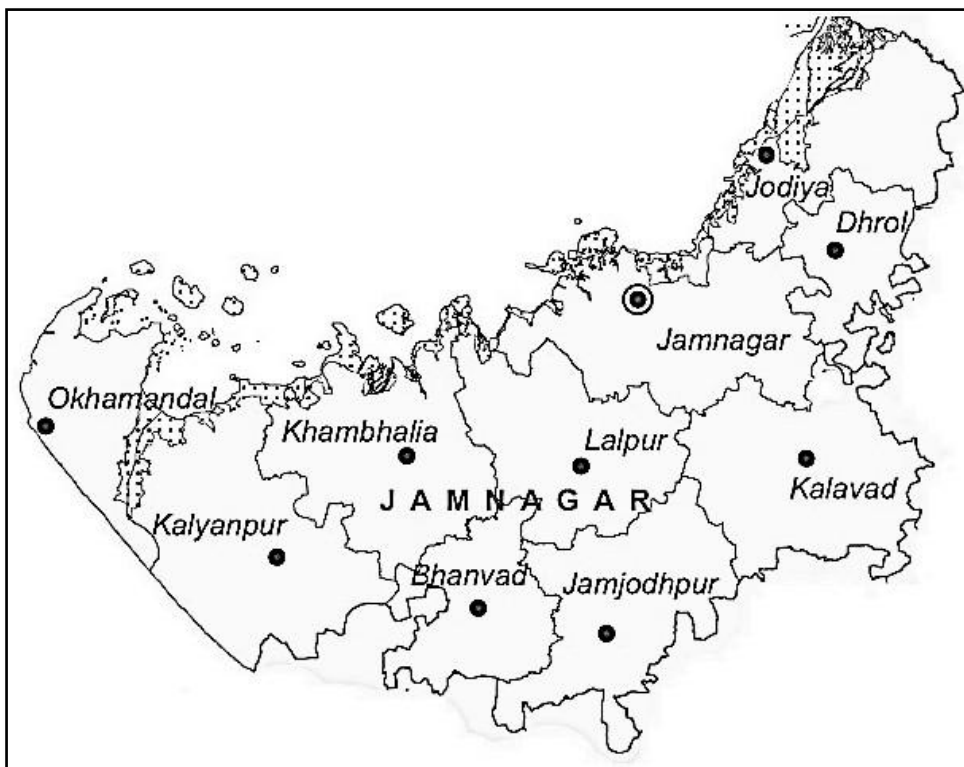
crops fields (Law et al 1963 and Dean et al 1982). They are highly adoptive to changing climate and possess very high rate of reproduction. The developing country has yet to comprehend the vast social, economic, scientific, technological and economical potential of biological diversity (Khoshoo 1988). As we know that broad spectrum insecticides have caused the decline of natural enemies of pests.

In this regard, the natural and agricultural systems have been manipulated to increase the efficacy of natural population control but the biological control is widely recommended in majority of agricultural practices. Since, the continuous use of insecticides has brought considerable decline in predatory insects. To conserve the natural predators is the need of hour and this can only be realized with the implementation of biological control. In this respect, the role of spiders in controlling and reducing the number of insect pests has been successfully noticed.

MATERIALS AND METHODS

Study area

I have selected the Jamjodhpur, Kalavad, Lalpur and Khambhalia area of Jamnagar district for study on spiders with respect to their possible role in the biological control of insect pests in cotton crop. For this purpose, different types of predacious spiders were collected by four methods. We can identify the particular species of spider after studying their genitalia and further consulting the keys to the family, genera and species as these have been mentioned in details. The details of methods are given below.



Four different study area of Jamnagar district

(1) Hand Picking Method

Hand picking method was widely used for the picking of spiders. This method was helped to capture web- weavers. The web- weavers were collected directly from their web into the plastic bottle of 3.5 × 2.5 cm. The living specimens of spiders were preserved in 70 % ethanol in laboratory.

(2) The Sweep net Method

This method was used for the collection of spiders in easy way. The sweep net was made of fabric such as canvas or sailcloth. The small size of spider species was also collected from this fabric net. The collection of good number of samples required more times of sweeping.

(3) Umbrella Method

The collection of spider in this method having the umbrella placed in inverse condition in below the plant. Then after the vegetation was beaten with a stick or vibrate by hand so dislodging spiders on the umbrella. The painting brush was used to coax spiders off the umbrella and collect it properly.

(4) Pitfall traps Method

This method is very useful and accepted for capture terrestrial invertebrates (Curtis 1980). Using this method, capture non weavers which wonder on ground and hunt the preys. The plastic bowls having 15 cm diameter and 6.5 cm depth was used for pitfall trapping. The pitfall trap was placed within the soil with lip of the bowl level with the ground. Then after the ethylene glycol was poured as preservative into the bowl from bottom up to 2 cm high, which eliminates the chances of escaping of spider. The pitfall bowl was protected with putting the roof of thick paper sheet over it. The pitfall was placed in night and collected in next morning time.

RESULTS AND DISCUSSIONS

The occurrence and abundance of predatory spider fauna from cotton crop was known (Tikader and Malhotra 1980). The selected study area was Jamjodhpur, Kalavad, Lalpur and Khambhalia in Jamnagar region, Gujarat. The collected total fauna from respective crop was preserved and identified in laboratory as mentioned in material and methods.

During research work, I observed 11 Families, 51 Genera, 101 Species and 4 groups of spiders in selected area (Fig. 1). The maximum number of predatory spider species was observed in Jamjodhpur (88) and minimum in Lalpur (74) (Fig. 2). The spiders were classified in four groups according to their predatory behavior. However in Hunting spider group (75.31 %) occupied highest number of species while lowest in miscellaneous spider group (3.13 %) (Fig. 3). Moreover, total 11 spider families were found in cotton crop. The highest and lowest class observed in Lycosidae family (17.56 %) and Scytodidae family (0.67 %) respectively (Fig. 4).

Biological control is a method of controlling pests such as weeds, mites, insects and plant diseases using other living organism. The maximum use of pesticide for more production of cotton is harmful to environment. The predatory spiders are uses insect pests as food and decrease the insect pest population and increase the yield of cotton crop. In recent scenario, it is better to used biological agents such as spiders for controlling the pests. So, bio-control in this sense is nothing but the use of spiders as the natural method of pest and pathogen control.

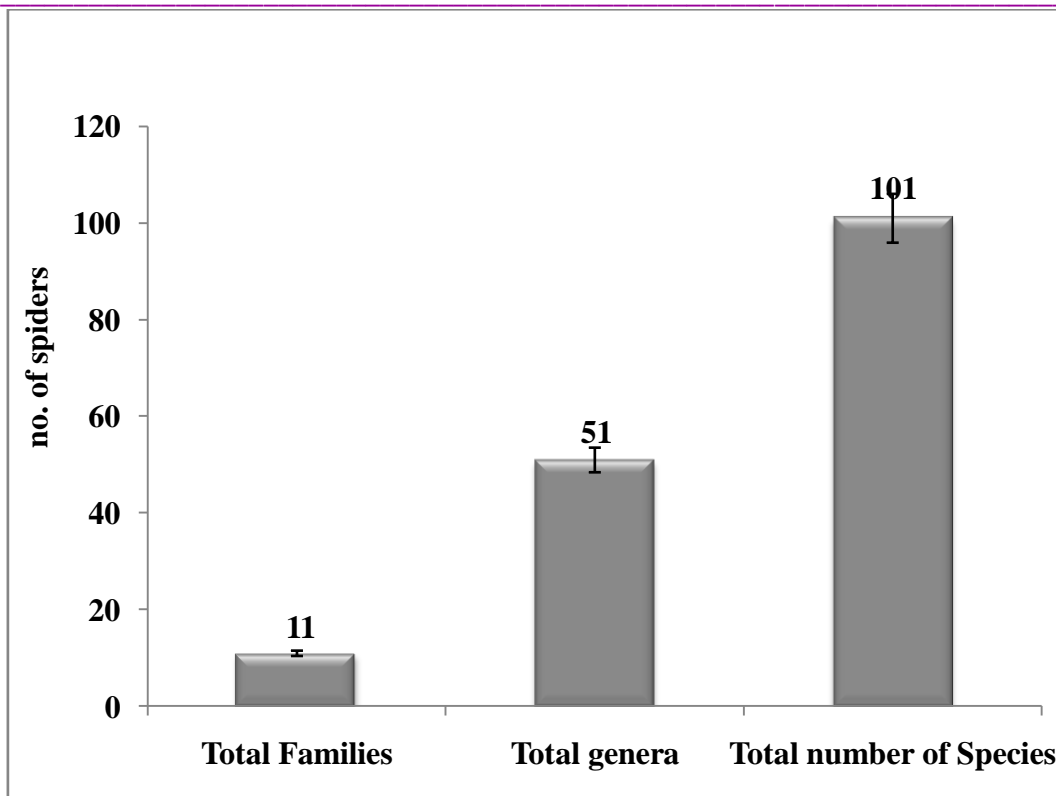


Fig. 1 Diversity of spiders in cotton

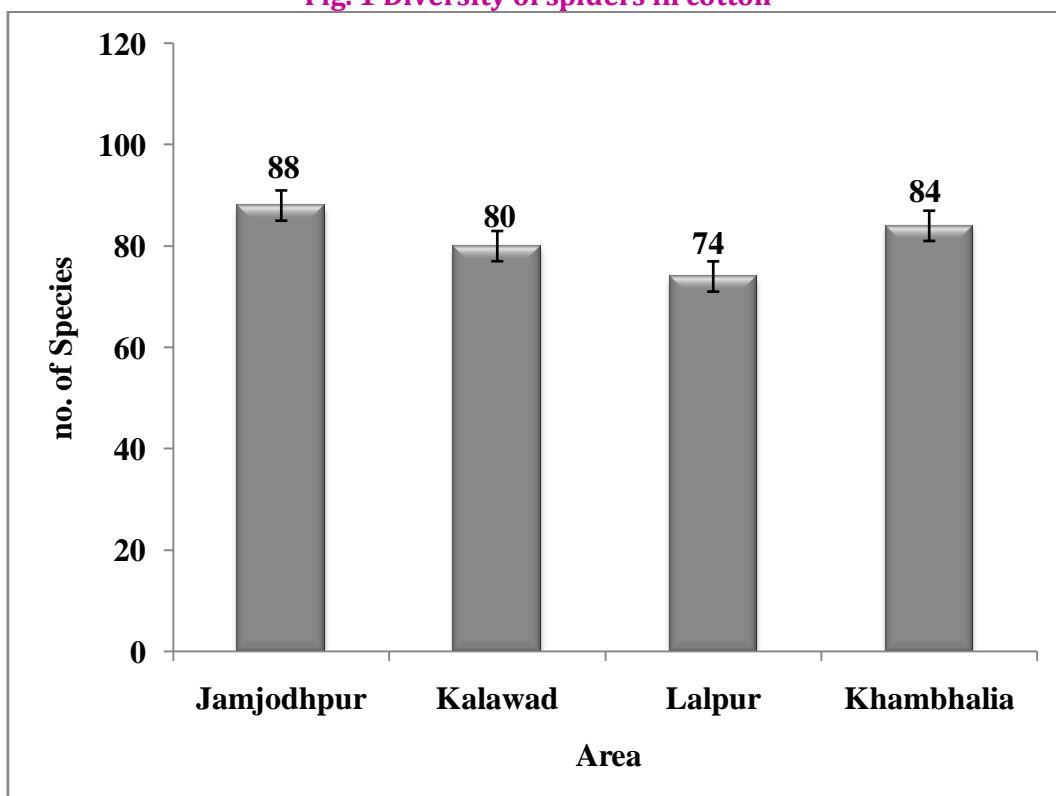


Fig. 2 Number of species in different area

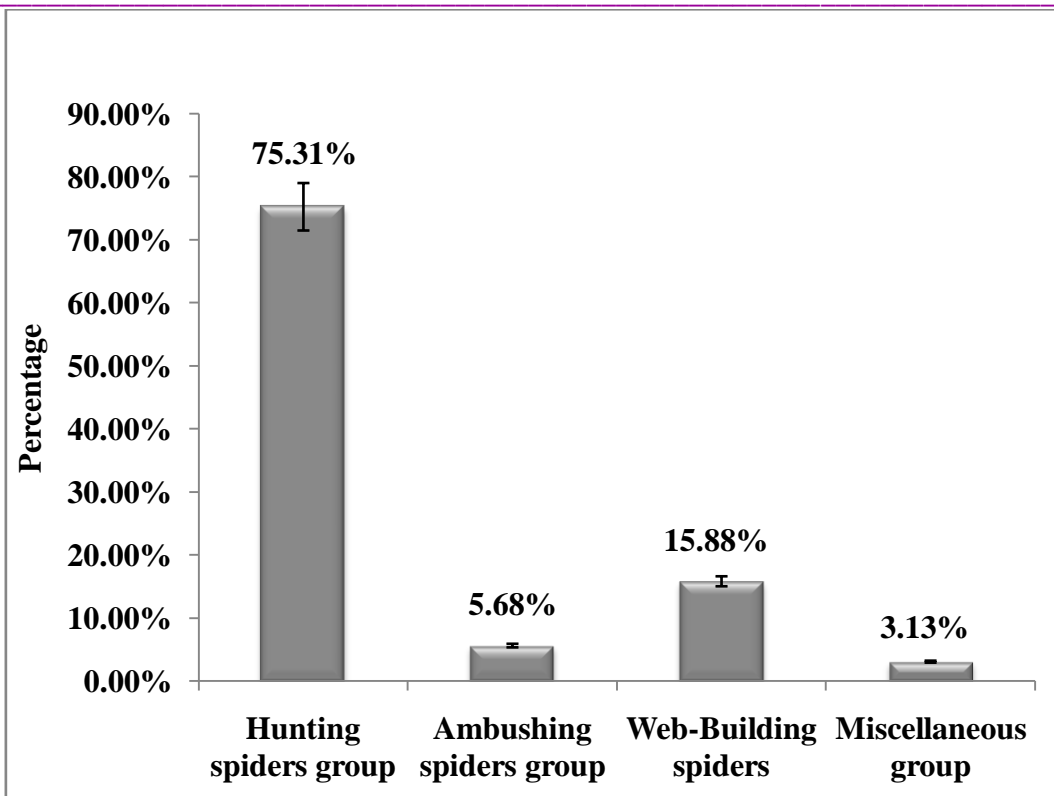


Fig. 3 Distribution of spider groups in cotton

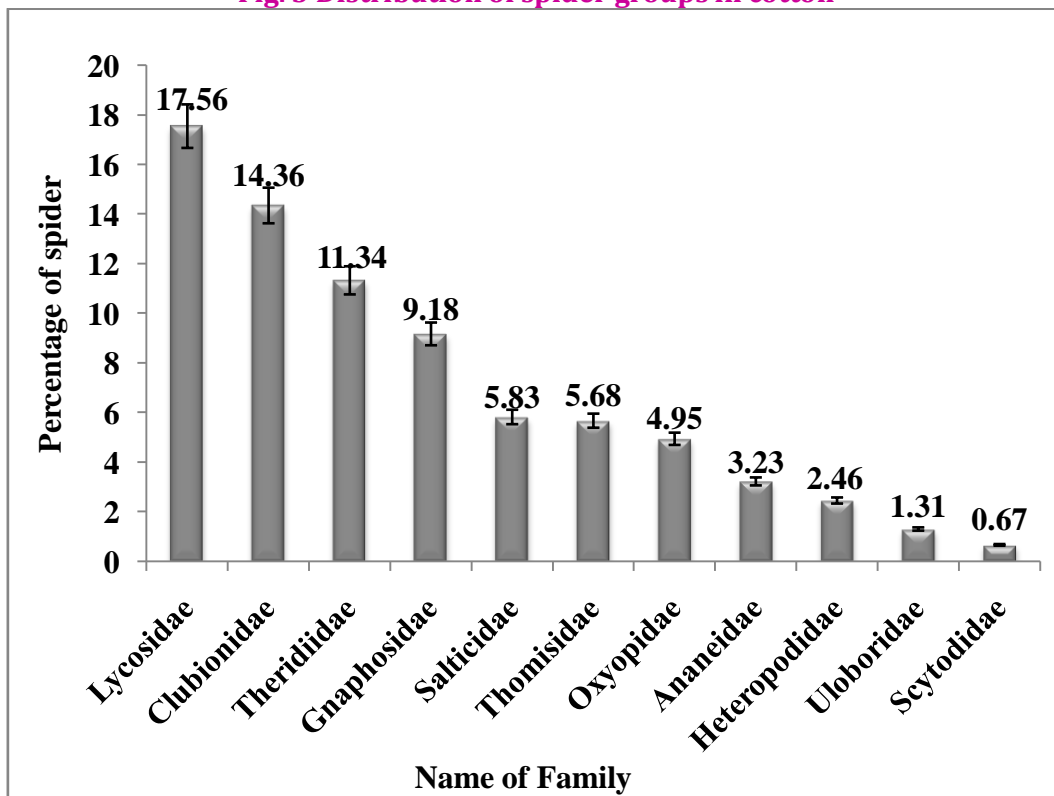


Fig. 4 Percentage of spider families in cotton

CONCLUSION

Spiders play a great role in controlling the insect pests due to their keen sight and tactile organs. The benefit of biological control that there are no ecological populations, reliable, suitable alternatives to pest control, highly precise, long-term control and protected for non-target organisms. It is better to used biological agents such as spiders for controlling the pests. So, bio-control in this sense is nothing but the use of spiders as the natural method of pest and pathogen control.

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