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FLORAL MORPHOLOGY OF THREE SESBANIA SPECIES AND ASSOCIATED INSECT VISITORS

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ABSTRACT

The study was conducted in the Field and Plant Taxonomy Laboratory of the Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh during April to August 2017 to know the floral morphology of *Sesbania* species and its associated insect species and their occurrences. The highest floral structure (standard, wing and keel etc.) was found in *S. sesban* and the lowest in *S. bispinosa*. Standard was orbicular and yellow with purple or brown streaks spotted on back, wing and keel straight and yellow color. Eleven species of insects belong to nine families under five orders were found on three *Sesbania* species and the occurrence of the insects as pollinator, pest and predator were 54.5, 27.3 and 18.2%, respectively. Among the insect orders, Hymenoptera occupied the highest abundance (36.4%) followed by Lepidoptera (27.3%), Coleoptera (18.3%), Odonata (9.0%) and Diptera (9.0%).

Keywords: *Sesbania*, flower,insect, pest, predator, pollinator

Introduction

The *Sesbania* belongs to the family Leguminosae (sub-family Papilionoideae) is known to Dhaincha in Bangladesh, where three species namely *S. sesban*, *S. bispinosa* and *S. cannabina* are commonly grown to incorporate organic matter in soil (Sarwar *et al*. 2017). *Sesbania* are cultivated for animal feed and fodder, ground cover, providing wood, firewood (Shahjalal and Topps 2000, Hossain and Becker 2001). Fertility of the soil in Bangladesh is declining due to intensive land use without green or organic manure and cultivable lands lose soil fertility and productivity. Cultivation of dhaincha might be one of the best options to overcome this situation.

The species of the dhaincha varies in their morphological characters such as plant architecture, leaf shape and size, floral shape, size and color etc. Different species of insect pest, predator and pollinator visit dhaincha field and they play role on the biology of the plants. Over 86 species of herbivorous insects were recorded on *Sesbania* in eastern and southern Africa (Sileshi *et al*. 2000). Herbivore insects attacked every part of *Sesbania* causing damage of varying degree at different growth stages of the plant. Predators maintain an ecological equilibrium between harmful and beneficial species by consuming the pest insects.

Flower visiting insects play significant vital role in the pollination of crops and therefore, develop a mutual relationship (Latif *et al*. 2016). Pollinating activities are different among plant species due to variation of reproductive structures and environmental condition. Floral characteristics *viz*. color, scent, the availability of pollen and nectar, flower arrangement in flat-trapped compound, umbel etc. serve as attractants to diverse insect pollinations (Macukanovic-Jacic *et al*. 2017).

Despite of the significant use of dhaincha as green manuring crop for soil productivity, little research has been done on the morphology, ecology and pollination biology of its native species, and associated insect pests and pollinators. The current study was aimed to provide information on the floral morphology of the species *S. bispinosa, S. cannabina, S. sesban* and to identify the insect pest, predator and pollinator.

Materials and Methods

Study site and climatic conditions: The study was carried out in the field and laboratory of the Department of Crop Botany, Bangladesh Agricultural University, Mymensingh, Bangladesh during February to November

2017. The study area is located at 24^0 75´ N latitude and 90^0 50´E longitudes at the elevation of 18 m above the sea level (UNDP and FAO, 1988). Climate of the area is sub-tropical with hot summer and cool winter. During the study, the maximum and minimum temperatures ranged from 25.9^0C to 32.8^0C and 12.8^0C to 26.7^0C, respectively and mean monthly rainfall was 257.9 mm (0 to 594.3 mm).

Study materials and periods: Three species of *Sesbania* namely *S. sesban, S. bispinosa* and *S. cannabina* were observed in this study. Observation was done during the flowering season of the species (from April to May for *S.sesban,* and from August to September for *S. bispinosa* and *S. cannabina*).

Pollinators or visitors collection: Cultivated *Sesbbania* plants were monitored during the blooming season to observe the foraging behavior and food habit of the associated insects. Floral visiting insects were collected by using hand net. Collected insects were killed by cotton soaked ethyl acetate and preserved for identification. The characters were observed under sterio-microscope and identified to the species level by using standard keys developed by Department of Biology, Valdosta State University (Latif *et al*. 2017).

Observation of floral morphology: Thirty open flowers from 10 randomly selected plants of each species were collected and dissected carefully to examine under the simple microscope for floral color and composition. The length and width of standard, wing, keel and the length of stamen, carpel and ovary were measured by ruler for floral characterization.

Result and Discussion

The studied *Sesbania* species differed in their floral morphology such as flower area, shape, size and color, which have been shown in Table 1. Result showed that the highest standard area was found in *S. sesban* (21.0 × 20.8 mm^2) followed by *S. cannabia* (13.4×12.9 mm^2) and *S. bispinosa* (11.7 × 11.1 mm^2). Standard shape and color in *S. sesban* was orbicular or obovate, yellow, in *S. cannabia* was sub orbicular, broadly round, yellow or orange-yellow, and in *S. bispinosa* was round-obovate, yellow or pale yellowish (Table 1). Wing area was also the highest in *S. sesban* (19.5 × 5.6 mm^2) and oblong shape and yellow color and the lowest area was in *S. bispinosa* (11.6 × 4.5 mm^2) and oblong shape and yellow color. Keel area was maximum in *S. sesban* (18.2 × 8.3 mm^2) and straight shape and yellow color and minimum

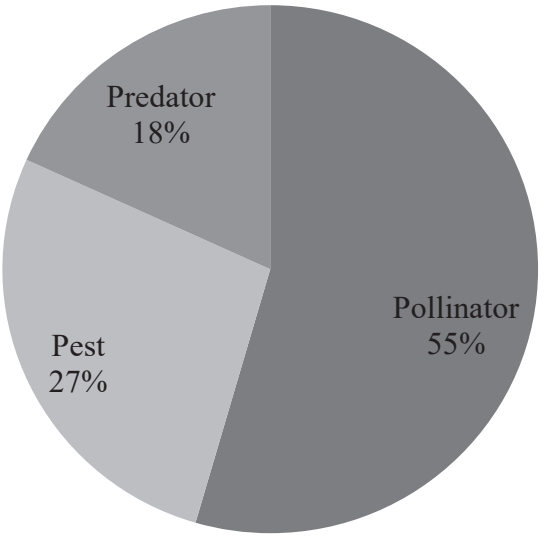


Figure 1. Occurrence of different categories of native insect species associated with *Sesbania.*

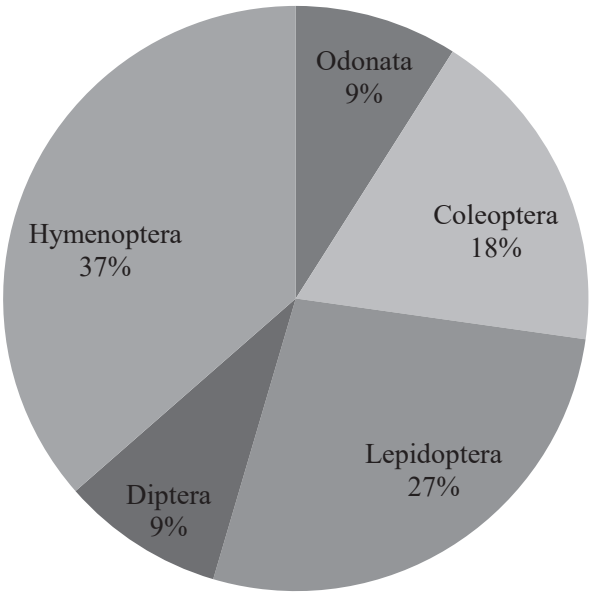


Figure 2. Occurrence of different orders of insect associated with *Sesbania.*

in *S. bispinosa* (10.9 × 4.9 mm^2) and straight shape and yellow color (Table 1).

Insect pests have been cited as one of the factors limiting the benefits from *Sesbania* (Karachi 1995, Rao *et al.* 2000). This study showed that twelve species of insects belong to ten families under five orders were associated with *Sesbania* (Table 2). Categorically the pollinator insects were forget-me-not, flower fly, honey bee, black ant, carpenter bee and potter wasp; predator insects were globe skimmer and lady bird beetle; and pest insects were

Table 1. Floral morphology of three *Sesbania* species

Floral part	Parameter	Species		
		S. bispinosa	*S. cannabina*	*S. sesban*
Standard	Area (mm^2)	11.7×11.1	13.4×12.9	21.0×20.8
	Shape	Round-obovate	Sub orbicular, broadly round	Orbicular or obovate
	Color	Yellow or pale yellowish	Yellow or orange-yellow	Yellow
Wing	Area (mm^2)	11.6×4.5	12.8×4.6	19.5×5.6
	Shape	Oblong	Oblanceolate to oblong	Oblong
	Color	Yellow	Bright yellow	Yellow
Keel	Area (mm^2)	10.9×4.9	12.5×5.8	18.2×8.3
	Shape	Straight	Rounded not beaked	Straight
	Color	Yellow	Pale yellow	Yellow

Table 2. Taxonomic profile and status of the insect species associated with *Sesbania*

Common name	Scientific name	Famaly	Order	Nature
Forget-me-not	*Catochrysops strabo* Fabricius	Lycaenidae	Lepidoptera	Pollinator
Flower fly	*Allograpta obliqua* Say	Syrphidae	Diptera	Pollinator
Honey bee	*Apis cerana indica* Fabricius	Apidae	Hymenoptera	Pollinator
Black ant	*Lasius niger* Linnaeus	Formicidae	Hymenoptera	Pollinator
Carpenter bee	*Xylocopa violacea* Linnaeus	Apidae	Hymenoptera	Pollinator
Potter wasp	*Delta esuriens* Fabricius	Vespidae	Hymenoptera	Pollinator
Globe skimmers	*Pantala flavescens* Fabricius	Libellulidae	Odonata	Predator
Lady bird beetle	*Coccinella septempunctata* Linnaeus	Coccinellidae	Coleoptera	Predator
Epilachna beetle	*Epilachna varivestis* Mulsant	Coccinellidae	Coleoptera	Pest
Forage looper moth	*Caenurgina erechtea* Cramer	Erebidae	Lepidoptera	Pest
Sulphur butterfly	*Phoebis sennae* Linnaeus	Pieridae	Lepidoptera	Pest

epilachna beetle, forage looper moth and sulphur butter. Occurrences of pest, predator and pollinator insects was 37.3, 18.2 and 54.5%, respectively. Abundance of insects in different taxonomic orders showed that the order Hymenoptera revealed the highest level followed by Lepidoptera, Coleoptera, Odonata and Diptera. Abundance and diversity of insects varied from region to region or location to location (Lalita and Kumar 2017). Insect abundance and diversity also varied with the growth stages of the plant species. This study showed that the pollinator insect species occupied the highest abundance followed by pest and predator species. The abundance of the insects were monitored at the flowering stage of the plant because of that the pollinator species were the highest abundant.

The *Sesbania* have been using as green manure crop in Bangladesh to improve soil fertility. Knowledge of floral morphology, pollination biology, ecology and breeding system of *Sesbania* sp. is essential to determine its genetic structure and multiplication. Identification of associated insect pests and their natural enemies, pollinator species and their role on the *Sesbania* are prerequisite for development of successful pest management program. In the present study, the floral morphology of three *Sesbani*a species was investigated to find out variation. The study also identified the insect pest, predator and pollinator species which were abundant in the *Sesbania* field during flowering stage of the plant. The findings will foster more research on the impact of pollinators on fruit set and management strategies for insect pests.

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