# Floral Biology And Pollination Of Vigna Catjang Endl.

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ABSTRACT

Flower biology studies various floral characteristics, such as flowering time, flower morphology, number of stamens and type of anther dehiscence, number of pollen and ovules, presence of nectar and odor to determine reproductive success. Study the contribution of flowers to flower biology is related to pollination mechanisms. Floral biology and pollination are prerequisites for fruit and seed formation and for the development of various preservation protocols. The aim of this study is to elucidate the flower biology, flowering, pollen production and flower visitor foraging behavior of *Vigna catjang* Endl. Seeds of economically important plants belonging to the legume family and used as legumes.

Key words: Flower biology, pollination mechanisms, pollen production.

## INTRODUCTION

Flower biology studies various floral characteristics, such as flowering time, flower morphology, number of stamens, type of anther dehiscence, number of pollen and ovules, presence of nectar and odor, to determine reproductive success. Study the contribution of flowers to Flower biology is related to pollination mechanisms. Pollination, the fundamental force of genetic modification of flowering plants, plays an important role in plant breeding programs. In angiosperms, the pollination machinery usually develops in three stages: the release of pollen from the anther, the movement of pollen from the anther to the stigma, and finally the normal placement of the pollen on the surface of the stigma, followed by pollen germination. The pollen grains that make up the next stage begin fertilization. The evolutionary success and survival of angiosperms depends on the efficiency of their reproductive capacity, and plants have evolved a wide range of reproductive strategies to optimize fitness.

Detailed knowledge of flower biology and pollination is therefore a prerequisite for fruit and seed formation and for the development of various preservation protocols.

The purpose of this study is to elucidate flower biology, flowering, pollen production, and visitor foraging behavior in Vigna catjang Endl. It belongs to the legume family and is an economically important plant whose seeds are used as legumes. In the form of sweets, it is used for leukemia and low energy. Cowpea has been a staple food and an important source of protein in many cultures since the Roman Empire. It was the most widely grown bean for human consumption in the old World (Khare 2007, Allen and Allen, 1981).

## MATERIAL AND METHODS

Different flowering seasons, such as flowering, anther dehiscence, and pollen release, were examined using methods proposed by Mathur and Mohan Ram (1986), Reddi *et*. al. (1988). Pollen productivity, evaluation, and the role of flower visitors in pollination were studied using methods proposed by Mandal and Chanda (1981). Descriptions and terminology for pollen morphology, and stigmatization, were developed accordingly by Erdmann (1960), Heslop Harrison and Sivannah (1977) and Heslop Harrison (1981). Pollen

viability studies were performed using TTC (Hauser and Morrison 1964, Dafni and Firmage 2000). The pollen-ovule ratio was determined by Cruden in 1977.

Following the standard method of Kearns and Inouye (1993), we carefully observed visitor foraging, diet type, and pollination syndrome. The pollen-ovule ratio of flowers was calculated using the method of Cruden (1977).

RESULTS AND DISCUSSION

The flowers are small, bisexual, with white flowers on short stems. The calyx consists of five sepals connected in a bell-shaped tube. The lobes are linear and pointed. Petals: 5, Papilionidae, multi-petaled. The rear petals are the largest leaflet or standard , the two lateral wings and the two boat-shaped petals beneath the front wings are keeled surrounds the staminal column. Stamens: 10, diadelphous, anthers uniform, basal. The Carpels, twisted, filamentous pistil emerging from the short ovary is laterally stigmatic near its apex. The ovary is sessile, ovule-rich and located on top. Fruits: Legumes. The pod is a narrow cylindrical structure, covered with short hairs and ending in a short hooked beak. Each pod contains up to 10 tiny seeds. In the morning (05:00 - 06:30) from June to September, the swallowtail-shaped flowers bloom. Anthers surround the style and release pollen before the flower opens (Table-1). The floral morphology provides an effective Vexillum-like landing gear for insects, and the position of the stamens and stigma provides opportunities for contact with each other. When the flowers open, they are visited by a variety of flowers, including *Amegilla*, *Halictus*, *Vespa*, Ants (Hymenoptera), *Borbo*, and *Eurema* sp. (Lepidoptera) for the collection of forage materials and Thrips (Thysanoptera) (Table-2,Figure-1) were observed to collect the forage materials i.e. nectar and pollen.

Ige *et al.* (2011) observed that Cowpea flowers produce nectars which attract insects. Various insects such as Butterflies, Houseflies (*Musca domestica),* Honeybees (*Apis mellifera*) were seen around the cowpea flower. Honeybee was the most prominent out of the various insects. Whereas Tchuenguem Fohouo *et al*. (2009) showed that *Apis mellifera adansonii, Belonogaster juncea , Polistes* sp., *Camponotus acvapimensis, Myrmicaria opaciventris, Chalicodoma* sp., *Amegilla* sp., *Megachille* sp., *Lagria villosa, Cheilomenes lunata* are visit the flower. Among the flower visitors *Apis mellifera adansonii* most dominant.

Choorykaew *et al.* (2004) observed flower visitors of *Afgekia sericea* and found *Megachile* spp. *Nomia, Anthophora, and Xylocopa. Pithitis smaragdula, Trigona sp., Chilades sp. Mylabris phalerata, Nectarinia sp*.

Aleman *et al*. ( 2014) showed that *Apis mellifera*, *Bombus atratus* , *Bombus morio* , *Megachile* spp., *Melissodes tintinnans* , *Psaenythia* sp. etc. visit the flower and *Apis mellifera* most dominant in *Desmodium* plant.

Tesserolli de Souza *et al*. ( 2017) observed that different flower visitors of *Vigna longifolia* and *Vigna luteola* like *Apis mellifera, Bombus morio, Centris decolorata, Lepeletier, Centris tarsata, Coelioxys sp , Eufriesea mussitans , Megachile susurrans, M. tenuitarsis, Pseudaugochlora* sp. , *Xylocopa* spp., *Exomalopsis analis, Hemiargus hanno hanno* Stoll, *Hesperiidae* spp., *Syngamia forella, Spilomelinae* sp. *Plusiinae* sp. *Plusiinae* sp., *Rhingia* sp., *Toxomerus* sp., *Ocyptamus* sp., *Sarcophagidae* sp., *Micropezidae* sp., *Bombylidae* sp. visit the flower for forage. Among the flower visitors *Apis mellifera* play important role in pollination.

Pollination in this plant resembles an explosive mechanism, and here keel claws play an important role in activating that mechanism. The reproductive column (stamens and stigma) is surrounded by a keel and is exposed when pollinators press on the wings and petals of the keel. As a result, the germ column comes into contact with the insect's body and is pollinated with pollen grains that graze the insect's forehead and back, and the wing-keel junction does not return to its original position, rendering the rupture mechanism inoperative. It was also supported by various researchers (Arroyo 1981, Yeo 1993, Lopez *et al* 1999, Galloni and Cristofolini 2003, Galloni *et al* 2007, Aleman *et al.* 2014). Among various insects, only *Amegilla* sp. and *Halictus* sp. members of the order Hymenoptera are able to deposit viable pollen grains on the receptive part of the stigma. Depending on the body size of *Amegilla* sp. and *Halictus* sp. a large number of pollen grains can be removed in a single visit.

Flower shape, structural arrangement of flower parts, amount of nectar, foraging mode, foraging frequency and pollination efficiency indicated that only *Amegilla* sp. and *Halictus* sp. readily transport pollen grains to the stigma of another flower, aiding in pollen dispersal and pollination, and greatly enhancing fruit set.

Floral morphology and cultivation systems are interrelated. Lloyd and Schoen (1992) concluded that families are characterized by specific pollination mechanisms such as papilionidae underwent natural selection that facilitated cross-pollination.

The presence of a stigmatic "membrane" and a "stigmatic" hair collar are structural features of the female genitalia. The stigmatic membrane prevents autonomous self-pollination, so some means is required for effective pollination. The presence of peripheral stigma prevents self-pollen attachment to the stigma during the early stages of flowering, maximizing outcrossing. The stigma and peristaltic hairs have been reported to be present in various Papilionidae, including *Vigna adenantha* (Castro and Agullo 1998), *Vicia faba* (Lord and Heslop-Harrison 1984), and *Medicago scutellata* (Kreitner and Sorensen 1985). I'm here. Coyne 1975*)*, *Lupinus Nanus* subsp. *latifolius* (Juncosa and Webster 1989), Crotalaria stipularia (Etcheverry 2001), Crotalaria micans (Etcheverry *et al*. 2003), *Vigna caracalla* (Etcheverry *et al.* 2008).

Table 1: Floral characters of *Vigna catjang Endl.*

| Floral Characters | Observations |
|---|---|
| Flowering period | June-september |
| Flower type | Zygomorphic |
| Flower colour | White |
| Flower shape | Papilionaceous |
| Flower opening time | 6:00 am – 6:30 am |
| Nectar | Present |
| No. of anthers/ flower | 10 |
| Anther dehiscence mode | Longitudinal |
| Average no. of pollen grains /anther | 950 |
| Average no. of pollen grains/flower | 9500 |
| Average no. of ovules/flower | 15 |
| Pollen/ ovule ratio | 634:1 |
| Pollen shape | Sub –prolate |
| Pollen type | Tricolporate |
| Pollen size | 24.30 ×22.85 µm |
| Stigma type | Wet, papillate |
| Stigma receptivity ( *In vivo*) | 26 % |
| Pollen viability ( TTC) | 76% |

Table 4: List of Flower visitors of *Vigna catjang Endl.*

| Flower visitors | Visiting time | Foraging materials | Pollen adhering region |
|---|---|---|---|
| **Hymenoptera:** | | | |
| *Amegilla* sp. | Day | Pollen and Nectar | Ventral region, Legs and mouth parts |
| *Halictus* sp. | Day | Pollen and Nectar | ,, |
| *Vespa* sp. | Day | Pollen and Nectar | ,, |
| Ant (Formicidae) | Day | Nectar | ,, |
| **Lepidoptera:** | | | |
| *Borbo* sp. | Day | Nectar | Proboscis, legs |
| *Eurema* sp. | Day | Nectar | ,, |
| *Everes* sp. | Day | Nectar | ,, |
| *Zizeeria* sp. | Day | Nectar | ,, |
| **Thysanoptera:** | | | |
| Thrips | Day and night | Pollen and Nectar | Throughout the body |

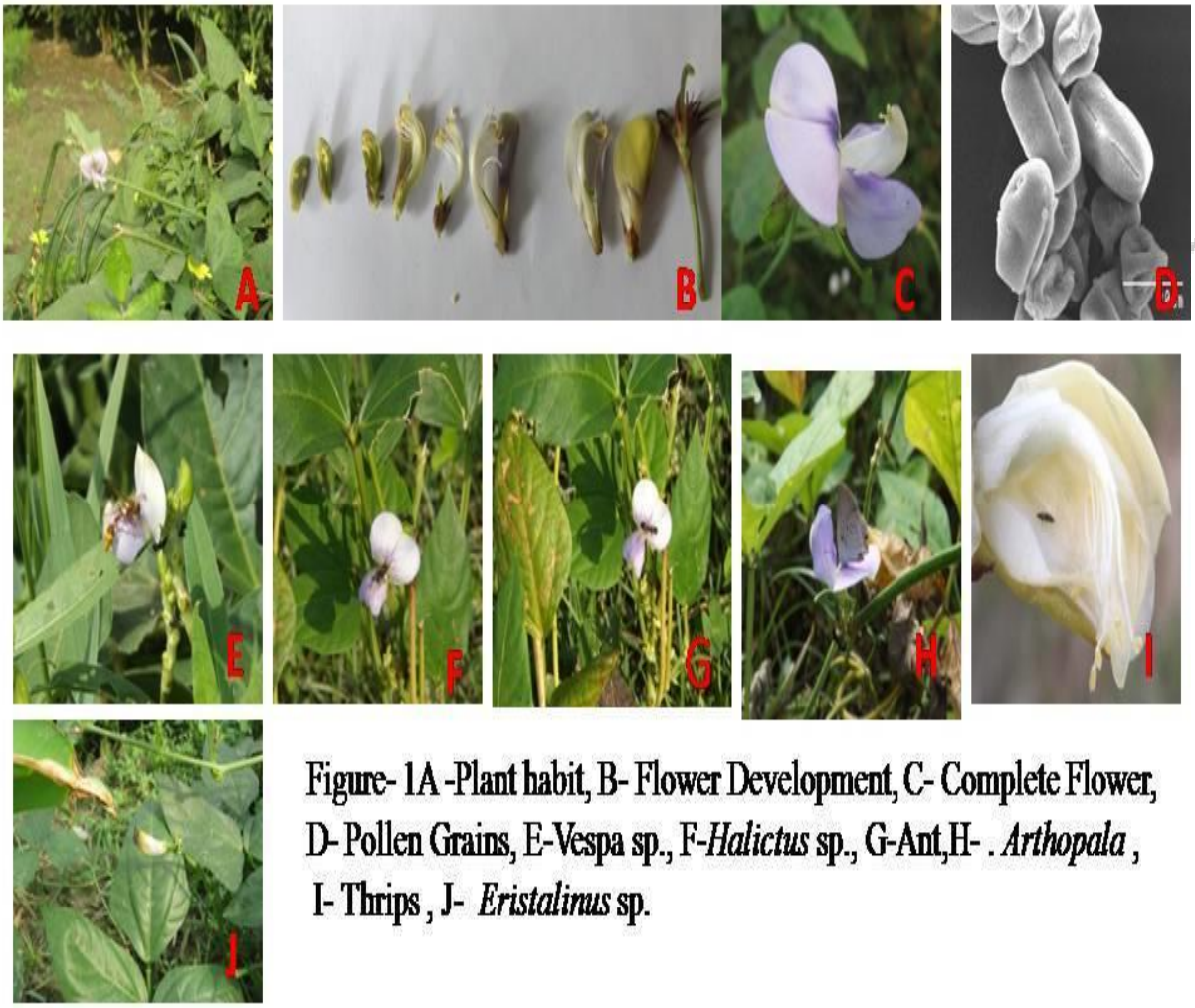


Figure- 1A -Plant habit, B- Flower Development, C- Complete Flower, D- Pollen Grains, E-Vespa sp., F-*Halictus* sp., G-Ant, H- . *Arthopala* , I- Thrips , J- *Eristalinus* sp.

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