

Pollination in Cucurbitaceae family

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Abstract: Pollination is an important ecological phenomenon where life exists and grows. Insects are the most important pollinators of plants. From plants, people get food, medicines, and other life stuff, which are actual results of pollination. Among the plant species, the edible and medicinal plants of the Cucurbitaceae family are the most common and oldest. Keeping this in mind, an attempt has been made to document the common pollinators in the Cucurbitaceae family. The field survey was carried out at agricultural lands in 24 parganas, Nadia, Hooghly, and Midnapore of West Bengal, India, during 2021–2023, and enumerated the pollinators. Results revealed that about 36 pollinators pollinate 11 common cucurbits in the study areas. It was noticed that selected plants are used for food and medicinal purposes. The study highlights the need for pollinators for the existence of human beings.

Keywords: Pollinators, fertilization, edible plants, fruits

Introduction: Cucurbitaceae is a family of many plant species with food values (Rolnik and Olas 2020). The most common vegetable in our kitchen, from tribal to urban areas, belongs to the family Cucurbitaceae. Some plants have only medicinal values in this family, and some plants act as nutraceuticals. The most common genera of the family are *Cucurbita*, *Lagenaria*, *Citrullus*, *Cucumis*, *Momordica*, *Luffa*, etc. The plant species of these mentioned genera have food values and are mostly used as vegetables. The common vegetables of this family are *Cucurbita pepo*, *Cucurbita maxima*, *Cucurbita moschata*, *Lagenaria siceraria*, *Citrullus lanatus*, *Cucumis melo*, *Momordica charantia*, *Momordica cochinchinensis*, *Momordica dioica*, *Luffa acutangula*, *Luffa aegyptiaca*, etc. The species are mainly pollinated by bees but also by birds, butterflies, bats, flies, moths, and ants. Pollination is very important for fruiting and producing seeds for the next generation, continuously increasing the population in the wild, and providing seeds for sustainable cultivation. If pollinators do not exist in nature, humans will lose many foods from plants.

Therefore, knowing about the relationship between food plants and pollinators is very important. Due to deforestation, anthropogenic activities, monocropping, and climatic changes, pollinators are going to go extinct, which will be a problematic issue in the future (Shivanna 2022). Hence, we need to maintain the ecological balance for sustainable ecoservices. Keeping this in view, an attempt has been made to enumerate some common pollinators of common plant species in the Cucurbitaceae family with food values.

Study area: The field study will be carried out on the agricultural lands of 24 parganas, Nadia, Hooghly, and Midnapore in West Bengal, to explore the diversity of insects and other pollinators of the proposed plants. The pollinators on selected plants (Ridge gourd, Sponge gourd, Ash gourd, Bottle gourd, Snake gourd, Cucumber, Bitter gourd, Melon, Scarlet gourd, Sweet gourd, and *Cucurbita moschata*) of the Cucurbitaceae family are observed and noted.

Results and discussion: The survey revealed that about 36 pollinators were observed on the flowers of Cucurbitaceae plants (Ridge gourd, Sponge gourd, Ash gourd, Bottle gourd, Snake gourd, Cucumber, Bitter gourd, Melon, Scarlet gourd, Sweet gourd, and *Cucurbita moschata*). It was noticed that they belong to seven orders. The highest pollinators were recorded in the order Lepidoptera (17), followed by Hymenoptera (8), Blattodea (4), Coleoptera (3), and each species from Diptera, Mantodea, and Orthoptera. Details are listed in Table 1 and illustrated in Figure 1. Some common pollinators are shown in Figures 2–7. Morphological variations of selected plants are also studied and presented in Table 2.

Table 1: Common enumerated pollinators of Cucurbitaceae family

Scientific Name	Order	Family
<i>Amata cyssea</i> Stoll, 1782	Lepidoptera	Erebidae
<i>Apis dorsata</i> Fabricius, 1793	Hymenoptera	Apidae
<i>Apis florea</i> Fabricius, 1787	Hymenoptera	Apidae
<i>Aulacophora foveicollis</i> Lucas, 1849	Coleoptera	Chrysomelidae
<i>Aulacophora indica</i> Gmelin, 1790	Coleoptera	Chrysomelidae
<i>Aulacophora lewisii</i> Baly, 1886	Coleoptera	Chrysomelidae
<i>Blatta orientalis</i> Linnaeus, 1758	Blattodea	Blattidae
<i>Blattella germanica</i> Linnaeus, 1767	Blattodea	Ectobiidae
<i>Botyodes asialis</i> Guenée, 1854	Lepidoptera	Crambidae
<i>Camponotus compressus</i> Fabricius, 1787	Hymenoptera	Formicidae
<i>Chabula acamasalis</i> Walker, 1859	Lepidoptera	Crambidae
<i>Coccinella transversalis</i> Fabricius, 1781	Coleoptera	Coccinellidae
<i>Delias eucharis</i> Drury, 1773	Lepidoptera	Pieridae

<i>Diacamma rugosum</i> Le Guillou, 1842	Hymenoptera	Formicidae
<i>Diaphania hyalinata</i> Linnaeus, 1767	Lepidoptera	Crambidae
<i>Diaphania indica</i> Saunders, 1851	Lepidoptera	Crambidae
<i>Glyphodes bicolor</i> Swainson, 1821	Lepidoptera	Crambidae
<i>Glyphodes bivitalis</i> Guenée, 1854	Lepidoptera	Crambidae
<i>Hieroglyphus banian</i> Fabricius, 1798	Orthoptera	Acrididae
<i>Hippotion celerio</i> Linnaeus, 1758	Lepidoptera	Sphingidae
<i>Lerema accius</i> Smith, 1797	Lepidoptera	Hesperiidae
<i>Loboptera decipiens</i> Germar, 1817	Blattodea	Ectobiidae
<i>Mantis religiosa religiosa</i> Linnaeus, 1758	Mantodea	Mantidae
<i>Monomorium minimum</i> Buckley, 1866	Hymenoptera	Formicidae
<i>Oecophylla smaragdina</i> Fabricius, 1775	Hymenoptera	Formicidae
<i>Parapoynx villidalis</i> Walker, 1859	Lepidoptera	Crambidae
<i>Parotis marginata</i> Hampson, 1893	Lepidoptera	Crambidae
<i>Periplaneta americana</i> Linnaeus, 1758	Blattodea	Blattidae
<i>Pieris brassicae</i> Linnaeus, 1758	Lepidoptera	Pieridae
<i>Poliobotys ablactalis</i> Walker, 1859	Lepidoptera	Crambidae
<i>Pycnarmon cribrata</i> Fabricius, 1794	Lepidoptera	Crambidae
<i>Spoladea recurvalis</i> Fabricius, 1775	Lepidoptera	Crambidae
<i>Syrphus ribesii</i> Linnaeus, 1758	Diptera	Syrphidae
<i>Theretra silhetensis</i> Walker, 1856	Lepidoptera	Sphingidae
<i>Xylocopa aestuans</i> Linnaeus, 1758	Hymenoptera	Apidae
<i>Xylocopa latipes</i> Drury, 1773	Hymenoptera	Apidae

Table 2: Morphological variations of selected cucurbits

Scientific name of the selected cucurbit crops	Color of the Flower	Male and Female flower ratio	Flower anthesis	Floral resource
<i>Cucumis melo</i>	Yellow	12:1	Early morning until afternoon	Nectar and pollen
<i>Cucurbita maxima</i>	Yellow	31:11	Early Morning until noon	Nectar and pollen
<i>Cucurbita moschata</i>	Yellow	33:15	Early Morning until noon	Nectar and pollen
<i>Cucurbita pepo</i>	Yellow	32:10	Early Morning until noon	Nectar and pollen
<i>Lagenaria siceraria</i>	White	15:5	Early evening until afternoon of the next day	Nectar and pollen
<i>Luffa acutangula</i>	Yellow	47:9	Early evening until the late night	Nectar and pollen
<i>Luffa aegyptiaca</i>	Yellow	23:1	Before sunlight of the morning to noon	Nectar and pollen
<i>Momordica charantia</i>	Yellow	37:2	Early morning before sunlight to noon	Nectar and pollen
<i>Momordica cochinchinensis</i>	Yellow whitish	17:3	Early morning	Nectar and pollen
<i>Momordica dioica</i>	White	11:3	Early morning	Nectar and pollen
<i>Trichosanthes cucumerina</i>	White	17:1	Early evening to next day morning	Nectar and pollen

Some other researchers have also documented the pollinators of plants belonging to Cucurbitaceae family. Canto and Parra (2000) reported the pollinators of *Cucurbita moschata* whereas Rust et al. (2003) reported the pollinators of *Ecballium elaterium*, a mediterranean endemic. Andrews et al. (2007) reported the pollinators of *Cucurbita* family. Santos et al. (2008) also reported the pollinators of *Cucumis sativus*. Mitchell et al. (2015) reported the role of moth pollinators in Cucurbitaceae. The above reports revealed that, the works has been done but not in deep. During our observations, authors have also seen other pollinators like *Ceratina hieroglyphica*, *Ceratina smaragdula*, *Braunsapis picitarsis*, *Halictus taprobanae*, *Halictus timidus*, *Trigona spinipes*, *Macroglossum neotroglodytus*, *Cephonodes picus* etc.

Medicinal values of selected cucurbits: During work on pollination of selected cucurbits (Ridge gourd, Sponge gourd, Ash gourd, Bottle gourd, Snake gourd, Cucumber, Bitter gourd, Melon, Scarlet gourd, Sweet gourd, and *Cucurbita moschata*), authors found that they have not only food values but they are used for medicinal purposes in study areas. The fruits of Bitter gourd are used in diabetes; Ridge & Sponge gourds are used against constipation; Cucumber is used to enhance the appetite; Bottle gourd is good for sound health.

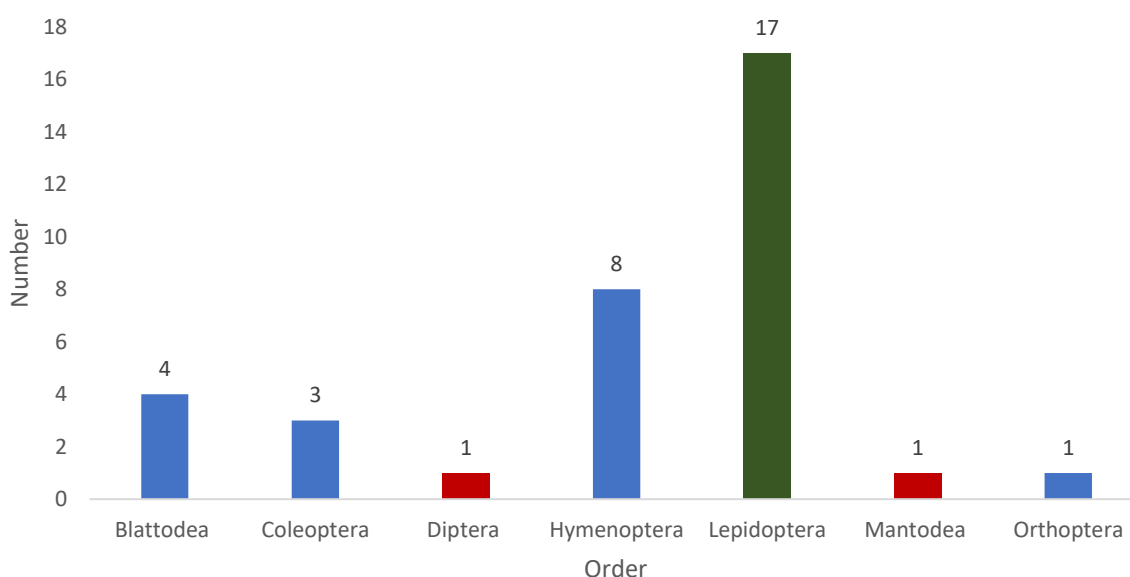


Figure 1: Pollinator diversity of Cucurbitaceae family in different orders



Figure 2: Pollination in *Luffa acutangula* flower by *Diaphania indica*

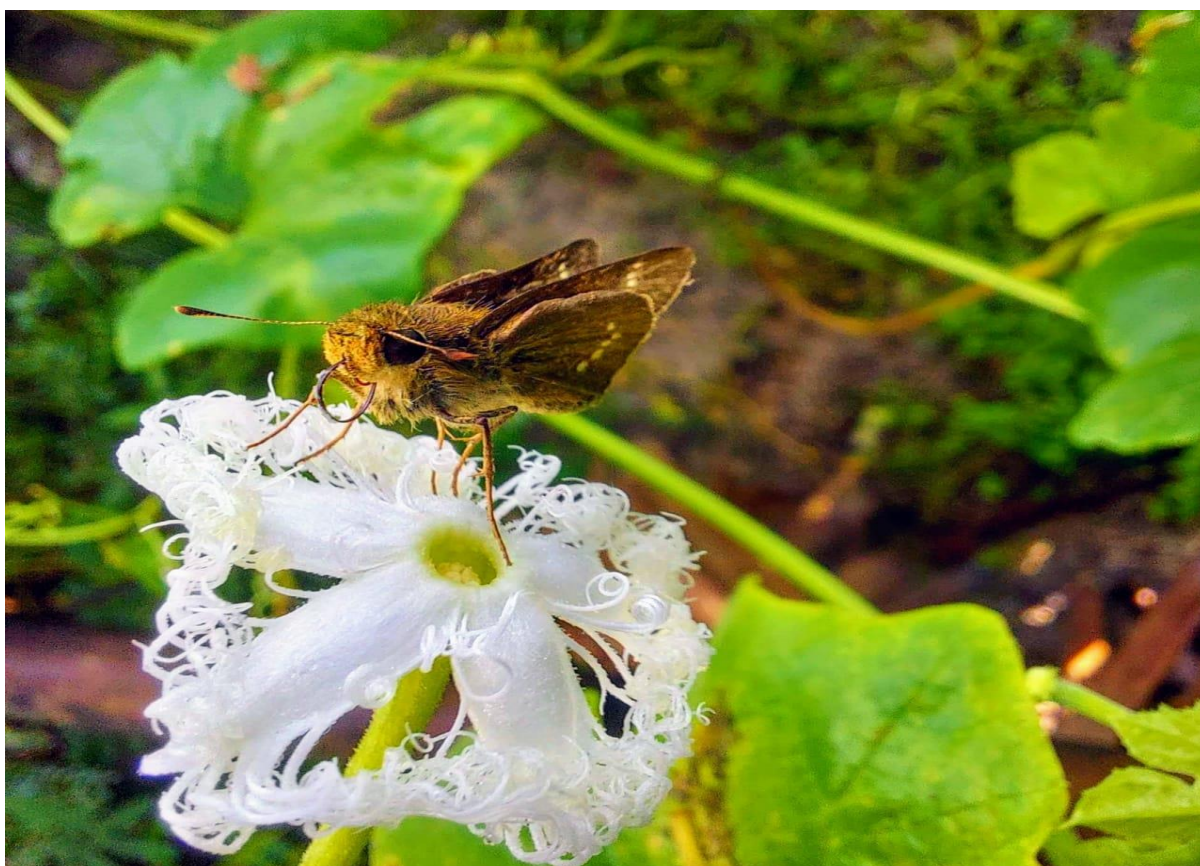


Figure 3: Nocturnal visitation, *Lerema accius* on the flower of *Trichosanthes cucumerina*



Figure 4: Pollination in *Luffa acutangula* flower by *Bastilla simillima*

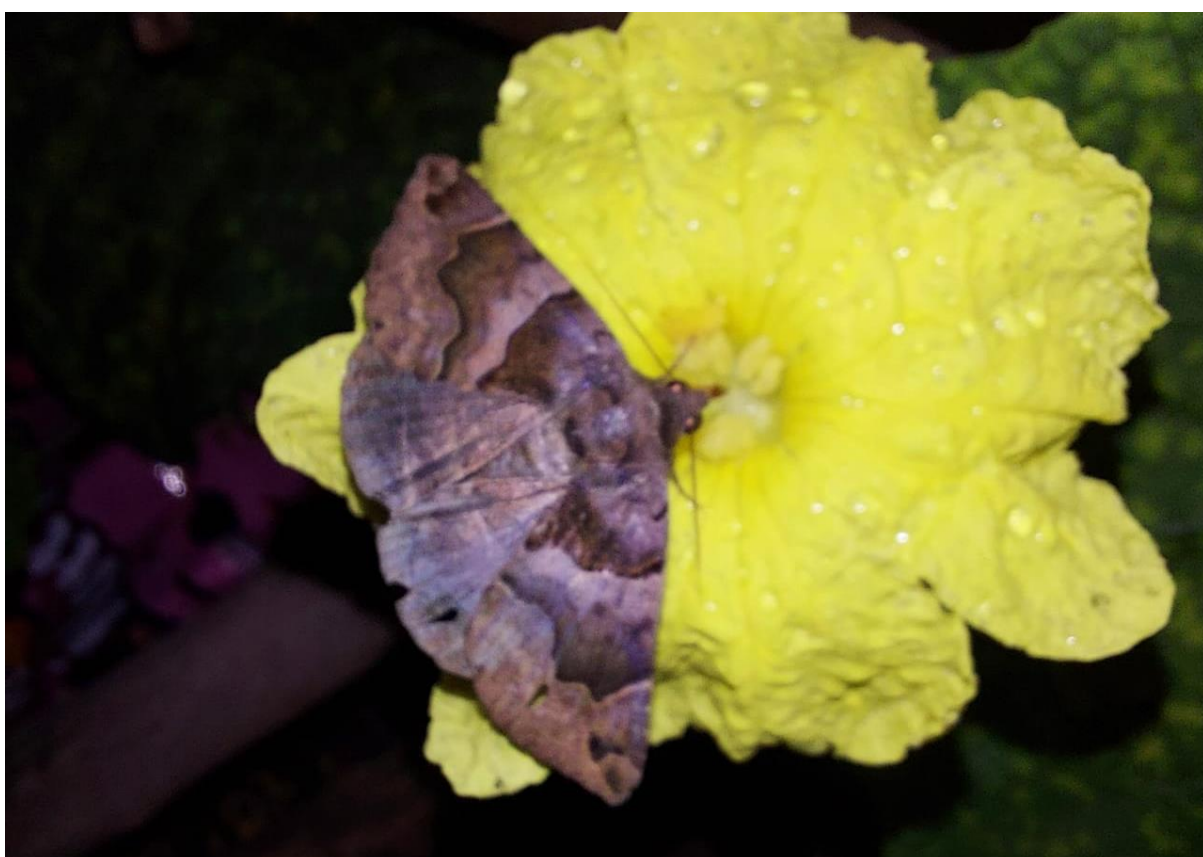


Figure 5: Pollination in *Luffa acutangula* flower by *Patania ruralis*



Figure 6: *Apis dorsata* on *Luffa acutangula*



Figure 7: *Xylocopa latipes* on Sponge gourd (*Luffa cylindrica*)

Conclusion: The present study highlights the importance of pollinators in the Cucurbitaceae family. Most species in this family are used as food and medicines. Therefore, the study concluded that there is an urgent need to document the pollinators in this family and also to develop their conservation strategies. It also suggests that there is a need for documentation of pollinators for other native crops.

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