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# Study on Floral Biology of Cucurbita Species

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**Abstract** A field trial was made during November to Match 2010-2011 and 2011-2012 to study the floral biology of two species *Cucurbita moschata* and *C. pepo*. One genotype each of both the species was chosen as the materials for the study. The study revealed that both species showed monoecious sex form. Using statistical analysis of mean and standard error it was found that it took lesser number of days for visible flower bud to opening of both male and female in *C. moschata* compared to *C. pepo* flower from the visible bud stage irrespective of the species. It was found that pollen germinability is higher in *C. moschata* than *C. pepo.* In both *Cucurbita pepo* and *C. moschata* stigma receptivity was highest at anthesis and reduced sharply two hours after.

**Keywords** Anthesis, Stigma receptibility, Pollen viability, Sucrose, Boric acid mixture.

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## Introduction

Floral biology is the study of science of flowers, which includes opening of flower, dehiscence of anthers, pollen viability and stigma receptivity and stigma receptivity. Usually anthesis of a flower takes place in the morning in most of the crops in some like bottle gourd, ridge gourd and snake gourd. Floral biology of a crop is very important for breeders to frame hybridization work. It is also influenced by environmental factor i.e. temperature, light, humidity and genetic factors as well. Detailed account on floral biology of the crop including time of anthesis, stigma receptivity, crossability, parthenocarpic fruit set and in vitro pollen germination studies are essential to frame a strategy to combat the fruit setting problems also [1–2]. Taking into consideration the above information, investigation on two cucurbita sp. was carried out on botanical characterization and different aspects of floral biology.

## Materials and Methods

The field experiments were carried at Central Research Farm, Gayeshpur, BCKV, Nadia, West Bengal. The soil texture is sandy loam and slighty acidic (pH 6.5). One local cultivar of pumpkin *(Cucurbita moschata)* and one local commercial variety of summer squash *(Cucurbita pepo)* were selected. The land of experimental site was thoroughly prepared by repeated ploughing. The vines of *C. moschata* were not trained over trellies. Fertilizers was applied @ 100 kg N, 60 kg $P_2O_5$ and 40 kg $K_2O$ to soil. Half dose of N along with entire phosphate and potash were broadcasted to the soil, rest of the N was top dressed at 60 days after

sowing. Both the cucurbita sp. were grown inside open. A randomized block design was followed with a spacing of 1 m × 1 m. The seeds were sown in 15th November in both 2010 and 2011. Ten randomly selected plants of both *cucurbita pepo* and *C. moschata* were taken for recording in the following way.

Anthesis and anther dehiscence time

Data were recoded on the following ways.

*Receptivity of the stigma*

Receptivity of the female flowers of the two cucurbita sp. was studied through hand pollination of 5 stages of the bud/opened flower about 12 h before and 6 h after anthesis (4.30 to 5 pm, 6 am, 8 am, 10 am, and 12 noon) with the bulk pollens from the male flowers.

*Pollen viability of male flower*

To determine the viability of pollen of male flower 2% carmine test is used. Male flowers were collected from the plants in the morning hours and taken to the lab, dipped in water to maintain its turgidity. Non viable pollen were recorded.

*Germinability of the pollen*

To check the pollen germinability pollen were put in germinating media with 10% sucrose and 0.025% boric acid in the grooved slide. Pollen germination was observed under the microscope and pollen tube length was recorded by ocular micrometer.

**Results and Discussion**

Anthesis

Anthesis of both *C. moschata* and *C. pepo* was recorded from 5.30 am. Onwards for 5 consecutive days at peak flowering period. In both the cucurbita species anthesis occurred before 5.30 am. However, the exact time could not be recorded due accessibility to field before the mentioned time. In the plants of *C. moschata* anthesis continued up to 7.00 to 7.30 am. while it was completed earlier in *C. pepo*. The anthers were found to dehisce at the time of opening of the flowers and the release of pollen grains continued for several hours. Prior to dehiscence at the time of opening of the flowers and the release of pollen grains continued for several hours. Prior to dehiscence, anthers became shiny in appearance. Commencement of dehiscence was detected by the appearance of longitudinal slits on the middle of anther lobe to which widened further and pollens were seen bursting out of anthers in yellowish orange sticky mass deposited on anther walls. However it has been reported that in pumpkin *(Cucurbita pepo)* anthesis started at 5am and completed 10 am. It is also reported that the plant summer squash bears large flower in the axil of leaf. Here anthesis started in the morning at 3-30 am. The flowers remained open for about in 8 h. The dehiscence takes place from 9 pm to 3 am [4]. Another reported that in flower anthesis began between 3 am and 4 am with peak reaching between 5 to 6 am in pumkin [5].

Receptivity of the stigma

Receptivity of the stigma of the female flowers of the two cucurbita sp. was studied through hand pollination of 5 stages of the bud/opened flower about 12 h before and six hours after anthesis (4-50 to 5-00 pm, 6 am, 8 am, 10 am and 12 noon) with the bulk pollens from the male flower of the male clone having kept in ambient condition was used for selfing and no fruit set might also occurred due to non-viability of pollens itself.

Pollen morphology

The pollen grains of male flowers of both *C. pepo, C. moschata* were round in shape with 3 germ pores. Diameter of the viable pollens ranged 65.8 to 66.4 and micron in *C. pepo* and between 65.4 and 65.7 microns in *C. moschata* (Table 1).

Pollen viability

Pollen grain viability in acetocarmine test was high to very high at the time of anthesis. In *C. pepo* mean pollen viability was 88.23 ± 5.86% in 1st year and 73.48 ± 7.58% in second year. In moschata mean pollen & viability was 75.19 ± 6.82% in first year and 82.86 ± 8.16% in the 2nd year. Pollen viability was observed

**Table 1.** Pollen viability and germinability in two Cucurbita species

| Poolen viability (%) | | | |
|---|---|---|---|
| *Cucurbita pepo* | | *Cucurbita moschata* | |
| First | Second year | First year | Second year |
| 88.23 ± 5.86 | 73.48 ± 7.58 | 75.19 ± 6.82 | 82.86 ± 8.16 |
| Pollen germinability (%) | | | |
| Cucurbita pepo | | Cucurbita moschata | |
| First year | Second year | First year | Scond year |
| 26.55 ±4.82 | 19.56 ± 5.26 | 35.61 ± 6.32 | 29.66 ± 7.96 |
| Pollen diameter (micron) | | | |
| *Cucurbita pepo* | | *Cucurbita moschata* | |
| First year | Second year | First year | Second year |
| 65.8 ± 7.82 | 66.4 ± 6.56 | 65.7 ± 5.42 | 65.4 ± 5.83 |

that about 97.64—98.55% in fresh by opened flowers but decreased to 74.73%. He also reported pollen grains stared under refrigeration mantaned 63% viability [5].It can be suggested to use high pollen mass at the time of hand pollination to get appreciable fruit set in both the species (Table 1).

In vitro pollen germinability

In the present investigation, germination of pollen grain was studied in the germinating media containing 10% sucrose and 0.025% boric acid in the grooved slide. In vitro pollen germination of both cucurbita sp. was in general low particularly in *C. pepo.* In *C.pepo* mean pollen germination was 26.55 ± 4.82% in the first year and 19.56 ± 5.26% in 2nd year. In moschata mean pollen germination 35.61 ± 6.32% in the 1st year and in the 2nd year 29.66 ± 7.96% (Table 1). It is found that about 40% pollen germination in vitro in different cucurbits such as ash gourd, sponge gourd, bitter gourd, bottle gourd, maskmelon and ridge gourd in the germinating liquid containing 20% sucrose which agreed well to the present findings in two cucurbita species.

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