Flowering Phenology and Histochemical Analysis of Cotton Varieties

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Abstract:

Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors."Flowering Phenology" refers to the seasonal timing of flowering. Another event under phenology is opening of flower, anther dehiscence, pollen presentation and stigma receptivity. Flower opening in all cotton varieties starts during 06.45 to 09.45 hours followed by anther dehiscence, which starts, from 07.00 hours depending on the weather conditions. In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. In histochemical test, Pollen grains of all the varieties of cotton studied showed the presence of both starch and lipids. Thus the Pollen grains of all cotton varieties belong to the class of starchy pollen as in all varieties it showed positive test.

Keywords: *Cotton varieties, flowers, starch, lipids, phenology.*

Introduction:

Cotton is one of the most commercial crops playing a key role in economic, political and social affairs of the world. Cotton is a tropical and subtropical crop grown on a variety of soil. The predominant types of soil on which the crop is grown are the black cotton soil and red sandy loams to loams found in the state of Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamilnadu. The sowing season of cotton varieties differs considerably in different regions for obtaining maximum yield of cotton. The crop yield is depending on reproductive success of the plant. During the process of reproduction the pollen grains plays very important role. Therefore, the Palynological investigations of cotton varieties H-8, NHH-52, BT-162, LRA-5166, Kaveri Kurnel, Ankur-216, Binni and Ajeet-11 were proposed to undertake for the investigations on flowering phenology, pollen histochemistry. Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors (Mori and Prance, 2005). "Flowering Phenology" refers to the seasonal timing of flowering.

A phenological record depends on parameter chosen by the various investigators and depends on the research levels, the aim of the research, and the type of analysis. The main events are the timing, duration, sequence, intensity and timing of flowering, which can determined by the physical environment factors like temperature, rainfall and day- length (Dafni, 1992). Plants reproductive characteristic can affect the flowering phenology, mode of seed dispersal and fruiting seed set efficiency. A wide variety of environmental factors may select for one or more reproductive characteristic in plant population (Smith *etal*, 1986) and such factors include seasonal climatic events (Schemske, 1977).

Pollen histochemical analysis are carried out for the following reasons i) possible relation between the pollen content and the mode of pollination ii) study of pollinator foraging behavior, nutritional demands, pollination mode, pollen content and iii) composition in relation to phylogeny (Dafni, 1992). Lipids and starch are important constituents of the pollen grains to establish the relations with flower foragers.

Materials and Methods

For the collection of phenological data of selected cotton varieties, field trips were undertaken daily or on alternate days. Events and the changes of the single flower are recorded to study the flowering phenology in relation to geographical (latitudinal and altitudinal) and climatic variables, the time and duration of pollen exposure and the interrelations among environmental variables (temperature and humidity) and flower development were noted.

Plants were observed from the beginning of flowering stage up to the opening of last flower. Flowering period was taken as the period from the opening of first flower up to the opening of last flower. The timing of onset, progress, termination and blooming of selected varieties under study were noted.

For the histochemical tests fresh and mature pollen grains were collected from freshly dehisced anthers. For the test of starch method proposed by Baker and Baker (1979) was followed. Pollen samples were immersed in to IKI solution and examined under the microscope for the change in colour. Dark bluish-black color indicates the presence of starch. For the estimation of lipids pollen sample were kept in freshly prepared stock solution of Sudan IV and treated pollen sample was observed under microscope within 2-3 minute to note the change in colour. A red color indicates the presence of lipid (Baker and Baker, 1983).

Observation:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7. In all varieties the flowering stands to terminate towards the end of month of December .

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

At the full bloom time the plants of cotton variety Ajeet-11 were with maximum height of 111 cm having up to 150 leaves per plant, however, in Ankur-651 height was 72 cm with 80 leaves. The number of leaves, more or less correlates with the height of plant. For each variety parameters like height, number of leaves, number of balls, number of flowers open per day, and number of anthers per flower showed variations for each parameter.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids.

Conclusions:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C. The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7 In all varieties the flowering stands to terminate towards the end of month of December.

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From the observations on flowering phenology, it is noticed that the flowering phenology is related with seasonal variations and environmental conditions and has an impact of different environmental factors.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids. Pollen histochemistry is possibly related to pollination mode, pollinator foraging behavior and phylogeny. The nutritive value of pollen also influences the behaviour of flower visitors.

References

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