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3. Pollen Viability of Selected Varieties of Gossypium sp

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Abstract

Viability means ability to live; but pollen viability is the ability of pollen to complete post-pollination events and to effect fertilization. As viability refers to the ability of pollen to deliver functional gametes to the embryo sac, the most authentic test to viability would be to assess the fertilization capacity of the pollen as measured by fruit and seed set following controlled pollination Pollen viability is considered as an important parameter of pollen quality. Environmental factors, particularly temperature and humidity greatly affect the pollen viability. From the observations, the percentage of viability was found to be maximum in H-8 (99.3%) and Ankur –651 (99.0%). It was minimum in Renuka-143; (93.2%) and PA-348; (93.8%). The data obtained during this investigation will be helpful for breeding programed of selected cotton varieties.

Key wards: *Gossypium* varieties, Pollen Viability, Tetrazolium test

Introduction

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 in H-8, Ankur –651, Renuka-143 and PA-348 were proposed to undertake for the investigations pollen viability.

Viability means ability. In the old literature the terms pollen viability and pollen sterility were used interchangeably (to live; but pollen viability is the ability of pollen to complete post-pollination events and to effect fertilization (Shivanna and Rangaswamy, 1992). Pollen viability refers to the ability of the pollen to perform its function of delivering male gametes to the

embryo sac. The period for which pollen grains remain viable after they are shade varies greatly from species to species. On the basis of their longevity pollen grains of different species can be grouped into three categories i.e. i) short- lived pollen ii) pollen with medium life span and iii) long lived pollen (Harrington, 1970 and Barnabas and Kovacs, 1997).

As viability refers to the ability of pollen to deliver functional gametes to the embryo sac, the most authentic test to viability would be to assess the fertilization capacity of the pollen as measured by fruit and seed set following controlled pollination (Heslop- Harrison and Shivanna 1984 and Shivanna and Rangaswamy, 1992).

Material and Methods

To carry the pollen viability test, the pollen grains were collected in sterilized petridishes at the time of anthesis. 10% tetrazolium salt solution was prepared and added to 60% sucrose solution in the ratio of 1:5 at the time of preparation of slides for observations, following the procedure described by Shivanna and Rangaswamy (1992). The tetrazolium test is based on the reduction of the colorless soluble tetrazolium salt to a reddish insoluble substance called formazan, in the presence of dehydrogenases. Pollen grains that have turned red in colour due to accumulation of formazan were taken as viable pollen grains. The pollen grains form the central area of coverslip were counted and their number was noted. The data thus obtained was analyzed statistically.

Result and Discussion

Pollen viability is considered as an important parameter of pollen quality. (Dafni and Firmage, 2000). Environmental factors, particularly temperature and humidity greatly affect the pollen viability. Pollen viability is a capacity to live, grow and germinate or develop (Lincoln *et al*, 1982). Pollen viability is assessed by several methods including nuclear and vital stains and *in vitro* germination of pollen. Nuclear dyes, such as acetocarmine and lactophenol, are regularly used to stain pollen in many species. Staining with IKI and TTC are common techniques used to determine pollen viability (Mulugeta *et al*, 1994; Shirazi and Muir, 1998; Zhou *et al*, 1999 and Dafni and Firmage, 2000). According to Barrow (1983) dyes of this type are not effective in staining cotton pollen because of its pollen wall characteristics and structure. Aslam *et al* (1964) found that 2,3,5-triphenyl tetrazolium chloride (TTC) was effective in staining cotton pollen.

Pollen viability in some cotton varieties is found to be undertaken by Barrow (1983) and Saoji *et al* (1987). Several methods are commonly used to evaluate the viability of pollen from

cotton (*Gossypium hirsutum* L.) and other species. However, Alexander (1969) developed a differential staining method that stains the cytoplasm of cotton pollen a deep red and the pollen wall a distinctive green. This stain easily distinguishes between mature and immature pollen by their staining patterns. Vital stains are also frequently used for evaluating pollen. The tetrazolium stains described by Roberts (1950) and Smith (1951) are colorless, soluble compounds that are reduced to insoluble red formazan by living tissues, causing the tissues to be stained red to deep purple. Non-living cells do not stain. They also noted that pollen from so-called semi-sterile translocation heterozygote plants showed high pollen viability and were difficult to distinguish from pollen produced by fully fertile normal plants.

During the present investigations TTC was used for pollen viability assay. From the observations, the percentage of viability was found to be maximum in H-8 (99.3%) and Ankur – 651 (99.0%). It was minimum in Renuka-143; (93.2%) and PA-348; (93.8%). Pollen viability data is useful in artificial pollination and in breeding experiments. As pollen viability plays an important role in fruit and seed set; an accurate measure of pollen viability could help to determine some of the causes for fruit shedding under stress conditions and could be useful in other fertility studies. Therefore, the data obtained during this investigation will be helpful for breeding programme of selected cotton varieties. The need for assessing viability of pollen in artificial pollination and breeding experiments, understanding of sterility problem and hybridization programs, fruit breeding programs and evolutionary ecology.

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