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Assessing Pollen Viability and Stigma Receptivity: A Practical Guide

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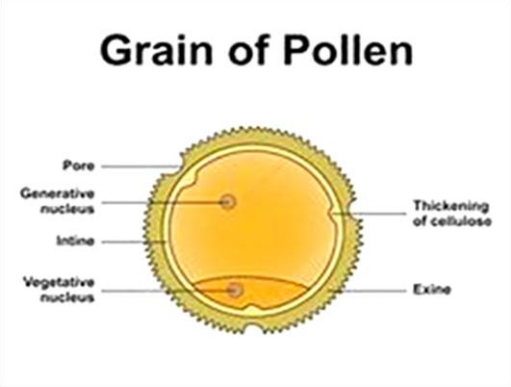
Introduction

Pollen viability and stigma receptivity are essential factors for plant reproduction. Testing these ensures successful breeding and shows yield improvement.

Pollen viability is the period during which pollen grains remain alive, healthy, and capable of germinating on a compatible stigma. It determines whether the pollen can participate in the process of fertilization. The viability period can range from a few minutes to several months, depending on the plant species and environmental conditions.

Pollen viability is crucial for successful fertilization and can be evaluated using the following methods:, while



A. Staining Techniques:

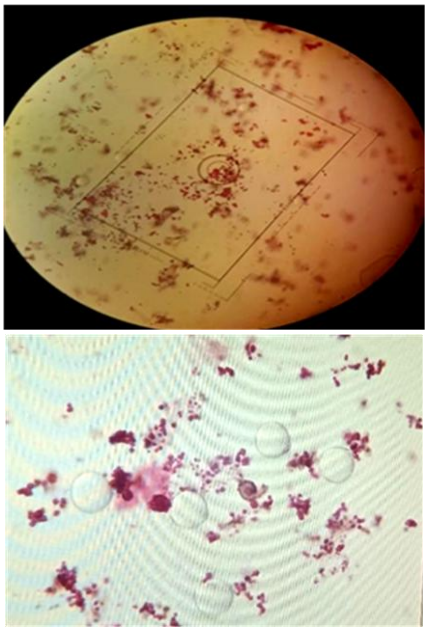
1. 2,3,5-Triphenyl Tetrazolium Chloride test:

In this pollen was incubated in 0.5-1% triphenyl tetrazolium chloride for 10-30 minutes and after that they are observed under microscope, the pollen which is viable turns to red where as non-viable pollen remains colourless.

2. Acetocarmine staining:

It stains the nucleus of viable pollen.

In this the pollen is mixed with 1-2% of acetocarmine solution and observed under microscope the viable pollen stains dark compared to non-viable pollen which remains colourless.



Acetocarmine staining of pollen grain

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B. In Vitro Germination Test:

The viability of pollen depends on the ability to germinate and form pollen tube as the pollen is incubated in medium containing sucrose (5-15%), boric acid (50-100 ppm) at 25^0C for few hours. The pollen grains that develops pollen tubes are considered as viable.

Stigma receptivity refers to the ability of the stigma to accept pollen, support pollen germination, and facilitate fertilization. A receptive stigma provides a suitable environment for pollen hydration, germination, and pollen tube growth toward the ovules.

Stigma receptivity is assessed by the following methods:

A. Peroxidase Activity Test:

In this method the stigma is dipped in benzidine H_2O_2 solution, the active stigma contain peroxidases that react with benzidine H_2O_2 to produce a colour change, blue or brown colour change indicates the presence of stigma receptivity.

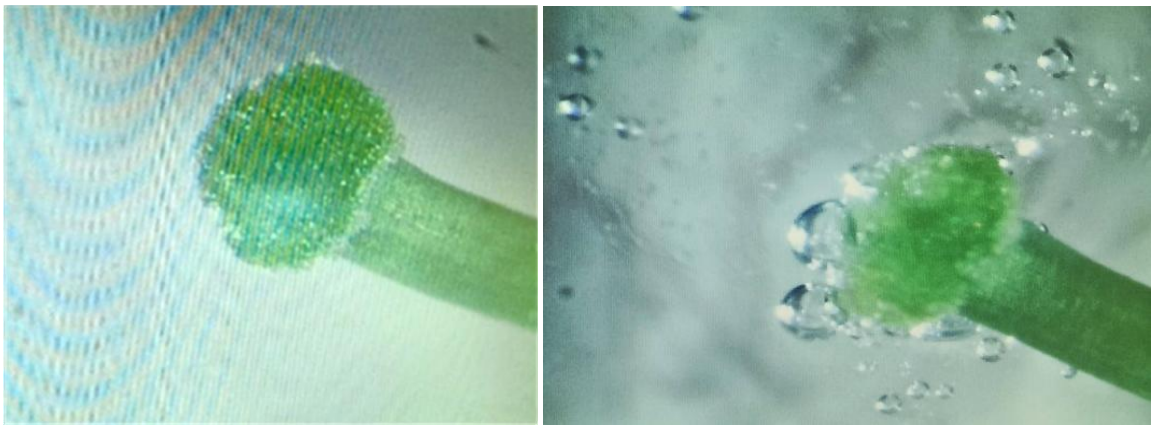
B. Hydrogen Peroxide (H_2O_2) Bubble Test

In this stigma peroxidase reacts with H_2O_2, releasing oxygen bubbles. As drop of 3% H_2O_2 is applied to the stigma. The stigma which shows more oxygen bubbles indicates more receptivity.

It is easy way of identifying the stigma receptivity for efficient fertilization.

Conclusion:

Pollen viability and stigma receptivity are critical for seed formation in plants. Pollen viability tests, such as staining techniques and in vitro germination, helps in determining whether pollen is capable of fertilization. Similarly, stigma receptivity tests, including peroxidase activity and hydrogen peroxide bubble tests, indicate whether the stigma is ready to accept pollen. These assessments are essential for optimizing controlled pollination, ensuring efficient fertilization, and improving fruit and seed production. Additionally, they aid in determining the best conditions for pollen storage, ensuring long-term viability for breeding programs. Understanding pollen



Hydrogen peroxide (H_2O_2) bubble test of stigma receptivity

viability and stigma receptivity also helps in conserving plant biodiversity and enhancing agricultural productivity. By employing these tests, plant breeders and researchers can develop superior crop varieties with better adaptability and higher yields. Therefore, routine evaluation of pollen viability and stigma receptivity is vital for sustainable plant reproduction and food security.

References:

1. Dafni, A., & Firmage, D. (2000). Pollen viability and longevity: Practical, ecological and evolutionary implications. *Plant Systematics and Evolution, 222*(1-4), 113–132.
2. Dafni, A., & Maues, M. M. (1998). A rapid and simple procedure to determine stigma receptivity. *Sexual Plant Reproduction, 11*(3), 177–180.
3. Shivanna, K. R. (2003). Pollen biology and biotechnology: An overview. *Current Science, 84*(8), 1007–1013.