Plant Mucilage Staining Solution

(Iron Salt Absorption Method)

P1511380

Storage Room temperature. Store in the dark.
Shipping Regular transportation.

Introduction

Some Brassicaceae (such as Arabidopsis thaliana) and Plantaginaceae plants synthesize and secrete large amounts of mucilaginous polysaccharides in the outer layer of their seed coat cells during development. This polysaccharide has the property of swelling and releasing upon contact with water, forming a transparent gelatinous substance that envelopes the seed.

The main component of seed coat mucilage is pectin (with rhamnogalacturonan as the core), along with small amounts of cellulose and hemicellulose. As a specialized cell wall structure, seed coat mucilage offers significant advantages such as easily observable phenotypes, simple isolation and extraction, relatively simple composition, and no adverse effects on normal plant growth and development when absent. It has thus become an ideal model system for studying plant cell wall (especially pectin) polysaccharide synthesis, regulatory mechanisms, and interactions among cell wall components.

The aforementioned mucilage also falls within the category of mucilaginous substances. Mucilaginous substances, also known as mucilage, encompass various similar compounds, the most important of which are mucilage and protopectin. Both share the characteristic of producing mucic acid upon hydrolysis. In terms of solubility, mucilage is soluble in cold water, whereas protopectin is insoluble in cold water. Regarding distribution, protopectin exists only in cell walls, while mucilage can be found both in cell walls and in plant extracts. The middle lamella of plant cells contains large amounts of mucilaginous substances, a property that can be verified using ruthenium red staining and iron salt absorption methods.

Staining Principle of Plant Mucilaginous Substances Staining Solution (Iron Salt Absorption Method): Based on the property of mucilaginous substances to readily absorb iron salts, the Prussian blue staining reaction can distinguish between intact and damaged cell walls—intact cell walls are stained blue, while damaged cell walls either remain unstained or are lightly stained. It is important to note that this product is intended for research purposes only and is not suitable for clinical diagnosis or other uses.

Component List

P1511380	Component	3×50 mL	Storage
P1511380A	Iron Salt Solution	50 mL	RT.
P1511380B	Perls Solution A	50 mL	RT. Store in the dark.
P1511380C	Perls Solution B	50 mL	RT.

Materials to Be Prepared by User

1. Microscope, forceps, pipette, incubator or water bath.
2. Distilled water.
3. Samples such as Arabidopsis seeds, plant tissues (normal or diseased tissues), etc.

Procedure (For Reference Only)

1. Staining of Mucilage in Plant Tissues

1.1. Slice the plant tissue into thin sections. If observing the effect of pathogen decomposition on mucilaginous substances, include both diseased and normal parts in the slice.

1.2. Add Iron Salt Solution dropwise onto the slice and treat for 10–30 minutes.

1.3. Rinse 3–5 times with distilled water, 2 minutes each time, to thoroughly wash away unabsorbed iron salts.

1.4. Add 1–2 drops of Perls Solution A onto the slice. After 2 minutes, add an equal volume of Perls Solution B. Mix and stain for 15–30 minutes.

1.5. Rinse with distilled water for 2–5 minutes.

1.6. Add glycerol or glycerol-gelatin mounting medium, cover with a coverslip, and examine under a microscope.

2. Staining of Seed Mucilage

2.1. Place a certain number of mature seeds into a centrifuge tube or Petri dish. Add an appropriate volume of distilled water to moisten the seeds and allow them to fully absorb water. The duration varies from 1 to 12 hours depending on seed size.

2.2. Remove as much water as possible without disturbing the seeds.

2.3. Refer to the tissue staining procedure (steps 1.2–1.5) for the staining steps.

2.4. Transfer the seeds to a concave slide to observe the staining results.

Experimental Results

Plant Diseased and Healthy Tissues:

Staining Target/Area	Staining Result
Diseased tissue	Unstained or light blue
Normal tissue	Blue

Plant Seeds:

Staining Target/Area	Staining Result
Outer layer mucilage	Light blue, easily detaches
Inner layer mucilage	Dark blue, ray-like structure; tightly bound to the seed surface, not easily removed

Notes

1. Perls Solution A should be stored protected from light and should not be pre-mixed with Perls Solution B.
2. Lack of staining does not necessarily indicate the absence of mucilage due to potential interference from other substances.
3. For your safety and health, please wear a lab coat and disposable gloves during operation.
4. Use the reagents as soon as possible after opening to avoid affecting subsequent experimental results.