

CHAPTER 01: SEXUAL REPRODUCTION IN FLOWERING PLANTS

The Recognition Test Before Fertilisation

Unpacking the dynamic, regulated process of
Pollen-Pistil Interaction.

The Initial Checkpoint: Acceptance or Rejection

Pollination does not guarantee the transfer of the correct pollen. The pistil acts as a strict **biological filter**, identifying the nature of **every pollen grain** that lands on the **stigma**.

RIGHT TYPE

SOURCE

Genetically compatible pollen of the exact **same** species.

PISTIL RESPONSE

Pistil recognizes and actively **accepts** the pollen.

OUTCOME

Promotes post-pollination events leading directly to **fertilisation**.

WRONG TYPE

SOURCE

Pollen from **other** species, or self-incompatible pollen from the same plant.

PISTIL RESPONSE

Pistil firmly **rejects** the pollen.

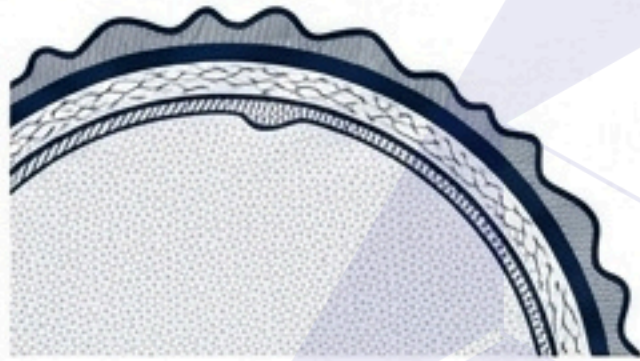
OUTCOME

Prevents pollen germination on the the stigma or actively inhibits pollen tube growth within the style.

The Chemical Dialogue

The ability of the pistil to recognize and selectively accept or reject pollen is a dynamic, continuous process mediated by interacting chemical components.

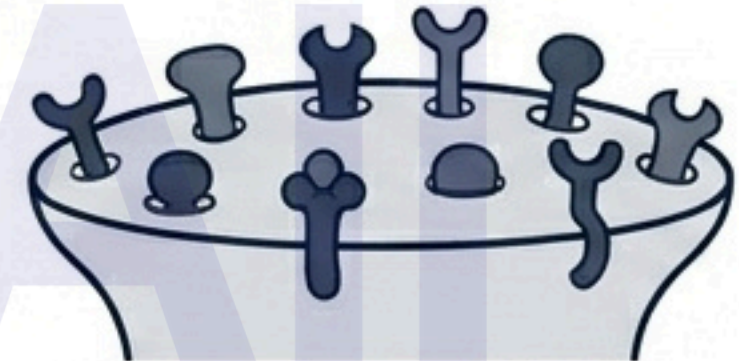
POLLEN GRAIN COMPONENTS



Features specific chemical signals located on the outer exine and inner intine walls.

SIGNAL RECOGNITION & MEDIATION

PISTIL COMPONENTS



Features highly specific biological receptors covering the stigma surface.

Recent Discoveries: Botanists have only recently begun to identify the specific molecular components and interactions that govern this precise acceptance or rejection dialogue.



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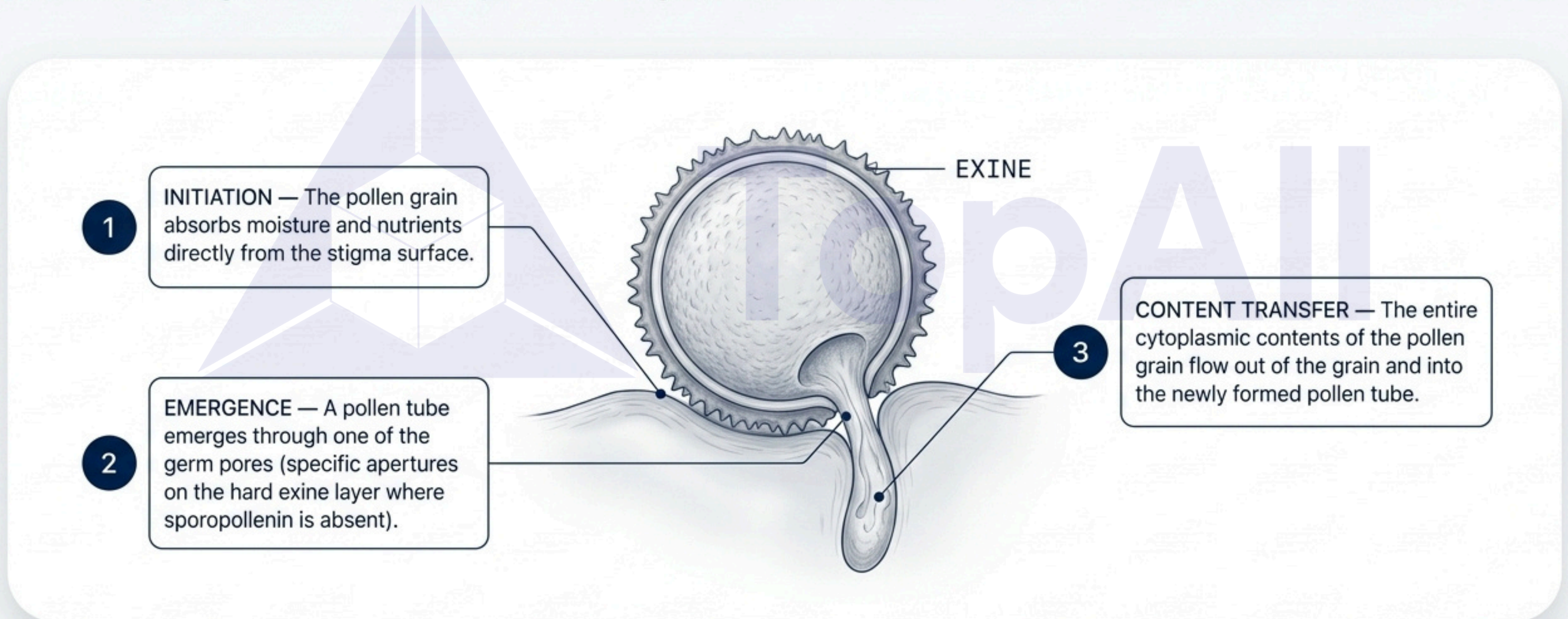
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Post-Acceptance: Pollen Germination

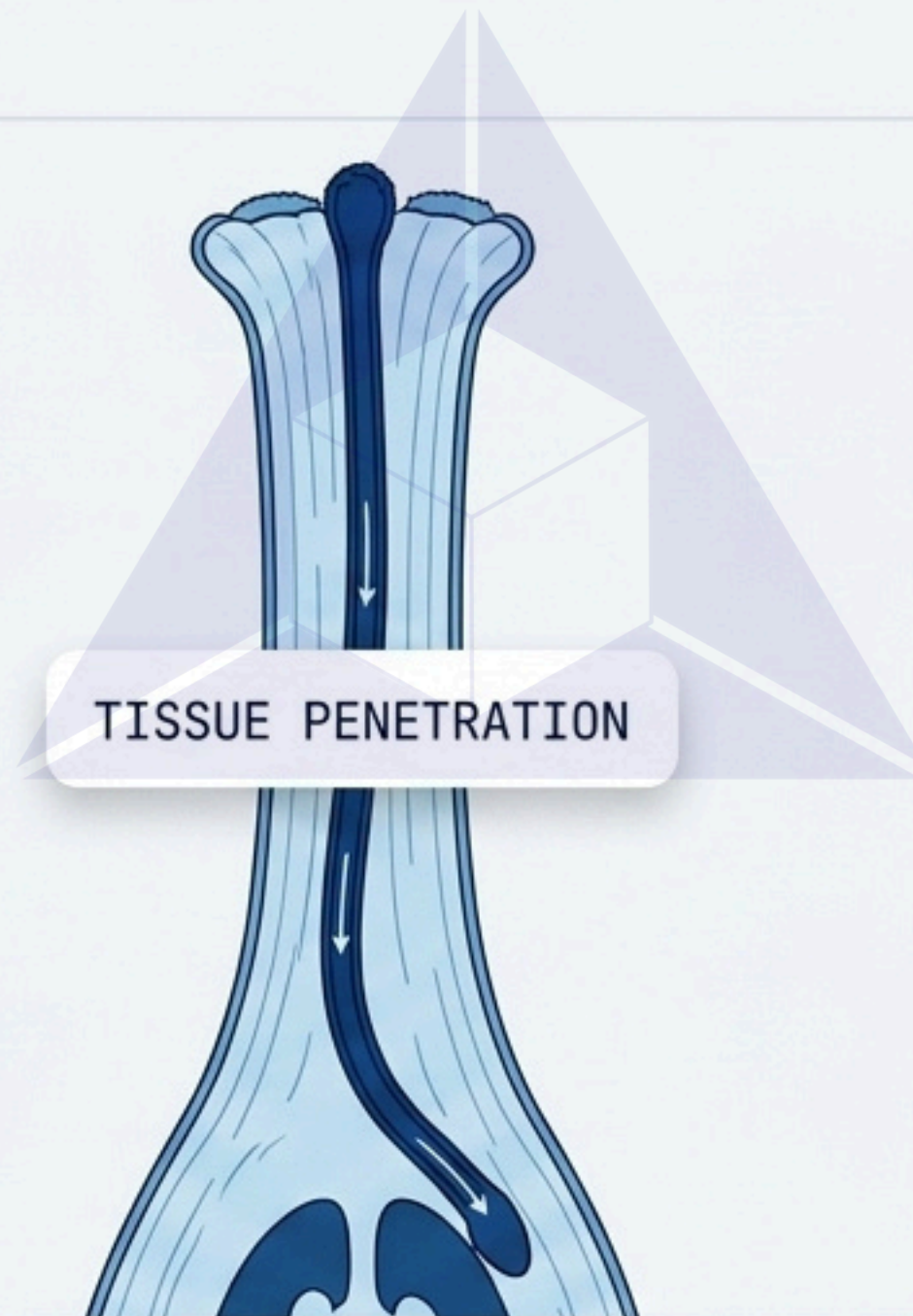
Once compatible pollen is recognized and accepted, its physical journey toward the ovary begins immediately at the stigma surface.



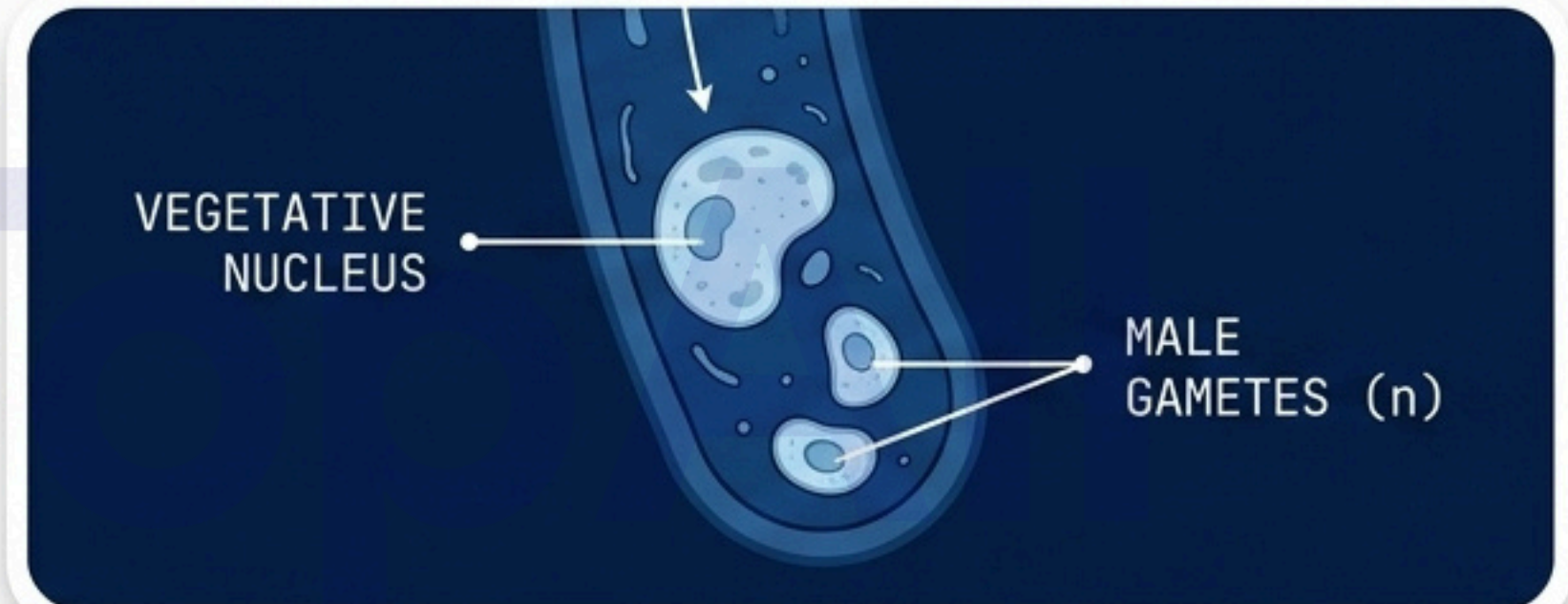
Navigating the Style: The Pollen Tube Journey

The pollen tube acts as a rapidly growing biological conduit, traversing the tissues of the stigma and the elongated style to reach the concealed ovary.

THE PATH



THE PAYLOAD



- If shed at 2-celled stage:** The generative cell divides mitotically during tube growth in the stigma/style to form two male gametes.
- If shed at 3-celled stage:** The pollen tube carries the two male gametes right from the beginning of the journey.

The Final Destination: Ovule Entry

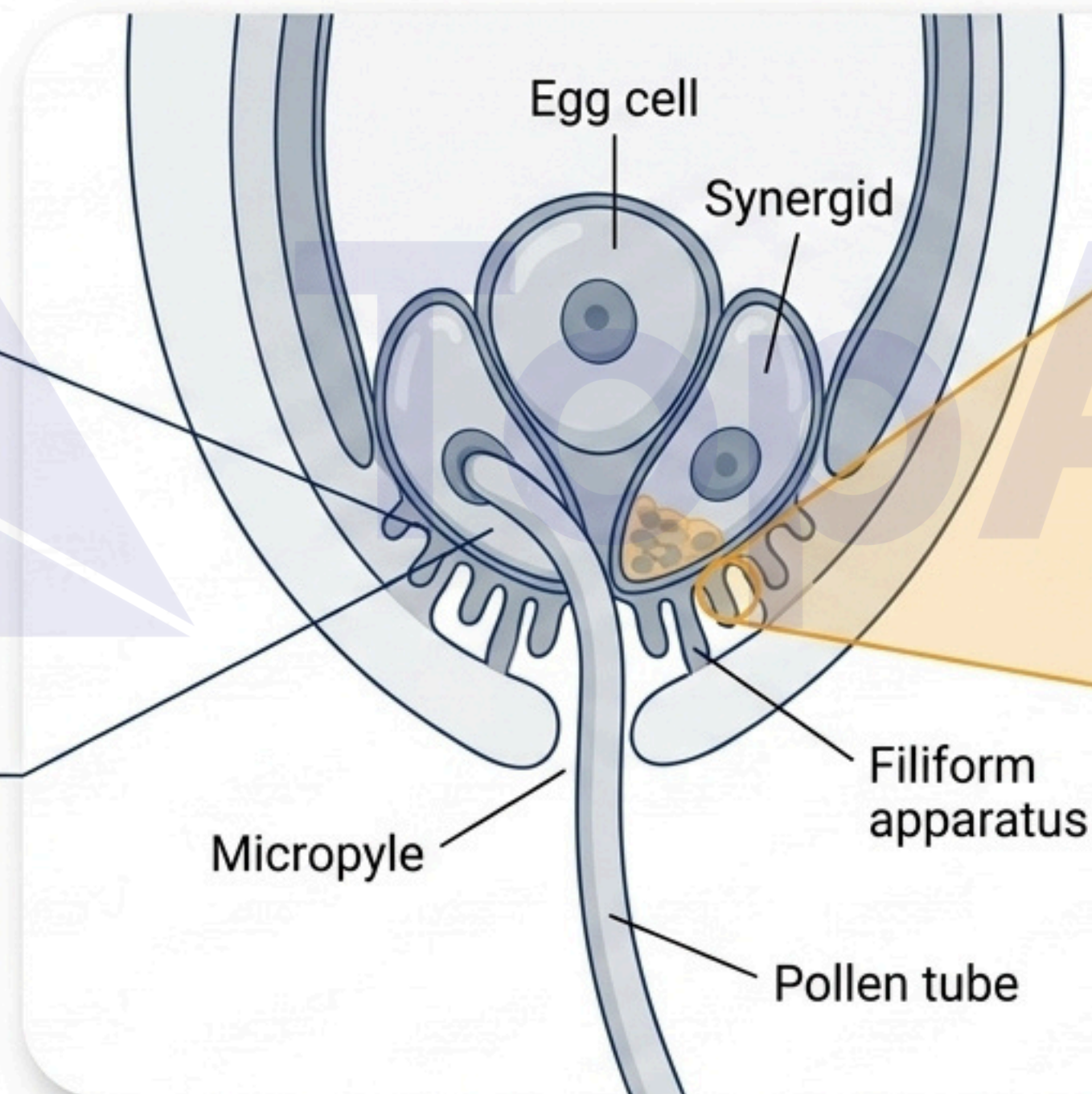
After safely reaching the ovary, the pollen tube must precisely navigate into the embryo sac to deliver its payload, setting the stage for double fertilisation.

A

The tube enters the ovule strictly through a small opening called the **MICROPYLE**.

B

It then penetrates directly into one of the two **SYNERGIDS** (components of the egg apparatus).



Crucial Guide:
The **FILIFORM APPARATUS** actively directs the advancing pollen tube into the synergid.

Filiform apparatus

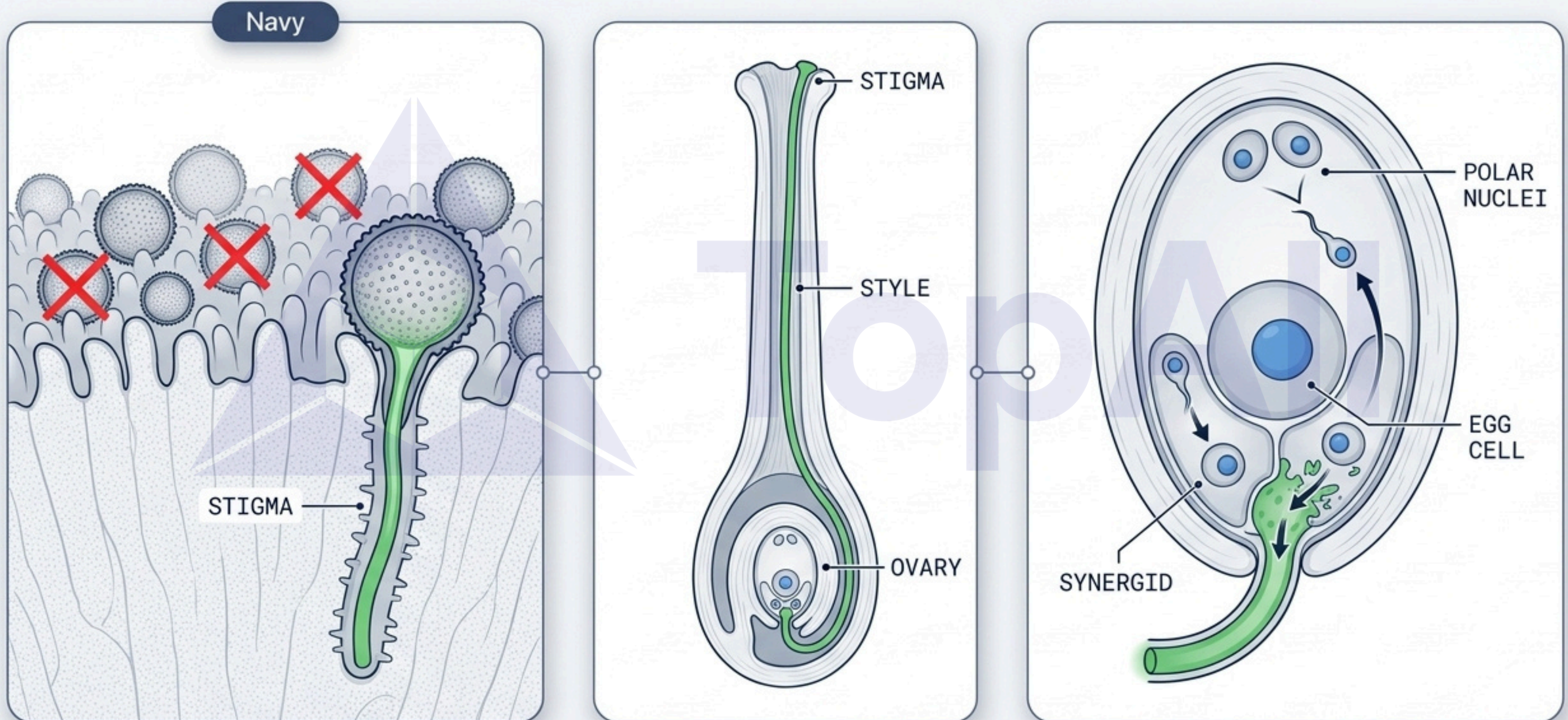
Pollen tube

Micropyle

Egg cell

Synergid

The Complete Pathway of Pollen-Pistil Interaction



Summary & Commercial Application

Pollen-pistil interaction is not a static event, but a highly dynamic, regulated biological checkpoint that governs plant genetics.



From initial deposition to final ovule entry, pollen-pistil interaction is a continuous process of chemical recognition, ensuring only compatible pollen secures fertilisation.

APPLICATION IN PLANT BREEDING

Understanding this dynamic dialogue allows plant breeders to manipulate the interaction—even forcing incompatible pollinations—to create superior commercial hybrids via artificial hybridisation.

1. EMASCULATION → 2. BAGGING → 3. CONTROLLED POLLINATION
Anther removal Stigma protection



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