

Experiments That Revealed Plant Hormones

Tracing the accidental observations that led to the isolation of the five major Plant Growth Regulators.

Observation:
5 accidental
discoveries that
revolutionized
modern botany.

The Initial Observation

Researchers: Charles and Francis Darwin.

Subject: Canary grass coleoptiles.

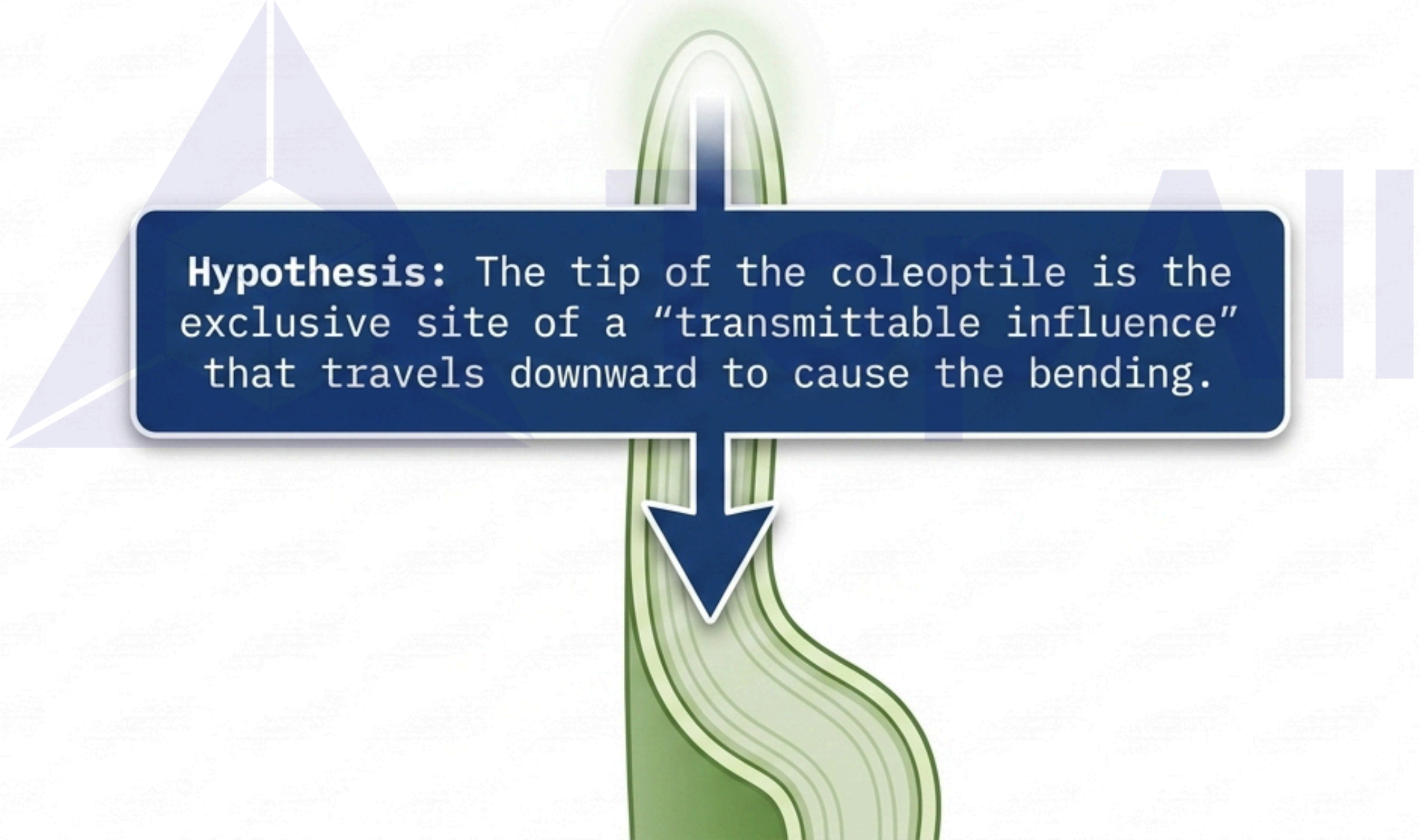
Event: They observed the plant consistently bending toward a unilateral light source.

Phenomenon:
phototropism



Isolating the Signal

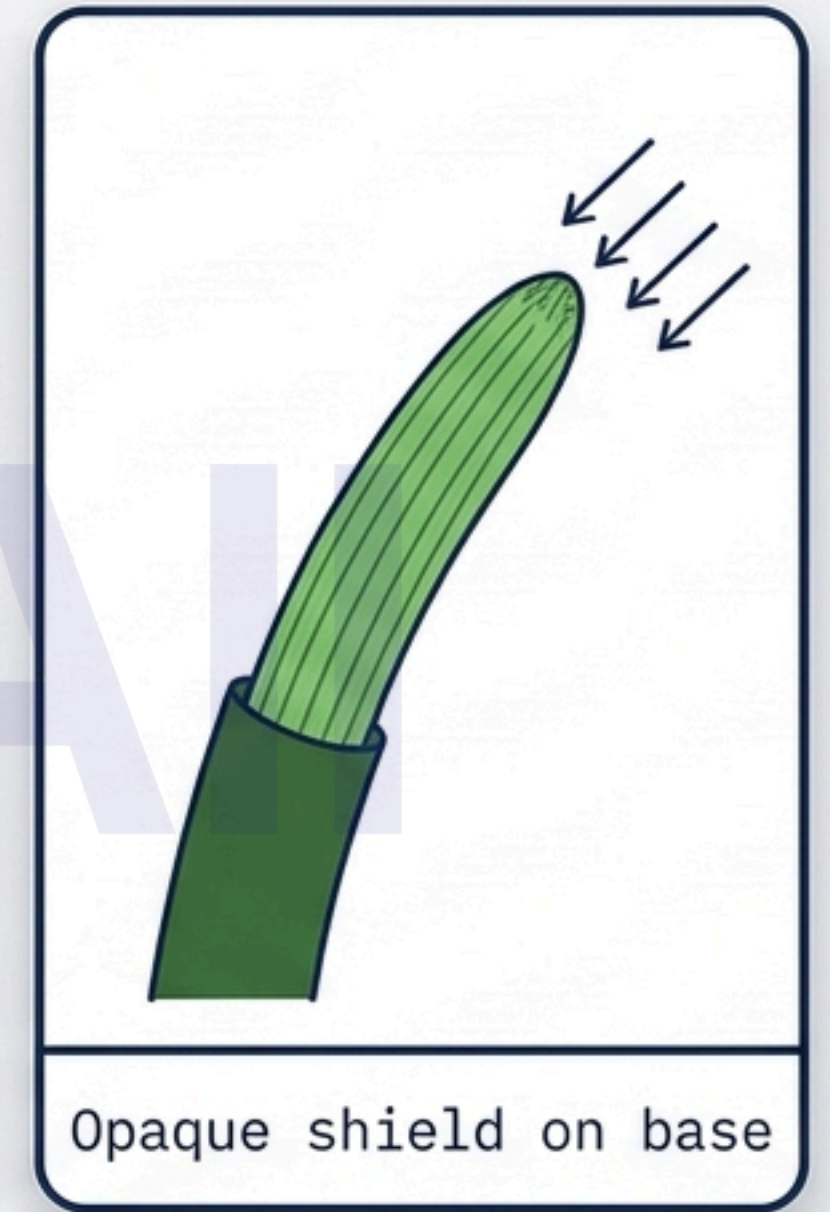
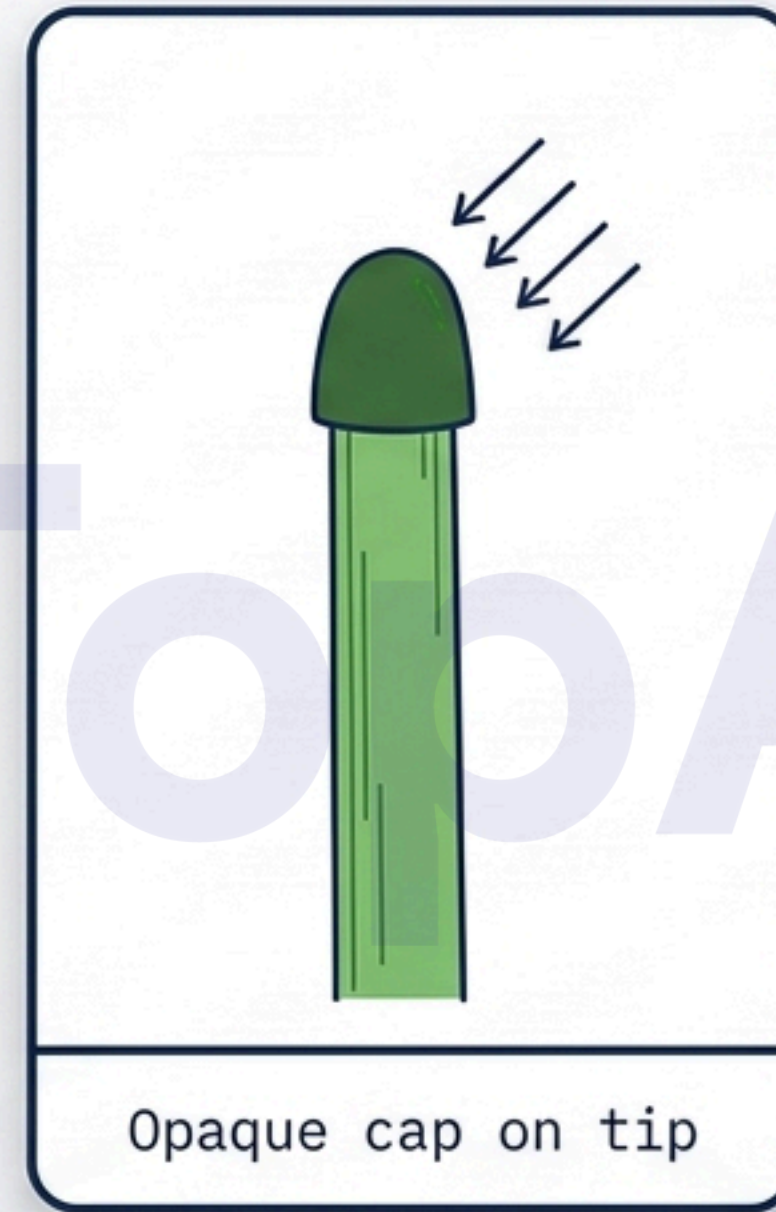
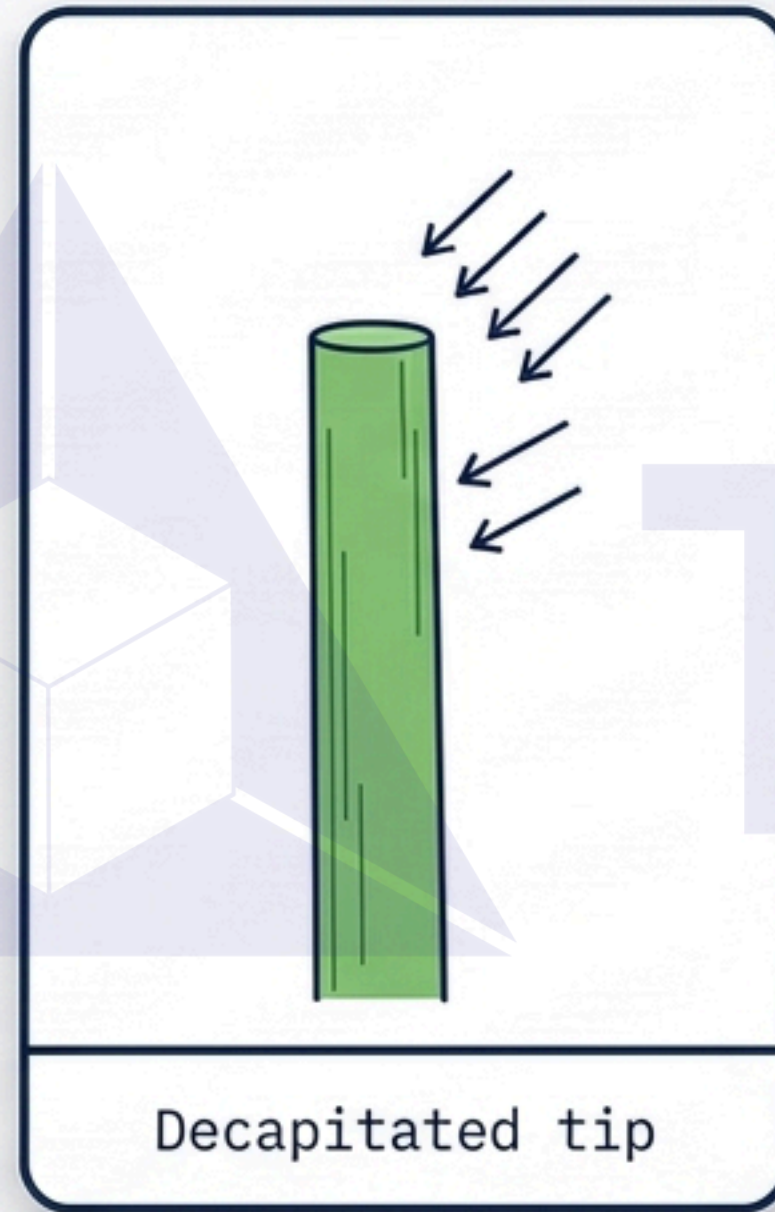
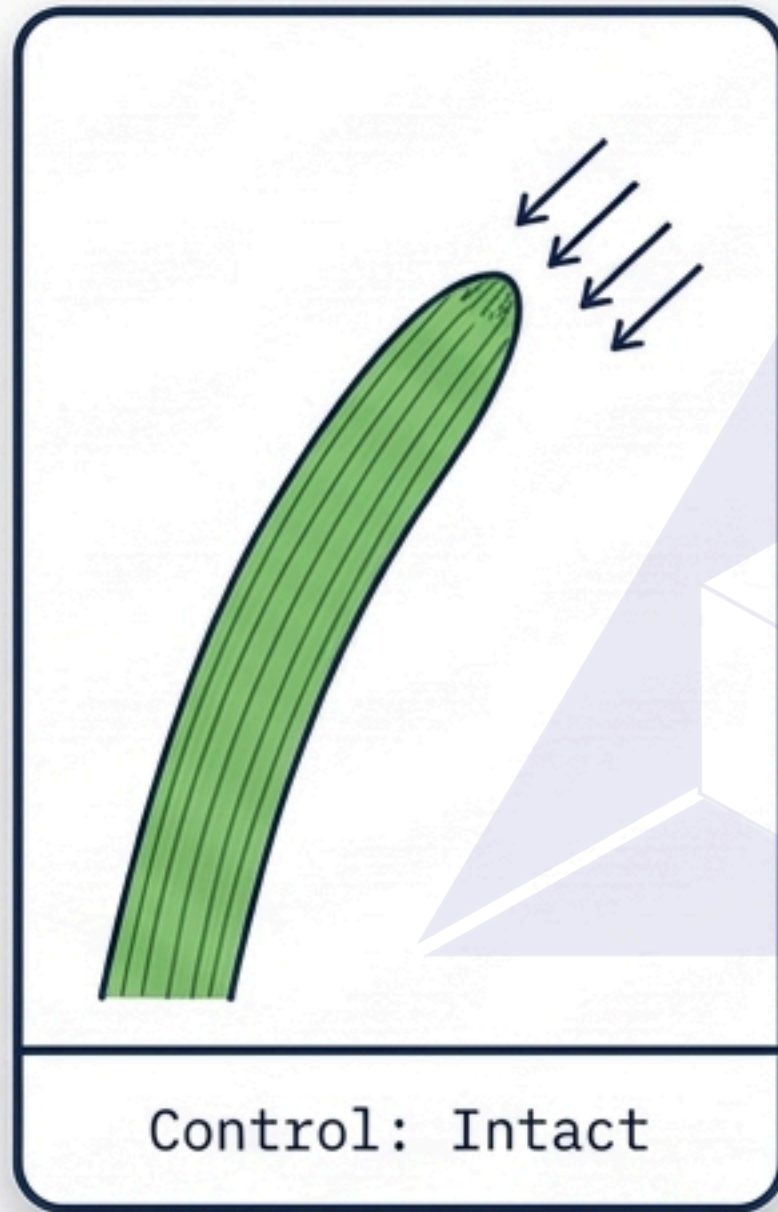
The Darwins concluded that the bending wasn't a whole-plant reaction, but a localized response driven by a traveling signal.



Hypothesis: The tip of the coleoptile is the exclusive site of a “transmittable influence” that travels downward to cause the bending.

The diagram illustrates a coleoptile tip. A large blue arrow points downwards from the tip, passing through a dark blue rectangular box that contains the hypothesis text. The coleoptile itself is shown as a green, curved structure at the bottom, indicating the direction of growth and bending. The background features faint, stylized green hills and a light blue sky.

Testing the Transmittable Influence



Conclusion: The tip must be present and exposed to light for phototropism to occur.



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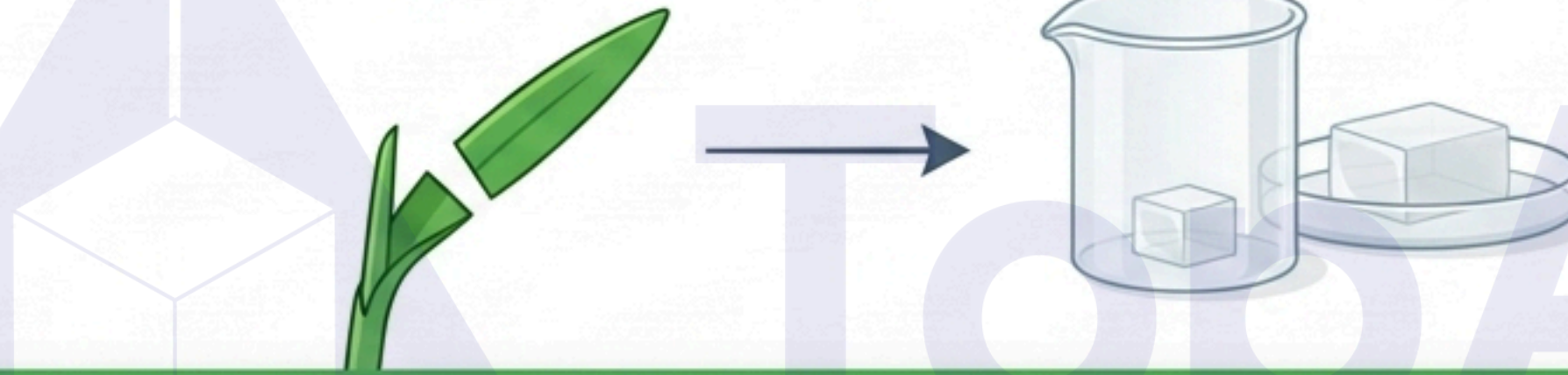
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From Influence to Isolation

Building on the Darwins' behavioral experiments, F.W. Went moved to the laboratory using oat seedlings. He successfully extracted the chemical responsible for the bending.



The transmittable influence was chemically isolated and officially named:

Auxin (from Greek 'auxein': to grow)

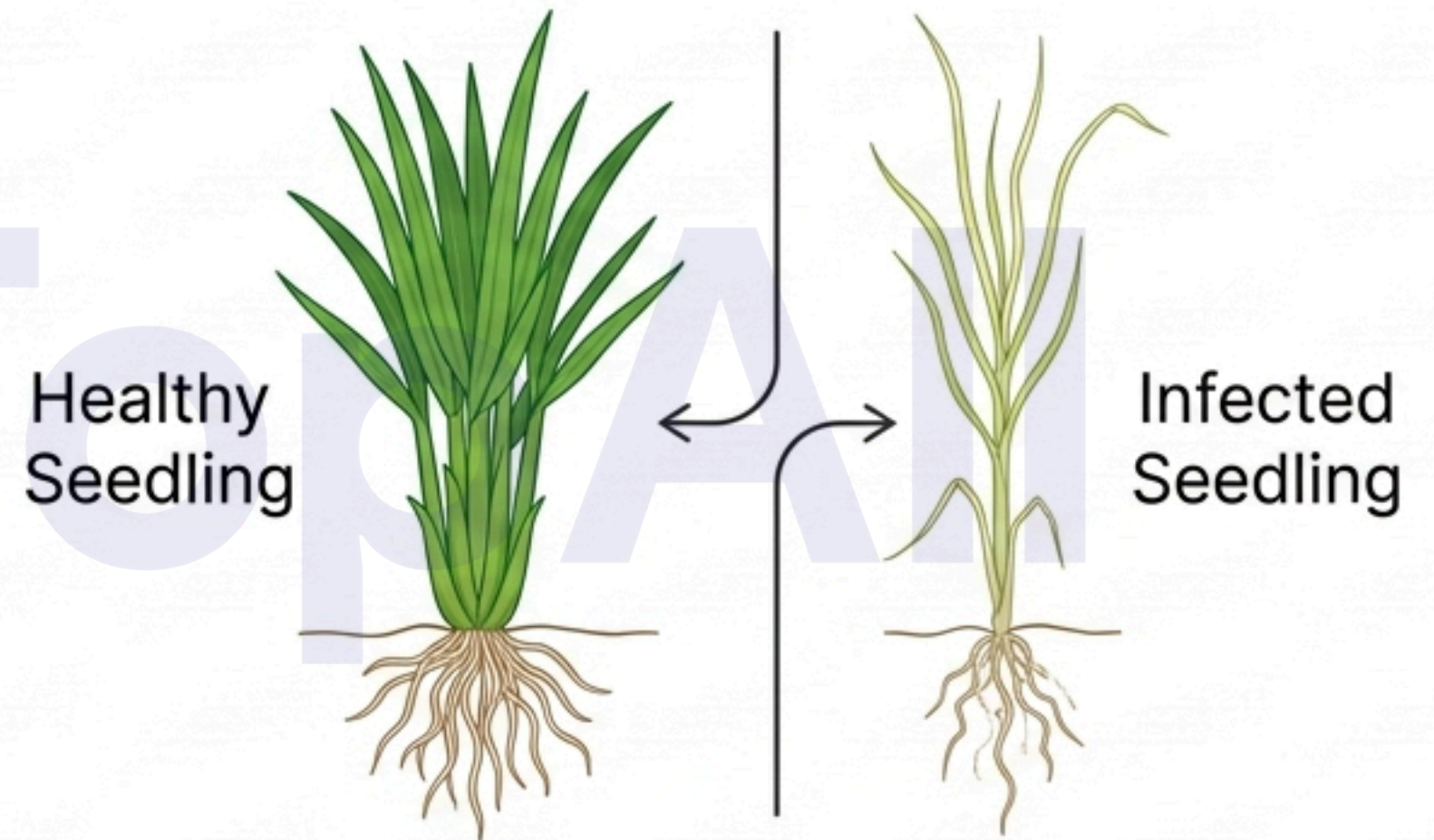
The "Foolish Seedling" Anomaly

In 1926, E. Kurosawa investigated a disease causing rice seedlings to grow excessively tall and weak. He recreated the symptoms simply by applying sterile filtrates from a specific fungus.

Disease Profile

Bakanae disease

Pathogen: *Gibberella fujikuroi*



Isolated Active Substance: gibberellic acid

The Proliferation Equation

F. Skoog and co-workers observed that tobacco stem internode callus (undifferentiated cells) would only proliferate under a very specific, synergistic set of conditions.



Miller et al. (1955) crystallized the active cytokinesis-promoting substance from this mix, naming it kinetin.

Inhibitors and Volatile Gases



The 1960s Naming Puzzle

Three independent researchers discovered three distinct growth inhibitors: inhibitor-B, abscission II, and dormin.

Plot Twist: Chemical characterization proved all three were the exact same molecule.

Unified as abscisic acid (ABA)

The 1910 Ripening Observation

H.H. Cousins confirmed that ripened oranges released a volatile substance.

Effect: It hastened the ripening of stored, unripened bananas nearby.

Identified as ethylene, the only gaseous PGR

The Chemical Architecture of Botany



Genomic control and environmental factors are not enough. The complex development of a plant is governed by intrinsic chemical regulators—and the foundational class of every one was discovered completely by accident.

Auxins
(Phototropism)

Gibberellins
(Fungal pathology)

Cytokinins
(Tissue culture)

Abscissic Acid
(Inhibitor isolation)

Ethylene
(Volatile ripening)



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