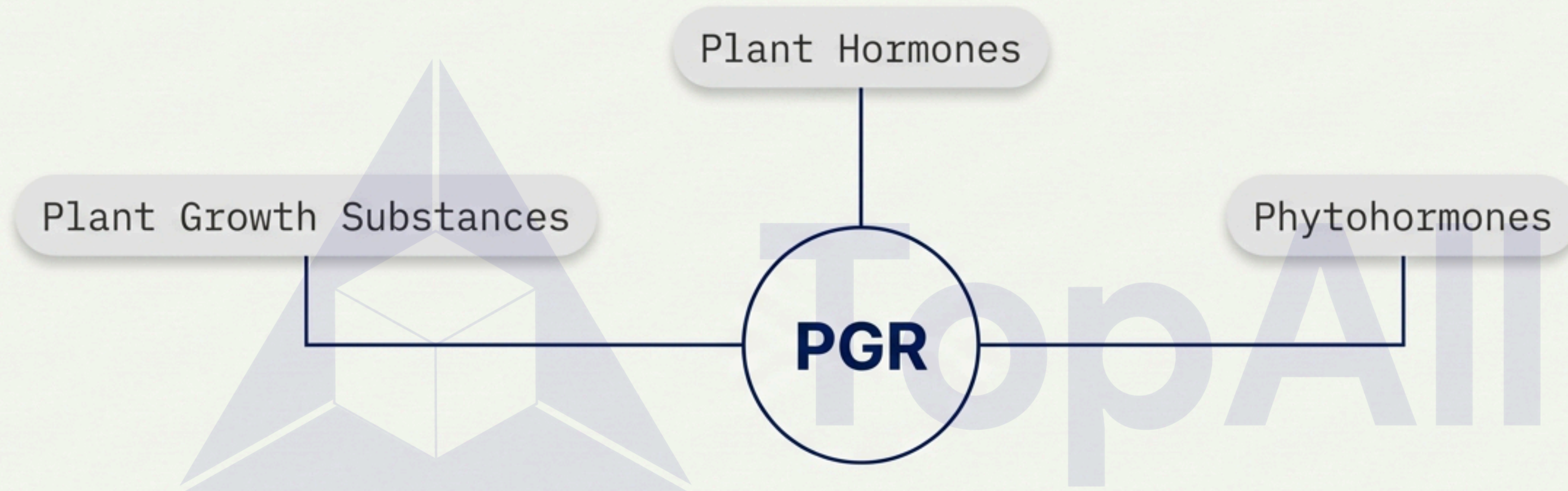


CHAPTER 13.4.1

Small Molecules, Big Effects

Decoding the Characteristics of
Plant Growth Regulators

What are PGRs?



The **Core Characteristic**: Despite orchestrating massive physiological changes across a plant's entire life cycle, PGRs are fundamentally characterized by their **small size** and **simple chemical composition**.

Chemical Diversity: Group I

Indole Compounds

Indole-3-acetic acid (IAA)

Naturally produced in growing apices (stems and roots) and migrates to regions of action.

Adenine Derivatives

N6-furfurylamino purine (Kinetin)

Modified forms of adenine (a purine). Promotes active cytokinesis (cell division).



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Chemical Diversity: Group II

Carotenoid Derivatives

Abscisic acid (ABA)

Discovered initially for regulating abscission and dormancy; acts as a general inhibitor of plant metabolism.

Terpenes

Gibberellic acid (GA₃)

An acidic compound that produces a wide range of responses, primarily increasing the length of plant axes.

The Gaseous PGR

Simple Gases

C_2H_4 (Ethylene)

A highly effective, volatile substance synthesized in large amounts by tissues undergoing senescence and ripening fruits.

Functional Nuance: While ethylene can fit into multiple categories of plant response, it acts largely as an inhibitor of growth activities.

The Functional Dichotomy

Growth Promoters

Involved in pattern formation, tropic growth, and structural expansion.

Cell Division

Enlargement

Flowering

Fruiting

Seed Formation

Auxins

Gibberellins

Cytokinins

Stress Responders & Inhibitors

Orchestrate plant responses to wounds, biotic, and abiotic stresses.

Dormancy

Abscission

Abscisic Acid (ABA)

Ethylene (C_2H_4)

The Orchestration of Plant Life

A Delicate Balance

For every phase of plant growth, differentiation, and development, these simple molecules act as intrinsic controllers. They do not operate in isolation—they work **synergistically** and **antagonistically** to govern the entire life cycle of the plant.





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