Topic: **AUXIN: GENERAL INTRODUCTION, DISCOVERY, AND TYPES**

Subject: Botany

M.Sc. (Semester II), Department of Botany
Course: MBOTCC- 7: Physiology and Biochemistry; Unit – III

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General Introduction and Discovery

Also known as the '**Growth hormone'**, auxin is the first growth hormone to be discovered in plants. Hormones are naturally occurring organic molecules that, at low concentrations exert an intense influence on physiological processes. Auxin regulates growth, chiefly by stimulating cell elongation in stems. Auxins also play a role in cell division and differentiation, in fruit development, in the formation of roots from cuttings, in apical dominance, and in inhibiting leaf fall (abscission) etc.

German botanist Julius von Sachs (1832- 1897) proposed that chemical messengers are responsible for formation and growth of different plant organs. His idea led to the eventual discovery of hormones. British physician E. H. Starling introduced the term 'hormone' to describe these chemical messengers. However, this term was introduced in plant physiology literature by H. Fitting.

Hormone concept in plant came through a series of simple experiments done by **Charles Darwin** (1880) and later by **F. W. Went** (1926) to describe a hormone like substance as a causative agent when plants grew towards light (i.e. phototropism due to auxin). Darwin used seedlings of canary grass for experiment (in many grasses, the youngest leaves are sheathed in a protective organ, coleoptiles which are very sensitive to blue light. If illuminated on one side with a short pulse of dim blue light, they will bend (grow) toward the source of the light pulse within an hour). Darwin found that the tip of the coleoptile perceived the light, for if they covered the tip with foil, the coleoptile would not bend. But the region of the coleoptile that is responsible for the bending toward the light, called the growth zone, is several millimeters below the tip. Thus, concluded that some sort of signal is produced in the tip, which travels to the growth zone, and causes the shaded side to grow faster than the illuminated side.

Later, in 1926, Frits Went demonstrated the presence of this growth-promoting chemical in the tip of oat (*Avena sativa*) coleoptiles. He allowed this chemical to diffuse out of excised coleoptiles tips directly into gelatin blocks. Then, if placed asymmetrically on top of a decapitated coleoptile, these blocks could be tested for their ability to cause bending in the absence of a unilateral light source. Because the substance promoted the elongation of the coleoptile sections, it was eventually named auxin from the Greek *auxein*, meaning “to increase” or “to grow.”

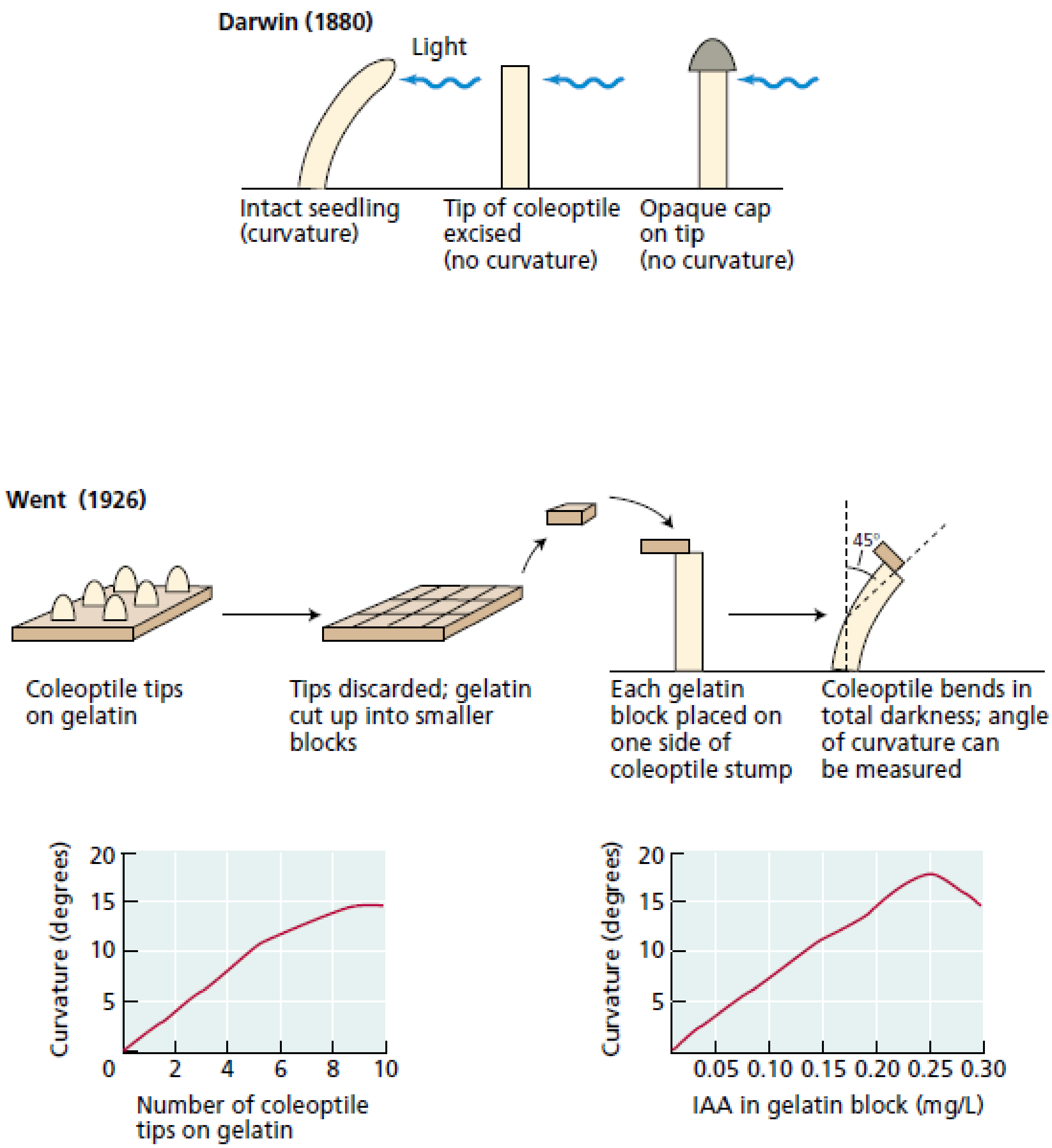

Fig. 1. Early experiments in auxin research[1].

[1] Taiz and Zeiger (2002)

Virtually, all plant tissues are capable of producing low levels of auxin. Auxin is synthesized in **meristematic regions** and other actively growing organs of the plant. Shoot apical meristems, young leaves and developing fruits, and seeds are primary sites of Indole acetic acid (IAA; principal auxin type in higher plants) biosynthesis.

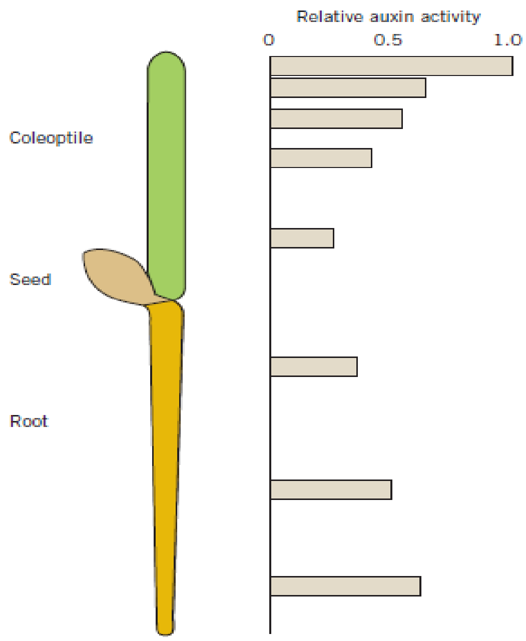

Fig. 2. Auxin distribution in an oat seedling (*Avena sativa*), showing higher concentrations of hormone in the actively growing coleoptile and root apices. (Based on data from Thimann, K. V. 1934. *Journal of General Physiology* 18:23–34.)[2]

Auxins can be quantified using bioassay, mass spectrometry or ELISA (Enzyme linked immunosorbent assay).

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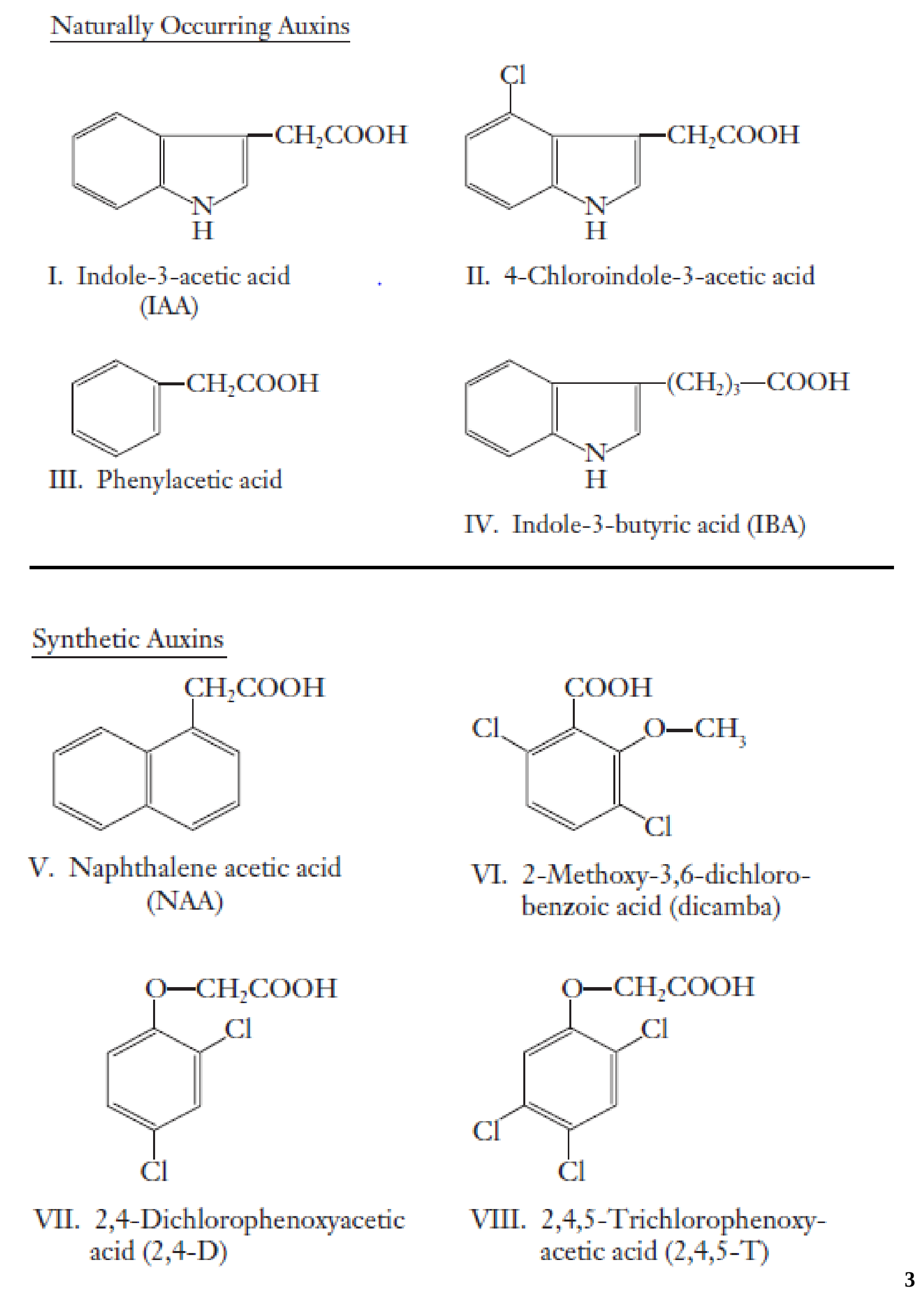
[2] Hopkins and Huner (2009)

Types of auxin

Natural auxins are isolated from plants, whereas synthetically produced auxins are mostly used as herbicides in horticulture and agriculture. IAA is the most abundant and physiologically active form of auxin.



[3]

[3] Hopkins and Huner (2009)

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