Auxin induced programmed cell death in mustard seedlings

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SUMMARY

Programmed cell death is a process of developmental aspect in plants. The objective of the present study was to understand the hormonal basis of senescence, in particular 2, 4-D induced senescence along with the identification and characterization of the biomolecules and elucidation of their role in this terminal in the life process of all plants. This study explained the auxin induced senescence (AIS) pathway on the basis the different hormones, cellular components, signals, death signals and markers of senescence.

Key words : Phytohormones, Auxins and IAA oxidase

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Phytohormones are known to regulate senescence in higher plants. Senescence among various plant groups, such as annuals, biennials, monocarpic, polycarpic and perennials are known to represent distinct patterns. In annuals and monocarpic plants, the plant undergoes necrosis (leaf yellowing/vein clearing) followed by senescence, resulting in the total death of plants. However, in the other group of plants comprising biennials, perennials and polycarpic plants, the selective elimination of plant organs, tissues and cells take place periodically, so that, rejuvenation takes place in these plants. The developmental processes of plant are collectively termed as programmed cell death (PCD).

Plant growth and development is regulated by hormones, of which auxins are one of the classical five types, together with ethylene, gibberellins, (+) – abscisic acid (ABA) and cytokinins (Kende and Zeevaart, 1997). Senescence is the final phase of plant vegetative and reproductive development, preceding the widespread death of cells and organs recapture of cellular material for use in other organs (Nooden, 1988; Bleecker and Patterson, 1997).

In the present study, 2, 4 – D mediated responses in the seedling of black-mustard has been studied. 2, 4 –D and IAA activities were studied at relatively high concentration. Experiments were carried out with young seedling of black mustard because of the following reasons:

– Members of Brassicaceae, to which black mustar belongs, are sensitive to differential concentration of IAA.

– IAA at lower concentration in this system acts as a cell elongation factors.

– IAA at relatively high concentration is growth inhibitory in this system.

This differential response to IAA is the basis of the present study. Hence, mustard seedling was chosen as the experimental system.

MATERIALS AND METHODS

Seeds of black mustard (*Brassica nigra* L.) were allowed o germinate at room temperature 35 ± 2°C on a thin layer of cotton. ABA, 2, 4 – D + AgNO3 was added on the 3rd, 5th and 7th days similarly on 0´ d, 1´ d, 3´ d and 4´ d. The root and shoot of the plants were measured in cm and the samples were collected from the above days.

Determination of root-shoot length:

One week old mustard seedling were uprooted and the roots and shoots were stretched with the help of a scale and root and shoot lengths were measured for every treatment in 3rd, 5th and 7th days similarly on 0´ d, 1´ d, 3´ d and 4´ d. Chlorophyll (Arnon, 1949), carotenoids (Mackinneys, 1964), lipid (Chapman, 1998), thin layer chromatography (Manoharan, 1981), phospholipids (Wagner *et al*., 1962), genomic DNA from plant tissue by the method of CTAB, agarose Gel Electrophoresis and catalase activity were analysed.