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A CASE STUDY

Significance of brassinosteroids in plant growth regulation

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SUMMARY

The brassinosteroids (BRs) are a group of plant originated steroidal lactones that exert pronounced growth promoting activities. BRs are engaged in a flurry of plant developmental aspects, including the stimulation of cell division and elongation, conferring stress tolerance, leaf development and vascular system differentiation. Though, rapid progress in BR biology is made, practical application of the BR-related knowledge to crop improvement has begun yet a little is accomplished towards the understanding of the mechanism involved. Moreover, the site of action of substances differs and need clear explanation. BR should also answer the questions concerning whether or not sterol hormones receptors predated the evolutionary divergence of the plants.

Key Words : Brassinosteroids (BRs), Structure, Biological activity, Vascular system, Steroidal lactones

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Recently, brassinosteroids (BRs) have gained fine reputation as the newest class of plant growth regulators. The use of such compounds has a great potential to increase plant productivity and yield. Since the discovery of brassinolide, steroidal lactones, from rape (*Brassica napus* L.) pollen, a large number of related compounds collectively called brassinosteroids (BRs) have been isolated from pollen, seeds, shoot and other parts of plant species. It is established now that they are all widely distributed in plants and are novel plant, promoting of growth steroidal lactones with structural similarities to animal steroids. Although, first isolation of BRs groups was obtained from rape pollen, later studies have shown that they may be found in wide range of plants including dicots, monocots, gymnosperms and algae. Over 60 kinds of brassinosteroids isolated so far, 31 have been fully characterized including 29 free and 2 conjugates. Extensive researches have shown that brassinosteroids are a new group of plant hormones that affect cell elongation, pollen tube growth, root growth and development, germination, senescence, photosynthesis, yield, regulation of gene expression in different plant species (Prakash *et al.*, 2003, Bao *et al.*, 2004 and Ozdemir F *et al.*, 2004). Plants that are deficient in BR biosynthesis or signal transduction pathways display characteristic growth-deficient phenotypes (Choe, 2004). The structure of brassinolide (the most active lactone steroid of BR family) was completely established by X- ray diffraction analysis of a single crystal which belong to the monoclinic space group $P2_1$ with a= 9.88 (2) A, b=7.63 (2), A, C= 17.98 (3) A and B=91.9 (1) (Grove *et al.*, 1979). There is one molecule of brassinolide and one molecule of water in the asymmetric unit. Generally, all brassinosteroids contain a steroid nucleus with a side chain at C-17 similar to the side chain in plant sterols. Other common features for all brassinosteroids, in addition to B oriented angular C-18 and C-19 methyl groups are (a) 2- orientation at C-5 (b) α-oriented hydroxyl group at C-22 and C-23 and (c) α -oriented hydroxyl group at C-2 and C-3 in ring A of the steroid nucleus (with exceptions).

Brassinosteroids greatly differ in functional group of C-24 (Sterol side chain) CH_3, brassinolide (BR_1) and brassinosteron (BR_2) = CH_2 dolicholide (BR3) and dolichosterene (BR4)= CH-CH3, homodolicholide (BR_{10}) and

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