

Brassinosteroids: New Horizons of Study and Application

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The role of steroids as hormones of mammals has been known since 1930 and steroidal hormones have been found also in insects and in fungi. Plants possess the ability to biosynthesize a large variety of steroids and their function as hormones was repeatedly postulated for plants also. It lasted however until 1979 that steroids with hormonal functions were discovered in plants. In that year American scientists published the isolation of a new steroidal lactone called brassinolide from bee-collected pollen of *Brassica napus L.* Later more than 40 structurally and functionally related steroids have been isolated from plants and this group of compounds is indicated now as brassinosteroids (BS). The question "Are the BS real plant hormones, or not?", which was discussed in the beginning of BS study, can be considered today as finally solved. All the data on BS properties in plants, and discovery of a gene that is specifically initiated by BS, and close approaching to identification of BS receptor make sure that BS are real plant hormones. BS demonstrate various kinds of regulatory activities on the growth and development of plants, such as stimulation of cell enlargement and cell division, lamina inclination, bending of leaves, and others. At the molecular level BS change the gene expression and the metabolism of nucleic acids and proteins.

Although BS are wide-spread in nature and are present in nearly every part of the plant, their content is extremely low. That is why the problem of their practical accessibility has to be solved by chemical synthesis. Starting from available natural steroids a number of BS has been synthesized in our laboratory. Their wide-scale physiological study was carried out together with partners from different biological and agricultural institutions. It gave an important information on their basic properties as plant-growth promoters and opened some new aspects of their activity. Specific features of BS that attracted our attention in the recent years are their ability to enhance plant resistance to unfavorable factors (stress, diseases, pollutants, etc.) and to improve the quality of crops together with crop increase. BS protective action is a result of stimulation of the natural protective forces of the plant itself. This can be reached by application of very low doses, which are comparable with natural BS content in plants. The obtained results were used for the elaboration of new chemicals for agriculture based on BS as active ingredients.

Recent results on BS synthesis, bioactivity, and practical application will be presented along with the first data on BS action in vertebrates.