599(2aK05)

EFFECTS OF GIBBERELLIN ON CELL ELONGATION AND SUGAR METABOLISM IN AZUKI BEAN EPICOTYL SEGMENTS.

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Auxin (IAA) and gibberellin (GA) control stem elongation in plants. IAA induces cell elongation of stem segments by causing a cell wall loosening, however, role of GA in elongation is still not clear. We studied GA effects on elongation of epicotyl segment in the light-grown azuki bean. GA synergistically stimulated IAA-induced elongation of the epycotyl segments, although GA did not cause elongation when applied alone. A split curvature test (SCT) suggested that GA might promote growth of the inner tissues. The SCT of segments with different lengths and the sugar analysis by HPLC revealed that GA stimulates sucrose transport in the epicotyl segments. GA had no apparent effects on water uptake or cell wall autolysis of the segments. Sucrose mimiced GA effect on cell erongation and these effects were inhibited by cell-wall synthesis inhibitors.

These results suggest that GA synergistcally stimulates IAA-induced cell elongation by enhancing sugar transport and metabolism in the inner tissues of stem segments.

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EFFECTS OF MICROGRAVITY AND PLANT HORMONES ON GROWTH OF AZUKI BEAN EPICOTYLS

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Effects of microgravity (horizontal clinostat) and plant hormones on growth of light-grown azuki bean epicotyls were studied. Clinorotation (1-3 days) significantly inhibited elongation growth of the epicotyls but did not affect their fresh weights. Segments excised from the clino-rotated epicotyls elongated in response to added auxin as did those from "control" plants. Here, some differences were observed between their abilities to use added sugars as growth promoters. To understand the mechanism of growth suppression under microgravity conditions, we further examined whether various hormones or minerals added to roots can restore the inhibited growth of intact epicotyls on the clinostat. Only GA and MS salts stimulated elongation growth of the epicotyls, and GA at lower concentrations specifically restored the inhibited growth on the clinostat. From these results, we concluded that the GA and sugar metabolisms are involved in plant responses to simulated microgravity.

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ISOLATION AND CHARACTERIZATION OF TWO TYPES OF GA 3β-HYDROXYLASE GENES IN RICE

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We have isolated and characterized two GA 3β-hydroxylases, *OsGA3ox1* and *OsGA3ox2* (*Oryza sativa* GA 3β-hydroxylase 1, 2), that catalyze the final step of bioactive GA synthesis from a monocot plant, rice. The molecular mapping of the genes using the recombinant inbred lines revealed that *OsGA3ox1* and *OsGA3ox2* were located at the top of the chromosome5 and at the bottom of the chromosome1, respectively. The mapping informations have suggested that *OsGA3ox2* corresponds to the location of *D18* locus, loss-of function of which causes a GA deficient dwarf mutant, *d18*. The sequence analyses of *OsGA3ox2* from four *d18* alleles directly showed that mutations occurred in these *d18* alleles. Finally, we confirmed our expectation by the complementation analysis.

The level of *D18* (*OsGA3ox2*) was controlled by the feedback regulation of the GA content, but the gene expression of *OsGA3ox1* was not regulated by the level of bioactive GA. The transcript of *D18* constitutively was seen in all organs we tested, while the transcript of *OsGA3ox1* was specifically observed in anther of flowers. These results demonstrate that there are two types of GA 3β-hydroxylase in rice, one constitutively functions in almost organs where GA_1 is synthesized, and another one is specific in anthers where GA_4 is actively synthesized and accumulated.

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CHARACTERIZATION OF ANTHER SPECIFIC GIBBERELLIN 3β-HYDROXYLASE GENE, *OsGA3ox1*, FROM RICE (*Oryza sativa* L.)

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Significant activity of gibberellin (GA) 3β-hydroxylase has been detected in mature anthers of rice (*Oryza sativa* L.). The activity has been also detected in anthers of Waito-C, a dwarf rice supposed to be a mutant for GA 3β-hydroxylase gene. Two genes for GA 3β-hydroxylase (*OsGA3ox1,2*) were cloned from rice, and *OsGA3ox1* was specifically expressed in anthers. Recombinant protein of *OsGA3ox1* catalysed not only 3β-hydroxylation but also 2,3-desaturation and 2β-hydroxylation. Further characterization suggested that GAs biosynthesized in anthers at heading stage were transfered to stems and promoted internode elongation, especially, the first internode.