delayed in the 10^{-6} M malformin A1 pretreated roots compared to the control. To explain the role of ethylene in the gravicurvature, we measured the curvature in the presence of ethylene production regulators such as IAA, ACC or cobalt ions. And these results suggested that the inhibition of curvature by malformin A1 might be mediated with ethylene production and the curvature was an inverse proportion to the ethylene production. These results suggested that the gravicurvature might be required the proper internal ethylene level in the primary root of maize.

E208

Effect of Brassinosteroid on the Ethylene Production in the Primary Root of Maize

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Brassinosteroid (BR), isolated from the rape pollen, has been known to regulate the growth and development of plants in the lower concentrations like plant hormones. To elucidate the action of BR, we studied the effect of ethylene production in the primary root of maize in the presence of BR. The ethylene production was increased by the treatment of BR, and this stimulation was proportional to the concentrations of BR. And the stimulated ethylene production was inhibited by the treatment of coablt ions. Further, the activity of ACC oxidase was stimulated by BR applications. These data suggested that BR stmulated the ethylene production in the conversion step of ACC to ethylene that is regulated by ACC oxidase in the primary roots of maize.

E209

Protective Roles of Exogenous Polyamines against Paraquat Toxicity in Radish Cotyledons

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The effect of exogenously applied polyamines (putrescine, spermidine, and spermine) in reducing the paraquat toxicity on radish (*Raphanus sativus* L. cv. Taewang) cotyledons was investigated to elucidate the physiological role of polyamines in plant oxidative stress resistance. In radish cotyledons, the superoxide-generating paraquat treatment (50 mM) caused an significant oxidative damage accompanying the losses of chlorophyll, carotenoid, and soluble protein. Also, the fresh weight of cotyledons was conspicuously decreased. However, polyamine pretreatments protected the radish cotyledons from paraquat-induced damages. Moreover, different polyamines led to different levels of protection against paraquat toxicity with spermidine (1 mM) being the most effective. The analysis of antioxidant enzymes in response to polyamine treatments showed that whereas putrescine and spermine treatments did not cause any increase in catalase, ascorbate peroxidase and guaiacol peroxidase activities, there were significant increases in catalase and ascorbate peroxidase activities after 1 day of spermidine treatment. It is suggested that the pretreatment of radish cotyledons with 1 mM spermidine among polyamines may induce antioxidant enzymes which lead to increased paraquat tolerance.

E210

Genomic Structure of Canaline-dependent Ornithine Carbamoyltransferase Gene from

Canavalia lineata

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Genomic structure of canaline-dependent ornithine carbamoyltransferase (OCT) gene from *Canavalia lineata* leaves was determined. We found the necleotide sequences of the canaline-dependent OCT gene containing 3,902 bp 3′ region and 2,737 bp promoter region. Canaline-dependent OCT gene consists of 5 exons and 4 introns. The exons range in size from 132 bp to 474 bp, while the introns range in size from 83 bp to the relatively large size of 1525 bp. Genomic structure of canaline-dependent OCT gene was compared to ornithine-dependent OCT gene from *Canavalia lineata*. Two genes consist of 5 exons and 4 introns, all the splicing junctions followed the conserved GT/AG rule. The size of exons of the two genes was similiar, but the size of introns showed great difference. The size of intron 1 of canaline-dependent OCT gene was 652 bp, while that of OCT gene was 338 bp. Also intron 4 of the canaline-dependent OCT gene 83 bp only, but that of OCT gene was 762 bp. The transcription initiation site of canaline-dependent OCT gene and ornithine-dependent OCT gene is located 66 bp and 12 bp upstream of the ATG translation initiation site, respectively. The 1,000 bp 5′ upstream region of canaline-dependent OCT gene contains many regulatory elements such as GT-1, I-BOXCORE, AT1BOX, NIT2 and GATAMOTIFCAMV etc. Also a single canaline-dependent OCT gene exists in the *Canavalia lineata* genome.

E211

Purification and Characterization of Ornithine Cabamoyltransferase from *Glycine max* Leaves

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Ornithine Cabamoyltransferase (OCT, EC 2.1.3.3) has been purified from *Glycine max* leaves. OCT was purified 121-fold with a yiled of 15.9% by dialysis, DEAE-Sephacel ion-exchange chromatography, Sephacryl S-200 gel filtration and Procion red-dye chromatography. The molecular weight of the native enzyme was approximately 114 kDa as estimated by Sephacryl S-200 gel filtration chromatography. The subunit molecular weight of the enzyme was 40 KDa based on SDS-PAGE. These result suggest that the native enzyme is a trimer. The effect of pH is significantly influenced by ornithine concentration ; optimal activity is at pH 7.5 when ornithine is saturating. At pH 7.5, the *km* values for the substrates are 0.36 and 0.12 mM for ornithine and cabamyl phosphate, respectively. Canaline competitively inhibited OCT activity enzyme. S-carbamoyl-L-cystein and L-cysteine were very strong inhibitors for the enzyme activity. OCT activity was approximately inhibited by 55% with 2 mM Zn^{2+} and Cd^{2+}. When tested from the three organs of *Glycine max*, leaves, shoots and roots, OCT activity of shoots is 2-fold higher than that of leaves. OCT activation energy was 13.8 kcal/mole as calculated from an Arrhenius plot.

E212

폴리아민 함량이 증가된 형질전환 담배 식물체에서의 생물적 스트레스에 대한 저항성 조사

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식물은 대부분 변화가 많은 환경조건에서 살게 되는데, 특히 식물의 생장과 발달에 지장