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Amended Soil with Biopolymer Reduces Zn Stress in *Camelina sativa* L.

Jung-Ho Shin[1], Sung-Jun Jung[1], Sung-Ju Ahn[1]*

[1]Department of Bioenergy Science and Technology, Chonnam National University, Gwangju, Korea

[Introduction]

Heavy metals are limiting factor of growth and production yield in plants. Heavy metal stress causes accumulation of reactive oxygen species (ROS) and disturb ion homeostasis. Plants have developed to efflux excess heavy metals and sequsterate mechanism. For example, vacuole localized P-type ATPase, heavy metal ATPase 3 (HMA3) can sequesterate heavy metals (Zn, Pb, Cd and Co) into vacuole.

Biopolymers were produced by living organism. In previous study, biopolymers were reported that enhanced soil strength and water retention capacity. But, effect on heavy metal by amended soil with biopolymer was not tested in Camelina yet. In this study, we investigated Camelina growth, metal contents and accumulation of HMA3 protein under heavy metal stress when soil was amended with or without biopolymers.

[Materials and Methods]

Soil was mixed with each 0.5% (g/g soil) β-glucan (BG) or xanthan gum (XG). Plants were grown for 7 days on soil with or without biopolymers. The plants were treated with 10 mM $ZnSO_4$ solution. The plants were harvested, then dry at 65°C. Metal contents of samples were measured using ICP-OES. Protein accumulation change of HMA3 was analysed by western blot using sucrose density gradient.

[Results and Discussion]

BG and XG amended soil revealed that higher growth of Camelina than control soil under Zn excess condition. Zn contents of Camelina grown on both BG and XG amended soil were lower than normal soil under Zn excess condition. However, Zn contents of soil were not changed. This result showed that amended soil with BG or XG reduced uptake into plants under Zn excess condition. Additionally, HMA3 accumulation in XG amended soil were decreased than normal soil under Zn excess condition. HMA3 accumulation decreased according to Zn contents in Camelina. In conclusion, amended soil with biopolymers prevent excessive Zn uptake into plants. The information of biopolymers reducing heavy metal damages may be helpful for enhancing biomass in agriculture.

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*Corresponding author: Tel. +82-62-530-2052, E-mail. asjsuse@jnu.ac.kr