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Effect of Plasma Treatment in Early Cultivation Stage of Barley Sprout

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[Introduction]

Plasma, which is often regarded as the 'forth state of matter', is a partially ionized gas. The recent tendency in plasma applications has been shifted from manufacturing industry to bio-conversion industry such as plasma medicine, plasma biotechnology, plasma agriculture and food since the early of 21 century. In this study, the influence of treatment plasma on barley seeds during the germination was evaluated for the first time.

[Materials and Methods]

Seeds of Korean barely (cv. Saechalssal) were harvested on May, 2017 from the experimental field and milled in the laboratory at the National Institute of Crop Science, Rural Development Administration, Korea. The atmospheric pressure plasma, which was discharged at a power of 19.5 W for 6 min inside. The four treatments were untreated control(T0-9G), single(T1-9G), double(T2-9G), and triple(T3-9G) 6-min exposures for 3 days. The fresh weight and length of barley sprout for 9 days grown were measured. The contents of GABA, amino acid and carbohydrate were analyzed and also phytochemicals such as policosanol and saponarin were analyzed.

[Results and Discussion]

The influence of plasma treatment on barley sprout was investigated by using a dielectric barrier discharge (DBD). The fresh weight of barley sprout was enhanced by 137.6% and 115.1% of the control when single and double 6-min exposures were applied, respectively. γ-Aminobutyric acid (GABA) and amino acid content increased as the number of plasma treatment increased. Especially, glutamic acid and alanine, GABA shunt-related metabolites, increased. The activity of glutamate decarboxylase (GAD) increased when treated with plasma. Also, Saponarin and policosanol content of barley sprout treated with plasma was higher than that of untreated. However, the contents of them decreased as the number of plasma treatment increased. Plasma can enhance the barley growth and increase the bioactive phytochemical content of barley sprout.

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