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Hardening Treatment of Cuttings Improves Drought Resistance in Sweet Potato

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[Introduction]

In crop cultivation, stressing plant or seed to increase their adaptability to environmental stress is known as hardening. This study was carried out to investigate the effect of hardening treatment of cuttings on seedlings growth under various soil moisture conditions in sweet potato.

[Materials and Methods]

The experiment was conducted for three months from April to June 2019. The variety of sweet potato used in the experiment was cv Shinyulmi. The hardening treatments of the cuttings were conducted for 0, 3, 5 days at 20°C. The soil moisture condition was adjusted to well-watered and drought condition. Growth parameters were measured at 7 days intervals after planting. Growth and physiological analysis were conducted for vine length, leaf chlorophyll content, NDVI, chlorophyll fluorescence (Fv/Fm), and dry weight of aerial and underground part. Root properties were analyzed at 14-day intervals and their root length, root surface area, and root mean diameter were examined using WIN RHIZO.

[Results and Discussion]

In the drought condition, 3-day hardening treatment (HT) initially showed lower value than 5-day HT, but after 28 days, the vine length was longer than both 5-day HT and control. SPAD values increased in 3-day HT and then decreased after 28 days after transplanting (DAT). The NDVI value was larger in 3-day HT than that of the other treatments, and the results were significantly different from the 5-day HT at 14 DAT. The fresh and dry weight of shoot and roots were the highest in the 3-day HT at 56 days after transplantation. Under well-watered conditions, unlike drought conditions, the 5-day HT showed longer vine lengths than the 3-day HT at 49 and 56 DAT. NDVI value was increased in hardening treatments from 42 DAT, and 5-day HT showed greater value than in 3-day HT. At 56 DAT, the fresh and dry weight of roots were greater in 5-day HT by as 0.986g and 0.105g 1.782g than those of the plants treated with 3-day HT. Unlike drought conditions, root length and surface area tended to increase over time in well-watered condition. The mean diameter of root was 0.059mm thicker at 28 days after transplanting in 5-day HT than 3-day HT. The experimental results showed that the hardening treatment of the cuttings of sweet potato was beneficial to the seedling establishment and growth after transplanting under both well-watered condition and drought condition. Especially, it was found that 3-day HT was more beneficial under drought conditions and 5-day HT was more beneficial under well-watered condition.

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