

Effect of LED Light Quality and Intensity on Growth Characteristics of Ginseng Cultivated in Plastic House

Sang Young Seo^{1*}, Jong hyeon Cho¹, Chang Su Kim¹, Hyo Jin Kim¹,
Min Sil An¹ and Du Hyeon Yoon²

¹Medicinal Resource Research Institute, JARES, Jinan 55440, Korea.

²Agricultural company corporation One'sberry Co., Damyang 57318, Korea.

This experiment was carried out using artificial bed soil and LED in the plastic film house(irradiation time: 07:00-17:00/day). Seedlings(n=63 per 3.3 m²) of ginseng was planted on May 17, 2018. LED was combined with red and blue light in a 3:1 ratio and irradiated with different light intensity(40-160 μmol/m²/s). Average air temperature from April to September according to the light intensity test was 20.4°C-20.9°C. Average artificial bed soil temperature was 20.1°C-21.7°C. The test area where fluorescent lamp was irradiated tended to be somewhat lower than the LED irradiation area. The chemical properties of the test soil was as follows. pH levels was 6.6-6.7, EC levels 0.9-1.3 dS/m and OM levels 30.6-32.0%. The available P₂O₅ contents was 73.3-302.3 mg/kg. Exchangeable cations K and Ca contents were higher than the allowable ranges and Mg content was high in the fluorescent lamp treatment. The photometric characteristics of LED light intensity are as follows. The greater the light intensity, the higher the PPF(Photosynthetic Photon Flux Density) value, illuminance and solar irradiation. Fluorescent lamp treatment had high illuminance value, but PPF and solar irradiation were lower than LED intensity 40 μmol/m²/s treatment. The photosynthetic rate increased(2.0-3.8 μmolCO₂/m²/s) as the amount of light intensity increased, peaking at 120 μmol/m²/s, and then decreasing. The SPAD (chlorophyll content) value decreased as the amount of light intensity increased, and was the highest at 36.1 in fluorescent lamp treatment. Ginseng germination started on April 5 and took 14-17 days to germinate. The overall germination rate was 68.8-73.6%. The growth of aerial parts(plant height etc.) were generally excellent in the treatment of light intensity of 120-160 μmol/m²/s. The plant height was 41.9 cm, stem length was 24.1 cm, leaf length was 9.8 cm and stem diameter was 5.6 mm. The growth of underground part (root length etc.) was the best in the treatment with 120 μmol/m²/s of light intensity. Due to the root length was long(24.8 cm) and diameter of taproot was thick(18.7 mm), the fresh root weight was the heaviest at 24.8 g. There were no disease incidence such as Alternaria blight, Gray mold and Anthracnose. Disease of Damping-off caused by *Rhizoctonia solani* occurred 0.6-1.5% and incidence ratio of rusty root ginseng was 30.8-62.3%. It is believed that the reason for the high incidence of rusty root ginseng is that the amount of field moisture capacity of artificial bed soil is larger than the soil. Leaf discoloration rate was 13.7-32.3%.

Key words: Ginseng, LED, Plastic film house, Light intensity

[본 연구는 인삼의 최적 생육환경 조성을 위한 ICT 융복합 첨단재배관리 시스템 개발 사업(사업번호:317018-05-4-HD020)의 지원에 의해 이루어진 결과로 이에 감사드립니다.]

*(Corresponding author) E-mail: ssy7717@korea.kr, Tel: +82-63-290-6341