

## Growth, yield and mineral element responses to temperature in *Codonopsis lanceolata*

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### Abstract

Temperature has an adverse effect for potential growth and development of *Codonopsis lanceolata*. The present study examined the responses of growth, yield and mineral element contents under temperature variables in *C. lanceolata*. Plant height exhibited the best result as being 2 m or higher the open field culture, while the growth is the most restricted in the 30°C. The open field culture also had the largest number of leaves in the early stage of growth. The number of leaves and the height tended to be increased with the temperature of 20°C and 25°C. The number of branches showed no significance as 32 branches and 26 branches in open field culture and 20°C, respectively. The smallest number of branches was observed in the 30°C with 15 branches. The leaf color recorded the lowest value in the open field culture unlike the growth above the ground. But all other temperature had no significance with the leaf color value between 50.0 and 52.6. The elevated temperature induced the thinner and shorter diameter and length of root. However, the root diameter was not significantly changed with the change of 1.8 cm and 2.1 cm at open field culture, with 20°C and 25°C, respectively. The fresh weights of the primary root and lateral roots were 6.3 g and 3.1 g, respectively, at the high temperature. The result showed the thickening of the lowest part under the ground as restricted. The fresh weights of the main root and lateral root were the highest on the open field culture, 20.6 g and 12.2 g, respectively. The contents of cellulose were the highest as 4.41% in the 20°C, followed by the open field culture, 25°C and 30°C. The higher temperature reduced the contents of cellulose. Moreover, P showed higher ratio in the high temperature while Ca and Mg exhibited the higher ratio towards the low temperature. On the contrary, minor quantity (less than 1%) of mineral nutrients was observed towards all temperature variables.

**Keywords:** *Codonopsis lanceolata*, temperature, root characteristics, mineral element

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