

Difference of photosynthesis response and growth characteristics in Korean and American Ginseng

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Objectives

Ginseng as perennial plant belonged to araliaceae is known about 11 species such as *Panax ginseng* C. A. Meyer, *Panax notoginseng* F. H. Chen, *Panax pseudoginseng* Wall, *Panax japonicus* C. A. Meyer, *Panax quinquefolius* L. etc. Representatives are Korean ginseng cultivated most internal and external centered around northeast Asia, American ginseng cultivated at Alabama, Georgia in America and Quebec in Canada, and Japanese ginseng growing at northwest of China and Japan. This study was practiced to make clear the photosynthesis characteristics of the two species.

Materials and Methods

○ Cultivation

Korean ginseng and American ginseng were cultivated at Pusan National University's farmland (Bubuk-myeon in Miryang city) in 2003. Ginseng seedlings were planted at 15cm distance by ginseng transplanter, followed by rice straw covering over bed soil to prevent from weeds and water evaporation. Ginseng administrative standard established by Rural Development Administration was followed as well.

○ Investigation method

Photosynthetic rate, stomatal conductance and SPAD of Korean ginseng and American ginseng leaves growing normally were investigated. Photosynthetic rate was measured for 3 times by LI-6400-40(Li-Cor) at the same leave unfolded completely of the growing plants during the whole growth stage with Flow rate at 500, CO₂ at 350, artificial PAR rays supplied by LI-6400-40 at 0, 50, 150, 200, 400, 600, 800, 1000, $\mu\text{molm}^{-2}\text{s}^{-1}$. Quantum rate to PS II fluorescence was measured at the dark adapted leaves, followed immediately by Photochemical efficiency to absorbed light of PS II at the same test spot after optimum-light treatment. Chlorophyll content, SPAD was measured by SPAD 502(Minolta) for 3 times.

Results

Though photosynthetic rate was increased as photosynthetic active radiation increased, maximum photosynthesis was reached at 400~600 $\mu\text{molm}^{-2}\text{s}^{-1}$ in American ginseng, and 300~400 $\mu\text{molm}^{-2}\text{s}^{-1}$ in Korean ginseng. Transpiration rate was higher in Korean ginseng of low photosynthetic rate than American ginseng.

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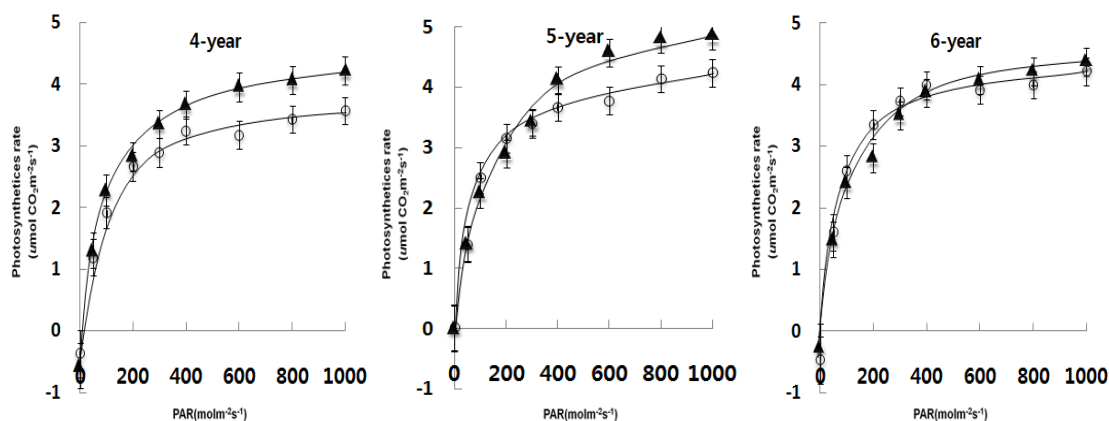


Fig. 1. Changes of photosynthetic rate according to PAR in Korean ginseng and American ginseng (○ : Korean ginseng, ▲ : American ginseng).

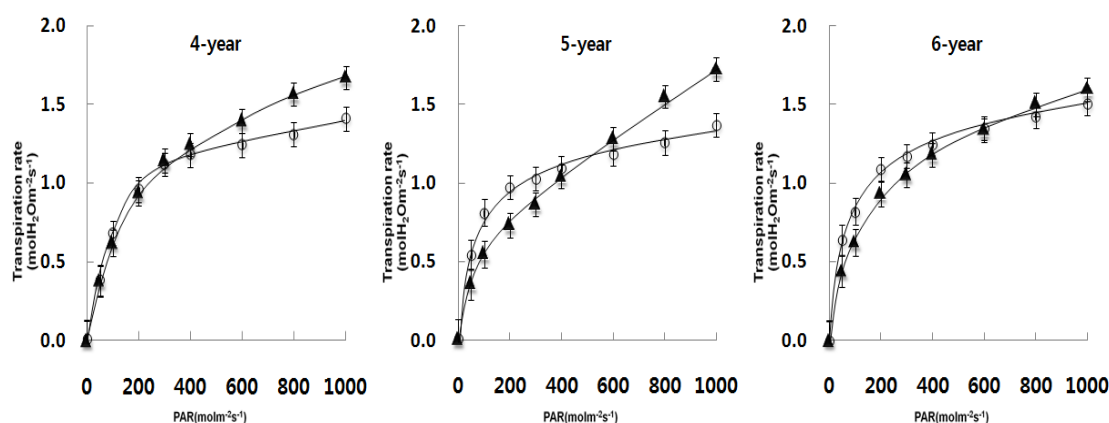


Fig. 2. Changes of transpiration rate according to PAR in Korean ginseng and American ginseng (○ : Korean ginseng, ▲ : American ginseng).

Table 1. Stem property in Korean ginseng and American ginseng

Year		leaf area (cm ² /plant)	SPAD	stem length (cm)	stem diameter (mm)
4	Korean ginseng	739.2a*	32.8a	35.3a	4.9a
	American ginseng	725.4a (98.1)	35.7b (108.8)	35.7a (101.1)	4.6a (92.9)
5	Korean ginseng	988.8b (100)	32.1a (100)	46.9a (100)	7.6b (100)
	American ginseng	926.4a (93.7)	36.6b (114.0)	44.8a (95.4)	7.0a (92.5)
6	Korean ginseng	969.0b (100)	33.5a (100)	47.0b (100)	7.8b (100)
	American ginseng	929.5a (95.9)	37.8b (112.8)	43.8a (93.2)	7.2a (92.3)

* Mean with same letters are not significantly different in DMRT(p<0.05)