

Comparison of Photosynthetic Characteristics between Dominant Shoot and Recessive Shoots of *Quercus variabilis*

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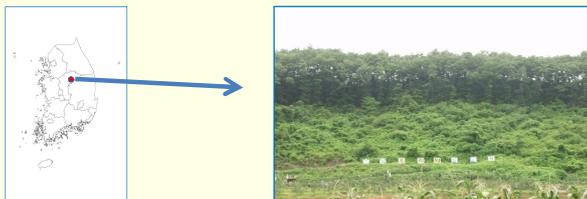
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Abstracts

In order to investigate the influence of the vigor difference of coppice shot on photosynthetic production, two-year-old coppice shoots of *Quercus variabilis* were classified into the dominant shoots and the recessive shoots, and their dry matter productions and physiological properties have been investigated. The dominant shoots showed much more leaves and branches than the recessive shoots, suggesting that the dominant shoots have more assimilatory organ. In addition, each leaf of the dominant shoots was wider and their chlorophyll content and photosynthesis rate at light saturation point were higher, indicating that the material productivity of each leaf is high. Moreover, the dominant shoots have shown higher specific leaf dry mass (g/m^2), higher maximum amount of water storage, and more resistance ability to water loss, which means that they are more tolerant to water stress.

Materials and methods

Study area



Methods

- > photosynthesis : Measured the light photosynthetic rate with an open gas flow system(Li-6400, Li-Cor, USA)
- > Leaf area : Calculated by determining the leaf dry mass (dried at 70°C for 48hrs) and determined using a Li-3100
- > Chlorophyll : Extracted chlorophyll from needles with DMSO(Dimethyl Sulfoxid)
- > Relative Water Content(RWC) = $(F_{wn} - D_w) / (F_w - D_w) - 1 \cdot 100$
 F_w : Weight of water saturation
 F_{wn} : Weight
 D_w : Dry weight



Li-6400



Li-3100

References

- Thomas T., Lei R. T., Kitao M., Koike T. 1996. Functional relationship between chlorophyll content and leaf reflectance, and light-capturing efficiency of Japanese forest species. *Physiologia Plantarum* 123 : 482-434
- 김선희, 성주한, 김영걸, 김판기. 2008. 광환경 변화에 대한 네 참나무 수종의 광합성 반응. *한국농림기상학회지* 10: 141-148.
- 김판기, 이용섭, 정동준, 우수영, 성주한, 이은주. 2001. 광도가 내음성이 서로 다른 3수종의 광합성 생리에 미치는 영향. *한국임학회지* 90 : 476-487.

Results and Discussion

Table 1. Dry weight sample tree for estimation the above-ground biomass of the *Quercus variabilis*.

Components	g (%)											
	1		2		3		4		5		6	
Stem	720	(46.5)	460	(62.5)	300	(59.8)	310	(56.7)	260	(61.0)	160	(63.2)
Branch	490	(31.6)	160	(21.8)	130	(25.9)	150	(27.5)	80	(18.7)	50	(19.7)
Leaf	338.4	(21.9)	115.2	(15.7)	72	(14.3)	86.4	(15.8)	86.4	(20.3)	43.2	(17.1)
Total	1548.4	(100)	735.2	(100)	502	(100)	546.4	(100)	426.4	(100)	253.2	(100)

Table 2. Leaf characteristics of the *Quercus variabilis*.

	Leaf Area ($\text{cm}^2 \text{leaf}^{-1}$)	Leaf DW (g leaf^{-1})	Specific dry mass (g m^{-2})
Dominant Shoot	62.3	0.7	105.7
Recessive Shoot	36.6	0.3	89.5

Table 3. Chlorophyll content between dominant shoot and recessive shoots of *Quercus variabilis*.

	Chlorophyll a (mg m^{-2})	Chlorophyll b (mg mg^{-2})	Chlorophyll a/b (mg mg^{-1})	Carotinoid (mg m^{-2})
Dominant Shoot	38.3	33.4	1.2	10.7
Recessive Shoot	45.5	32	1.4	10.2

Table 4. Water retentivity of detached leaf of *Quercus variabilis*.

	Water Retentivity ($\text{gH}_2\text{O m}^{-2}$)	Relative Water Content
Dominant Shoot	0.14	1.1
Recessive Shoot	0.11	0.82

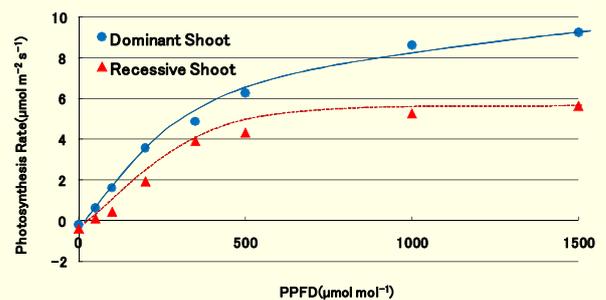


Figure 1. Light response curves between dominant shoot and recessive shoots of *Quercus variabilis*.

- ✓ The dominant shoots have been shown to have much more leaves and branches than the recessive shoots.
- ✓ The dominant shoots was chlorophyll content and photosynthesis rate at light saturation point were higher, therefore material productivity of each leaf is high.