A Basic Study on Leaf and Stem Production of *Angelica acutiloba*

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ABSTRACT

This study was conducted to develop effective production system in greenhouse for leaves and stems of *Angelica acutiloba* by using connect pots in 2003 and 2004. Seed germination rate and plant biomass of *Angelica acutiloba* collected in 2004 were higher than those harvested in 2003. Germination rate of *Angelica acutiloba* seeds collected in 2003 was 10%, while germination rate of seeds collected in 2004 was above 90%. Especially, plant growth and yield of *Angelica acutiloba* grown in connect pots sized with 4 × 4 × 5cm(length × width × height) were the highest. These results indicate that leaf and stem production of *Angelica acutiloba* can be improved by using connect pots and optimizing seed collecting time in greenhouse.

Kew words : leaf and stem, production, *Angelica acutiloba* Kitagawa, green house, connect pot, seed collecting year

INTRODUCTION

Korean angelica utilized as a herbal medicine material is one of perennial Umbelliferae plant and has three varieties such as *Angelica gigas* Nakai, *Angelica acutiloba* Kitagawa, and *Angelica sinensis* Diels. Physical characteristic of *Angelica acutiloba* utilized as a herbal medicine material is one of perennial Umbelliferae plants (Choi et al. 2003).

Angelica acutiloba has reddish purple stems and alternate leaves, and blooms white flowers. It is in flower from June to July. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Insects. Perennial growing to 1m. The seeds ripen from August to September and produce seeds with 1.8 g in 1000-seed weight.

The essential oils obtained from the seeds and roots by steam distillation are known to contain d-phellandrene, -pinene, osthenole, osthole, angelicin, -thujene, camphene, and numerous other compounds.

The fruits of angelica contain a higher percentage of oil and are rich in coumarins. Root oil is considered superior to the oils obtained from other parts of the plant. Leaves of the plant contain 0.2-0.6% essential oil

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and vitamins B_{12} and E as the large amount. Main composition of essential oil is n-butylidenephthalide ($C_{12}H_2O_2$), n-valerophonone-o-carboxylic acid ($C_{12}H_{14}O_3$), and bergaptem, ligustilide (James 1995).

As flavoring agents, roots and seeds of angelica are widely used in alcoholic liqueurs such as benedictine and chartreuse, and in gin and vermouth. The fruit is used in herbal teas. The leaves are sometimes blanched, boiled, and eaten in salads or as a garnish with vegetables and meats. Leaf stalks may be candied and used in cakes and desserts (Choi and Lee 1994).

The essential oil of angelica is used in perfumes, soaps, salves, oils, shampoos, and cigarettes. Efficacy of oriental medicine was follows. The root is emmenagogue, oxytocic, sedative and tonic. It is used in the treatment of women's complaints and also eases dizziness. *Angelica acutiloba* also can be utilized as a medicinal plant for vegetables because several ingredients in leaves of *Angelica acutiloba* have specific fragrance (Louis 2000).

Several studies have focused on mulching techniques as a leaf production of *Angelica acutiloba* (Choi et al. 2003). Generally, physical properties in soil significantly affect enhancement of crop yield. Mulching culture is the most commonly-used method for improving soil physical properties. Recently, mulching culture for medicinal plants has been well used to promote early shoot and root growth and yield (Choi et al., 1987, Han et al., 2003, Lee et al., 1997, Yoon et al., 2000).

Therefore, this study was conducted to determine feasibility of production system of leaf-stem in *Angelica acutiloba* using connect pots in greenhouse.

MATERIALS AND METHODS

Seeds of *Angelica acutiloba* as a native variety were harvested at the medicinal plant garden of Sunchon National University in August, 2003 and 2004, respectively, the seeds were used for experiment.

After collection, the seeds were stored in a refrigerator at 4℃ for 14 days. The seeds were planted in connect pots in greenhouse of Missouri University Agronomy on 15th of August, 2004. The connect pots used were 3 ×3 ×5cm, 4 ×4 ×5cm, 5 ×5 ×5cm, 6 ×6 ×5cm in length, width and height, respectively.

The pots was filled with soil mixtures of Sta-Green and Peat Moss mixed with 50:50 ratio.

The soil Sta-Green includes N-P_2O_5-K_2O=0.05-0.03-0.03 (Table1).

Five seeds per pot, collected in 2003 and 2004, were planted onto pots, and three seedlings per pot were finally selected for the experiment. Harvest was made when the plant height reached 8-10 cm high. The shoot and root fresh weight of whole plants were measured.

General cultural procedure and management such as weed control followed conventional culture methods for medicinal plants (Rural Development Administration (RDA), 1995).

All measurements for plant growth and yield were

Table 1. Composition of soil Sta-Green

Guaranteed Analysis	Content(%)	Others
Total Nitrogen(N)	0.05	Ammoniacal Nitrogen 0.01% Nitrate Nitrogen 0.01% Urea Nitrogen 0.03%
Available Phosphate(P_2O_4)	0.03	Ammonium Phosphate
Soluble Potash(K_2O)	0.03	Potassium Nitrate

referred to standard measurement of RDA, Korea (RDA, 1989).

RESULTS AND DISCUSSION

Germination rate by seed collecting year

Germination time and rate of *Angelica acutiloba* seeds by collecting year are shown in Table 2.

Germination of *Angelica acutiloba* seeds collected in 2004 was initiated from the 21st of August while those in 2003 from the 28th of August. The results show that *Angelica acutiloba* seeds collected in 2004 were more early germinated than those in 2003. Germination rate of *Angelica acutiloba* seeds collected in 2003 and 2004 was 10 and 92%, respectively, showing higher germination capacity in seeds collected in 2004. The result show that germination rate was lower as the seed collecting year increased. Germination was complete within 2 days after germination initiation, from 21st to 23th of August.

These results indicate that leaf and stem production of *Angelica acutiloba* can be improved by optimizing seed collecting time in greenhouse.

Growth and Yield of Leaves-stems by Connect Pot Size

1) Growth of *Angelica acutiloba*

The result on growth of *Angelica acutiloba* as affected by different connect pot sizes is shown Table 3.

Plant height, number of leaves per plant, and fresh weight of *Angelica acutiloba* grown in pot sized with 3 ×3 ×5cm(length × width ×height) were 6.2 cm, 4.2 and 12.1 g, respectively. However, when the plants were grown in pot sized with 4 ×4 × 5cm(length × width × height) and the bigger one, plant height, number of leaves per plant, and fresh weight of *Angelica acutiloba* were 8.5-9.1cm, 5.4-5.6 and 16.3-19.4g, respectively. The results show that bigger connect pots produce more growth of *Angelica acutiloba.*

2) Yield of Angelica acutiloba

The result on leaf and stem production of 10-week old *Angelica acutiloba* as affected by different connect pot sizes is shown Figure 1.

Leaf and stem fresh weight of *Angelica acutiloba* were very low in 3 ×3 ×5cm(length × width × height)-size-pot were 6.2 cm, 4.2 and 12.1 g, respectively. However, the plants grown in pot sized with 4 ×4 ×

Table 2. Effect of seed collecting year on the seed germination of *Angelica acutiloba.*

Seed gathering year	Germination		
	first day	date	rate(%)
'03 seed	Aug. 28	-	10
'04 seed	Aug. 21	Aug. 23	92

Table 3. Effect of connect pot sizes on the growth of *Angelica acutiloba*

Connect pot	Plant height (cm)	Number of leaf	Weight (g)
3 ×3 ×5cm	6.2b*	4.2b	12.1b
4 ×4 ×5cm	8.9a	5.4a	18.6a
5 ×5 ×5cm	8.5a	5.6a	16.3ab
6 ×6 ×5cm	9.1a	5.5a	19.4a

*Mean separation within column by Duncan's multiple range test, 5% level of significance.

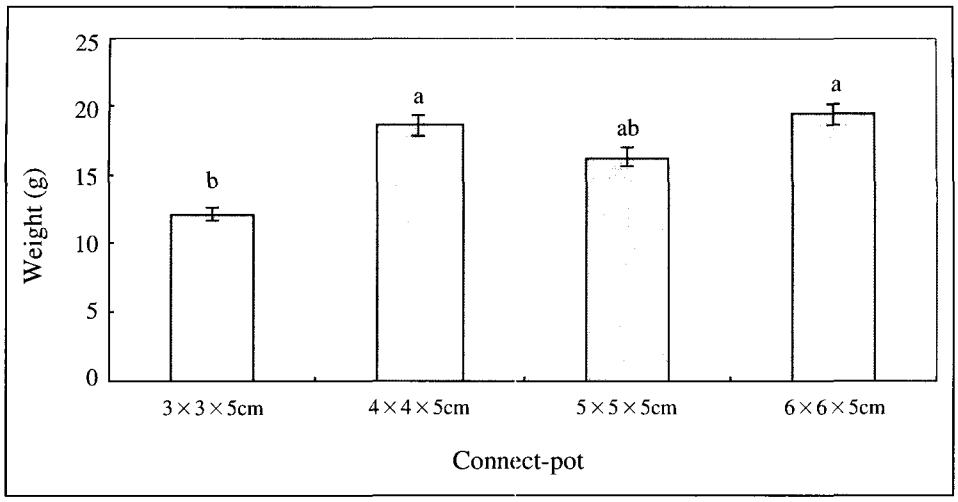

Fig . Comparison in effects of different connect-pot on the yield of leaf and stem in *Angelica acutiloba* Kitagawa.

5cm(length × width × height) showed higher fresh weight of *Angelica acutiloba* than those in 3 × 3 × 5cm-size-pot. The results show that bigger connect pots can improve the yield of *Angelica acutiloba*.

These results indicate that leaf and stem production of *Angelica acutiloba* can be improved by using connect pots.

ANNOUNCEMENT

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