

Study on Leaf and Stem Production of *Angelica acutiloba* by Mulching materials

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ABSTRACT

This study was conducted to produce effectively more leaves of *Angelica acutiloba* through year-round production system by using various mulching materials.

Soil temperature by covering treatment was the highest in P.E.(Polyethylene Film) mulching and followed by rice straw mulching, especially showing highest temperature in Tr. PE(Transparent Polyethylene Film) from April through May. Water content of soil was higher in P.E. mulching than in non-mulching. Leaf and stem production of *Angelica acutiloba* through year-round production showed the highest in PE mulching also root production of *Angelica acutiloba* showed the highest in P.E. mulching.

These results suggest that leaf and stem production of *Angelica acutiloba* can be maximized through P.E. mulching cultivation system.

Key words : mulching material, leaf and stem production, *Angelica acutiloba* cultivation system

INTRODUCTION

Korean angelica has three varieties such as *Angelica gigas* Nakai, *Angelica acutiloba* Kitagawa, and *Angelica sinensis* Diels. Korean angelica utilized as a herbal medicine material is one of perennial Umbelliferae plant.

Angelica acutiloba Kitagawa has reddish purple stems and alternate leaves, and blooms white flowers in June to July. Fruits ripen in August to September and produce seeds with 1.8 g in 1000-seed weight.

Leaves and stem of *Angelica acutiloba* contain 0.2~0.6% essential oil, and vitamins B₁₂ and E as the large amount. Main compositions of essential oil are n-

butylidenephthalide (C₁₂H₂O₂), ligustilide, n-valerophonone-o-carboxylic acid (C₁₂H₁₄O₃), and bergapten. These substances are used as a herb medicine for anemia remedies including hematic. *Angelica acutiloba* also can be utilized as a medicinal plant for vegetables because several ingredients in leaves of *Angelica acutiloba* have specific fragrance (Choi *et al.*, 2004).

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

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et al., 2003). Thus, this study was conducted to produce effectively more leaves of *Angelica acutiloba* through year-round production by using various covering materials such as P.E(Polyethylene Film) materials and rice straw mulching.

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 planted on 20th of October, 2003 for the treatment. Mulching with rice straw and 0.03 mm Tr. PE(Transparent Polyethylene Film) and Bl. PE(Blue Polyethylene Film) were made before seedlings of one-year-old *Angelica acutiloba* emerged. Non-mulching was the control

For mulching management many holes on mulching materials were made to protect the emerged seedlings from mulching materials. *Angelica acutiloba* was planted into 40 by 20 cm distance as an optimizing plant density, fertilized with N-P₂O₅-K₂O-organic matter=4-8-7-1,500 (kg/10a) as a basal fertilizing at 10 days before transplanting, and refertilized with 2 kg nitrogen on each hole of PE mulching materials as a supplementary fertilizing on 20th of June. After side

fertilizing the plants were directly irrigated through mulching holes for minimizing water loss by run-off (Choi et al., 2004).

Experiment was conducted in plot of 10m² area and arranged into randomized block design with 3 replicates. Temperature and moisture content of the soil in experimental plot were periodically observed during growing season. General cultural procedure and management such as weed control followed conventional culture methods for medicinal plants(Rual Development Administration (RDA), 1995).

All measurements for plant growth and root yield were referred to standard measurement of RDA, Korea (RDA, 1989).

RESULTS AND DISCUSSION

Change of Temperature and Moisture in Soil by Mulching

Change of Soil Temperature : Fig. 1 shows change in soil temperature observed during growth season of *Angelica acutiloba* from April to December.

The results showed non-mulching was the lowest

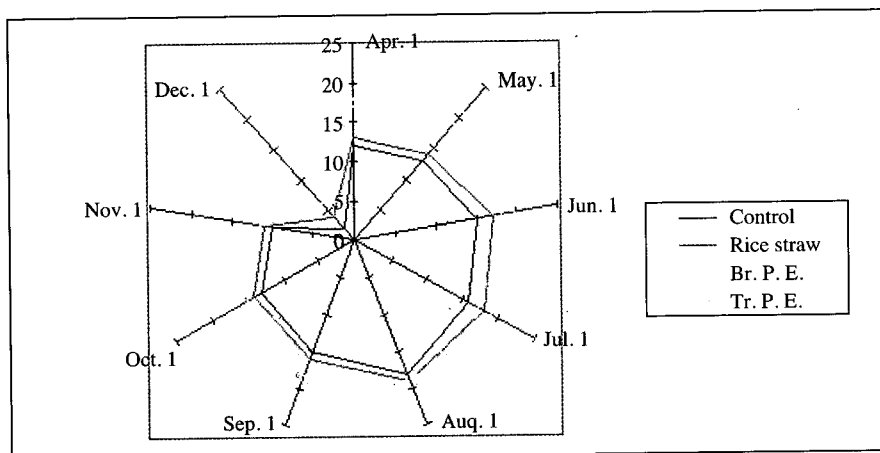


Fig. 1. Seasonal changes of mean soil temperature as influenced by different mulching materials.

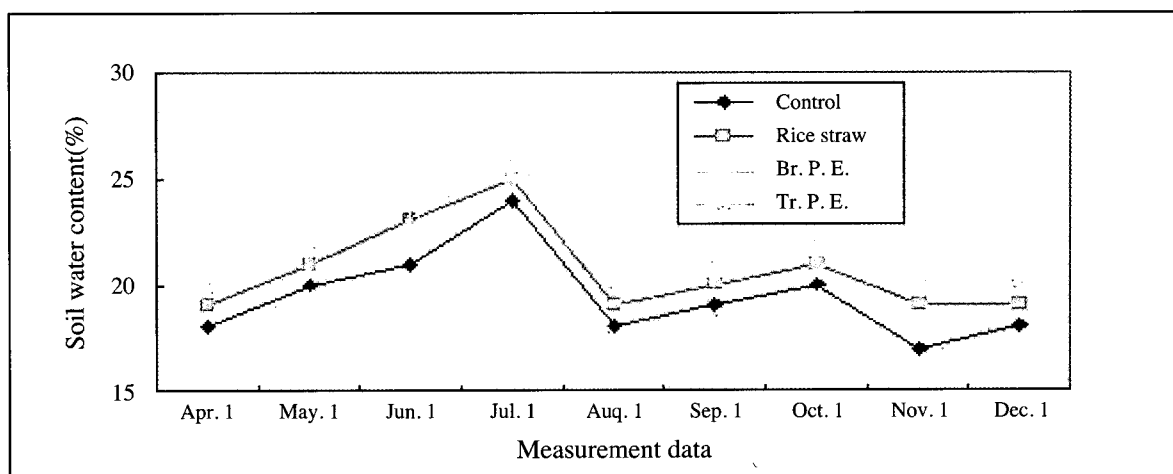


Fig. 2. Change in water content of soil non-mulche and mulched with the P.E(Polyethylene Film) during *Angelica acutiloba* Kitagawa cultivation.

temperature and followed by straw mulching, and P.E.(Polyethylene Film) mulching, especially Tr P.E.(Transparent Polyethylene Film)mulching was the highest temperature between April and May, and later were not different from non-mulching. This result was supported by those of Lee *et al.*(1997) who reported, in mulching culture of taro, that soil temperature in P.E. mulching was increased as the highest compared to non-mulching. Choi *et al.*(2004 1987) also reported that covering by P.E. mulching increased soil temperature greatly, and it significantly improved early leaf-stem yield of *Angelica acutiloba*.

Change of Soil Moisture : Soil moisture was measured from April through December and the results showed in Figure 2.

Water content of soil was the highest when covered with P.E.(Polyethylene Film) and followed by with rice straw. It was thought that PE mulching keeps constant water content without water evaporation.

Willis(1962) and Willis *et al.*(1963) suggested that crop yield can be increased by mulching because it helps soil keep water well.

Yield of *Angelica acutiloba*

Leaf-stem Yield of *Angelica acutiloba* : Leaf yield of *Angelica acutiloba* grown by covering with Tr. P.E(Transparent Polyethylene Film). mulching showed the highest, and followed by Br. P.E. mulching(Blue Polyethylene Film), and rice straw mulching (Fig. 3, Left).

The result suggest that tunnel covering on the emerged *Angelica acutiloba* in April increased soil temperature and stimulated plant growth as well as yield. Choi and Hwang(1985) reported the same results that top growth of *Angelica acutiloba* in PE tunnel and vinyl plastic house was increased because of keeping warm temperature. These results show that P.E.(Polyethylene Film) mulching can produce more leaves of *Angelica acutiloba* through year-round production system than any other covering mean.

Root Yield of *Angelica acutiloba*

Effects of soil covering with mulching on root production of *Angelica acutiloba* were investigated and the results showed that root yield of *Angelica acutiloba* grown by P.E.(Polyethylene Film) mulching showed the

highest, and followed by rice straw mulching (Fig. 3, Right)

P.E. mulching was the best way not only for improving physical properties of soil but also for stimulating root growth such as root enlargement. Yoon *et al.*(2000) reported that P.E. mulching stimulated root growth and yield of *Angelica gigas* due to prevention of soil drying, change of soil temperature, and soil erosion. It is generally accepted that improvement of soil physical properties can improve productivity and quality of medicinal plants. Also, Choi *et al.*,(2004) reported the same results that top growth of *Angelica acutiloba* in P.E. mulching and tunnel were increased because of keeping warm temperature.

Therefore, we conclude that the best method for improving physical properties of soil was P.E. mulching that shows higher growth and yield of *Angelica acutilob* in year-round production system.

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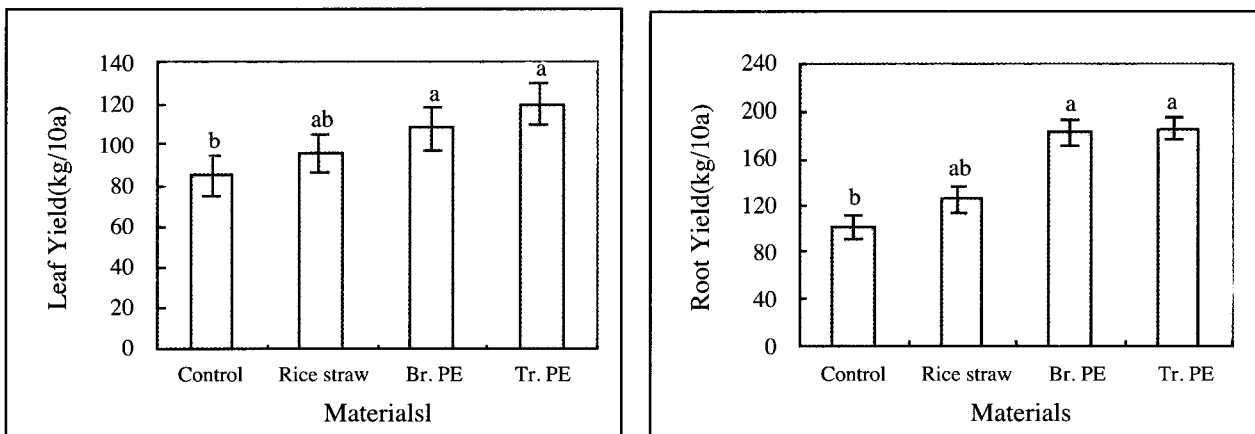


Fig. 3. Comparison in effects of different mulching materials on the yield of leaf (left) and root (right) in *Angelica acutiloba* Kitagawa.

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