

## Study on Leaf Production of *Angelica acutiloba* by Mulching with Polyethylene Film

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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 and polyethylene(PE) tunnel. Soil temperature by covering treatment was higher in PE mulching and PE tunnel than in rice straw mulching, especially showing the highest temperature in PE tunnel from April through May. Water content of soil was higher in PE mulching than in non-mulching. Leaf production of *Angelica acutiloba* through year-round production showed the highest in PE tunnel and root production in PE mulching. These results suggest that leaf production of *Angelica acutiloba* can be maximized through PE tunnel cultivation system.

**Key words** : mulching material, leaf production, *Angelica acutiloba* Kitagawa, PE tunnel cultivation system

### INTRODUCTION

Korean angelica utilized as a herbal medicine material is one of perennial Umbelliferae plants and has three varieties such as *Angelica gigas* Nakai, *Angelica acutiloba* Kitagawa, and *Angelica sinensis* Diels. of them *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 of *Angelica acutiloba* contain 0.2~0.6% essential oil,

and vitamins B<sub>12</sub> and E as the large amount. Main compositions of essential oil are n-butylidenephthalide (C<sub>12</sub>H<sub>2</sub>O<sub>2</sub>), ligustilide, n-valerophonone-o-carboxylic acid (C<sub>12</sub>H<sub>14</sub>O<sub>3</sub>), 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. Generally, physical properties in soil significantly affect enhancement of crop yield. Mulching culture is the most commonly-used method

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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; Choi and Lee, 1993). Thus, this study was conducted to produce effectively more leaves of *Angelica acutiloba* through year-round production by using various covering methods such as PE mulching, tunnel, 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 September to October, and planted on 20th of November, 2001 for the treatment. Mulching with rice straw and 0.03 mm-transparent PE film, and covering with PE tunnel 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. To escape heat injuries 10 cm-diameter holes were made for ventilation in tunnel. *Angelica acutiloba* was planted into 40 by 20 cm distance as an optimizing plant density, fertilized with

N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O-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.

Experiment was conducted in plot of 10m<sup>2</sup> area and arranged into randomized block design with 3 replicates. General cultural procedure and management such as weed control followed conventional culture methods for medicinal plants (Rural Development Administration (RDA), 1989). Temperature and moisture content of the soil in experimental plot were periodically observed during growing season. All measurements for plant growth and root yield were referred to standard measurement of RDA, Korea (RDA, 1995).

## RESULTS AND DISCUSSION

### Change in Temperature and Moisture in Soil by Mulching

Figure 1 shows change in soil temperature observed during growth season from April to December.

The results showed non-mulching was the lowest

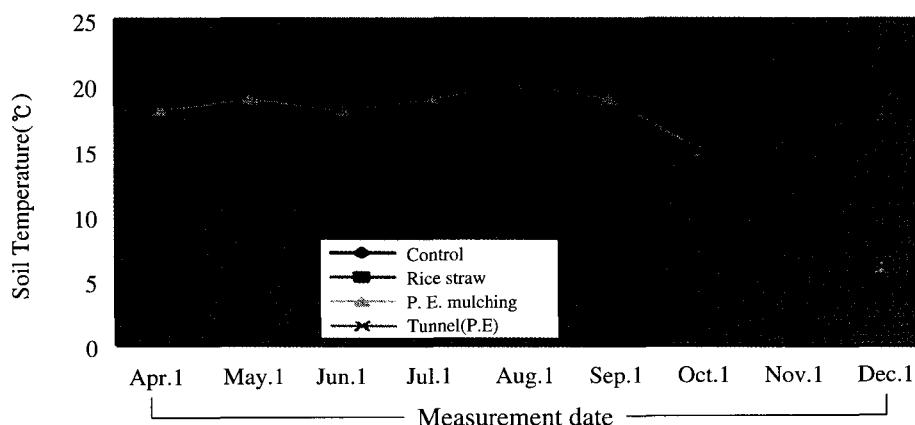


Fig. 1. Seasonal changes of mean soil temperature as influenced by different munching materials and tunnel during *Angelica acutiloba* Kitagawa cultivation.

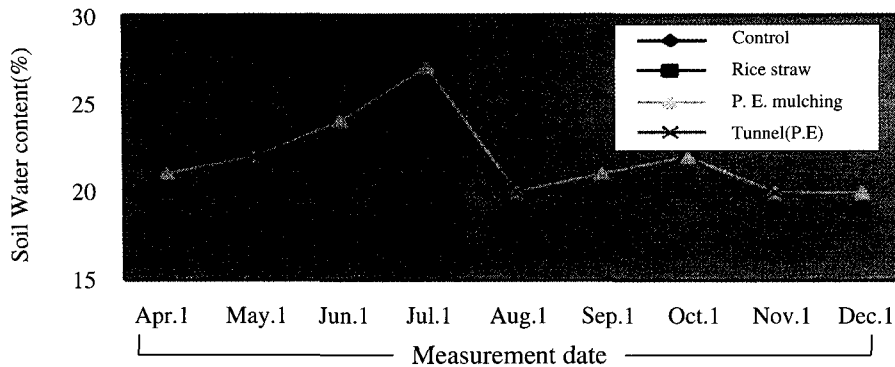


Fig. 2. Change in water content of soil non-mulched, mulched and tunneled with the transparent P.E films during *Angelica acutiloba* Kitagawa cultivation.

temperature and followed by straw mulching, and PE mulching, especially PE mulching and tunnel was the highest temperature between April and June, and later was 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.*(1987) also reported that covering by PE tunnel increased soil temperature greatly, and it significantly improved early garlic yield.

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 PE film, and followed by with tunnel and 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.

#### Effects of Soil Mulching and Tunnel on Leaf Yield of *Angelica acutiloba*

Leaf yield of *Angelica acutiloba* grown by covering with tunnel showed the highest, and followed by PE mulching, 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

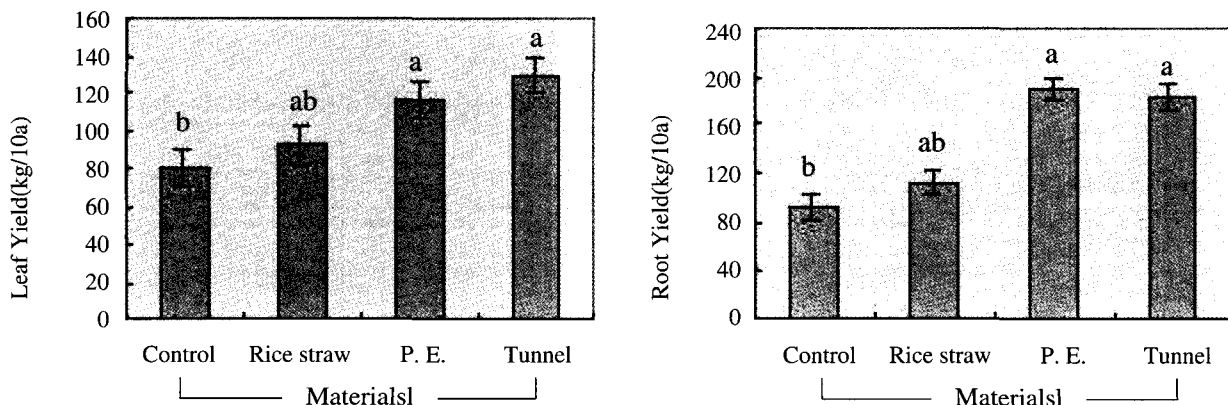


Fig. 3. Comparison in effects of different mulching materials and tunnel on the yield of leaf (left) and root (right) in *Angelica acutiloba* Kitagawa.

that topgrowth of *Angelica acutiloba* in PE tunnel and vinyl plastic house was increased because of keeping warm temperature. These results show that PE tunnel can produce more leaves of *Angelica acutiloba* through year-round production system than any other covering means.

#### **Effects of Soil Mulching and Tunnel on Root Yield of *Angelica acutiloba***

Effects of soil covering with mulching and tunnel on root production of *Angelica acutiloba* were investigated and the results showed that root yield of *Angelica acutiloba* grown by PE mulching showed the highest, and followed by tunnel, and rice straw mulching (Fig. 3, Right).

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

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