

## Temperature Effect on Seed Germination and Seedling Growth of *Angelica acutilobu*

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### ABSTRACT

Special objective of this study is to investigate morphological characteristics of seeds and effects of environmental factors such as light and temperature on their germination and seedling growth of *Angelica acutilobu* in Umbelliferae plants, using them as oriental medicine materials. Seed shape of *Angelica acutilobu* is ovate. Color of seed coats varied from yellow to dark brown. Seed size was 5.5 mm in length, 4.0mm in width. One thousand-seed weight of *Angelica acutilobus* was 3,210mg. Optimum temperatures for seed germination and seedling growth ranged from 20 to 25 °C.

**Key Words :** *Angelica acutilobu*, Morphological characteristics, seeds, germination

### INTRODUCTION

Increasing concerns about human's health with improvement of their living standard, consumption of oriental medicinal stuffs is continually increased and their import from China also is steadily increased. In most recent, statistical data indicated most of the imported medicinal stuffs belong to Umbelliferae medicinal plants.

Umbelliferae medicinal crops have low germination under natural condition. The plants grow naturally throughout the temperate area of the Northern Hemisphere. Nearly 125 genus and 2,900 species of Umelliferae are distributed the world over (Lee et al., 1997), and about 34 genus 85 species of them are found in the Korean peninsula. The best known of these and

probably most abundant are *Anethum graveolens*, *Angelica dahurica*, *Angelica gigas* and *Angelica acutilobu*.

Germination capacity of seeds is strongly influenced by environmental factors such as temperature and water stress, which may interact in their effect (McGinnies, 1960; Tadmor et al., 1969). Light is required in some cases. Germination of most of plant was better at alternating temperature than at constant temperature. However, some crop plants have similar germination under alternating and constant temperature.

The purpose of this study was to determine optimum temperature for improving seed germination and early seedling growth of *Angelica acutilobu*. Little information is available for environmental influences on germination of *Angelica acutilobu* in Umbelliferae plants.

Table 1. Morphological characteristics of seeds in *Angelica acutiloba*

Species	Shape	Color	Length (mm)	Width (mm)	1,000-seed weight (mg)
<i>Angelica gigas</i>	Ovate	Yellowish brown	6.5	4.7	3,900
<i>Angelica acutiloba</i>	Ovate	Brown	5.5	4.0	3,210

## MATERIALS AND METHODS

### 1. Morphological characteristics of Seeds in medicinal plants of umbelliferae.

*Angelica gigas* and *Angelica acutiloba* were used as test plants. Morphological characteristics including size, length, width, shape, 1000-seed weight, color, and pattern were measured.

### 2. Seed Germination and growth variation of *Angelica acutiloba* by environmental stress.

Effect of Temperature on Seed Germination and Seedling Growth Seeds of *Angelica gigas* and *Angelica acutiloba* were obtained from a field near Hamyang Medicinal Plant Experiment Station of Kyungnam Agricultural Research and Extension Services in October 2000 and 2001 and then stored at 4°C until used. Two layers of Whatman No.1 filter paper were placed in petri dish then 3ml of distilled water were pipetted onto the filter paper. Seeds were imbibed in distilled water for 24 hours at 20°C and rinsed in new tap water at 12hour intervals. One hundred seeds were evenly placed on the wetted paper in each 9cm petri dish. The petri dishes were separately placed in growth chambers programmed at different temperatures. Temperatures tested were 5, 10, 15, 20, 25, 30, 35, and 40°C, respectively. Number of germinated seeds was determined at 8 weeks after seeding and transformed to percent germination for analysis. Plant height and number of leaf were measured at 8 weeks after germination and represented as 'bad', 'moderate',

'good', and 'excellent' on the basis of the data. Germination experiments were conducted following the procedure of "Research Investigation Standard of Agriculture" provided by Rural Development Administration. The experiment was conducted with 3 replicates.

## RESULTS AND DISCUSSION

### 1. Morphological Characteristics of Seeds

Seed shape of *Angelica gigas* and *Angelica acutiloba* were ovate. The results were supported by earlier report of Lee et al. (1997) that Umbelliferae plants forms 2 seeds as a schizocarp and their seeds are elliptic, oblong or ovate.

Color of seed coats varied from yellow to brown. Seed size was ranged from 6.5 to 5.59mm in length and from 4.7 to 4.7mm in width.

One thousand-seed weight of *Angelica gigas* was 3,900mg and *Angelica acutiloba* was 3,210mg. The results were supported by earlier report of Choi et al. (2000) that Umbelliferae plants of seeds 1000-seed weight of *Buplerum falcatum* was lowest and *Angelica gigas* highest.

### 2. Germination degree

Germination rate of *Angelica acutiloba* was 93%(highest) at 25°C, over 90% between 20 and 25°C, and minimum by 21%(lowest) at 5°C. This result indicates that optimum temperature for seed germination of was between 20 and 25°C. Germination

Table 2. Effect of temperature on seed germination of medicinal plants.

Medicinal plants	Germination(%)							
	5℃	10℃	15℃	20℃	25℃	30℃	35℃	40℃
<i>Angelica gigas</i>	20	52	67	90	92	88	81	31
<i>Angelica acutiloba</i>	21	54	69	90	93	89b	83	35

Table 3. Effect of temperature on seedling growth of medicinal plants

Medicinal plants	Degree of early growth <sup>*)</sup>							
	5℃	10℃	15℃	20℃	25℃	30℃	35℃	40℃
<i>Angelica gigas</i>	+	++	+++	+++	++++	++++	++	+
<i>Angelica acutiloba</i>	++	++	+++	++++	++++	++++	++	+

<sup>\*)</sup> +: bad, ++: moderate, +++: good, ++++: excellent

percent for *Angelica acutiloba* were similar to *Angelica gigas*.

They were well germinated between 20 and 25℃ but were poorest germination at 5℃. Choi and Lee (1994) reported that temperatures ranged from 20 to 25℃ improved seed germination of Umbelliferae plants. However, it is thought that more in-depth experiments on effects of alternating temperatures will be needed.

### 3. Early seedling growth

Plant height and number of leaf of medicinal plants tested were adversely affected at very low temperature. Seedling growth of *Angelica gigas* was poorest at 5℃, intermediate between 15 and 20℃, and optimized at 25 and 30℃, respectively. Early seedling growth of Umbelliferae plants was maximized at 25℃. Maximum growth for *Angelica acutiloba* occurred between 20 and 25℃ and at 30℃.

However their growth was poor at 5℃.

Therefore it is assumed that optimum temperature for seed germination and seedling growth of Umbelliferae plants ranged from 20 to 30℃ and especially temperature at 25℃ improved seeding growth. However, it was thought further detail researches on effects of other environmental factors such as light including light intensity, light quality, and photoperiod,

and fertilization.

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