

Morphological Characteristics of Seeds in Medicinal Plants of Umbelliferae***

Eun Il Lee*, Young Ok Ko**, Chu Ho Choi**, Jong Ki Lee*** and Seok Hyeon Kim*

산형과 약용작물 종자의 형태적 특성***

이은일* · 고영옥** · 최주호** · 이종기*** · 김석현*

ABSTRACT: The most typical morphological characteristics of seeds of eight species in Umbelliferae are summarized as follows:

1. The common characteristics of seeds in Umbelliferae were bi-partite fruits, compound of 2-seeds(fruitlet), oil canals and funiculus or carpaphore.
2. Seed shape of Umbelliferae were oblong or elliptic and ovate; seed colors were yellow, pale yellow or brown, dark brown or black.
3. Seed size ranged from 2 to 7mm in length and 2~5mm in width. *Angelica dahurica* bore the largest seed while *Ligusticum acutilobum* showed the smallest. The 1000-seed weight ranged from 1.7g in *Bupleurum falcatum* to 3.9g in *Angelica gigas*.

Key words: Umbelliferae, Bi-partite fruits, Funiculus or Carpaphore

The details of seed morphology of medicinal plants are still not well known to agronomists due to their scarcity and small size. However, the information on medicinal plants are of great importance in order to find out the adequate methods to enhance germinability of those plants. In this paper most common medicinal plants, frequently utilized by the people in Korea, were examined and characteristics of those seeds were described. The plants observed here are *Bupleurum falcatum*, *Ostericum koreanum*,

Angelica dahurica, *Anethum graveolens*, *Angelica gigas*, *Foeniculum vulgare* and *Ligusticum acutilobum*.

Main interests of the morphological observation are dorsal and ventral part, carpophore or funiculus, oil-canals, veins, remains of style, and existence of wings, of which characteristics are considered to be critical to identify the species as well as to explain the physiological phenomena.

본 연구는 1993년도 한국학술진흥재단의 공모과제 연구비에 의하여 수행되었음.

* 경상대학교 농과대학 농학과(Department of Agronomy, College of Agriculture, Gyeongsang National University, Chinju 660-701, Korea)

** 진주산업대학교 농학과(Department of Agronomy, Chinju National University, Chinju 660-758, Korea)

*** 농촌진흥청 연구관리국(Research Management Bureau, RDA, Suwon 440-707, Korea) <'97. 2. 28 接受>

MATERIALS AND METHODS

Eight species of medicinal plants⁴⁾ seeds in Umbelliferae were collected from several different places (Table 1).

Measurements of *Bupleurum falcatum*, *Ostericum koreanum*, *Angelica dahurica*, *Anethum graveolens*, *Angelica gigas*, *Foeniculum*

Table 1. Eight species of medicinal plants in Umbelliferae used in this experiments

Species	Seed sources	Cropping year	Stored condition
<i>Bupleurum falcatum</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Ostericum koreanum</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Angelica dahurica</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Anethum graveolens</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Angelica gigas</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Foeniculum vulgare</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Ligusticum acutilobum</i>	GPRDA HMPES NYAES	1993~1994	5~10°C
<i>Ledebouriella seseloides</i>	GPRDA HMPES NYAES	1993~1994	5~10°C

GPRDA : Gyeongnam Provincial Rural Development Administration, HMPES : Hamyang Medicinal Plant Experiment Station, NYAES : National Yeongnam Agricultural Experiment Station,

culum vulgare, *Ligusticum acutilobum*, and *Ledebouriella seseloides* of medicinal plants in Umbelliferae include the weight in grams of 1000 seeds, and the size in the length and width in millimeters. The seed samples were randomly selected for the measurements and used 10 to 30 seeds per species. They vary depending on the size of the seeds, the degree of seed development and the environment under which they were grown.

OBSERVATION OF THE SEED COAT

The wet seed was cut into small pieces, fixed immediately in 2.5% glutaraldehyde in 0.1M phosphate buffer, pH 7.4 overnight, and followed by washing in phosphate buffer three times (30min. each). Rinsed tissue was dehydrated in a graded ethanol series (up to 100%) and embedded in araldite. Semithin section was mounted on slide glass, stained in 1% toluidine blue, and examined using light microscope.

RESULTS AND DISCUSSION

Seed characteristics of medicinal plants in Umbelliferae studied with special emphasis on morphology and color were shown in Figs. 1, 2 and Table 2.

The bi-partite fruits in umbels are compound of 2-seeds (fruitlet)¹⁾. The following description for each species was made as follows:

1. *Bupleurum falcatum* (시호)

The seed was oblong and narrowly elongated at the hilum. It was divided into two parts by the persistent funiculus or carpa-

phore²⁾. At the tip, it carried the remains of the style. The surface was dull and wartlike protuberances. Color was brown to dip black. The midrib was prominently appeared on the oblique dorsal and on ventral has 2 ribs showing. It did not have any wing as the others. Seeds were about 4mm in length and 2mm in width. Thousand-seed weight was 1.7g(Fig. 1).

2. *Ostericum koreanum*(강활)

The seed was elliptic. The dorsal side was convexed with 3 longitudinal strong ribs, besides the marginal ribs. The ventral side was plain to somewhat concave with two deep oil tubes²⁾ starting at the top and running down

in a curve on each side of the central axis which was called commissure. The surface was dull and rugged. The seed is light-brown, to dark-brown, and is 6mm in length and 3mm in width. Thousand-seed weight was 2.9g(Fig. 1 and Table 2).

3. *Angelica dahurica*(백지)

The seed was about broadly elliptic or ovate, but the base was somewhat extended and bluntly truncate. At the tip the margin was turned backwards so that a small depression was formed carrying the remains of the style. The seed was flattened with the marginal, winged edge. The width of wing was 0.1 to 0.2mm. On the slightly convexed

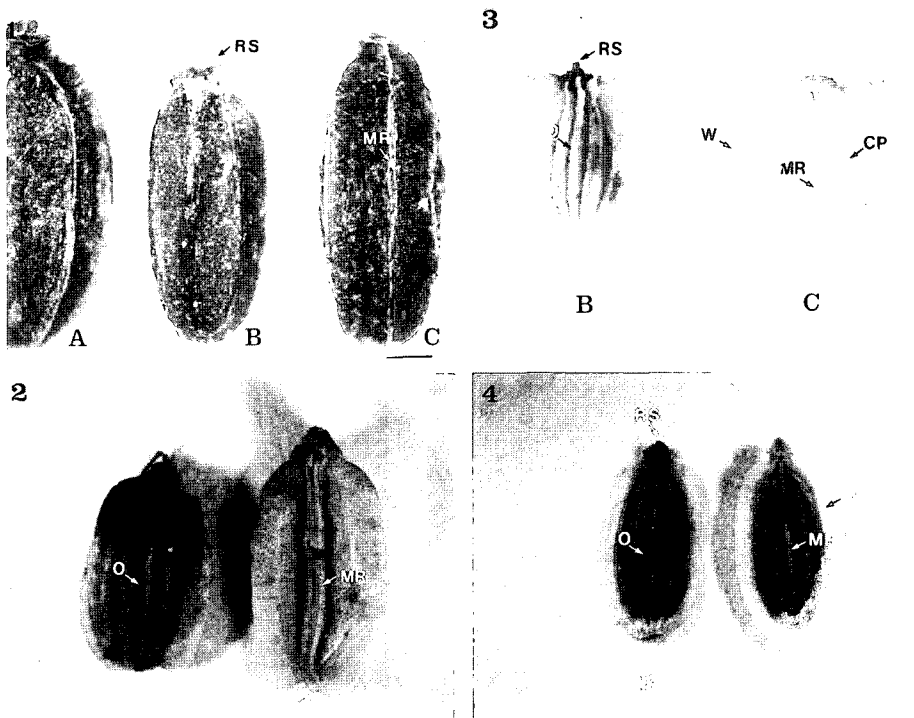


Fig. 1. The morphology of seeds in medicinal plants of Umbelliferae.

1. *Bupleurum falcatum*; 2. *Ostericum koreanum*; 3. *Angelica dahurica*; 4. *Anethum graveolens*.

A: Side view, B: Ventral view, C: Dorsal view.

CP: Carpophore, MR: Midrib, O: Oil-canal, RS: Remains of style, W: Wing, Bar scale=0.5mm.

Table 2. Characteristics of eight species of medicinal plant seeds in Umbelliferae

Species	Shape	Color	Length × width	1,000-seed weight
			mm	g
<i>Bupleurum falcatum</i>	Oblong	Brownish black	4×2	1.7
<i>Ostericum koreanum</i>	Elliptic	Brown	6×3	2.9
<i>Angelica dahurica</i>	Elliptic or ovate	Pale yellow	7×5	2.6
<i>Anethum graveolens</i>	Oblong or elliptic	Brown	3×2	0.9
<i>Angelica gigas</i>	Elliptic or ovate	Yellowish brown	7×5	3.9
<i>Foeniculum vulgare</i>	Oblong	Brown	6×2	3.3
<i>Ligusticum acutilobum</i>	Oblong or elliptic	Brown	3×2	2.0
<i>Ledebouriella seseloides</i>	Ovate	Brown	6×3	3.8

dorsal side, there was a slender fragile funiculus or carpophore²⁾. There were three longitudinal veins being narrowly separated at the middle of dorsal side. Next to these veins four oil-canals³⁾ start at the tip to the bottom. The ventral side was concave with two oil-canals starting lower down than those of the dorsal side. The surface was dull, and the color was pale yellowish on the dorsal side and ventral side. The seed was about 7mm in length and 5mm in width. Thousand-seed weight was 2.6g(Fig. 1 and Table 2).

4. *Anethum graveolens*(소회향)

The fruit was oblong or elliptic, dorsally flattened; ribs prominent the dorsal and intermediate narrow, the lateral conspicuously winged, about 0.05mm; oil-canals³⁾ solitary in the intervals, 2 to 4 on the commissure which was the part of a mericarp that adjoined the other mericarp. The size of seed was 3mm in length and 2mm in width. The color of the seed was brownish. Thousand-seed weight was 0.9g(Fig. 1 and Table 2).

5. *Angelica gigas*(당귀)

The seed was elliptic or ovate. The dorsal side was convexed with three longitudinal strong ribs besides the marginal ribs. The

ventral side was plain to somewhat concave with two deep brown oil canals³⁾ starting at the top and running down in a curve on each side of the central axis which was called commissure. The surface was dull, and color was light yellowish brown on the dorsal side and ventral side. The seed is 7mm in length and 5mm in width. The color of the seed is pale yellowish. Thousand-seed weight was 3.9g(Fig. 2 and Table 2).

6. *Foeniculum vulgare*(회향)

The seed was oblong slightly flattened laterally. Ovary 2-celled fruit, 2 one-seeded mericarp, eventually separating from the base upward. It had a slender, fragile funiculus or carpophore²⁾. The rib was slender, longitudinally grooved, and it carried the remains of style at the tip but prominent, oil canals³⁾ solitary in the intervals, 2 on the commissure. The seed size was 6mm in length and 2mm in width. Thousand-seed weight was 3.3g(Fig. 2 and Table 2).

7. *Ligusticum acutilobum*(일당귀)

The seed was oblong or elliptic, somewhat flattened laterally. The ribs was narrowly winged and, but almost invisible; oil-canals³⁾ 2 to 4 in the intervals 6 on the commissure; the seed was 3mm in length and 2mm in

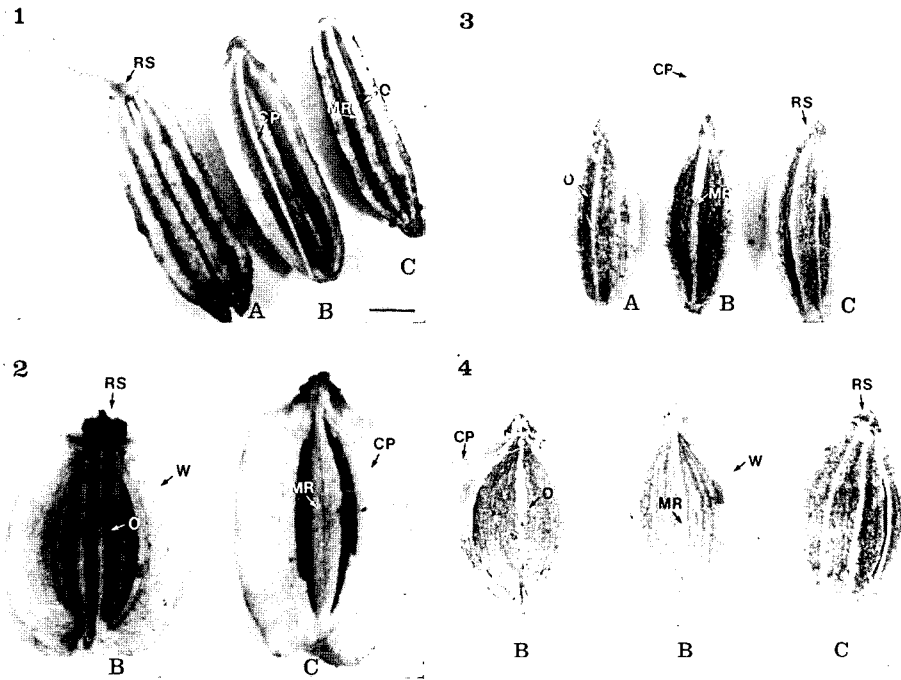


Fig. 2. The morphology of seeds in medicinal plants of Umbelliferae.

1. *Foeniculum vulgare*; 2. *Angelica gigas*; 3. *Ligusticum acutilobum*; 4. *Ledebouriella seseloides*.
 A: Side view, B: Ventral view, C: Dorsal view.
 CP: Carpophore, MR: Midrib, O: Oil-canal, RS: Remains of style, W: Wing, Bar scale=0.76mm.

width. There was very fragile funiculus or carpophore²⁾. The color of seed was brownish. Thousand-seed weight was 2.0g(Fig. 2 and Table 2).

8. *Ledebouriella seseloides*(방풍)

The seed was ovate in outline and the surface was dull and the color was yellowish brown to brown on the dorsal side and somewhat paler on the ventral side. The base was somewhat extended and slightly truncated at the tip. It had a slender, fragile funiculus or carpophore²⁾. The margin was turned backwards so that a small depression was formed carrying the remains of the style. The seed was flattened with marginal, winged edge, and 0.5mm wide. On the slightly convexed,

dorsal side there were three longitudinal veins being most widely separated at the middle. The oil-canal³⁾ was invisible. The seed was about 6mm in length and 3mm in width. The color of the seed is brownish. Thousand-seed weight was about 3.8g(Fig. 2 and Table 2).

적 요

산형과에 속하는 약용작물의 특성은 분열과로서 두 개의 종자가 형성되고 유관(油管)과 주병 혹은 果柄이 현저하게 특이한 모양을 나타내고 있어서 산형과 작물분류 뿐만 아니라 더 나아가서 종자의 특성이 식물분류에 이용되고 있다. 종자의 형태는 장방형, 타원형 그리고 난형이며 종피색은



Fig. 3. Anatomy of seed coat in *Bupleurum falcatum*.

H: Husk, EP: Epidermis, P: Pericarp testa, N: Nucellar tissue, A: Aleurone layer, EN: Endosperm, Bar scale=0.05mm.

열은 노란색에서부터 흑갈색까지 다양하다. 종자의 길이는 2~7mm 그리고 폭이 2~5mm이다. 이 중에서 가장 작은 종자인 시호는 그 천립중이 1.7g이고 가장 큰 종자인 당귀는 3.9g이다.

LITERATURE CITED

1. Chin J.I. 1984. Chinese Medicinal Plant Dictionary I, II and III. Dong Do Moon Hwa Sa, Seoul, Korea.
2. Gleason Henry A and Arthur Cronquist. 1963. Manual of Vascular Plants of Northern United States and adjacent Canada. pp. 508-516.
3. Kim B.W, Lee B.Y and Kim K.D. 1987. Studies on seed propagation method of *Oenanthe stolonifera* DC. I. Flowering habit seed structure and seed development of *O. stolonifera*. Agric. Res. Seoul Nat'l Univ. 12(1):15-20.
4. Lee C.B. 1980. Manual of Vascular Plants of Korea. Hyang Moon Sa, Seoul, Korea. pp. 577-592.