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Edible Sprout Production from *Ainsliaea acerifolia* Seeds

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ABSTRACT

This study was carried out to investigate the morphological characteristics of the plants and seeds of Ainsliaea acerifolia and to determine the optimum condition for producing sprouts from the seeds. Plant height, flower stalk length, and pod number were higher in natural habitat than in campus farm. Average 1.2 seeds per pod was set but only 0 to 2 seeds per plant was set in plants with the enveloped flower stalks, indicating that this is an outcrossing species. Most of seeds were 9-11mm long and 1.1-1.4mm wide. Fresh weight of seeds was ranged from 10mg to 17mg. Seeds germinated well at 15° C and 20° C. Mean germination period was 11.5 day at 15 to 25° C. Sprouts grown at 15° C was longest(5.4cm) and heaviest(738mg/10 sprouts). Chlorophyll content was 333mg per fresh weight 100g. Protein, Fe, vitamin B1, vitamin B2, and vitamin C were respectively 23.7mg, 6.4mg, 1.82mg, 0.49mg, and 10.7mg.

Key words : plant morphology, seed germination, sprout growth, chlorophyll, general components, *Ainsliaea acerifolia*

INTRODUCTION

Korean food markets have many wild food plants that are gathered from its fields and forests. Korea lies within an area approximately from 33-37 degrees north latitude and 126-130 degrees east longitude. The peninsula has a strongly seasonal climate with hot monsoonal summers and cold, dry winters. Annaual precipitation for Korea is 1300mm. The country is very mountainous and lowlandhills are vegetated with warm temperate deciduous forests of mixed hardwoods and pine. In the mountains, from 600 masl to the summits near 1600 masl, are cool temperate deciduous forests mixed with Pinus and Abies(Pemberton and Lee, 1996).

Ainsliaea acerifolia is native to Korea, which is found in the mountains from 500masl to 800masl. Young leaves of the species has been traditionally used as a wild vegetable. Fresh leaves of this plants are usually picked out from natural habitats and used as a fresh vegetable. They are also preserved with salts for using as a storage food. However, it is not still cultivated by farmers because the cultivation practices were not developed. Utilization of the species has been limited to some of local people because its nutritive values were unknown scientifically. Therefore, an attempt for propagation, cultivation, and utilization of this species is needed to be tried. Especially, the seeds

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of this species seems to be very suitable for producing a sprout food.

In Korea, soybean sprouts and mungbean sprouts has been traditionally popular. Buckwheat sprouts were recently developed for its diverse use(Kim et al., 1998).

This study was carried out to investigate the morphological characteristics of the plants and seeds of *Ainsliaea acerifolia* and to determine the optimum condition for producing sprouts from the seeds.

MATERIALS AND METHODS

Plant materials used in this experiment were gathered from 650 masl of Mt. Yeonyeop near Chunchon. Thirty plants in natural habitat were randomly designated for morphological study. Another thirty plants were digged out and transplanted to open air field with shading on campus farm. Those plants *in situ* and *ex situ* were investigated and compared each other for plant height, leaf number, leaf length, leaf width, flower stalk length, and flower number.

To determine the mode of pollination, the selected flower stalks of the plants were put in parafin envelopes to protect pollinaters and investigated whether seeds are set or not on 4 weeks later.

Seed characteristics were determined by measuring seed length, seed width, and seed fresh weight. Seeds were stored in a 4° C refrigerator for four months after harvest. The seeds were sterilized with 4% sodium hypochlorite solution for 10 minutes and soaked in cold water for 24 hours. Germination test was done with 50 seeds on petri dishes with filterpapers in three replications under the dark condition at 10° C, 15° C, 20° C, and 25° C.

Sprouts germinated from the seeds were measured for length and fresh weight on 7 days after germination. The sprouts were exposed to light for two days to make be greenish and then measured for chlorophyll content as described by Hiscox and Israelstam(1979).

General component of the sprouts were analyzed by the standard procedure of the Korean Food Research Institute.

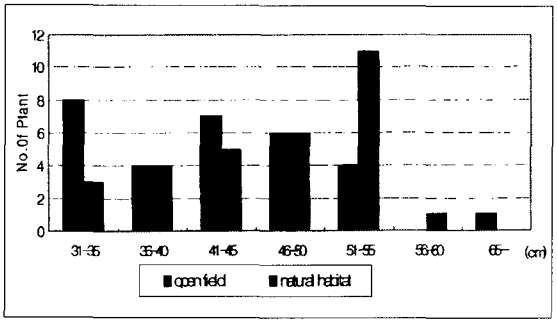
RESULTS AND DISCUSSION

Plant height, leaf number, leaf length, leaf width, petiole length, flower stalk length, and pod number were investigated *in situ* and *ex situ*(Fig. 1). There was not much difference in morphology between plants *in situ* and *ex situ*. Plant height, flower stalk length, and pod number were higher in natural habitat than in campus farm, indicating the consistence of environment in late growing season. Average plant height of *Ainsliaea acerifolia* was 47.1cm *in situ* and 43cm *ex situ*. Average leaf number per plant was 4.8 *in situ* and 5.3 *ex situ*. Petiole was longer in open air field (9.1cm) than in natural habitat(7.3cm) while average pod number was 8.1 in natural habitat and 6.4 in open air field.

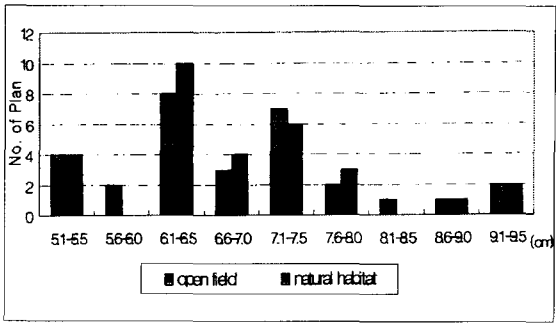
Average 1.2 seeds per pod was set but only 0 to 2 seeds per plant was set in plants with the enveloped flower stalks, indicating that this is an outcrossing species.

The seed characteristics of *Ainsliaea acerifolia* are shown in Fig. 2. Seed length was ranged from 7.9mm to 11.2mm while seed width was ranged from 1.0mm to 2.3mm. Most of seeds were 9-11mm long and 1.1-1.4mm wide. Fresh weight of seeds was ranged from 10mg to 17mg and averaged 12.5mg. After 3 to 4 days buckwheat sprouts were grown up to 12-15cm long and 0.9-1mm in their hypocotyl diameter(Kim et al., 1998).

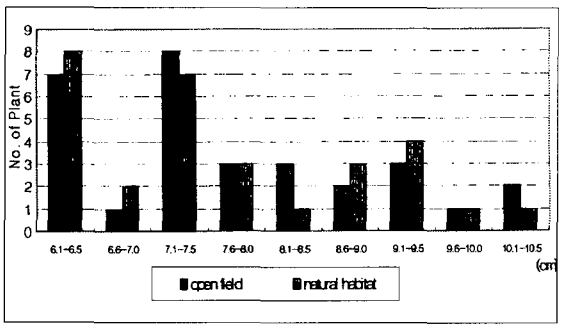
Seeds germinated well at 15° C(95%) and 20° C(97%)(Table 1). Mean germination period was 20 days at 10° C but 11.5 day at other higher temperatures. Cho et al.(1997) demonstrated that germination rates of *Ligularia fisheri* and *Synurus deltoides* were relatively higher at 15° C. Kwon(1992, 1993) had found the highest germination rate at 15° C in *Aster scaber*.



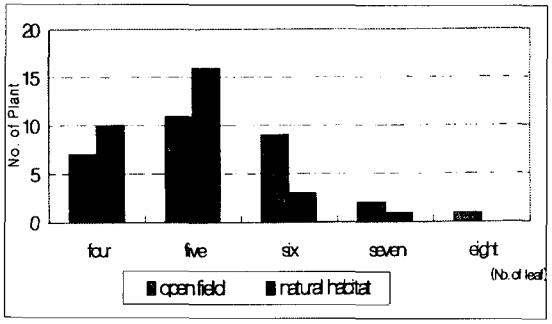
Plant length



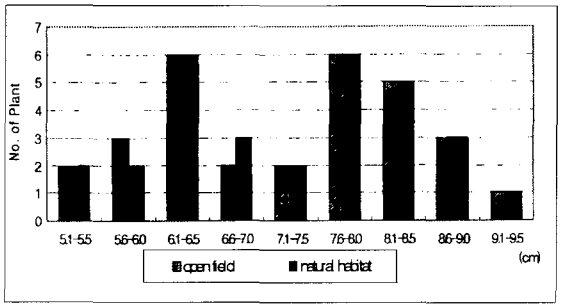
Leaf length



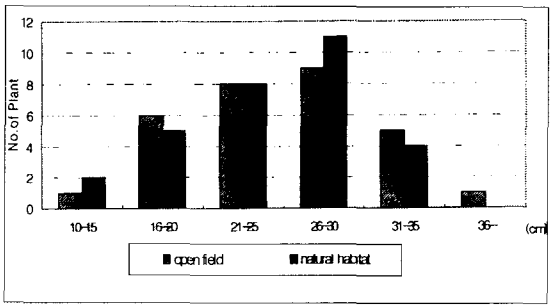
Leaf width



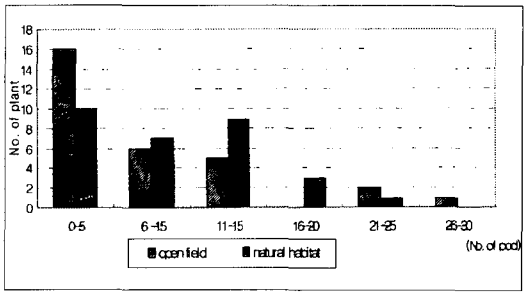
No. of leaf



Petiole length

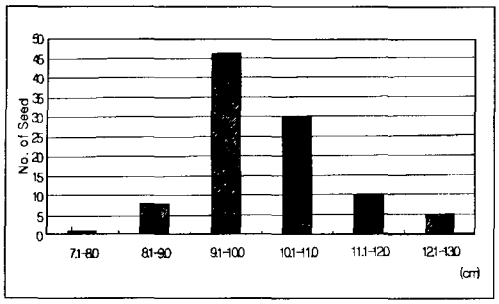


Flower stalk length

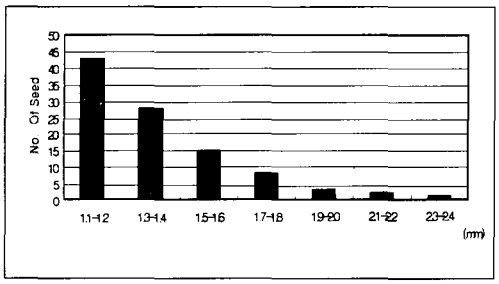


No. of pod

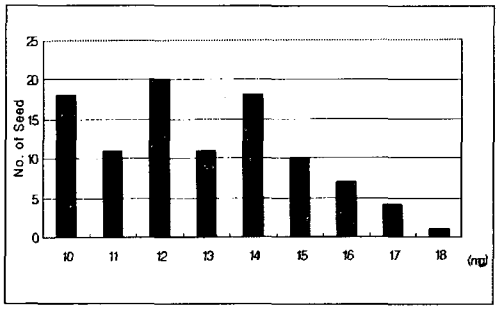
Fig. 1. Comparison of morphological characteristics between plants grown in natural habitat and plants grown in open aerial field.



Seed length



Seed width



Seed Weight

Fig. 2. Length, width, and fresh weight of Ainsliaea acerifolia seeds.

Table 1. Effect of temperature on seed germination and germination period of *Ainsliaea acerifolia*

Temperature	10℃	15℃	20℃	25℃
Germination period (day)	19.9a	11.5b	11.5b	11.5b
Germination rates (%)	23.3c	95.0a	96.7a	88.3b

Table 2. Growth characteristics of *Ainsliaea acerifolia* sprouts.

Temperature(℃)	Length of sprout(cm)	F.W. of sprout (mg/10sprouts)
15℃	5.4a	738a
20℃	5.1a	708a
25℃	4.6a	704a

Growth response of sprouts to temperature was determined by measuring the increased length and fresh weight of sprouts during given time(Table 2). Sprouts grown at 15° C was longest(5.4cm) and heaviest(738mg /10sprouts) among the sprouts grown at other higher temperatures. Kim et al.(1994) reported that the germination rate was high in small seed size of soybeans, which was ranged 89.7% - 98.6% and the yield of soy sprout compared to grain weight in each variety were ranged from 556% to 684%. They had also found that the growth rates of soy sprouts were almost linear relation with cultivation days, especially, the initial

Fig. 3. Flowers(A) and seeds(B) of *Ainsliaea acerifolia*.

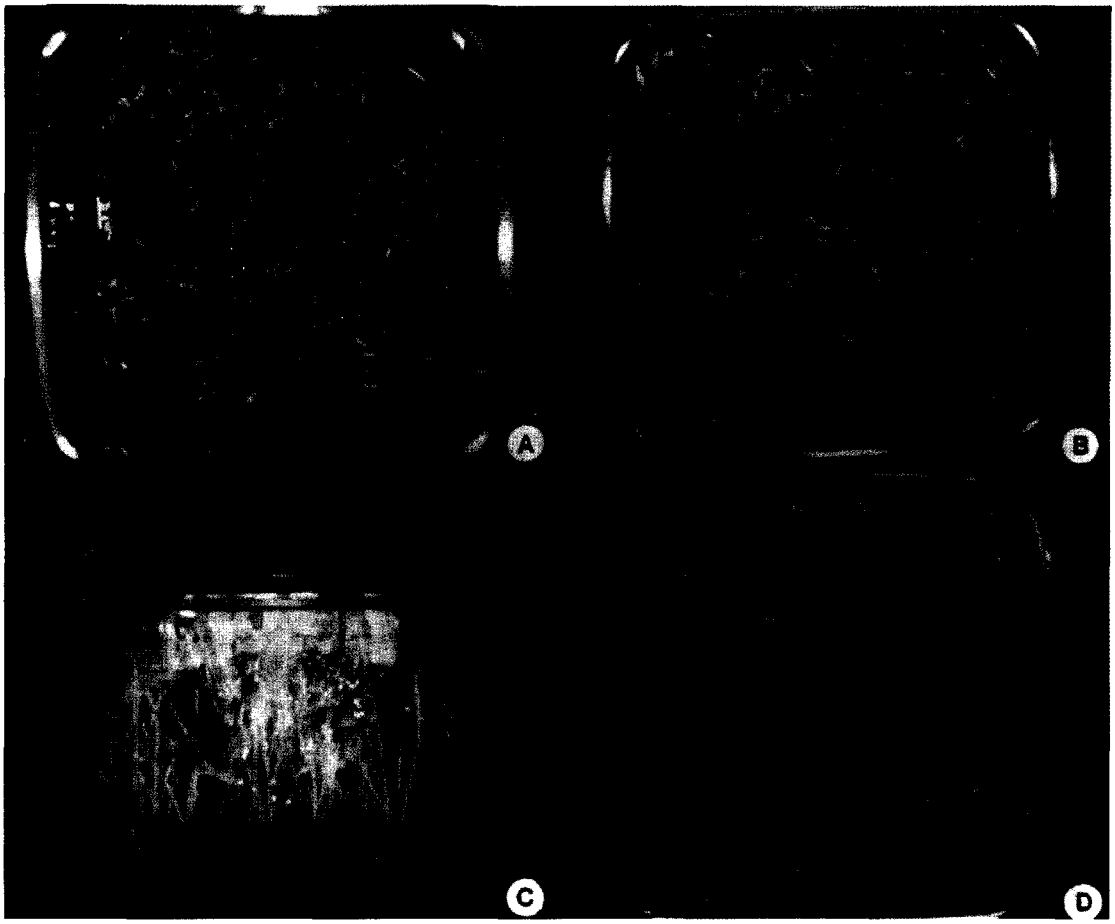


Fig. 4. Sprouts of *Ainsliaea acerifolia* A: seeds germinated 6 days after inoculation, B, C: yellow sprouts 15 days after germination. D: green sprouts 21 days after germination.

Table 3. Chlorophyll coctents and nutritive value of *Ainsliaea acerifolia*.(mg/g)

Components / Species	Chlorophyll (mg)	protein (mg)	Lipid (mg)	Fiber (mg)	Fe (mg)	Vitamin B_1 (mg)	Vitamin B_2 (mg)	Vitamin C (mg)
Ainsliaea acerifolia	333	23.7	6.0	20.4	6.4	1.82	0.49	10.7

growth rates were high within 3 days.

The chlorophyll content and general components in leaves of *Ainsliaea acerifolia* are shown as Table 3. Chlorophyll content was 333mg per fresh weight 100g. It was relatively higher compared to other wild plants which were studied previously by Cha(1964). Protein content(23.7mg/fresh weight 100g) in *Ainsliaea acerifolia* was 5 to 10 fold compared to the matured leaves of *Ligularia fischeri*(4.6mg), *Aster scaber* (2.3mg), *Brassica rapa*(1.3mg), and *Spinacia oleracea* (2.6mg). Lipid(7 to 60fold), fiber(5-40fold), Fe(4-13fold), and vitamin(B1, B2, C) were also higher in *Ainsliaea acerifolia* than in the matured leaves of other vegetables exampled above. Minerals except for Fe and

vitamin A were not analyzed in this experiment and thus further study is needed. Buckwheat sprouts provided an abundance of such nutrition as protein, amino acids, minerals, and crude fiber(Kim et al., 1998).

REFERENCES

Pemberton R. Lee N.S. 1996. Wild food plants in South Korea; market presence, new crops, and exports to the United States. Economic Botany 50(1):57-70.

Cha J.H. 1964. General componet analyses of Korean wild edible plants(I). Vitamin, chlorophyll and carotene contents in wild plants. Kor. J. Botany 20(4):1-8.

Cho D.H., Park C.H., Park B.J., Shin S.E., Lee K.C., Yu C.Y., Ahn S.D. 1997. Effects of growth regulators, temperature, and light on the germination in wild vegetables(Chwinamil) seeds. Kor. J. Plant Res. 10(1):39-44.

Hiscox J.D., Israelstam G.F. 1979. A method for the extraction of chlorophyll from leaf tissue without maceration. Can. J. Bot. 57:1332-1334.

Kim S.L, Son Y.K., Hwang J.J., Kim S.K., Hur H.S. 1998. Development of buckwheat sprout as a functional vegetale. RDA. J. Crop Sci. 40(2):191-199.

Kim Y.H. Kim S.D., Hong E.H. 1994. Characteristics of soy sprouts cultivated with soybeans for sprout. RDA J. Agri. Sci. 36(2):107-112.

Kwon T.R., Cho J.H., Kwon Y.S., Lee S.P. 1992. Domestication of Korean native plants. Annual reports of Kyoungpuk RDA pp456-471.

Kwon T.R., Cho J.H., Kwon Y.S., Lee S.P., Choi B.S. 1993. Dormancy breakage and germination stimulation of potential wild vegetable seeds. J. Agr. Res. 35(2):416-421.

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