Korean J. Plant Res. 21(3) : 192~195 (2008)

Agronomic Characteristics of *Alisma plantago* as Affected by Transplanting Dates of in Southern Parts of Korea

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Abstract - This study was conducted to find out some important agronomic characteristics and qualities in response to different transplanting dates in *Alisma plantago* at southern parts of Korea. Yield components such as number of floral axis per plant, plant height and number of leaves were highest at the transplanting date of Aug. 15 and Aug. 25. Plants sown at Aug. 15 and Aug. 25 also showed highest yield. Considering from our results, optimum transplanting date were semed to be transplanting date of Aug. 15 and Aug. 25.

Key words - *Alisma plantago*, Transplanting dates, Quality, Yield

Introduction

Alisma plantago is grown mainly in medicinal plants and as one of the most important cash crops in Korea, providing good quality for diuresis, vomit, gonorrhea, kidney trouble, and poor digestion (Park *et al.,* 1993, 2000; Kwon *et al.,* 1994, 1997, 2000, 2001a, 2001b, 2001c, 2002, 2003, 2004, 2005; Shin *et al.,* 2000, 2001; Kim *et al.,* 2000).

Sunchon region of Korea is the most important production area of *Alisma plantago*. Integrated cultural techniques for successful *Alisma plantago* production have been developed through research works conducted at the Sunchon National University (Kwon *et al.,* 1994, 1997, 2000, 2001a, 2001b, 2001c).

There were many researches for increasing *Alisma plantago* productiveity (Hyun *et al.,* 2006; Shin *et al.,* 2006).

But there was not any research work on the proper transplanting time and floral axis setting for yield and major agronomic characteristics in *Alisma plantago*.

Therefore the purpose of this study is to examine about floral axis setting and proper transplanting time for yield.

Materials and Methods

This experiment was conducted at farmer's field located at Yongjun-ri, Haeryong-myon, Sunchon city, Chonnam, Korea that is the major production area of the *Alisma plantago* from July, 2003 to December, 2007.

Alisma plantago variety, Yongjun local was used in this study. Arable soil layer had pH 5.2 and 2.3% organic matters and 97 ppm phosphate, but contents of K,Ca and Mg were low as shown in Table 1.

Seeds were sown with broadcast sowing on flooded nursery in July 20 and Transplanting were transplanted in to main paddy field on Aug. 15, Aug. 25, Sept. 5, Sept. 15 and Sept. 25, Oct. 5, respectively with 20 × 15cm.

Seed beds apply 25kg of complex fertilizer (21-17-17) and 200 kg of compost at the area of 66m² and after making seed bed of 120cm was made in wide, the mixture of 1ℓ of seed and 10ℓ of sand are sown equally on the whole surface of seed bed. The complete randomized black design was used and treatment was randomized in each of the three blocks. The size of each experimental plot was 20m² (4 × 5m).

Water was irrigated only for furrow before it sprouts after seeding and the vinyl tunnel was installed for preventing the loss of seeds by showers. When it sprouted completely after 10 days of seeding at 10 days after sawing, water is provided to top by night and it was provided only for furrow by day.

Water is provided more and it was managed by the depth of 3cm. Amount of application to the main paddy field was 100kg of complex fertilizer (21-17-17) per 10a and 2,000kg of compost and 50kg of urea was applied as based fertilizer in 30 days of transplantation at 30 days after transplanting and 50kg of urea.

For the prevention of damages by blight and harmful insects, Chlorothalonil-Wp, 75% of Daconil (30g/20l), product in Kyungbuk

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Table 1. Soil properties of the experimental plot at the beginning of experiment

PH	OM	P_2O_5	Ex-(me/100g)			CEC	SiO_2
(1:5)	(%)	(ppm)	K	Ca	Mg	(me/100g)	(ppm)
5.7	2.3	97	0.29	4.0	1.6	9.4	95

agricultural chemicals company is applied for preventing Brown leaf blight, Inidacloprid-Wp, 10% of Konido (20l/10g), product in Kyungbuk agricultural chemicals company for aphides and Tebufenozide-Wp, 8% of Mimic (20l/20g), product in Kyungbuk agricultural chemicals company for *spodoptera exigua* by three times at intervals of 10 days after 10 days of transplantation.

Other controls conform to the cultivation of second cropping *Alisma plantago* of early cultivated rice at farmhouse, Haeryong-myeon, Suncheon-city and when flower stalk buds in the flowering time, the lower part of the roots was cut before hardening. For the investigation of growth and characteristics, 20 samples showing uniform growth are selected and the examination method was based on the standard of medicinal crops of Rural Development Administration (R.D.A. 1989).

Results and Discussion

Agronomic characteristics

The means of floral axis formation date, flowering date, number of floral axis per plant, plant height, number of leaves, injury of disease and insect and the statistical analysis for the agronomic characteristics were presented in Table 2.

Floral axis formation date was earlier than the other transplanting dates at the transplanting date of Aug. 15 and Aug. 25 and it was earlier to Sept. 10. The later transplanting dates showed later values in floral axis formation date ranged from Sept. 15 to Sept. 30.

Flowering date at the transplanting date of Aug. 15 and Aug. 25 was earlier with Sept. 15 and other transplanting dates showed later values.

Plant height was higher at the transplanting date of Aug. 15 and Aug. 25 and it ranged from 72 to 74cm. The later transplanting dates showed lower values shorter than the other earlier transplanting dates in plant height ranged from 50 to 63cm.

Number of leaves at the transplanting date of Aug. 15 and Aug. 25 was more from 21 to 23 and other transplanting dates showed lower values in number of leaves from 14 to 20.

Plants at transplanting date of Aug. 15 to Aug. 25 showed lower values in disease and insect pest with degree I and other transplanting dates showed higher values in disease and insect pest from 2 to 3.

Yield and quality characteristics

The means of fresh rhizome yield, dried skin rhizome yield and quality of color and luster were presented in Table 3.

Table 2. Variation of agronomic characteristics of *Alisma plantago* by different transplanting date

Transplanting	Floral axis	Flowering	No. of floral	Plant height	No. of	Disease and insect pest (1-9)		
date	formation date	date	axis/plant	(cm)	leaves	*Blb*	*Rn*	*Se*
Aug. 15	Sept. 10	Sept. 15	6	72	21	1	1	1
Aug. 25	Sept. 10	Sept. 15	7	74	23	1	1	1
Sept. 5	Sept. 15	Sept. 20	6	63	20	2	2	2
Sept. 15	Sept. 20	Sept. 25	4	56	19	2	3	3
Sept. 25	Sept. 25	Sept. 30	3	54	17	3	3	3
Oct. 5	Sept. 30	Oct. 5	2	50	14	3	3	3
Mean ± SD	-	-	5 ± 2.4	61.5 ± 3.7	19 ± 1.8	2.2 ± 0.2	2.3 ± 0.3	2.3 ± 0.2
F value		275.30	57.7	89.5	82.7	44.6	51.4	62.3
L.S.D. (0.05)		0.84	0.6	0.5	2.6	1.7	0.1	0.1

Blb: Brown leaf blight.
Rn: *Rhophalasiphum nymphaeae* (linnaeus).
Se: *Spodoptera exigua.*

Table 3. Variation of yield and quality of *Alisma plantago* by different transplanting date

Transplanting date	Fresh rhizome yield (kg/10a)	Dried skin rhizome yield (kg/10a)	Quality	
			Color	Luster
Aug. 15	792.9	262.2	White (3)	Shine (3)
Aug. 25	984.8	286.7	Heavy white (4)	Light shine (4)
Sept. 5	752.4	249.4	White (3)	Shine (3)
Sept.15	738.5	224.5	Soft white (2)	Dark shine (2)
Sept. 25	702.8	181.3	Yellow (1)	Yellow (1)
Oct. 5	621.7	144.7	Yellow (1)	Yellow (1)
Mean ± SD	765.5 ± 88.2	224.8 ± 43.4	-	-
F value	48.5	26.4	4.7	4.7
L.S.D. (0.05)	41.7	21.8	1.3	1.3

Plants at transplanting date of Aug. 15 and Aug. 25 showed heavier values in fresh rhizome yield and dried rhizome yield than plants at any other transplanting date.

Dried skin yield, it ranged from 262kg/10a at Aug. 15 to 286 kg/10a at Aug. 25 which was higher than that of any other transplanting date ranged from 144kg/10a to 249kg/10a.

The results may be Attributable to the facts that high temperature in late August nothing hindered early growth of *Alisma plantago*.

According to park *et al.* (1993), Kwon *et al.* (1994), Kwon *et al.* (2000) and Kim *et al.* (2000), transplanting date affected fresh rhizome yield and dried skin rhizome yield of *Alisma Plantago*.

Based on the results obtained so far, plants grow more upwards as early transplanting date was higher.

At early transplanting individual plants grow more vigorously because of less severe competition for light, soil water and mineral nutrients among plants.

Transplanting date at Aug. 15 and Aug. 25 showed relatively good quality values with heavy white (4) and white (3) in color and light shine (4) and shine (3) in luster.

As a results, the optimal transplanting date of *Alisma plantago* seems to be ranged from Aug. 15 to Aug. 25 at the southern area of Korea.

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(Received 8 May 2008 ; Accepted 12 June 2008)