

Response of *Alisma plantago* Varieties Cultivated After Early Maturing Rice Cropping to Fertilizer Levels

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ABSTRACT

This study selects Sunwol local group, Gusang local group and Yongjun local group to examine the appropriate amount of applied fertilizer in cultivating the double crop seed of *Alisma plantago* by transplantation in the southern area, improve and complements the double cropping techniques and contribute to stable production. While the plant height is 45, 47 and 49cm and the number of leaves is 11.7, 12.5 and 14.4 at non-fertilizing plot, the plant height is 67, 72 and 75cm and the number of leaves is 15.8, 17.2 and 19.3 at all fertilizing plot and their growth is active and in the character of plant height and the number of leaves, especially in the groove of N-P₂O₅-K₂O = 30-15-45kg/10a, the mean plant height of Sunwol is 75cm and mean number of its leaves is 19.3, the mean plant height and number of leaves in Gusang are 72cm and 17.2 respectively and those of Yongjun are 67cm and 15.8 respectively. While the number of floral axis is 1, 2 in non-fertilizing plot, that of the whole varieties in all fertilizing plot is 3, 4, 5 and the mean floral axis of Sunwol is N-P₂O₅-K₂O = 10-5-15, 20-10-30, 30-15-45 kg/10a and 18-0-18 of complex fertilizer and 21-17-17kg/10a and it is small in all fertilizing plot. The yield of dry root per 10a is high in all fertilizing grooves and especially in the groove of N-P₂O₅-K₂O = 30-15-45 kg/10a, it is 372.6kg, in the groove of 18-0-18kg/10a using complex fertilizer, it is 389.1kg and in that of 21-17-17kg/10a, it is 376.7kg.

Key Words : *Alisma plantago*, fertilizer levels, dry root yield

INTRODUCTION

It is widely known that the fertilizing reaction of crop is varied depending on such factors as soil, weather and variety, but how fertilizing effect and the appropriate amount of applied fertilizer are varied by

related factors have not concretely revealed (Mokpo Agriculture, 1990 ; Ryu et al, 1994 ; Lee et al, 1994 ; Kim et al, 1992 ; Park, 1992). Because the reaction of applied fertilizer has not simple relation to each factor, but it is shown as the interaction among factors and then many field tests are required and the analysis of them is complex.

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It was reported that in the appropriate transplanting period and planting density test of second cropping *Alisma plantago* of rice in middle mountain area in 1991 by Ryu et al (1994), rhizome is large when it is transplanted in the 30th of July and its quantity is great and it is increased in planting density of 20 x 25cm, and in the second cropping *Alisma plantago* test of early cultivated rice at southern plain, its quantity is greatest in transplanting in the 20th of July with planting density of 20 x 35cm.

In the test of seeding period to days of rearing seedling between 1988 and 1989 by Choi et al (1990), the quantity of rearing seedlings for 30 days which are sown in the 30th of June is greatest and in planting density test, its yield was increased in the density of 20 x 35cm.

This test reports some results as a result of examining the reaction of appropriate amount of applied fertilizer when it was planted by second cropping of early cultivated rice with the planting density of 20 x 35cm in the 30th day of August.

MATERIALS AND METHODS

This test was conducted at the farm field located at Haeryong-myeon, Suncheon-city, Chonnam with three repetitions of randomized block design from July to December, 1999 and Yongjun local group, Sunwol local group and Gusang local group was used as test variety.

25kg of complex fertilizer (21-17-17) and 200kg of compost are applied at the area of 66m² in the 20th of July and then the mixture of 1 l of seed and 5 l of sand is evenly sown on the whole seedbed after making the narrow rice-nursery type seedbed of 120cm wide. Water is provided to the furrow before sprouting after sowing and vinyl tunnel is installed to prevent the loss of seeds by a shower. When it puts forth the bud after 10 days of sowing, water is provided to the upper side at night and it is collected in furrow by day. As nursery

grows, water is added a little and it is managed with the depth of 3cm.

It is transplanted at the main rice field in the 30th of August with the planting density of 20 x 35cm and 100kg of complex fertilizer (21-17-17) per 10a and 2,000kg of compost are used in transplanting and 50kg of urea is applied as the first additional fertilizer after 30 days of transplantation and 50kg of urea is used as the second additional fertilizer in 60 days of transplantation.

For the prevention of damages by blight and harmful insects, Chlorothalonil-Wp. 75% is applied for preventing Brown leaf blight, Imidacloprid-Wp. 10% for aphides and Tebufenozide-Wp. 8% 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 root is cut before hardening.

For the investigation of growth and characteristic, 20 samples showing uniform growth are selected and the examination method is based on the standard of medicinal crops by the Office of Rural Development.

The physical and chemical composition of surface soil layer is performed at the soil with much contents of organic matters and phosphate and pH 5.2 shown in Table 1. The amount of applied fertilizer is in the same level as shown in Table 2.

RESULTS AND DISCUSSION

1. Condition of plant height

In the condition of plant height on the aerial part by the amount of applied fertilizers according to the fertilizing conditions of second cropping *Alisma plantago* of early cultivated rice, while plant height

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

pH(H ₂ O)	EC	OM	T-N	Av. P ₂ O ₅	Ex. cation(cmolt/kg)			SiO ₂
					K	Ca	Mg	
1 : 5	(ds/m)	(g/kg)	(mg/kg)	(mg/kg)				
5.2	0.093	20.7	0.34	952	0.66	3.74	0.98	40

Table 2. Combined application levels of fertilizers on *Alisma plantago L.*(kg/10a)

No.	Basic dressing	Top dressing			
		1st	2nd	3rd	
	N - P ₂ O ₅ - K ₂ O		N		
1	0 - 0 - 0	(0 - 0 - 0)	0	0	0
2	22 - 25 - 25	(10 - 5 - 15)	40	30	30
3	43 - 50 - 50	(20 - 10 - 30)	40	30	30
4	65 - 75 - 75	(30 - 15 - 45)	40	30	30
5	Compound fertilizer 100 (18 - 0 - 18)		40	30	30
6	Compound fertilizer 100 (21 - 17 - 17)		40	30	30

() : Amount of ingredient

shows 49cm for Sunwol local group, 47cm for Gusang local group and 45cm for Yongjun local group at the plot of N-P₂O₅-K₂O = 0-0-0 kg/10a, 68cm, 67cm and 65cm at the plot of 10-5-15kg/10a respectively and it is larger at the plot of 20-10-30kg/10a as 71cm, 69cm and 66cm respectively and it is increasingly grown at the plot of 30-15-45kg/10a as 75cm, 72cm and 67cm respectively. At the plot of 18-0-18kg/10a with complex fertilizer, Sunwol local group is 70cm, Gusang local group is 68cm and Yongjun local group is 66cm and at the groove of 21-17-17kg/10a, these are larger as 73cm, 71cm and 70cm respectively.

In the condition of growth of plant height by varieties based on the amount of applied fertilizer, Sunwol local group is greatest, followed by Gusang local group and Yongjun local group.

The number of floral axis is one in Sunwol, two in Gusang and Yongjun and three in Yongjun at the plot of N-P₂O₅-K₂O = 0-0-0 kg/10a and two in Sunwol, three in Gusang and four in Yongjun at the plot of 20-10-30kg/10a and 30-15-45kg/10a as shown in Fig. 2. Sunwol is three, Gusang is four and Yongjun is five at the plot of 18-0-18kg/10a and 21-17-17kg/10a with

complex fertilizer and it is found that as the amount of applied fertilizer is larger, the number of floral axis is more and in the condition of floral axis by varieties according to the amount of applied fertilizer, Sunwol is least, followed by Gusang and Yongjun.

In the number of leaves, Sunwol has 14.4, Gusang has 12.5 and Yongjun has 11.7 at the plot of N-P₂O₅-K₂O = 0-0-0 kg/10a, 16.4, 14.7 and 13.5 respectively at the plot of 10-5-15kg/10a, 18.6, 16.6 and 15.5 respectively at the plot of 20-10-30kg/10a and 19.3, 17.2 and 15.8 respectively at the plot of 30-15-45kg/10a.

At the plot of 18-0-18kg/10a with complex fertilizer, Sunwol has 16.5 leaves, Gusang has 15.4 and Yongjun has 14.3, 17.8, 16.6 and 14.8 at the plot of 21-17-17kg/10a and as the amount of applied fertilizer is more, the number of leaves is larger. On the condition of growth of leaves, Sunwol is best, followed by Gusang and Yongjun.

All fertilizing plots show higher growth in all growth characters than non-fertilizing plots, and the plot of N-P₂O₅-K₂O = 30-15-45 kg/10a of fertilizing plots shows the highest growth, followed by the plot of N-P₂O₅-K₂O

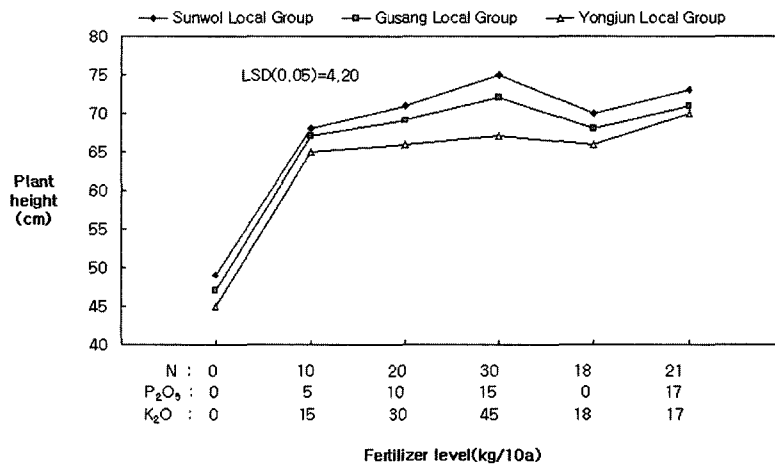


Fig. 1. Changes of plant height in different fertilizer level *Alisma plantago*

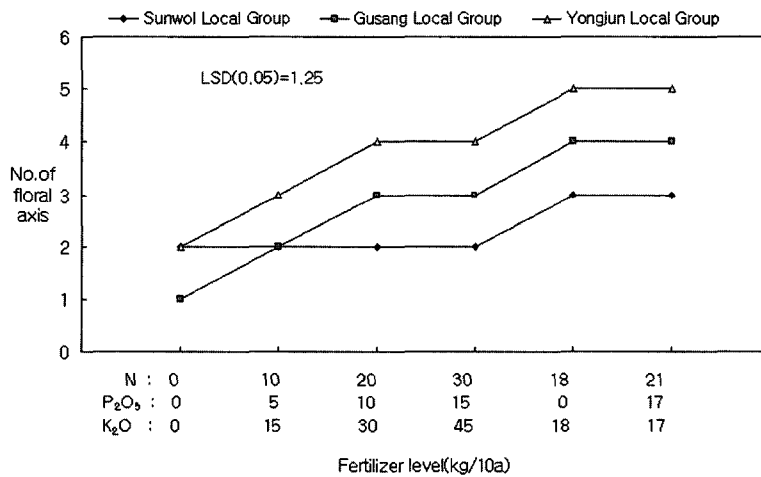


Fig. 2. Changes of NO. of floral axis in different fertilizer level *Alisma plantago*

= 20-10-30 kg/10a, 18-0-18kg/10a groove using complex fertilizer and 21-17-17kg/10a plot.

2. Variation of Quantity of Root

Since most of the farmhouses cultivating second cropping *Alisma plantago* of early cultivated rice use chemical fertilizers, the characteristics of forms at surface and subsurface with different fertilizer levels are examined to trace the appropriate amount of fertilizers and the difference of quantity of roots according to the amount of applied fertilizers is confirmed.

Consequently, the yield of dry root at subsurface is 223.0kg in Sunwol, 188.5kg in Gusang and 167.3kg in Yongjun at the plot of N-P₂O₅-K₂O = 0-0-0 kg/10a, 262.1kg, 251.9kg and 244.1kg respectively at 10-5-15kg/10a, 307.6kg, 287.1kg and 269.7kg respectively at 20-10-30kg/10a plot and 372.6kg, 361.7kg and 342.1kg respectively at 30-15-45kg/10a plot. Sunwol is 389.1kg, Gusang 366.9kg and Yongjun 343.2kg at 18-0-18kg/10a plot using complex fertilizer and 376.7kg, 345.4kg and 337.8kg respectively at 21-17-17kg/10a plot, and it is found that all fertilizing plot have much

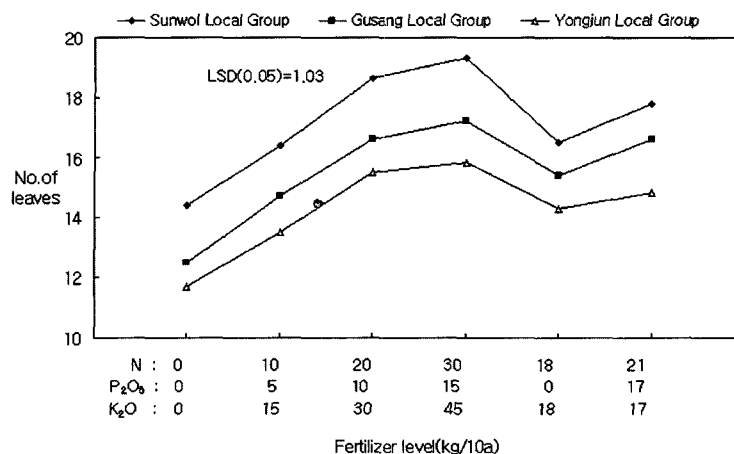


Fig. 3. Changes of NO. of leaves in different fertilizer level *Alisma plantago*

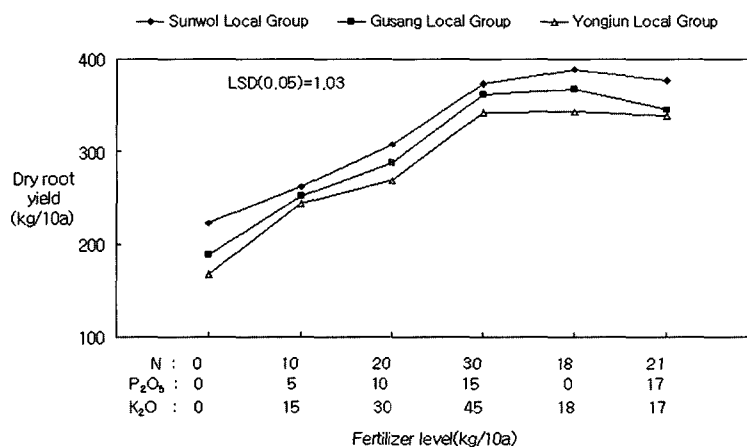


Fig. 4. Changes of Dry 200t yield in different fertilizer level *Alisma plantago*

Table 3. Analysis of variance for yield and agronomic characters.

Factor	df.	plant height	No. of leaves	Floral axis	Dry root yield(kg/10a)
<Main plot>					
Replication	2	0.50	0.85	0.69	1378.97
Variety group(Vg)	2	72.00**	34.99**	10.24**	6486.13**
Error(a)	4	1.25	0.32	0.27	95.99
<Sub plot>					
Fertilizer level(F)	5	783.82**	23.83**	6.61**	44138.21**
Vg × F	10	6.36**	0.39	0.57	158.03
Error(b)	30	0.98	0.70	0.32	308.47

quantities in comparison with non-fertilizing grooves and it is because phosphate is accumulated excessively on arable soil layer of experimental field.

The reasons that major complex of double cropping of *Alisma plantago* at Haeryong-myon, Suncheon, Chonnam are lower maximum temperature and higher minimum temperature than inland area owing to oceanic climate peculiar to the southern area and it controls the high temperature obstacle in summer (Kwon et al, 2000) and when typhoon strikes, damage from lodging can be reduced at the ocean area because of long plant height, but the double cropping can reduce the damage from typhoon because of short plant height (Kwon et al, 2000). Accordingly, it is better to harvest early cultivated rice in the middle of August and cultivate *Alisma plantago* by transplantation in the late August in the southern area and for the amount of applied fertilizer, the use of N-P₂O₅-K₂O = 30-15-45 kg/10a, complex fertilizer (18-0-18) 100kg/10a or (21-17-17) 100kg/10a is best to increase the yield.

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Received 2000. 8. 15

Accepted 2000. 10. 15