Korean J.Plant Res. 8(3) 258~262(2005)

Effect of Sowing Date and Plant Density on Yield of Rapeseed in Autumn Sowing

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ABSTRACT

In autumn, to determine the optimal planting date and plant density of rapeseed in southern areas of Korea, Yudal variety for autumn sowing, the highest yielding variety was grown under three different planting dates and five different plant densities. Yield components such as plant height, ear length, number of seedling stand per m², number of branches and pod length were highest at the plots with Sep. 30 of planting date and 30/20 cm drilling of plant density. Yield of seed, oil and 1,000 grains weight were highest at the Sep. 30 of planting date and 30/20 cm drilling of plant density. Judging from the results reported above, at optimum planting date and plant density of rapeseed seemed to be Sep. 30 of planting date and 30/20cm plant density in autumn sowing.

Key words : Autumn sowing, Planting date, Plant density, Rapeseed

INTRODUCTION

The origin and early culture of rapeseed is obscure due to many interspecific hybrids of *Brassica* species and extremely difficult tracing of the evolution of the species. The earliest written records of rapeseed (200 to 1,000 B.C.) are found in India. Rapeseed was introduced into China from Korea more than 2,000 years ago. However, the cultivation of rapeseed for oil production has a shorter history as compared with sesame and perilla cultivation in korea. Rapeseed has been grown widely as an oil seed crop in the southern part of Korea including Jeju island, increasing cultivation area, production and yield per unit area as an important winter crop. Particularly, rapeseed is grown as one of the most important sightseeing resources for tourists in JeJu island. Monocropping of the rapeseed is obtained from late September to early June for transplanted cultivation, and from early October to mid-June for directly sown cultivation in Korea. Stand establishment of rapeseed is easy, and the plants can tolerate a wide range of pH even though optimum soil acidity is around seven. According to our experience rapeseed also can bo grown on marginal soil. On light, sandy loam soils, rapeseeds do well n Korea since they start regrowing early in spring and the root system is deep, thus suffering less from drought and/or coldness. However, the small seeds need shallow sowing ranging from one to three cm and enough moisture in the surface layers for germination. The winter rapeseed also

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is grown well on the paddy low land after harvesting rice crop in Korea. It seems to be fairly tolerant to wetness and salinity even though prefering well aerated soils and suffering from water-logging. Too much water favours attacks by fungi on the roots and decreases tolerance to low temperatures during winter and early spring. Thus it is important that surplus surface water should be drained away, particularly when grown on the paddy low land. On the other hand the soil should not be laboured too much since a heavy layer of fine particles will cause lack of air if the soil is saturated with water in clay soils.

In Korea, *Sclerotinia* species attacking stem and branches is destructive if cultivation is too intensive, but this fungus is dependent upon quite special weather condition. When grown on the upland, it is generally serious if rapeseed cultivations do come again too often in the rotation. However, when grown on the paddy low land after rice cultivation, continuous rapeseed cultivations are successful because of killing the fungus by flooding during the rice growing period. The rapeseed is sown alone in the sequential cropping systems as a row crop. Rotations are important in growing rapeseed on the upland in Korea (Kae *et al.*, 1994 ; Kwon 1994a ; Kwon 1994b ; Kwon *et al.*, 1984 ; Bang *et al.*, 1994 ; Hwang *et al.*, 1993 ; Lee *et al.*, 1994 ; Lee and Kwon, 1974 ; Kae *et al.*, 1971 ; Kwon *et al.*, 1972 ; Lee *et al.*, 1972a ; Lee *et al.*, 1972b ; Kim *et al.*, 1984a ; Kim *et al.*, 1984b)

Taiwan[#1] variety, industrial rapeseed currently grown for lubricating oil, materials of cosmetics and plastic film. Therefore the purpose of this study is to examine the effect of planting date and plant density on yield and quality of rapeseed.

MATERIALS AND METHODS

Rapeseed variety, Yudal for lubricating oil, materials of cosmetics and plastic film was grown at the experimental field of Mokpo Branch station of Crop Experiment Station in Korea. Seeds sown in main field on Sep. 30, Oct. 10 and Oct with dropping of 50×30 cm, 50×20 cm and drilling of 30/20 cm distance with one plant per hill.

The complete randomized block design was used and treatment was randomized in each of the three blocks. The size of each experimental unit was 20 m^2(4 m×5 m). The fertilizer was applied in the field at a ratio of N-P2O5-K2O = 10-8-8 kg/10a and other cultural practices followed the conventional method in the southern region of Korea.

RESULTS AND DISCUSSION

Comparisons of the agronomic characters and yield among planting date and plant density.

Mean values of the measured characters are presented in Table 1. As shown in Table 1, plant height ranged from 116 to 141 cm, ear length from 24 to 40 cm, number of seedling stand per m^2 from 7 to 255, number of branches from 81 to 2295, seed set percentage from 84 to 87 and pod length form 4.8 cm to 5.7 cm.

All the characters showed large variations.

Planting date of Sep.30 and plant density of 30/20 cm drilling showed relatively higher values for all characters with 141 cm in plant height, 40 cm in ear length, 172 in number of seedling stand per m^2, 2236 in number of branches and 5.8cm in pod length(Table 2). The results indicate that planting date and plant density show different adaptabilities to a particular environment and planting date of Sep. 30 and plant density of 30/20 cm drilling seems to be the most suitable treatment for spring autumn of yield components at the southern area of Korea. Analysis of variance for yield are listed in Table 3. As shown in Table 3. Yield character showed large variations. The results indicate that planting date

Table 1. Variation of agronomic characteristics of rapeseed variety Yudal under different planting date and plant density.

Seeding date	Ridge width × Intraow spacing	Plant height (cm)	Ear length (cm)	No. of seedling stand/m²	No. of effective branches/m²	Pod length (cm)
Sep. 30	50×30 cm dropping	131	36	7	211	5.2
	30×20 cm drilling	141	40	127	2236	5.8
	50×20 cm dropping	130	31	15	270	5.3
	50×15 cm dropping	136	36	20	281	5.2
	50×10 cm dropping	136	31	30	690	5.1
Oct. 10	50×30 cm dropping	129	36	7	119	5.6
	30×20 cm drilling	127	31	147	1323	5.4
	50×20 cm dropping	131	37	15	240	5.6
	50×15 cm dropping	130	37	20	261	5.5
	50×10 cm dropping	131	31	30	390	5.6
Oct. 20	50×30 cm dropping	123	34	17	92	5.7
	30×20 cm drilling	116	24	255	2295	5.4
	50×20 cm dropping	124	38	15	135	5.7
	50×15 cm dropping	118	34	20	81	5.4
	50×10 cm dropping	122	29	30	270	5.3

Table 2. Variation of yield characteristics of rapeseed Yudal under different planting date and plant density.

Seeding date	Ridge width × Intraow spacing	10a		Wt. of 1 ℓ (g)	No. of 1,000 grains
		Seed yield (kg/10a)	Index		
Sep. 30	50×30 cm dropping	246.9	100	670	2.9
	30×20 cm drilling	310.5	126	672	3.2
	50×20 cm dropping	241.6	98	667	3.1
	50×15 cm dropping	303.4	123	668	3.0
	50×10 cm dropping	271.4	110	611	3.0
Oct. 10	50×30 cm dropping	195.9	79	666	3.0
	30×20 cm drilling	288.0	117	671	3.2
	50×20 cm dropping	260.9	106	662	3.1
	50×15 cm dropping	281.6	114	664	3.0
	50×10 cm dropping	273.5	111	660	3.1
Oct. 20	50×30 cm dropping	196.0	79	670	2.8
	30×20 cm drilling	259.6	105	675	3.1
	50×20 cm dropping	228.6	93	660	2.9
	50×15 cm dropping	256.4	104	667	3.0
	50×10 cm dropping	236.1	96	665	3.1

Table 3. Analysis of variance for yield.

Source of variance		DF	MS	LSD		CV (%)
				0.05	0.01	
Main plot	Replication	2	3.874	-	-	-
	Sowing date (A)	3	129.733**	59.00 kg	89.34 kg	19.5
	Erra (a)	6	-	-	-	-
Sub plot	Planting density (B)	4	7.261	43.90	59.18	12.4
	A×B	12	4.284	52.19	66.84	-
	(B×A)	(12)	(3.981)	(80.15)	(107.66)	-
	Erra (b)	32	-	-	-	-
	Total	59				

and plant density show different adaptabilities to a particular environment and 30/20 cm drilling of Sep. 30 seems to be the most suitable treatment for autumn sowing in yield and yield components at the southern area of Korea.

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(Received May. 18, 2005)
(Accepted Sep. 22, 2005)