

Mechanized Seeding Methods of Hybrid Rapeseed for Double Cropping System in Paddy

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Abstract - In order to select the seeding machine for mechanizing cultivation of rapeseed in southern areas of Korea, three different seeding machines, ridge rotary, power tiller ridge rotary, tractor ridge rotary were used for sowing one of the high yielding rapeseed cv. Hybrid with five different seeding methods. Seeding of ridge rotary was reduced the seeding effort with 45% and yield components such as plant height, ear length, number of branches and pods, pod length and seed setting rate were higher. The seeding of ridge rotary also was showed highest seed yield. On the basis of time requirement for seeding, vegetative and yield parameters ridge rotary seeding machine was a suitable seeding machine for rapeseed cultivation at the southern area of Korea.

Key words - Rapeseed, Seeding machine, Mechanizing cultivation

Introduction

Rapeseed which is grown for its edible oil and is one of the most important cash crops in the Republic of Korea, providing good quality oil, meal, honey and beautiful scenery. In addition to its use in foods, rapeseed oil is used for making soaps and as a high-temperature lubricant to jet engines. The meal or oil cake remained after extracting the oil contains 35 percent or more protein of which 60 to 70 percent of the protein being digestible, is suitable for human consumption and also used as a good livestock feed supplement in Korea.

The commercial production of rapeseed in Korea started in the 1960's and by 1975 rapeseed was planted more than 26,000 hectares were covered by rapeseed crop. The rapeseed plant is successfully grown from September to June in the southern areas of Korean peninsula, and its yellow flowers also provide honey and beautiful scene to tourists, particularly in Jeju island. Today, rapeseed that is zero in erucic acid content is grown for edible oil; where as oil from rapeseed that is high in erucic acid content is used in potash mining industry.

Rapeseed culture could be concentrated in the southern Korea where rice-rapeseed double cropping system would be profitable for farmers. Double cropping increases the utilization of paddy fields. Edible oil production such as salad oil from rapeseed could enhance the self-supply of oil. *Sclerotinia*, root and stem rot would be pro-

duced due to flooding during the growing season of rice crop. Rapeseed is a good crop for winter cropping on the drained paddy soil (Kae *et al.*, 1994 ; Kwon 1994a ; Kwon 1994b ; Kwon *et al.*, 1984 ; Hwang *et al.*, 1993 ; Lee *et al.*, 1994 ; Lee *et al.*, 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).

The purpose of this study were to evaluate and suitable seeding machine for mechanizing cultivation and to evaluate the agronomic characteristics of rapeseed in southern areas of Korea.

Materials and Methods

Rapeseed variety, Hybrid which has superior quality for lubricating oil, materials of cosmetics and plastic film was grown at the experimental field of Mokpo Branch Station of Crop Nat'l Experiment Station, RDA in Korea. 1.5kg/10a seed was sown at dried paddy field on Oct. 14 with seeding machines, ridge rotary, power tiller ridge rotary, tractor ridge rotary. The complete randomly block design, where treatments were treatment was randomized in each of three block. Each experimental unit were 20m²(4m×5m).

Fertilizer was applied at the rate of 15-8-8 kg/10a of N-P₂O₅-K₂O. One third of the total N, total P₂O₅ and K₂O and manure of 1 MT/10a were incorporated into the soil before seeding and the rest of N fertilizer was applied in late February.

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Table 1. Comparison of optimum time of seeding and moulding with the different seeding machine and seeding method

No. of test	Seeding method	Seeding time(min.)	Moulding time(min.)	Total time(min.)	Index
1	Manual broadcasting	50	56	106	100
2	Seeding by ridge rotary	58	-	58	55
3	Manual broadcasting after moulding with ridge rotary	50	46	96	91
4	Manual broadcasting after moulding with power tiller ridge rotary	50	46	96	91
5	Manual moulding and broadcasting after with moulding power tiller ridge rotary machine	100	56	156	147
6	Manual broadcasting after moulding with tractor ridge rotary	50	-	50	47
	Mean \pm SD	60 \pm 20.0	34 \pm 15.8	94 \pm 38.0	-

Table 2. Variation of inherent characters of hybrid rapeseed with different seeding machine

No. of test	Seeding method	Bolting date	Flowering date	Flower ending	Maturing date	Flowering days	Maturing days	Growth duration
1	Manual broadcasting	Apr.4	Apr.20	May 13	Jun.14	26	55	248
2	Seeding by ridge rotary	Apr.2	Apr.18	May 12	Jun.13	25	54	247
3	Manual broadcasting after moulding with ridge rotary	Apr.2	Apr.18	May 13	Jun.14	26	55	248
4	Manual broadcasting after moulding with power tiller ridge rotary	Apr.2	Apr.18	May 12	Jun.13	25	54	247
5	Manual moulding and broadcasting after with moulding power tiller ridge rotary machine	Apr.4	Apr.20	May 13	Jun.14	26	55	248
6	Manual broadcasting after moulding with tractor ridge rotary	Apr.4	Apr.20	May 12	Jun.13	25	54	247
	Mean \pm SD	Apr.3 \pm 1.1	Apr.19 \pm 1.1	May14 \pm 0.6	Jun.13 \pm 0.7	2.65 \pm 0.7	55 \pm 0.7	248 \pm 0.7

Results and Discussion

Comparison of the necessary time of seeding and moulding

Mean values of the required for time seeding, moulding and necessary and necessary are presented in Table 1.

As shown in Table 1, seeding time required ranged from 50 to 100 min., moulding time from 46 to 56 min., necessary time from 50 to 156min.. All the times showed large variations. Bolting date, flowering date, flower ending date, maturing date, flowering days, maturing days and growth duration are presented in Table 2.

As shown in Table 2, bolting date ranged from Apr. 2 to Apr. 4, flowering date from Apr. 18 to Apr. 20, flower ending from May 12 to May 13, maturing date from Jun. 13 to Jun. 14, flowering days 25 to 26, maturing days from 54 to 55 and growth duration from 247 to 248 days. All the characters showed not large variation.

Mean values of the measured characters are presented in Table 3.

As shown in Table 3, plant height ranged from 150 to 158cm, ear length from 27 to 29cm, number of branches from 5 to 6, number of pods from 23 to 26, and pod length from 5.7 to 6.5cm. Large variations are not observed in these agronomic characters.

Variation of yield characters of hybrid rapeseed with different seeding machine are presented in Table 4. As shown in Table 4, seed setting rate ranged from 82 to 95%, seed yield from 261 to 342kg/10a, seed capacity from 395 to 505kg/10a, 1l weight from 661 to 688g, 1,000 grains weight from 3.1 to 3.3 and number of plants by per m² from 88 to 139.

All the yield characters showed large variations. Seeding of ridge rotary showed relatively superior values for all agronomic and yield characters, those were 158cm of plant height, 29cm of ear length, 6 in number of branches, 26 of number of pods per ear, 6.5cm of pod

Table 3. Variation of agronomic characters of hybrid rapeseed under different seeding machine

No. of test	Seeding method	Plant height (cm)	Ear length (cm)	No. of branches	No. of pods per ear	Pod length (cm)
1	Manual broadcasting	150	29	6	24	6.4
2	Seeding by ridge rotary	158	29	6	26	6.5
3	Manual broadcasting after moulding with ridge rotary	155	28	5	24	6.2
4	Manual broadcasting after moulding with power tiller ridge rotary	158	28	5	23	5.8
5	Manual moulding and broadcasting after with moulding power tiller ridge rotary machine	157	29	6	25	6.0
6	Manual broadcasting after moulding with tractor ridge rotary	153	27	6	23	5.7
	Mean \pm SD	155 \pm 3.1	28 \pm 0.8	6 \pm 0.6	24 \pm 1.2	6.1 \pm 0.3

Table 4. Variation of yield characters of hybrid rapeseed under different seeding machine

No. of test	Seeding method	Seed setting rate (%)	Per 10a (kg/10a)			Wt. of 1ℓ (g)	Wt. of 1,000 grains (g)	No. of plant/m ²
			Seed yield	Index	Seed capacity			
1	Manual broadcasting	93	316	100	465	680	3.2	105
2	Seeding by ridge rotary	95	342	108	505	688	3.3	139
3	Manual broadcasting after moulding with ridge rotary	89	301	95	443	680	3.2	110
4	Manual broadcasting after moulding with power tiller ridge rotary	82	341	108	503	677	3.1	138
5	Manual moulding and broadcasting after with moulding power tiller ridge rotary machine	85	306	97	449	681	3.1	90
6	Manual broadcasting after moulding with tractor ridge rotary	88	261	93	395	661	3.1	88
	Mean \pm SD	89 \pm 4.8	311 \pm 27.0	-	460 \pm 41.3	678 \pm 9.0	3.2 \pm 0.1	112 \pm 22.4

length, 95% in seed setting rate, 316kg/10a in seed yield, in 505kg/10a in seed capacity, 688g in 1ℓ weight, 3.3g in 1,000 grains weight and 139 in number of plant per m².

The results indicate that seeding machine show different adaptabilities to a particular environment and seeding of ridge rotary seems to be the most suitable seeding machine for rapeseed seeding on the basis of all parameters at the southern area of Korea.

Rapeseed fits easily into any farming system growing grain with little additional capital expenditure on plant or machinery. Cultivations necessary for small grains are quite suitable for rapeseed, which is also extensively sown following a cereal crop using minimum tillage or direct sowing techniques by machinery.

According to the results from the experiment with different seeding machines, there are large differences in time of seeding and

moulding, agronomic characters and yield. Seeding of ridge rotary machine for the several characters were very high and the time of seeding and moulding were very short. Judging from the results reported above, at optimum machine for seeding and moulding of rapeseed seemed to be ridge rotary.

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