

## Effect of Fertilizer Level and Seeding Rate on Yield and Yield Components of Rapeseed in Upland Field

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### ABSTRACT

In order to select suitable fertilizer level and sowing rate of Dangyo <sup>®</sup>(hybrid) rapeseed at the southern area of Korea, two varieties of Naehanyuchae (Normal) and Dangyo <sup>®</sup>(hybrid) rapeseed currently grown for oil production by two fertilizer level with 10-8-8 kg/10a and 15-8-8 kg/10a and three sowing rate with 500 g/10a, 1,000g/10a and 1,500g/10a with relatively high yield was grown at the same condition yield and yield components were observed. Dangyo <sup>®</sup>(hybrid) rapeseed was superior to oil-eed rapeseed for yield at the 15-8-8 kg/10a of fertilizer and 1,500 g/10a of sowing rate. Fertilizer level, N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O = 15-8-8 kg/10a and sowing rate, 1,500 g/10a showed somewhat higher value in two varieties of Naehanyuchae(Normal) and Dangyo <sup>®</sup>(hybrid).

*Key words* : Rapeseed, Fertilizer level, Seeding rate

### INTRODUCTION

Southern part of Korea including Jeju island is the most important production area of rapeseed. For successful rapeseed production, integrated cultural techniques have been developed through research works conducted at the Mokpo Branch Station and six Provincial Rural Development Administration located in the southern area. The seed is ordinarily sterilized with Benoram fungicide. Some farmers use their own seed not sterilized, sometimes resulting in impure and poor crop attacked by pests. For transplanted rapeseed culture, late September is optimum for sowing and early November for transplanting 40 days old seedlings on

main field. The optimum time for direct sowing culture is required for 90 m<sup>2</sup> seed bed for 10a main field and 500g per 10a for direct sowing culture.

The plant space is 12×12 cm for seed bed, 50×30 cm for transplanting and 50×15 cm for direct sowing. Fertilizer application level is 60-30-30g/3.3 m<sup>2</sup> of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O for seed bed, 10-8-8-200-1.5 kg/10a of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O-Lime-Boron for main field. The time at which the application of fertilizer takes pace is rather important. Potassium and phosphorus should be given before sowing. It is also important to give 4~5kg of nitrogen per 10a before sowing winter rate. An additional 5~6 kg of N should be applied when the plants start regrowing in the spring by normal cultivars

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But hybrids did not examine with heavier application of nitrogen fertilizer from 10 to 15kg/10a. Therefore the purpose of this study is to examine for hybrids the effect of fertilizer level and seeding rate on yield and yield components of rapeseed.

## MATERIALS AND METHODS

Naehanyuchae(Normal) and Dangyo <sup>#</sup>(Hybrid) rapeseed varieties was grown at the experimental field of Muan city in Korea. Field conditions before the experiment are listed in Table 1. Cultivars used in this experiment were Naehanyuchae(Normal) and Dangyo <sup>#</sup>(Hybrid).

Average bolting date in Naehanyuchae (Normal) was Mar. 28, which was one day earlier than that of fertilizer level, 15-8-8 kg/10a, Mar. 29 and it was two days later than that of fertilizer level, 10-8-8 kg/10a, Mar. 26 and in Dangyo <sup>#</sup>(hybrid) was Mar. 26, which was same day withfertilizer level, 15-8-8 kg/10a, Mar. 26 and it were one day later than that of fertilizer level, 10-8-8 kg/10a, Mar. 25.

Average flowering date in Naehanyuchae (Normal) was Apr. 14, which was same day in all treatment, Apr. 14 and in Dangyo <sup>#</sup>(Hybrid) was Apr. 18, which was same day in fertilizer level, 15-8-8 kg/10a and one day later than that of fertilizer level, 10-8-8 kg/10a, Apr. 17.

Naehanyachae (Normal) and Dangyo <sup>#</sup>(hybrid) cultivars were seeded in two different fertilizer level with N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O = 10-8-8 and 15-8-8 and three

different sowing rate as follows broad seeding with 150 cm ridge width and 120 cm seeding width. Seed were sown at 300 g seeds/10a, 500 g seeds/10a and 600 g/10a in broad seeding.

The complete randomized block design was used with three blocks and each experimental unit was 12.5 m<sup>2</sup>(2.5 m × 5 m). Fertilizer was applied at the rate of 10-8-8 kg/10a and 15-8-8 kg/10a of N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O. One third of the total N, total P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O and manure of 1 MT/10a were incorporated in to the soil before sowing in Oct 10 and the rest of N Fertilizer was applied in late February of following year, and other cultural practices followed th conventional method in the southern region of Korea.

## RESULTS AND DISCUSSION

### Inherent characteristics

Differences of bolting date, flowering date, maturing date, flowering period, maturing period and growth duration in variety, fertilizer level and sowing rate are shown in Table 2.

Average bolting date in Naehanyuchae (Normal) was Mar. 25, which was same day in all treatment, Mar. 25 and Dangyo <sup>#</sup>(hybrid) was Mar. 26, which was one day later than Naehanyuchae(Normal), Mar. 25. Average flowering date in Naehanyuchae (Normal) was Apr. 16, which was same day in all teratment, Apr. 16 and Dangyo <sup>#</sup>(hybrid) waw Apr. 18, which was two day earlier than Naehanyuchae (Normal). Average maturing date in Naehanyuchae (Normal) was June 8, which was same day in al treatment, June 8 and in Dangyo <sup>#</sup>(hybrid) was June 11, which was one day earlier than

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

Field	pH (1:5H <sub>2</sub> O)	OM (%)	P <sub>2</sub> O <sub>5</sub>	EX (me/100g)			LR (100g/10a)
				K	Ca	Mg	
Upland field	6.08	1.31	62	0.34	7.38	2.62	129

Table 2. Mean values of inherent characteristics of rapeseed under different fertilizer and sowing rate of upland field.

Variety	Fertilizer (kg/10a)	Sowing rate (g/10a)	Bolting date	Flowering date	Maturing date	Flowering period (day)	Maturing period (day)	Growth duration (day)
Naehanyuchae (Normal)	10-8-8	300	Mar.25	Apr.16	June 8	39	33	240
		500	Mar.25	Apr.16	June 8	39	33	240
		600	Mar.25	Apr.16	June 8	39	33	240
	15-8-8	300	Mar.25	Apr.16	June 8	39	33	240
		500	Mar.25	Apr.16	June 8	39	33	240
		600	Mar.25	Apr.16	June 8	39	33	240
	Mean ± SD		25 ± 0.00	16 ± 0.00	9 ± 1.15	40 ± 1.16	34 ± 1.11	240 ± 1.19
Dangyo <sup>#</sup> (Hybrid)	10-8-8	300	Mar.26	Apr.18	June 11	40	32	239
		500	Mar.26	Apr.18	June 11	40	32	239
		600	Mar.26	Apr.18	June 11	40	32	239
	15-8-8	300	Mar.26	Apr.18	June 11	40	32	239
		500	Mar.26	Apr.18	June 11	40	32	239
		600	Mar.26	Apr.18	June 11	40	32	239
	Mean ± SD		26 ± 1.27	18 ± 1.04	11 ± 1.17	40 ± 0.45	32 ± 0.86	239 ± 0.45

that of fertilizer level 10-8-8 kg/10a and 15-8-8 Kg/10a, June 11 and it was same day later than that of Naehanyuchae (Normal) June 8.

Average flowering period in Naehanyuchae (Normal) was 39 day in all treatment, and in Dangyo<sup>#</sup>(hybrid) was 40 day in all treatment.

Average maturing period in Naehanyuchae (Normal) was 33 day in all treatment, and in Dangyo<sup>#</sup>(hybrid) was 32 day in all treatment.

Average growth duration in Naehanyuchae (Normal) in all treatment, 240 day and in Dangyo<sup>#</sup>(hybrid) was 239 day with same in all treatment.

### Yield and yield components

Plant height, ear length, pod length, number of pods per ear and seedling stand are important factors for determining seed yield because they themselves are seed yield components and photosynthetic organs. Average plant height, length ear and pod, number of pods and seedling stand and seed yield are presented in

Table 3.

Average plant height of Dangyo<sup>#</sup>(hybrid) was 170cm, which was about 8cm longer than that of Naehanyuchae (Normal), 162 cm. Dangyo<sup>#</sup>(hybrid) of fertilizer level 15-8-8 kg/10a by sowing rate 500 g/10a was the longest one in plant height with 175 cm in this trial. It was about 11 cm longer than Naehanyuchae (Normal) which was known to be having longer plant height among 15-8-8 kg/10a of fertilizer and 500 g/10a of sowing rate.

Average ear length of Dangyo<sup>#</sup>(hybrid) and Naehanyuchae (Normal) were 44 cm and 30cm, respectively, and hence Dangyo<sup>#</sup>(hybrid) was about 14 cm longer in ear length than Naehanyuchae(Normal). Dangyo<sup>#</sup>(hybrid), 15-8-8 kg/10a, 500g/10a was the longest treatment in ear length with 41 cm, which was about 7 cm longer than that Naehanyuchae(Normal) 32 cm.

Average pod length of Dangyo<sup>#</sup>(hybrid) and Naehanyuchae(Normal) were 5.6 cm and 5.4 cm

Table 3. Mean values of growth habits and seed yield of rapeseed under different fertilizer level and sowing rate at the upland field.

Variety	Fertilizer (kg/10a)	Sowing rate (g/10a)	Plant height (cm)	Ear length (cm)	Pod length (cm)e	No. of pods per ear	Seed yield	Index
Naehanyuchae (Normal)	10-8-8	300	158	29	5.4	25	238	90
		500	163	30	5.5	29	265	100
		600	163	28	5.4	27	257	97
	15-8-8	300	163	30	5.3	25	270	102
		500	164	32	5.7	30	276	104
		600	162	28	5.3	24	262	99
Mean $\pm$ SD			162 $\pm$ 1.21	30 $\pm$ 1.13	5.4 $\pm$ 1.13	27 $\pm$ 2.15	261 $\pm$ 4.72	-
Dangyo <sup>ns</sup> (Hybrid)	10-8-8	300	168	42	5.4	40	396	99
		500	169	46	5.5	41	401	100
		600	168	39	5.4	36	396	99
	15-8-8	300	171	44	5.7	45	433	108
		500	175	47	5.7	44	457	114
		600	173	43	5.7	43	433	108
Mean $\pm$ SD			170 $\pm$ 4.85	44 $\pm$ 7.63	5.6 $\pm$ 0.16	42 $\pm$ 8.21	419 $\pm$ 84.73	-

respectively, and hence Dangyo<sup>ns</sup>(hybrid) was about 0.2 cm longer in pod length than Naehanyuchae(Normal). Dangyo<sup>ns</sup>(hybrid), 15-8-8 kg/10a, 500g/10a was the longest treatment in pod length with 5.7 cm which was about 0.3 cm longer than that Naehanyuchae (Normal) 5.4 cm.

Average number of pods per ear of Dangyo<sup>ns</sup>(hybrid) and Naehanyuchae (Normal) were 42 and 27, respectively, and hence Dangyo<sup>ns</sup>(hybrid) was about 15 more than that Naehanyuchae (Normal) 30. Dangyo<sup>ns</sup>(hybrid), 15-8-8 kg/10a, 500g/10a was the most treatment in number of pods per ear with 38, which was about 6 more than that Naehanyuchae (Normal) 30.

Average seed yield of Dangyo<sup>ns</sup>(hybrid) was 419 kg/10a, which was about 158kg/10a more than that of Naehanyuchae (Normal), 261kg/10a. Dangyo<sup>ns</sup>(hybrid), 15-8-8 kg/10a, 500 g/10a was the most one in seed yield with 457 kg/10a in this trial. It was about 181 cm more than Naehanyuchae (Normal) 262 kg/10a which

was known to be having more seed yield among 15-8-8 kg/10a, 500 g/10a.

Dangyo<sup>ns</sup>(hybrid), 15-8-8 kg/10a, 500 g/10a had significantly more pods per ear and seedling stand and longer length in plant, ear and pod. Analysis of variance for the growth habits and seed yield in Table 3 showed significant difference among fertilizer level and sowing rate, and Dangyo<sup>ns</sup>(hybrid) 15-8-8 kg/10a, 500g/10a had more seed yield than any other fertilizer level and sowing rate in this experiment.

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