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Growth and Yield on Planting Density in Soybean Cultivars According to Different Maturing Growth Types on Paddy Field

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Objectives

This study conducted to investigate effects of high planting densities on the growth and yield of soybean according to different maturing growth types and to provide the data for the cultivation techniques in late planted soybean with double cropping system of winter crops at paddy field in Korea.

Materials and Method

Field studies were conducted at the Honam Agricultural Research Institute on Junbuk Province in the southwestern Korea (36° N lat) on a commerce silt loam soil at paddy field using early (cv. Sunamkong), middle (cv.Doremikong) and late (cv. Somyeongkong) soybeancultivars. Seed were hand planted at 16 July, 2003. Plants were planted at a high seeding rate and thinnedto a plant density of 70 x 10 cm (row width x plant spacing), 50 x 10 cm, and 30 x 10 cm. Experimental design was a randomized complete block in a split plot arrangement with three replications.

Results and Discussion

Yield was significantly affected by the planting density and cultivars. Yield from different planting densities responded similarly in three soybean cultivars and increased when planting density increased. Someongkong showed the highest increasing rate of yield about 26 % by 338 g m^{-2} at 30 x 10cm compared to yield of conventional planting density (70 x 10cm). Also, the planting density significantly affected pod and seed number and seed weight, but not seed per pod. The highest and lowest dry matter production per square meter appeared at 30x10cm and at 70x10cm, respectively, in all soybeans. CGR showed greater at R3~R4 stages compared with V7~R2 or R2~R4 growth stages and showed the greatest at 30 x 10 cm across planting densities in three soybean cultivars. Relationship between grain yield and CGR in three planting densities showed a highly significant positive relation (R2= 0.757) at R3 to R4 stages, and significant relations (R2 = 0.505, 0.617) at V7 to R2 and V2 to V3. Also, there was a highly significant positive difference between grain yield and leaf area index (LAI) across R3 to R4 and R2 to R3 stages. Therefore, present results suggested that the highly grain yield production of late planting to be mainly related to three characteristics; 1) a high CGR at vegetative and early reproductive stage in high planting density, 2) a high capability to expand the leaf area during vegetative period after emergence, and 3) a cultivation of relatively late maturity soybean cultivars planted late.

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Table 1. Yield and yield component in three soybean cultivars with three planting density.

Cultivars	Plant density (cm)	Number of pod (no. Plant^{-1})	Number of seed (no. Plant^{-1})	Seed per pod (no.)	Seed weight (g 100 seed^{-1})	Yield (g m^{-2})
sunamkong	70×10	45.7	82.3	1.80	10.5	239
	50×10	44.4	83.5	1.88	10.5	281
	30×10	35.0	61.5	1.76	10.1	302
Doremikong	70×10	45.1	95.1	2.09	13.4	263
	50×10	34.1	74.0	2.17	12.9	315
	30×10	33.9	68.8	2.03	12.9	342
Somyeongkong	70×10	57.2	108.6	1.83	9.0	248
	50×10	49.3	100.2	2.03	8.4	280
	30×10	46.4	97.1	2.09	8.4	338

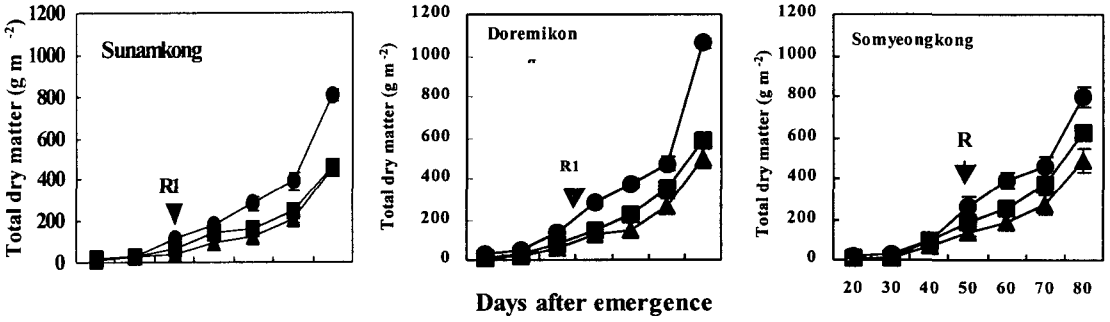

Fig. 1. Total dry matter production of three soybeans in three planting densities. ● 30x10cm, ■ 50x10cm, ▲ 70x10cm. All data shows in ±SE. n=10

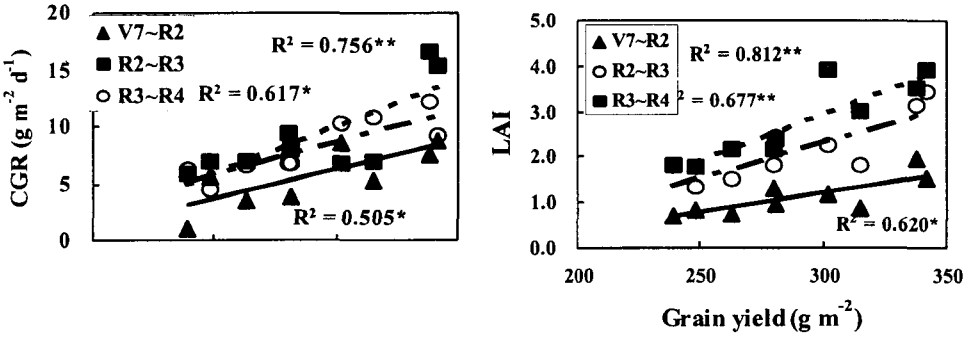

Fig. 2. Relationship between the grain yield and crop growth rate (CGR), and leaf area index (LAI) of three soybean cultivars in three planting densities according to late planting. * and ** is a significant level at 0.05 and 0.01 according to DMRT. The solid line, dotted line, and dot-dash-line are regression lines gained at V7~R2, R2~R3, and R3~R4 stage, respectively.