Differences in Productivity among Wheat, Barley and Rye for Forage

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ABSTRACT

TO select the most suitable crop and variety of forage for productivity at the southern part of Korea, The crops of wheat, barley and rye were grown from Oct. 1999 to June 2000. Paldanghomil variety of rye crop was shown to have the highest productivity in comparison to other varieties of crops used in this experiment.

It showed relatively high plant height, number of tiller, forage yield and dry matter yield. There fore, it was concluded that Paldanghomil of rye crop was the most suitable crop with high yield in the southern part of Korea. The heritabilities of all characters were estimated to be high.

Key words **:** Forage crop, heritability, productivity.

INTRODUCTION

Wheat, barley and rye has been the important forage and grain crops. High forage, grain and early maturing are the major consideration in korea. However its importance as a staple food is diminished recently due to increase of rice production and import of other cereals, from foreign countries (Youn *et al.* 1991).

There was no research of the forage yield (productivity) and agronomic characteristics in wheat, barley and rye has been done of southern part of korea. This experiment is to investigate the yield and yield components of wheat, barley and rye.

MATERIALS AND METHODS

An experiment was conducted from Mar. 1999 to Aug. 2000 at Sunchon National University, six varieties of three crops listed in table 1 were used in this trial.

The complete randomized block design with variety as treatment was used and treatment was randomized in each of the three blocks. Each experimental unit was 12.5㎡ (2.5m × 5m). 15kg/10a seeds were sown at upland soil with 120 cm ridge width and 90 cm seeding width on 0ct. 20.Fertilizer was applied at the rate of 12-10-8 kg/10a of N-P_2O_5-K_2O. One third of the total N, total P_2O_5 and K_2O and manur of 1 MT/10a were incorporated into the soil before sowing and the rest of N fertilizer was applied in early-Mar.

Ten plants were randomly sampled from each plot at flowering stage, and plant length, number of leaves were measured. To determine yield, all the plants in 1㎡ from each plant were harvested by cutting at about 3cm above soil level. After determining fresh yield, plant

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Table 1. Heading, plant height, number of tiller per ㎡ and ratio of leaf in dry weight to total dry weight(Lw/Tw × 100) of six varieties in crops

Crops	Variety	Heading date	Plant height(cm)	No, of tiller(㎡)	Lw/Tw × 100 (0/0)	clipping (May 10)
Wheat	Urimil	May 14	114	431	31	
	Geurumil	May 16	111	420	36	
Barley	Olbori	May 10	98	358	23	
	Gangbori	May 12	96	347	28	
Rye	Paldanghomil	May 2	128	487	12	
	Chilbohomil	May 4	125	465	13	

Table 2. Genotypic variances(6^2G), environmental variances(6^2E), heritabilities(h^2) and analysis of variance in observed characters

Character	6^2G	6^2E	h^2	Variance	
				Variety	Error
Heading date	3.42	0.27	90.44	5.74**	0.442
Plant height(cm)	18.83	0.45	93.13	66.21**	0.735
No. of tiller (㎡)	74.27	0.79	91.75	79.79**	0.824
Lw/Tw × 100 (%)	12.11	0.41	90.42	30.11**	0.696

** Significance at 1%.

Table 3.Forage yield of the varieties in wheat, barley and rye

Yield	Wheat		Barley		Rye	
	Var. Urimil	Var. Geurumil	Var. olbori	Var. Gangbori	Var. Paldanghomil	Var. Chilbohomil
Forage yield	2.104	1.934	1.745	1.626	2.325	2.217
Dry matter yield	521	516	437	415	564	547

Table 4. Genotypic variances(6^2G), environmental variances(6^2E), heritabilities(h^2), and analysis of variance in yields

Yield	6^2G	6^2E	h^2	Variance	
				Variety	Error
Forage	4781.07	837.25	68.81	12286.870**	831.58
Dry matter	427.36	24.69	93.34	1124.224**	24.695

materials of about 600g were sampled and weights were measured after drying for 30 min at 105℃, then for 72 hour at 70℃ in a forced-air oven. Analyses of variance for the characters were used to calculate genetic and environmental variance components (Grafius *et al.*, 1952 ; Robinson *et al.*, 1949, 1951).

RESULTS AND DISCUSSION

Comparisons of the agronomic characters among crops and varieties. Mean values of the measured characters are presented in table 1 and the results from analyses of variance for the characters are in table 2.

As shown in table 1 and 2, plant height ranged from 96 to 128cm, heading and harvesting date from May 2 to May 16, number of tiller per plant from 347 to 487 Lw/Tw × 100(%) from 12 to 36%.

All the characters showed large variations, and their varietal differences in mean value were significant at the 1% level Table2. Paldanghomil, the superior variety of forge rye showed relatively higher values for all the characters with 128 cm in plant in plant height 487 in number of tillers, 12 % in Lw/Tw × 100(%). Compared with the inferior variety, Chilbohomil, Paldanghomil showed higher values of 3 cm in plant height and 22 number of tillers.

The results indicate that varieties show different adaptabilities to a particular environment and Paldanghomil seems to be the most suitable variety for Autumn sowing at the southern area of Korea. Heritabilities in a broad sense for several agronomic characters are listed in table 2. Since the genotypic variance observed characters were generally greater than the environmental variance compoments, values of heritability in all the characters were estimated to be high. Valuees of variance compononts were large variations. Since all the characters showed high values of heritability, selection efficiency to bred such genotypes would be high.

Genetic and environment1 variances and heritability analyses of variance of all the characters were used to estimate genetic and environmental variance and the results are presented in table 2.

Genetic variance components were much larger in magnitude than environmental variance components and hence th values of heritability were generally high in most of the variables. The values of heritability is all the varieties were high from 90.44 to 93.13 percent. The results indicate that selection efficiency would generally be high in breeding genotypes with high nutrient quality.

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