Korean J.Plant.Res. 7(1) 54~59(2004)

Relationship between Yield and Weather Elements of Barley in Sunchon Area, Korea

Byung-Sun Kwon
College of Agriculture and Life Science, Sunchon Nat'l Univ. Sunchon 540-742, Korea

ABSTRACT

This study was conducted to investigate the relationships between yearly variations of weather elements and productivity in rice. In addition, coefficients of correlation among yield and yield components were used to find out the relationships between weather elements and productivity. Coefficients of variance (C.V.) of air temperature mean was considerable with 25%, but the variation by duration of sunshine was small in May. Culm length and number of spikes were great with c.v. of 21.5, 16.4%, respectively. Coefficients of correlation between temperatures of cultivation in May and yield were positive correlations. Coefficients of correlation between precipitation and sunshine of cultivation period from Oct. to May and yield were negative correlations. Coefficients of correlation amount the culm length, number of spikes, 1,000 grains wt. of seed, and yield were positively significant at the level of 1%, respectively.

Key words **:** Weather elements, Productivity of naked barley cultivar "Hinssalbori".

INTRODUCTION

A crop is close to the environmental effects, especially weather condition. There have been many reports about the effect of meteorological elements on growth and yield. The mat rush was high positive correlation among the maximum temperature of March and April and the characters of quantities and it showes a high significance(Kwon, 1993). Coefficients of correlation between maximum temperature in November and plant height, stem diameter, number of stems, root diameter and dry weight of roots of *Alisma plantago* were positively significant at 5% level (Kwon *et al.*, 1994). Coefficients of correlation between maximum, minimum, mean temperature in April, May and yield of onion were negative significant at the level of 5,1 %, respectively (Kwon, 1998). Coefficients of correlation between mean temperature in September November and yield, yield components of garlic were positive significant at the level of 5, 1%, respectively (Kwon, 1998). Yield and number of total branches of peanut vary greatly with c. v. of 28.31, 19.39%, respectively(Kwon, 1998). Yield and plant height of perilla vary with c.v. of 12.62, 59.06%, respectively (Kown *et al.*, 1998). Coefficients of correlation between duration of sunshine in April and stem length, fiber yield of hemp were positively significant at the level of 5, 1%, respectively (Kwon *et al*, 1998). Duration of

*Corresponding author : **Byung-Sun Kwon**, E-mail : kbs@sunchon.ac.kr

sunshine in August would be used as a predictive variable for the estimation of yield and flowering date of red pepper (Kwon *et al*, 1998). Significant correlations were recognized between yield of barley and average temperature of March minimum temperature of May and duration of sunshine of May, respectively (Kim *et, al.*, 1993). Total seed cotton yield can be predicted by multiple regression equation with independent variable of climatic factors in July such as monthly averages of average temperature, maximum temperature and minimum temperature (Park *et al.*, 1995). Coefficients of correlation between the amount of precipitation in April and yield of potato and daily mean temperature in June were negatively significant at the level of 5, 1%, respectively (Park *et al.*, 2001). This experiment of naked barley cultivar "Hinssalbori" will be developed yield and analysis the relation of weather. conditions to naked barley cultivar "Hinssalbori" growth and yield at Sunchon area, Jeonnam in order to obtain the basic data of relation of crop to weather by demands conditions and to develop safe cultivation and production techniques according to changes of meteorological environments and then the following results are reported.

MATERIALS AND METHODS

This experiment used that the yield and meteorological datas were produced from 1991 and 2000, The datas were esimated equations among the growth, yield, weather conditions.

Hinssalbori naked barley variety was grown at the experimental farm of Sunchon local in Korea. Seed were sown in the main paddy field of dry condition on October 30 with 90cm (seeding width) × 30cm (ridge width) distance with 15kg/10a amount of seeding on October 30 in every years.

The fertilizer was applied in the field at a ratio of N-P_2O_5-K_2O=12-10-10(kg/10a) and other cultural practices followed the conventional method in the southern region of korea.

RESULTS AND DISCUSSION

Variabilities of Meteorological Elements

The weather conditions from 1991 to 2000 naked barley cultivar "Hinssalbori" growth, variability of yield character and the variabilities of meteorological elements during naked barley growth period are shown in Table 1.

The greatest variabilities of meteorological elements are precipitation of December and January with c. v. of 97.9, 53.1%, respectively, but the variation of the temperature of mean, maximum and minimum in April were relative small with c. v. of 5.7, 5.0, 6.2%, respectively.

Considering the variabilities of yield character during the cultivation period in Table 3, while the coefficient of variation in number of spikes were very low as 6.2% and it is governed by genetic characters to variety, spike length and yield were 67.5, 54.9%, respectively, and it is influenced by environmental factors and such a trend was shown as 28.50% in fresh weight of stem of rush(Kwon, 1993), 30.20% in soybean(Won *et al.*, 1983) and 14.24% in barley(Kim *et al.*, 1993) but in case of mat rush the fiber yield was 6.3%(Kwon *et al.*, 1993) and it is considered that these results were due to the differences in character of crops.

Correlation among Meteorological Elements, naked Barley cultivar "Hinssalbori" Growth and Yield

As shown in Table 4. There are positive correlation between temperature of mean, maximum and minimum and yield, and then it is found that high temperature condition in January and May has a favorable influence on the yield.

In the precipitation, there is highly significant

Table 1. Variablilities of meteorological elements for 10 experimental years.

Meteorological elements	Month	Max.	Min.	Mean±S.D		Range	C.V.(%)
Air Temperature (℃) mean	Oct.	19.1	16.6	17.9	1.45	2.5	7.9
	Nov.	13.1	9.8	11.2	0.76	3.3	6.8
	Dec.	6.9	3.8	5.4	0.56	3.1	10.4
	Jan.	4.2	2.1	3.2	0.54	2.1	16.8
	Feb.	6.4	2.3	4.4	0.36	4.1	8.2
	Mar.	9.2	6.3	7.8	0.69	2.9	8.8
	Apr.	15.0	11.3	13.2	0.75	3.7	5.7
	May.	18.8	16.6	17.7	4.43	2.2	25.0
Air Temperature (℃) Max.	Oct.	22.4	20.4	21.4	1.54	2.0	7.2
	Nov.	17.2	14.0	15.6	0.81	3.2	5.2
	Dec.	11.0	8.3	9.7	0.74	2.7	7.6
	Jan.	8.5	6.0	7.3	0.71	2.5	9.7
	Feb.	10.1	6.8	8.5	1.49	3.3	17.5
	Mar.	13.2	10.8	12.0	0.82	2.5	6.8
	Apr.	18.5	15.9	17.2	0.86	2.6	5.0
	May.	22.5	20.9	21.7	1.55	1.6	7.1
Air Temperature (℃)Min.	Oct.	16.2	14.0	15.1	1.29	2.2	8.5
	Nov.	9.8	5.6	7.7	0.57	4.2	7.4
	Dec.	3.3	0.5	1.9	0.21	2.8	11.1
	Jan.	1.0	-1.7	-0.4	1.72	0.7	43.0
	Feb.	3.4	-1.5	1.0	0.45	1.9	45.0
	Mar.	5.6	2.7	4.2	0.48	2.9	11.4
	Apr.	12.2	7.4	9.8	0.61	4.8	6.2
	May.	15.6	13.0	14.3	1.26	2.6	8.8
Precipitation (mm)	Oct.	201.0	18.8	110.0	45.5	182.2	41.4
	Nov.	219.5	9.7	114.6	22.2	209.8	19.4
	Dec.	59.6	0.0	29.8	29.2	59.6	97.9
	Jan.	54.0	8.7	31.4	16.1	22.6	51.3
	Feb.	65.1	0.7	32.9	10.7	32.2	32.5
	Mar.	164.2	37.5	100.9	22.8	63.3	22.6
	Apr.	193.1	47.2	96.6	24.4	96.5	25.3
	May.	250.1	46.1	148.1	18.3	204.0	12.4
Duration of sunshine(hr)	Oct.	271.9	164.3	218.1	38.4	107.6	17.6
	Nov.	243.1	161.9	202.5	33.3	40.6	16.4
	Dec.	232.0	179.4	205.7	35.1	26.3	17.1
	Jan.	235.6	166.6	201.1	35.3	34.5	17.6
	Feb.	229.4	157.1	193.3	34.2	36.1	17.7
	Mar.	239.0	150.8	195.0	31.5	44.0	16.2
	Apr.	260.4	155.1	207.8	29.8	52.6	14.3
	May.	288.0	189.4	238.7	32.9	98.6	13.8

Table 2. Variabilities of agronomic characters for 10 experimantal years.

characters	Max.	Min.	Mean	±S.D	Range	C.V.(%)
Culm length(cm)	80	65	73	15.4	15	21.5
No. of spikes/m^2	651	625	638	36.2	26	16.4
WT. of 1,000 grains(g)	34.5	30.2	32.4	2.60	4.3	13.5
Yield (kg/10a)	395	360	378	121.4	35	11.7

negative correlations between the precipitation of October, November and yield, negative correlations between precipitation of the other month, December, January, February, March, April and May and yield and then it is found that small precipitation condition in October have a favorable influence on the yield.

In the duration of sunshine, a negative correlation between the duration of all growth periods, October, November, December, January, February, March, April and May and yield is shown and there is highly significant negative correlation between duration of sunshine and yield, in May then it is found that small duration of sunshine for the all growth periods of October, November, December, January, February, March, April and May have a profitable influence on the yield.

Correlation between Yield and Yield Components

As shown in Table 3. coefficient of correlation between yield and yield components were a highly significant positive correlation among the culm length, per spike, number of spikes per m^2, weight of 1,000 grains and yield were shown and seed the more yield.

REFERENCES

Kwon,B.S., 1993. The relationships between meteorological elements and mat rush yield. sunchon Nat'l Univ. Bull. 12 : 45- 51.

Kwon,B.S.,J.T.Lim, D.H.Chung and J.J.Hwang. 1994. Relationships between meteorological factors and growth and yield of *Alisma plantago* L. in Seung ju Korea.

Korean J. Medicinal Crop Sci. 2: 7-13.

Kown,B.S., Y.B.Oh and H.L.Cho. 1998. Relationships between meteorological factors and yield of onion in Muan area. Journal of Basic Science of Sunchon Nat's Univ. 9: 127-135.

Kwon,B.S., S.K.Choi and H.L.Cho. 1998. Relationships between meteorological factors and yield of garlic in Goeung area. Journal of Basic Science of Sunchon Nat'l Univ. 9 : 137-145.

Kwon,B.S., and H.L.Cho. 1998. Effects of meteorological elements an growth and yield of peanut. Sunchon Nat'l Univ. Bull. 17 : 45 - 54

Kwon, B. S., and H.L.Cho. 1998. Effects of meteorological elements on growth and yield of perilla. Sunchon Nat'l Univ. Bull. 17 : 35 -44.

Kwon,B.S., and J.T.Lim. 1998. Relationship between meteorological elements and fiber yield of hemp in

Table 3. Coefficients of correlation between yield components and yield.

characters	2)	3)	4)
1) Culm length (cm)	0.881**	0.984**	0.911**
2) No. of spikes/m^2		0.955**	0.868**
3) WT. of 1,000 grains(g)			0.937**
4) Seed yield (kg/10a)			-

Table 4. Coefficients of correlation between agronomic characters and meteorological factors in each month.

Meteorological factors	Month	Culm length (cm)	No. of spikes/m²	WT. of 1,000 grain(g)	Seed yield (kg/10a)
Air Temperature (℃) mean	Oct.	0.375*	0.185	0.266	0.321
	Nov.	0.127	0.029	0.132	0.314
	Dec.	0.215	0.210	0.224	0.396*
	Jan.	0.384*	0.452*	0.488**	0.418*
	Feb.	0.178	0.072	0.239	0.338
	Mar.	0.195	0.025	0.244	0.463**
	Apr.	0.042	0.125	0.022	0.315
	May.	0.425*	0.058	0.252	0.384*
Max.	Oct.	0.493*	0.427*	0.447**	0.395*
	Nov.	0.041	0.005	0.039	0.215
	Dec.	0.364*	0.321	0.254	0.314
	Jan.	0.212	0.273	0.311	0.327
	Feb.	0.273	0.155	0.324	0.461*
	Mar.	0.413	0.215	0.373**	0.531**
	Apr.	0.324	0.175	0.169	0.114
	May.	0.447*	0.166	0.214	0.215
Min.	Oct.	0.271	0.088	0.165	0.216
	Nov.	0.134	0.025	0.112	0.234
	Dec.	0.210	0.176	0.214	0.442*
	Jan.	0.484*	0.441	0.542**	0.473**
	Feb.	0.215	0.076	0.210	0.422*
	Mar.	0.186	0.065	0.131	0.318
	Apr.	0.081	0.104	0.048	0.388*
	May.	0.450*	0.086	0.121	0.529**
Precipitation (mm)	Oct.	- 0.566*	- 0.820**	- 0.695**	- 0.499**
	Nov.	- 0.611*	- 0.505	- 0.667**	- 0.688**
	Dec.	- 0.188	- 0.321	- 0.265	- 0.311
	Jan.	- 0.275	- 0.554**	- 0.488**	- 0.567**
	Feb.	- 0.131	- 0.061	- 0.119	- 0.011
	Mar.	- 0.039	- 0.381	- 0.214	- 0.297
	Apr.	- 0.284	- 0.122	- 0.234	- 0.399*
	May.	- 0.121	- 0.121	- 0.014	- 0.184
Duration of sunshine (hr)	Oct.	- 0.094	- 0.166	- 0.039	- 0.025
	Nov.	- 0.424*	- 0.281	- 0.314	- 0.215
	Dec.	- 0.172	- 0.055	- 0.005	- 0.127
	Jan.	- 0.042	- 0.311	- 0.036	- 0.113
	Feb.	- 0.125	- 0.301	- 0.172	- 0.395*
	Mar.	- 0.313	- 0.495**	- 0.424	- 0.391*
	Apr.	- 0.254	- 0.111	- 0.214	- 0.460**
	May.	- 0.493**	- 0.699**	- 0.660**	- 0.674**

※ $P < 0.05$

※※ $P < 0.01$.

Boseon area. J. of Science and Education of Sunchon Nat'l Univ. 6 : 1-9.

Kwon,B.S., and J.U.Chun. 1998. Relationship between meteorological elements factors and yield of red pepper. Regional Development Research, Sunchon Nat'l Univ. 9 : 183-191.

Kim,DH., C.H.Heo, D.J.Kang and Y.S.Lee. 1993. Effects of meteorological elements on growth and yield estimation of barley in Chinju area. RDA. J. Agri. Sci 35 : 81-88.

Park,H.J., S.K.Kim, D.H.Chung, B.S.Kwon and J.T.Lim. 1995. Relationship between meteorological elements factors and yield of monoculture cotton in Mokpo area. Korean J. Crop Sci. 40 : 142-149.

Park,H.J., B.S.Kwon and J.S.Shin. 2001. Relationship between meteorological elements and yield of potato in Goheung area. Korean J. Plant Res. 133- 138.

(Received Feb. 5, 2004)
(Accepted Mar. 25, 2004)