

Relationship between Meteorological Elements and Yield of Hot Pepper in Yeosu Area of Korea

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ABSTRACT

This study was conducted to investigate the relationships between yearly variations of meteorological elements and yearly variations of productivity in hot pepper. In addition, correlation coefficients among the yields and yield components were used to find out the relationships between meteorological elements and productivity. Yearly variation of the mean air temperature in May and July showed large with coefficients of variation(C.V.) of 25.0, 8.9%, respectively, but the variation of the duration of sunshine in May were relative small. Yield and plant height was greatly with C.V. of 7.14, 11.6%, respectively, diameter of fruit showed more or less C.V. of 2.28% and length of fruit showed less variation. Correlation coefficients between maximum temperature in period of cultivation from May and yield are positively significant at the level of 1%. Correlation Coefficients between precipitation in period of cultivation from May to August and yield are negative significant at the level of 5 and 1%, respectively. Correlation coefficients amount the plant height, length of fruit, diameter of fruit per plant, and seed yield were positively significant at the level of 1%, respectively.

Key Words : meteorological elements, productivity, hot pepper, yield, correlation.

INTRODUCTION

Crop has a close relation to the environmental effects, especially weather condition. Many researchers

reported(Kwon et al., 1986; Cho and Chung 1979; Choi et al., 1993; Hyun, 1982; Lee et al., 1977; Li, 1982; Robert, 1982; Ryu et al., 1977; Rhu et al.,1982; Won et al., 1983) on weather and growth of crops and recently

the research of meteorological effect evaluation and yield prediction has been developed.

This experiment develops the estimated equation of hot pepper yield with increasing demands and analysis the relation of weather conditions to hot pepper growth and yield at Yeosu area, Chonnam in order to obtain the basic data of relation of crop to weather conditions and to develop safe cultivation and production techniques according to changes of meteorological environments and then the following results are reported.

We wish to show our thanks to related agencies and farm houses which cooperated to carry out this research.

MATERIALS AND METHOD

This experiment was used the yield produced from 1991 to 2000 and meteorological data observed during the cultivation period as shown in Table 1, and induces the estimated equations of correlation among growth, yield and weather conditions, dispersions and yield.

RESULTS AND DISCUSSION

Variabilities of Meteorological Elements

The weather conditions from 1991 to 2000, hot pepper growth, variability of yield character and the variabilities of meteorological elements during hot pepper growth period are shown in Table 2.

The greatest variabilities of meteorological elements are mean temperature in May. Their efficient of variance reach 25.0% while, the greatest temperature change during cultivation period was occurred in July as 8.9% and coefficient of variability was mean temperature 25.0% to the contrary, the mean

temperature of August was 2.98%, maximum temperature of August was 6.2% and minimum temperature of August was 6.9% and it has relatively stable meteorological elements.

Considering the variabilities of yield character during the cultivation period in Table 3, while the variability coefficient of length fruit setting was very low as 2.79% and it is governed by genetic characters peculiar to variety, those of yield and plant height were high as 13.57%, 9.55% and it is influenced by environmental factors in some degree and such a trend was shown as 28.50% in fresh weight of stem of rush(Kwon, 1994), 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., 1994) and it is considered that these results were due to the differences in character of crops.

Correlations among Meteorological Elements, Hot pepper Growth and Yield.

As shown in Table 4, it is positive correlations between temperature of May, June, July, August and September in mean, maximum and minimum air temperature and yield and then it is found that high temperature condition from May to September has a favorable influence on the yield.

In the precipitation, a negative correlation between the precipitation of all growth periods, May, June, July, August and September and yield is shown and then it is found that the small precipitation for growth periods of May to september and yield is shown and then rich sunshine for those of May, June, July, August and September produced high yield.

Correlation between growth and yield characters, a

Table 1. Cultivated area and yield of hot pepper in Yeosu area.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cultivated area(ha)	286	263	248	283	263	253	257	237	234	174
Total yield (kg/10a)	180	189	166	173	192	214	196	208	209	207

Table 2. Variabilities of meteorological factors for 10 experimental years (1991-2000).

Meteorological		Max	Min	Mean	Range	C.V.(%)	S.D
Air temperature(°C)	May	18.8	16.6	17.7	2.2	25.0	4.43
	Jun.	22.0	20.2	21.1	1.8	7.3	1.53
	Jul.	27.8	22.4	13.9	5.4	8.9	1.24
	Mean	27.6	23.4	25.5	4.2	6.6	1.68
	Sep.	23.7	21.3	22.5	2.4	7.0	1.58
Max	May	22.5	20.9	21.7	1.6	7.1	1.55
	Jun.	25.8	22.6	24.2	3.2	6.8	1.64
	Jul.	32.0	25.1	28.6	6.9	6.2	1.78
	Aug.	30.8	26.4	28.6	4.4	6.2	1.78
	Sep.	27.8	24.3	26.1	3.5	6.5	1.70
Min.	May	15.6	13.0	14.3	2.6	8.8	1.26
	Jun.	18.9	16.8	17.9	2.1	7.9	1.41
	Jul.	24.9	20.2	22.6	4.7	7.0	1.58
	Aug.	25.0	20.7	22.9	4.3	6.9	1.60
	Sep.	21.3	18.3	19.8	3.0	7.5	1.48
Precipitation (mm)	May	250.1	46.1	148.1	204.0	2.7	4.06
	Jun.	381.9	31.9	206.9	350.0	2.3	4.80
	Jul.	546.6	112.5	329.6	434.1	1.8	6.05
	Aug.	603.0	129.9	244.3	473.1	2.1	5.21
	Sep.	246.2	21.9	134.1	224.3	11.1	14.9
Duration of sunshine	May	288.0	189.4	238.7	98.6	0.1	0.06
	Jun.	233.9	107.8	170.9	126.1	2.6	4.36
	Jul.	296.5	120.4	208.5	176.1	2.3	4.81
	Aug.	271.6	131.9	201.8	139.7	2.4	4.74
	Sep.	270.3	177.8	224.1	92.5	3.6	4.99

Table 3. Variabilities of agronomic characters for 10 experimental years.

Characters	Max.	Min.	Mean	Range	C.V.(%)	S.D
Plant height(cm)	89.5	74.7	82.1	14.8	11.6	9.55
Fruit length(cm)	12.3	7.0	9.7	5.3	28.7	2.79
Fruit diameter(cm)	2.12	1.70	1.91	0.42	2.28	4.35
Yield of fruit(kg/10a)	214.0	165.7	189.9	48.3	7.14	13.57

highly significant positive correlation among plant height, length of fruit, diameter of fruit and seed yield is shown and the more hot pepper yield is shown and then

rich sunshine for those of May, June, July, August and September produced high yield.

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Table 4. Correlation coefficients between agronomic characters and meteorological factors in each month.

Meteorological factors	Mon.	Plant height(cm)	Fruit length (cm)	Fruit diameter	Yield of fruit(kg/10a)
Air Temperature (°C) Mean	May	0.492*	0.223	0.522**	0.515**
	Jun.	0.179	0.014	0.072	0.101
	Jul.	0.181	0.025	0.161	0.089
	Aug.	0.260	0.212	0.307	0.343
	Sep.	0.301	0.246	0.247	0.222
Air Temperatuer (°C) Max.	May	0.673**	0.365*	0.610**	0.596**
	Jun.	0.417*	0.152	0.353*	0.328
	Jul.	0.234	0.012	0.240	0.180
	Aug.	0.257	0.182	0.285	0.299
	Sep.	0.029	0.528**	0.030	0.082
Air Temperature (°C) Min.	May	0.332	0.219	0.387*	0.413*
	Jun.	0.320	0.338	0.465*	0.318
	Jul.	0.188	0.066	0.149	0.055
	Aug.	0.296	0.287	0.357*	0.407*
	Sep.	0.411*	0.016	0.387*	0.396*
Precipitation (mm)	May	-0.535**	-0.528**	-0.470*	-0.477*
	Jun.	-0.545**	-0.145	-0.562**	-0.505**
	Jul.	-0.276	-0.193	-0.389*	-0.383*
	Aug.	-0.432*	-0.051	-0.412*	-0.477*
	Sep.	-0.175	-0.442*	-0.192	-0.379*
Duration of sunshine (hr.)	May	0.347	0.047	0.327	0.224
	Jun.	0.468*	0.320	0.396*	0.319
	Aug.	0.080	0.004	0.085	0.073
	Sep.	0.237	0.495*	0.270	0.375*

Table 5. Correlation of coefficient between of each character of red pepper for ten years. (1,991~2,000)

	Plant height(cm) (1)	Fruit length(cm) (2)	Fruit diameter(mm) (3)	Yield(kg/10a) (4)
1	1.00	0.54**	0.98**	0.93**
2		1.00	0.60**	0.68**
3			1.00	0.96**
4				1.00

significant at 5%, 1% level.

Correlation between Growth and Yield and Yield Characters

As shown in Table 5, in correlation between growth and yield characters, a highly significant positive correlation among plant height, length of fruit, diameter of fruit and seed yield is shown and the more hot pepper yield was described.

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(Received Feb. 25, 2003)

(Accepted Apr. 10, 2003)