Journal of Agrometeorology 5 (1) : 117 -119 (June 2003)

Short Communication

Growing degree days for rice and wheat in Ludhiana region

B. GOSWAMI, G. S. MAHI, S. S. HUNDAL and UDAY S. SAIKIA[1]
Department of Agricultural Meteorology, Punjab Agricultural University, Ludhiana
[1]Division of Agricultural Physics, IARI, New Delhi

Wheat and rice are the major crops of *rabi* and *kharif* season respectively in Punjab state. Climate and weather variability significantly affect the technologies and management strategies in the irrigated areas. A better understanding of the climatic resources can help to increase productivity. Temperature is considered to be one of the dominant factors (Yoshida, 1978) that affects the growth and yield of rice (Chaurasia *et al.*, 1996). Each phase has low and high temperature threshold. Low temperature in early growth stages retards the development of seedling and dry matter production. Several studies have been made to determine the effect of temperature on growth and development of wheat crop, but many of these concentrated on the development stages such as grain growth (Sofield 1977). Experiment with spring wheat (Mahi *et al.*, 1991; Mc Master and Wilhelm, 1998) showed that the effects of temperature on growth and grain yield of cereals depend on the stage of development of the crop. It was found that grain size in rice is much more stable at high temperatures than in wheat (Chowdhury and Wardlaw, 1978).

For the present analysis, data on phenology of wheat (1999-2000) and rice (1999) were collected from an experiment on the farm of Punjab Agricultural University, Ludhiana. Data on daily maximum and minimum temperature were collected for both the crop seasons.

The cumulative values of growing degree days (GDD) in wheat and rice crops were calculated by summing mean daily temperature above base temperatures. The base temperature for wheat is 4.4 °C (Peterson, 1965) and of rice is 10 °C (Thomas, 1957) respectively.

The sowing of rice nursery was done on May 12, 1999 and the transplanting was undertaken 30 DAS. Tillering started 39 DAS. The two rice varieties (PR 111 and PR 114) attained the physiological maturity on 124 and 128 DAS respectively (Table 1). The phenological events followed the same trend in both the varieties. GDD for both the varieties of rice indicated that for PR-114 they were relatively higher as compared to PR-111 due to longer duration of the variety.

Both varieties of wheat were sown on November 3, 1999 and the initiation of emergence was observed at 4 DAS. Panicle initiation and grain filling started on 99, 118 DAS for WH-542 and 104 and 122 DAS for PBW-343. The two varieties attained physiological maturity on 155 and 158 DAS respretion..

Similar differences in GDD were

Table 1 : Growing degree days (GDD) and phenological stages of two rice variety (PR- 111 and PR-114).

Phenological stages	PR-111		PR-114	
	DAS	Σ GDD	DAS	Σ GDD
Transplanting	30	631	30	631
Start tillering	39	833	39	833
Booting	87	1825	94	1956
Heading	95	1974	106	2194
Start grain filling	108	2238	114	2357
Physiological maturity	124	2547	128	2627

Table 2 : Growing degree days (GDD) and phenological stages of two wheat variety (WH- 542 and PBW-343)

Phenological stages	WH-542		PBW-343	
	DAS	Σ GDD	DAS	Σ GDD
Start emergence	4	98	4	98
Complete emergence	7	142	9	174
CRI stage	28	433	32	458
Tillering	34	502	38	522
Jointing	57	701	62	721
Flag leaf initiation	73	826	78	842
Booting	95	1012	99	1028
Panicle initiation	99	1028	104	1071
Anthesis	106	1108	111	1132
Grain filling	118	1232	122	1258
Soft dough	134	1442	138	1469
Hard dough	146	1629	150	1670
Physiological maturity	155	1785	158	1810

observed between two wheat varieties i.e. WH-542 and PBW-343. PBW-343 indicated higher cumulative growing degree-days than WH-542 due to longer duration.

REFERENCES

Chaurasia, R., Kaur, P., Mahi, G. S. and Singh, G. 1996. Effect of canopy environment on grain, growth and yield components of rice. *J. Plant Sc. Res.*, 11-12: 32-34.

Chowdhury, S. I. and Wardlaw, I. F. 1978. The effect of temperature on kernel development in cereals. *Aus. J. Agri. Res.*, 295: 205-223.

Mahi, G. S., Mavi, H. S., Chaurasia, R., Singh, G. and Jhorar, O. P. 1991. Climate based wheat yield model. *Proc. Natn. Symp. On Statistical Methodology for Dryland Agriculture.* Pp. 187-195. CRIDA, Hyderabad.

Mc Master, Gregory, S. and Wilhelm, W. W. 1998. Is soil temperature better than air temperature for predicting winter wheat phenology. *Agron. J.*, 90: 602-07.

Peterson, R. F. 1965. Wheat-botany, cultivation and utilization. Interscience Publishers Inc: 17-33.

Thomas, J. E. 1957. Rice in Spain. *World Crops.* 9: 247-250.

Sofield, I., Evans, L. T., Cooke, M. G. and Wardlaw, I. F. 1977. Factors influencing the rate and duration of grain filling in wheat. *Aust. J. Plant Physiology,* 4: 785-97.

Wardlaw, I. F. 1970. The early stages of grain development in wheat: Response to light and temperature in a single variety. *Aust. J. Biol. Sci.*, 23: 765-74.

Yoshida, S. 1978. Tropical Climate and its influence on rice-IRRI Research Paper. Series No. 20: p. 7.