PHASIC DISTRIBUTION OF TOTAL HEAT UNITS IN WHEAT CULTIVARS IN INDIA

1. Accumulation of mean temperatures above a crop specific base value is called heat units (HU) and multiplication with the photoperiod is known as the pheno-thermal units (PTU). The wheat crop has lent itself admirably to studies on its vegetative and reproductive durations in terms of the PTU. For practical purposes, heat units, which are easier to compute, give as good a measure of wheat development as the PTUs. In view of the envisaged increase in temperatures in the rabi season in the coming years on account of climate change, demand will arise for breeding of varieties with higher heat unit requirements in wheat growing regions. Evaluation of the pheno-thermal relations of the increasing number of new cultivars will be simplified, if the percentage accumulation of heat units in different phenomenological phases of wheat shows a similar distribution in the various zones.

2. For wheat cultivars, PTUs with a base temperature of 4.5°C for completion of the vegetative and maturity phases of wheat have been presented by Pande et al. (1974). The methodology and nomenclature used for delineation of the different stages of the crop do not appear to be uniform. Therefore, to carry out an examination of the above type, heat unit data for various sub-phases of growth of the wheat crop in various zones (Venkataraman and Rahi 1983) is the prime need. For wheat crop, the minimum (base) temperature varies growth-stage wise, of which the minimum was 3.3°C, considering all the growth stages of the crop (Kakde 1985, Kashyapi and Das 1999). Different authors have used different minimum (base) temperature for this computation. However, the data on heat units of different cultivars of wheat, accumulated above a base mean temperature of 3.3°C, for specified growth phases from sowing to harvest-maturity obtained from a number of evapotranspiration stations of India Meteorological Department (IMD), as presented by Kashyapi and Das (1999) have been analysed.

3. As a first step, the heat unit distributions at the IMD stations of Ludhiana and Jabalpur were compared with those presented by (a) Kaur et al. (2001) for the wheat crop at Punjab Agricultural University (PAU), Ludhiana and (b) Agarwal et al. (1999) for the wheat crop at Jawaharlal Nehru Krishi Vidyapeeth (JNKV), Jabalpur (Table 1). For the PAU and JNKV wheat crops, heat units had been accumulated above a base temperature of 5°C. In the range of 15 to 20°C mean temperature that prevails in the wheat belt in the rabi season, use of 3.3°C will utmost overestimate by 2% the distribution percentage based on 5°C. Thus, distribution percentage of heat units for various phases based on either 5°C or 3.3°C will not be affected.

4. To conclude, the features of similarity in the distribution, amongst the various crop stages of the total heat units, ranging from 1578 at Jorhat to 2349 at Akola is
significant and gives rise to the expectation that the distribution percentage of the total heat units may be the same for all the cultivars in a homogeneous temperature zone. To ensure the above phenological data of only those sowing dates giving near maximal yields amongst the sowing date treatments, must be taken up for analysis (Venkataraman, 2004).

5. The authors are thankful to Shri S. K. Banerjee, the then DDGM (Agrimet) for providing the necessary facilities in preparation of the manuscript. They are also thankful to Mrs. S. Renuka Devi, S.A. for her assistance in preparation of the manuscript.

References

Agarwal, K. K., Shanker, U., Upadhyay, A. P. and Gupta, V. K., 1999, “Accumulated heat unit requirements for different phenophases of wheat (Triticum aestivum) cultivars as influenced by sowing dates of Jabalpur”, Journal of Agrometeorology, 1, 173-176.

Kakde, J. R., 1985, “Agricultural Climatology”, Metropolitan Book Co. (P) Ltd., New Delhi, First Edn. (1985), 1-387.

Kashyapi, A. and Das, H. P., 1999, “Requirement of heat unit and agrometeorological indices in selected wheat growing zones”, Mausam, 50, 1, 63-70.

Kaur, G., Kler, D. S. and Singh, S., 2001, “Studies on heat unit requirement of wheat (Triticum aestivum) under different planting techniques at higher nitrogen nutrition”, Indian J. Environment and Ecoplanning, 5, 383-386.

Pande, H. K., Ravindranath, E. and Lahiri, S., 1974, “Optimum time of planting for wheat crop in acid lateritic zone”, Indian Journal of Agronomy, 19, 127-131.

Venkataraman, S., 2004, “Assessing degree-day requirements of phenological phases of kharif Pigeon pea”, Under Publication in Journal of Agrometeorology.

Venkataraman, S. and Rahi, A. K., 1983, “Influence of temperature climatology on productivity of wheat crop in India”, Mausam, 34, 1, 81-84.