

SOME ASPECTS OF HEAT UNITS OF WHEAT

Swaminathan (1968) has drawn attention to the comparable nature of the per day yield of a crop at places with widely varying durations of its active growth. Hence the increasing time taken by the wheat crop, to enter the flowering phase as one proceeds from south to north, is likely to be a major factor in the N-S wheat yield gradients.

Wheat is a non-thermoperiodic plant (Went 1953). The duration of its vegetative phase is strongly and linearly related to the mean daily effective growing temperature (Nuttonson 1955). The variety NP4 is grown at a number of crop-weather stations in India and the local tall varieties grown along with it show an identical phenological behaviour. Therefore, to investigate the temperature dependence of the vegetative phase duration of the tall Indian wheat varieties, the average dates of sowing and commencement and cessation of ear emergence of NP4 wheat grown at a number of crop weather stations in India were taken.

For the phases sowing to ear emergence and ear emergence, the heat units accumulated, as given by the products of the length of the phase

in days and the mean temperature above a base temperature of 4°C during the phase were worked out.

The average total heat units for the two phases for NP4 wheat at the different stations are shown in Table 1. This reveals the near constancy of the number of total heat units for the period sowing to ear emergence at all the stations, no difference being noticeable between stations like Labhandi and Chinsurah where the crop is irrigated and the other where it is raised rainfed. The heat units for the duration of ear emergence phase is not constant nor does it reveal any pattern.

For stations situated at the different latitudes round about the 78°E longitude, the delay in flowering per latitude as one proceeds from south to north shows a relationship (Fig. 1) which may be mathematically expressed by the equation—

$$D = 2.4335 - 0.6(X-16) + 0.0781(X-16)^2$$

where, D = delay in degrees per degree latitude and X = latitude in degrees north. Fig. 1 indicates that the Hopkins' Law will be obeyed in the higher latitudes only. It would be interesting to study this further on a global basis by getting

TABLE 1

Heat unit summations for NP4 wheat

Station	Lat. (°N)	Long. (°E)	Average dates of			Heat unit accumulations and average temp. (°C) in the phases	
			Sowing	Commence- ment of flo- wering	Completion of flowering	Sowing to ear emergence	Ear emergence
Dharwar	15°26'	75°06'	22 Oct	10 Dec	26 Dec	934	315
Parbhani	19 16	76 47	10 Oct	6 Dec	1 Jan	22.2 1069	(23.7) 486
Niphad	20 06	74 07	26 Oct	20 Dec	2 Jan	(23.0) 936	(22.6) 252
Jalgaon	21 03	75 34	23 Oct	14 Dec	28 Dec	(20.8) 1053	(23.4) 303
Nagpur	21 09	79 22	30 Oct	27 Dec	12 Jan	(23.7) 1001	(25.0) 256
Labhandi	21 16	81 30	19 Nov	18 Jan	9 Feb	(20.9) 960	(20.0) 427
Powerkhera	22 44	77 42	31 Oct	1 Jan	18 Jan	(20.0) 965	(23.4) 260
Chinsurah	22 52	88 24	11 Dec	13 Feb	2 Mar	(19.6) 939	(19.3) 305
Kanpur	26 28	80 21	6 Nov	19 Jan	7 Feb	(18.0) 1005	(22.0) 247
Aligarh	27 50	78 10	1 Nov	20 Jan	11 Feb	(17.0) 967	(17.0) 182
Delhi	28 40	77 10	11 Nov	8 Feb	1 Mar	(18.8) 970	(12.3) 241
						(17.5)	(14.1)

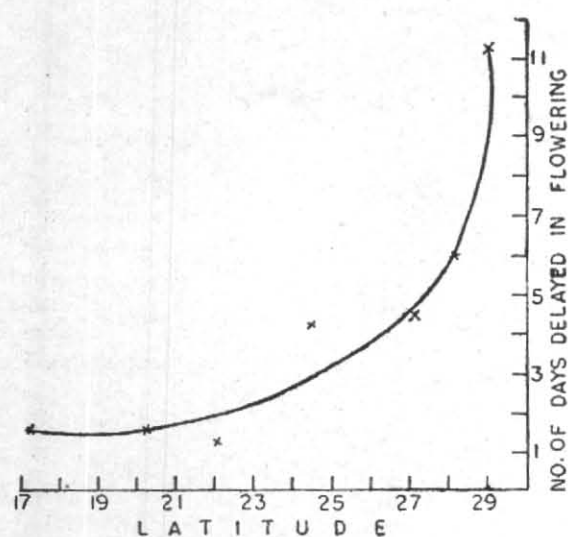


Fig. 1. Delay in flowering vs latitude

data from the wheat growing regions in the southern hemisphere also.

For tall Indian wheat varieties the heat unit summation provides a handy tool for determining, from meteorological factors alone the optimum sowing date that will ensure the longest duration of active growth phase.

The above study relates to tall Indian wheat varieties, which are being fast replaced by the new high yielding dwarf varieties. Therefore, for the newly introduced wheat varieties precise determination of (i) the phenological—meteorological relationship with the short series phenological and yield data collected under the All India Co-ordinated trials and (ii) examination of the average yields of predominantly dry farming and irrigated wheat districts *vis-a-vis* the length of vegetative phase, appears warranted from the point of view of climatic delineation of the optimum regions and growing periods. This is being looked into.

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