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Short communication

Assessing degree-day requirements of phenological phases of *kharif* pigeonpea

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Assessment of requirements of " Degree Days ", above a base temperature, for completion of various growth stages in the vegetative and maturity phases of a crop is vital for delineation of homogenous zones of climate for it. The main source of phenological data is the sowing date trials. However, care must be taken to see that the phenological data for assessing degree-day requirements for optimum growth, relate to crops free of (i) moisture stress for *kharif* crops and (ii) temperature stress for irrigated crops. In selecting such a crop, phasic crop-life durations and yield can be used as indicators. Such an exercise relating to pigeonpea crop at Anand is detailed below.

Data on days, growing degree days (GDDs) accumulated above a mean temperature of 10 degrees centigrade and yield for pigeonpea cultivars , GT 100 and BDN 2, sown on 3 different dates in 1993 and 1994 at Anand, Gujarat have been presented by Patel *et al.* (2000) for 5 phenological phases, viz:- P1 - Emergence to initiation of primary branch; P2 - Initiation of primary branch to flower bud initiation; P3- Flower bud initiation to 50% flowering; P4- 50% flowering to 50% podding and P5- 50% podding to physiological maturity.

From the yield data of Patel *et al.* (2000), it was noted that the percentage reductions in yields in D2 and D3 sowings vis-à-vis that of D1 were respectively (a) 96 and 66 in 1993 and 69 and 53 in 1994 for GT100 and (b) 99 and 75 in 1993 and 73 and 47 in 1994 for BDN2. Thus for phenological purposes for normal growth, data of D1 and D2 crops in 1993 and only D1 crop in 1994 were eligible for consideration.

However, it was seen that in 1993 the phenological data reported by Patel *et al.* (2000) for the first phase were out of place. This was confirmed from an examination of data for cultivar GT 100 for 1993 presented by Patel *et al.* (1999). The duration of and GDDs accumulated for phase I in 1993 for the D1 and D2 dates of sowing were taken from the data of Patel *et al* (1999) for GT 100. For GT100 for the year 1993 averages of those presented by Patel *et. al* 1999 and 2000 were taken. The data of D1 94 of BDN2 showed that (i) the duration of phase 2 and 3 seem to have been over or underestimated at the expense of the other and (ii) phase 5 of the crop had suffered a stress.

In the data reported by Patel *et al* (1999; 2000) the phase Sowing to Germination, P0, has not been covered. However, from their 1999 paper the duration and GDD requirements of GT 100

Table 1 : Normal requirements and phasic-fractional fulfillment of duration and GDDs for *kharif* pigeonpea

Phase	Total				Percentage of total			
	GT -100		BDN -2		GT100		BDN2	
	Days	GDD	Days	GDD	Days	GDD	Days	GDD
P0	8	150	8	150	5	6	4	5
P1	27	500	30	539	18	19	17	18
P2	49	896	56	1044	33	33	31	34
P3	12	223	21	389	8	8	11	13
P4	20	371	22	363	13	14	12	12
P5	35	553	45	553	23	20	25	18
Total	151	2693	182	3038				

for P0 can be taken as 7 and 150 respectively. As the germination phase for the 2 cultivars can be expected not to be much different the same values were adopted for BDN 2 also. Keeping the above features in view, the normal durations and GDD requirements for the six phenological phases of GT 100 and BDN 2 for a maximal yield crop were computed afresh and are set out in Table 1. The percentage of days spent and GDD accumulated in each of the phases are also given in Table 1.

From Table 1 it is seen that the increase in normal life of about 30 days in BDN 2 compared to that of GT100 is due to an increase of about 10 days in each of the phases 2, 3 and 5. However, despite an increase in duration of phase 5 of BDN 2 its degree-day requirement for this phase is the same as that of GT 100. Thus the longer duration of phases 2 and 3 of BDN2 compared to that of GT100 (i) accounts for the increased GDD requirements of BDN2 (ii) results in phase 5 occurring in cooler temperatures which are not conducive for pod setting in Pigeonpea (Balakrishnan and Natarajaratnam, 1988) (iii) explains the lower yields of BDN2 even in D1 sowings of both years and (iv) will expose the BDN2 crop to soil moisture stress in an earlier phase or date of sowing. From Table 1 it is seen that except for phase 3 the fractional fulfillment of the total GDD requirements is comparable in both cultivars. Thus phase 3 may require the use of a genetic coefficient for BDN2.

The GDD requirements enumerated above should assist in demarcation of optimum areas and periods for maximizing yield of GT 100 and use GT 100 as a standard for calibrating the phenological behaviour of other pigeon pea varieties. The present communication is an attempt to indicate the method by which relevant phenological data that can help in zonation of rainfed crops can be culled out from data on reported sowing date trials.

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