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Short communication

Thermal time requirements of ten genotypes of *Brassica* species at Hisar

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Oilseeds, which come next to food grains in terms of volume in our country, play a vital role in our economy. Among oilseed crops, rapeseed-mustard are second most important oilseed crop after groundnut, contributing nearly 25 to 30% of the total oilseed production in India (Anonymous, 2006). Optimum sowing time is one of the important non – monetary inputs which play a pivotal role in achieving potential yield of any crop. Every crop needs a specific amount of heat units or growing degree days (GDD) to enter from one phase to another phase. Among species and cultivars, there are considerable differences in accumulated heat units and days taken to reach different growth stages (Singh *et al.*, 1993). Kumari and Rao (2005) reported that higher temperatures during the reproductive phase reduced the duration of the late- sown *Brassica* crop.

A field experiment was conducted at the research area of Department of Agricultural Meteorology, CCS Haryana Agricultural University, Hisar (Lat. 29°10'N, Long. 75°46'E, and altitude 215.2m amsl), during the rabi season of 2008-09. The experiment was laid in split-plot design with the main plot treatments being three sowing dates, viz., 15th October, 27th October and 10th November (D1, D2 and D3, respectively) and ten varieties of *Brassica* species were allocated to sub-plot treatments. Among species five were *Brassica juncea* varieties (V1- Laxmi 8812; V2- RH30; V3- Varuna; V4- RH819; V5- Kranti) and five *Brassica napus* genotypes (V6- GSL-1; V7- HNS-0501; V8- HNS-0004; V9- HNS-0403; V10- HNS-0401) with three replications.

The weather data required for the study were collected from the Agrometeorological Observatory of the Department of Agricultural Meteorology, CCS Haryana Agricultural University, Hisar. The fertilization, irrigation and management practices as recommended in the packages of practices for mustard crop in the Hisar region were strictly applied.

The heat units (HU) accumulated by the crop for different phenological stages were computed as under:

$$\text{HU (°C Day)} = \sum_{a}^{b} [((Tmax + Tmin)/2) - Tb]$$

Where, T_{max} is daily maximum temperature (°C); T_{min} is daily minimum temperature (°C); T_b is base temperature as 5°C for *Brassica* species (Morrison *et al.*, 1990); 'a' is starting date of a phenophase and 'b' is ending date of that phenophase.

The cumulative thermal time requirements were higher in the 15th October sown crop followed by 27th October and 10th November sown crops, at all phenological stages. These values at physiological maturity were 1670, 1524 and 1465°C day for D1, D2 and D3, respectively (Table.1). Among the *Brassica juncea* varieties, the highest number of heat units accumulated were 1526°C day by Kranti; and the next higher was 1524°C day by RH819. Among the *Brassica napus* genotypes, HNS-0403 accumulated higher thermal time with 1618°C day as compared to other genotypes. The next genotype with higher HU was HNS-0004.

The *Brassica* crop sown on 15th October consumed more thermal units as compared to 27th October and 10th November sown crops because early sown crop took more days to mature as compared to late sown crop. Singh (1999), Roy *et al.* (2005) and Chakravarty *et al.* (2006) also reported that less amount of heat units were recorded from sowing to maturity in *Brassica* crop as planting was delayed.

The first sown crop took less number of days for the occurrences of germination and 50% flowering phenophases as compared to D2 and D3 (Table 1). But for the completion of flowering, D1 took more days as compared to other dates of sowing. However, for the physiological maturity phase, no much significant difference was observed among dates of sowing. But, Sahoo *et al.* (2000) and Poureisa and Nabipour (2007) reported that the quick rise in the air temperatures during reproductive stage shortened the seed filling period. Among the varieties of *B. juncea,* Kranti took more days to complete its life cycle, whereas among the genotypes of *B.*

Table1: Heat units' requirement and phenophase occurrence of *Brassica* cultivars under different sowing environments

Treatments	Heat units' requirement (°C Day)				Phenophase occurrence (days)				Total number of days
	Germination	50% flowering	Completion of flowering	Physiological maturity	Germination	50% flowering	Completion of flowering	Physiological maturity	
Date of Sowing									
D1 - 15th October	81	866	1517	1670	3	53	72	14	142
D2 - 27th October	75	796	1364	1524	3	58	58	12	131
D3 - 10th November	83	730	1253	1465	4	65	47	10	126
Varieties									
V1 - Laxmi 8812	79	734	1256	1505	3	52	56	18	129
V2 - RH30	79	708	1312	1516	3	50	63	15	131
V3 - Varuna	79	737	1284	1513	3	52	59	16	130
V4 - RH819	80	760	1338	1524	3	54	61	14	132
V5 - Kranti	80	715	1334	1526	3	51	64	14	132
V6 - GSL-1	79	923	1446	1600	3	73	46	10	132
V7 - HNS-0501	80	779	1418	1533	3	55	66	8	132
V8 - HNS-0004	79	770	1475	1602	3	55	70	7	135
V9 - HNS-0403	80	923	1470	1618	3	72	53	10	138
V10 - HNS-0401	80	921	1447	1589	3	72	52	10	137

napus, HNS- 0403 took more days. Twelve (12) days difference between first and second sowing shortened the life cycle by eleven (11) days and twenty six (26) days difference between first and third sowing, reduced the life span of the crop by sixteen (16) days. The interaction between dates of sowing and varieties was found significant.

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