Influence of Weather Parameters on Wheat Yield under varying sowing dates

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Objectives

- To study the effect of sowing date and genotype on phenophases of wheat.
- To evaluate the performance of wheat genotype under variable weather conditions.
- To study the heat use efficiency in different growth environments.



METHODOLOGY

- The experiment was carried out in permanent plots under the All India Co-ordinated Research Project on Agrometeorology at the Student's Instructional Farm, C.S.Azad University of Agriculture & Technology, Kanpur, during winter (*Rabi*) seasons of 2004-05, 2005-06 and 2006-07.

- The climate of the area is semi arid. The rainfall received in 2004-05 (with 7 rainy days), 2005-06 (with 5 rainy days) and 2006-07(with 5 rainy days) were 35.5, 28.2 and 61.3 mm, respectively.

- The soil had PH 7.9, electrical conductivity 0.42 dS/m, Organic carbon 0.41 % and analyzing low in available N (180.4 kg/ha), medium in P(19.8 kg/ha) and moderate K(195.0 kg/ha).
- The experiment was laid out in Split - Plot Design, with 9 treatment combinations replicated four times. The main plot consisted of three sowing time, Viz. timely (26th to 30th November), moderately late (10th to 15th Dec.) and very late 25th to 30th Dec.), while sub plot treatments consisted of three wheat genotypes (HD-2285, K-8804 and K-9107) .
- Wheat crop was sown 22.5cm apart at 5 cm soil depth with a seed rate of 100 kg/ha. by seed drill The crop received uniform dose of plant nutrients @ of 120 kg N, 60kg P2O5 and 60 kg K ha-1. Half dose of the nitrogen and full doses of phosphorus and potash were applied at the time of sowing and rest of the nitrogen was given in two equal parts after first irrigation when the moisture was sufficient in the field.

Results

Treatment	Mean Grain yield (kg ha.-1)	Mean Biomass yield (kg ha.-1
Environment		
1. Timely sown	4574.8	10723.3
2. Moderately late	4097.7	9736.7
3. Very late	3650.2	8436.7
SD	462.36	1146.9
±CV %	11.26	11.91
Genotype		
HD-2285	4484.1	10473.3
K-8804	4109.4	9373.3
K-9107	3729.1	9050.0
SD	377.50	746.1
±CV %	9.19	57.75

FINDINGS

- **Effect of sowing time on grain yield**

  The extent of variation in grain yield was recorded in different years. This was due to variations in amount and distribution of rainfall in different years. Crop sown during 2004-05, 2005-06 and 2006-07 received 35.5, 28.2 and 61.3 mm total rainfall, respectively.

  The weekly (Met. Week) rainfall distribution pattern revealed that crop received 5.4, 0.5, 2.5, 6.2, 9.2, 11.2 and 0.5 mm rainfall in 01, 02, 03, 04, 05, 10th and 13th meteorological weeks during 2004-05, while, 5.2, 6.0, 9.0, and 8.0mm rainfall in 51st, 10th, 11th and 14th meteorological weeks during 2005-06 and 0.4, 21.1, 20.0 5.2, 13.2 and 1.4 mm in 50th , 06th, 07th , 09th, 11th and 12th meteorological weeks, respectively, during 2006-07.

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- The lowest grain yield realized during 2004-05, might be due to the reason that crop experienced relatively more unfavourable weather (particularly more cloudy days and higher minimum temperature) continuously from crown root initiation to flowering stages compared to crop seasons of 2005-06 and 2006-07.
- The relatively higher grain yields recorded by timely-sown crop were mainly attributed to effective rainfall received during crop season. Grain yield decreased by 18.6% in 2004-05, 16.8 % in 2005-06, 25.0 % in 2006-07 and by 20.2 % an over all yield reduction due to very late sowing over timely-sown crop.

Effect of Environment and genotypes on heat unit (0days) and days taken at different phenophases of wheat

(2004-05 to 2006-07)

Pheno phases	Heat Units (^{0}days)						Days taken					
	Environment			Genotype			Environment			Genotype		
	Time sown	Mode r-ately late	Very late	HD-2285	K-8804	K-9107	Timel y sown	Mode r-ately late	Very late	HD-2285	K-8804	K-9107
Emergenc e	108.7	97.7	98.1	89.5	102.8	110.4	8	9	10	8	9	10
CRI	265.2	227.4	222.0	228.5	239.4	245.2	21	22	22	21	22	22
Tillering	452.4	411.0	450.6	422.6	440.6	448.8	40	40	43	39	41	43
Jointing	595.2	593.2	621.6	575.0	609.5	623.2	54	55	55	52	55	57
PI	761.6	715.9	794.4	720.4	753.7	793.0	68	65	66	63	66	69
Flowering	875.4	844.0	930.6	845.8	891.0	911.2	77	73	74	72	75	78
Anthesis	1054.5	998.6	1096.5	990.2	1063.7	1088.9	88	83	83	81	85	88
Milking	1213.0	1201.1	1296.0	1198.0	1236.0	1269.5	98	94	93	93	95	98
Dough	1444.3	1391.6	1461.2	1387.8	1432.1	1471.0	112	104	100	103	105	108
Maturity	1630.8	1621.6	1625.4	1577.8	1626.5	1666.1	121	115	107	112	114	116

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- Thus, very late sowing caused mean yield reduction of 31 kg/ha/day over timely sowing of wheat. Similarly, biomass yield of very late-sown crop was lower to its timely-sown, with wide variation during 2006-07 only. The reduction in grain yield in 2004-05 might be due to higher minimum temperature which increased the rate of respiration resulting in poor yield.
- Timely-sown crop took more days (16 Days) to complete its life cycle (Seeding to physiological maturity) compared with very late-sown crops. Each day delayed in sowing beyond timely to moderately late and very late sowing reduced the grain yield by 12.9 kg and 30.8 kg/ha/day, respectively, on the basis of pooled mean data.

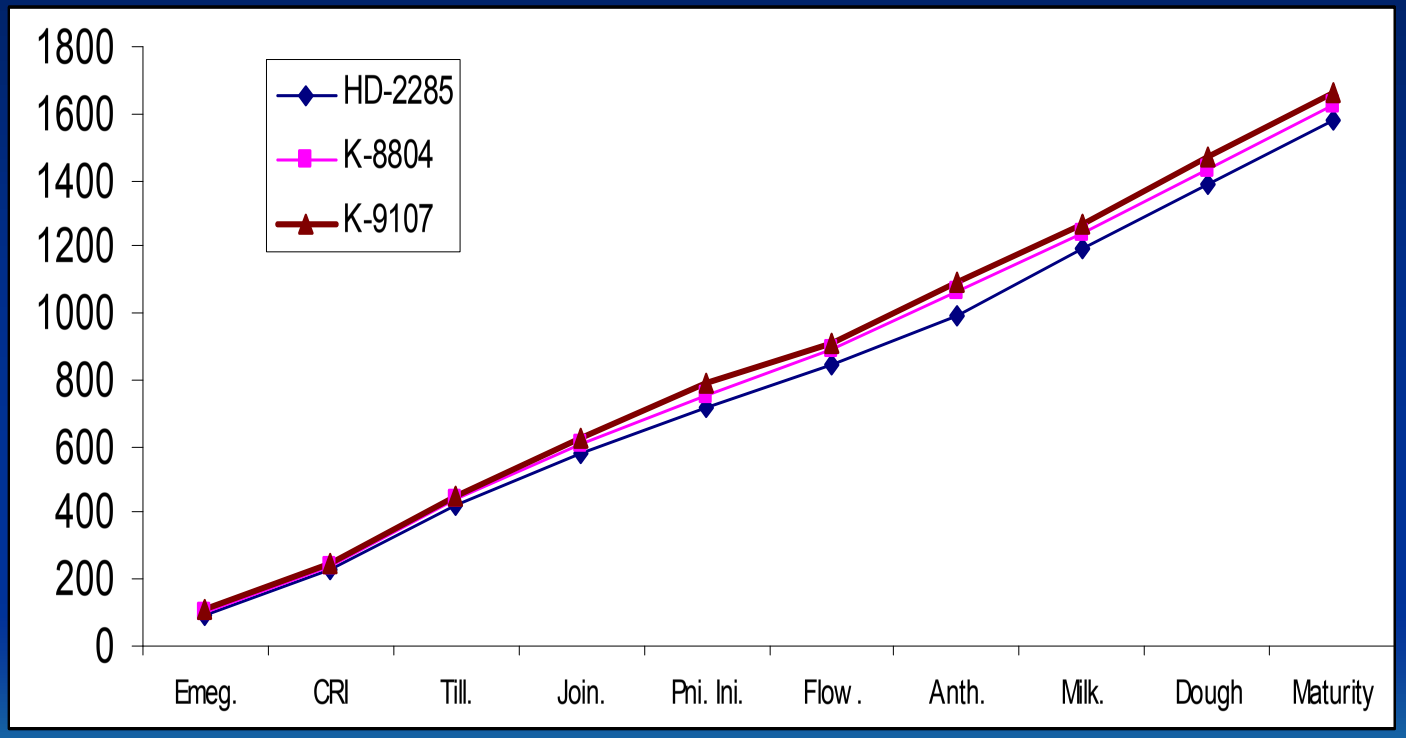
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- **Effect of genotype on grain and straw yield**

  The varieties differed significantly for grain and straw yield in all the seasons,. The maximum grain yield (4484.1 kg/ ha) was obtained in HD-2285, than rest of the varieties. Varieties K-8804 (4109.4 kg/ha) and K-9107 (3729.1kg/ha) ranked 2nd and 3rd position when sown in mid to very late during all the seasons.

  These findings are in consonance with the report of Kumar and Kumar (1998) The straw yield was maximum in HD-2285, (10245.6 kg/ha) followed by K-9107 (10171.1 kg/ha) and K-8804 (9267.9 kg/ ha) however in relation to date of sowing, maximum straw yield was obtained under timely sown (10843.9kg/ ha) and the lowest under the very late sown (8764.8 kg/ha) of wheat cultivars.

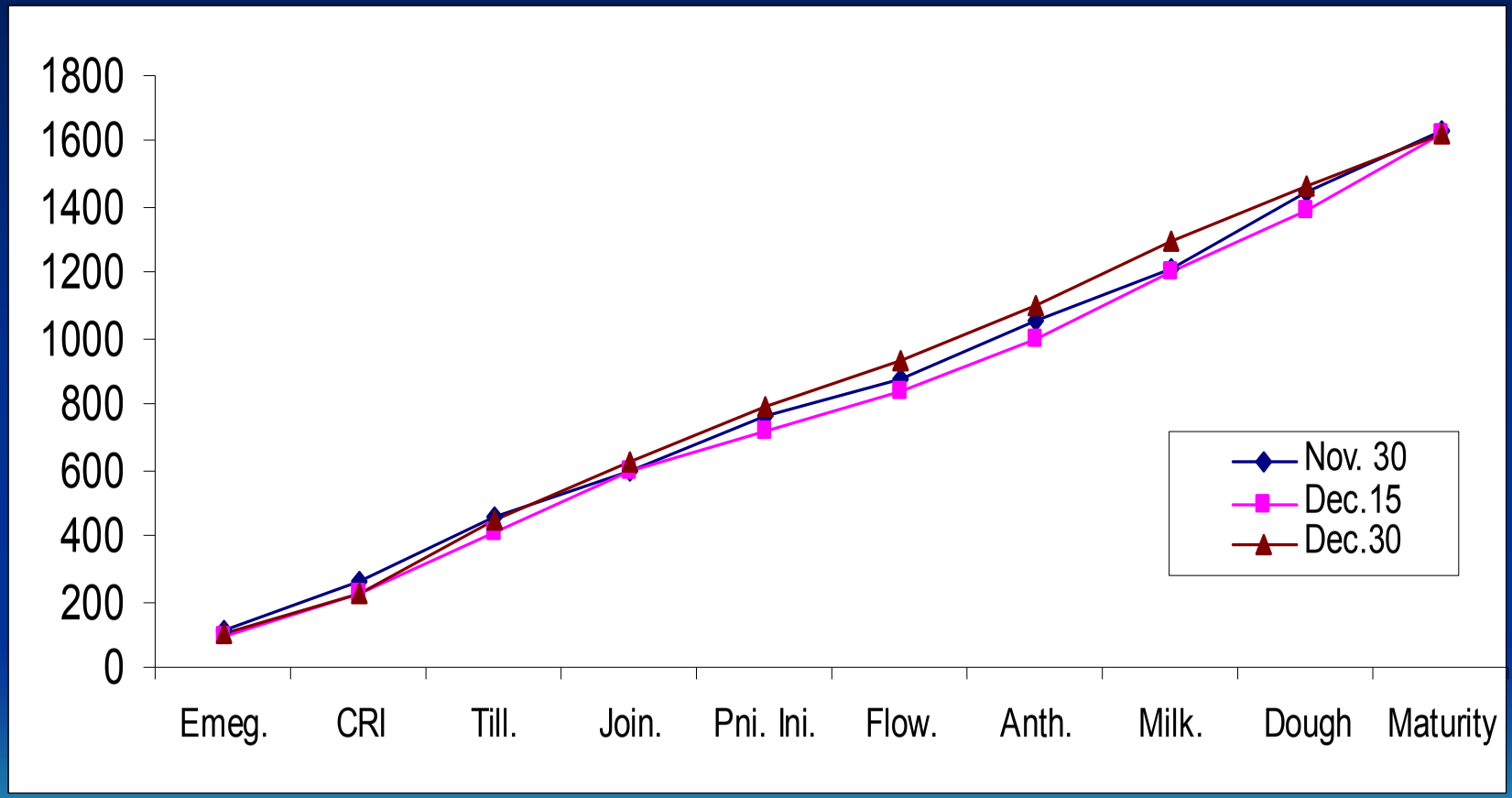
Effect of varieties on the cumulative heat units at different phenophases of wheat



Effect of sowing dates and genotypes on maximum and minimum temperature (^{0}C) at flowering phases of wheat (2004-05 to 2006-07)

Treatment	HUE in terms of Grain yield (kg ha.-1 oC-1 day-1)	HUE in terms mean Biomass yield (kg ha.-1 oC-1 day-1)
Environment		
1. Timely sown	2.82	6.68
2. Moderately late	2.53	6.35
3. Very late	2.24	5.64
Genotype		
HD-285	2.70	6.49
K-8804	2.44	5.88
K-9107	2.24	6.11

Effect of sowing dates on the cumulative heat units at different phenophases of wheat.



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. The growing degree days of all the three seasons for different sowing dates and varieties of wheat are presented in Table- 3 and depicted in Fig.1& 2. It is observed that earlier sown-crop availed lesser growing degree days during the Panicle initiation, Flowering , Anthesis , milking and Dough phenophases than late-sown crop except Emergence , CRI, Tillering and Maturity. However, overall GDD was observed at maturity more or less same during all the sowing dates. It is revealed that GDD of different phenological stages of different varieties was observed that the variety K-9107 availed more growing degree days followed by K-8804 than HD-2285 in all the phenological stages might be K-9107 was long duration genotype subsequently over others.

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अखिल भारतीय गेहूँ समन्वयक
शोध योजना ग्यारहवीं
(अ.गे.स.यो. आर.)
गेहूँ फूलना पत्ती पर प्रभाव
डुबाई सिंचाई एवं गेहूँ की प्रजातियाँ


प्रजाति- के- ९०१७


प्रजाति- के:- ६१०७
बुवाई तिथि-२३-११-२००७
प्रजाति- के:-६१०७
बुवाई तिथि-२३-११-२००७

conclusion

- it is concluded that higher yield and yield attributing characters of timely sown wheat was owing to relatively more favourable temperature experienced by the crop during its growth and reproductive periods. Temperature gradually increases toward the first fortnight of February onward, plants were subjected to earlier water stress due to increasing evapo-transpiration losses and forced to enter rapid reproductive development phases consequently, and total growing period was also reduced with delayed sowing until 30th December. The studies indicated that the climate is major determinant in assessing the performance of the wheat crop.


THANK'S