

Effect of Temperature on Performance of Wheat Varieties under Semi-arid Conditions of Uttar Pradesh

Pramod Kumar¹ Fateh Singh¹ Ravindra Kumar¹, M F Hussain¹ and Ajay Pratap Singh²

¹ Regional Agriculture Research Station, Kalai (Aligarh) ²Mangalayatan University, Aligarh

Ajaypratap.1582@gmail.com

ABSTRACT

A field experiment was conducted during rabi seasons of 2005-06 and 2006-07 with two varieties of wheat (PBW 343 and HUW 234), and seven dates of sowing at kalai(Aligarh),research station of C.S.Azad university of Agriculture and technology,Kanpur. Sowing dates were kept different in order to allow the crops to be exposed to different temperature conditions. Planting time influenced the maturity.Higher grain yield of wheat variety PBW 343 was recorded with planting in second week of November. Similarly variety HUW 234 yielded higher when planted in fourth week of November. The results indicated that wheat yield reduced with increase in daily mean post-anthesis temperature.

Key Words: Temperature, Phenology, variety, Yield

INTRODUCTION

Wheat is one of the most important cereal crops of India. It is grown in a range of weather conditions. Among all the weather parameters, temperature plays an important role during vegetative as well as reproductive stages.^[1] Increase in daily maximum and minimum temperature during crop causes adverse effect on crop growth and yield of wheat. In the current climate change scenario, where the rise in temperature has been observed, it is of utmost importance to study and assess the behavior of wheat varieties in terms of their growth and yield parameters in different temperature conditions. Keeping in view an attempt was made to find out the effect of temperature conditions on yield of long and short duration varieties of wheat.

MATERIALS AND METHODS

A field experiment was conducted during rabi seasons of 2005-06, 2006-07 at Kalai (Aligarh), research station of C.S. Azad University of Agriculture and Technology, Kanpur. The soil was sandy loam having pH 7.5, organic carbon 0.47%, available phosphorus and potassium contents 13.5 and 112.50 kg ha⁻¹ respectively. The experiment comprising seven dates of sowing I, II, III, IV week of November (D₁, D₂, D₃, D₄) and I, II, III week of December (D₅, D₆ D₇) with two varieties PBW 343(long duration) and HUW 234 (short duration) was conducted in completely randomized block design with four replications. Sowing was done in mid of every week during both years. The range of

mean, maximum and minimum temperature was 11.5-25.5, 35.4-18.5, 2.4-15.5°C and 12.2-30.6, 37.4-18.4, 3.4-23.7 during 2005-06 and 2006-07 crop seasons respectively. The statistical analyses were carried out following standard methods.

RESULT AND DISCUSSION

CROP PHENOLOGY

The data on number of phenological events (Table-1) shows that emergence and CRI occurred 2-3 days late in both varieties when planted in December (D₅, D₆, D₇). This may be due to lower temperature prevailing in December. However, other phenological events occurred earlier as compared to November sowing (D₁, D₂, D₃, D₄). Tillering in December sowing was earlier by 13-14 days, whereas, boot-leaf, ear-emergence and anthesis occurred earlier by 6-10 days. The hard dough stage was earlier by 8-10 days in December sowing but there was no such difference between November and December sowings with respect to days between anthesis and hard dough stage. Early occurrence of these stages may be attributed to relatively higher temperature prevailed during this period. In respect of varieties warmer conditions led to 5-10 days reduction in crop period.^[2,4]

Table-1: Number of days taken to reach 50% of phenological events (mean of two years)

| Stages | PBW 343 | | HUW 234 | |
|-----------------------|---------|-----|---------|-----|
| | I | II | I | II |
| Emergence | 8 | 11 | 9 | 11 |
| Crown root initiation | 22 | 24 | 21 | 22 |
| Tillering | 52 | 44 | 51 | 38 |
| Boot leaf | 84 | 78 | 78 | 69 |
| Ear emergence | 93 | 85 | 86 | 77 |
| Anthesis | 100 | 92 | 91 | 82 |
| Hard dough | 134 | 124 | 120 | 115 |
| | | | | |

I= November planting (D₁, D₂, D₃, D₄).

II= December planting (D₅, D₆, D₇)

Table-2: Effect of sowing dates on yield of varieties (kg ha⁻¹)

| Dates of sowing | PBW 343 | | | HUW 234 | | |
|--|---------|---------|-------|---------|---------|-------|
| | 2005-06 | 2006-07 | Mean | 2005-06 | 2006-07 | mean |
| D ₁ (1st week November) | 39.25 | 38.07 | 38.66 | 32.22 | 31.27 | 31.18 |
| D ₂ (2nd week November) | 43.12 | 40.25 | 41.69 | 35.16 | 33.22 | 34.19 |
| D ₃ (3rd week November) | 41.50 | 41.10 | 41.30 | 38.62 | 36.10 | 37.36 |
| D ₄ (4th week November) | 38.43 | 39.36 | 38.90 | 41.27 | 39.28 | 40.28 |
| D ₅ (1st week December) | 33.10 | 34.15 | 33.63 | 39.38 | 37.12 | 38.25 |
| D ₆ (2nd week December) | 27.72 | 28.00 | 27.86 | 35.20 | 32.44 | 33.82 |
| D ₇ (3 rd week December) | 24.36 | 23.87 | 24.12 | 29.17 | 28.25 | 28.71 |
| CD(P=0.05) | 1.80 | 1.06 | 1.43 | 1.80 | 1.06 | 1.43 |

GRAIN YIELD

Apart from phenology, there was impact of temperature on grain yield also. The grain yield exhibited significant variations owing to sowing time (Table 2). The highest grain yield 4169 kg ha⁻¹ of long duration variety (PBW 343) was obtained with planting in second week of November followed by sowing done in third week of November. Similarly short duration variety (HUW 234) yielded higher when planted in fourth week of November as compared to early or late planting. Long duration variety (PBW 343) did not perform well under late planting (December). On an average reduction in yield was observed to the tune of 33.31% as compared to early planting (November). The results indicate that wheat yield reduced with rise in daily mean post anthesis temperature. Reduction in yield with rise in temperature during grain filling stage was also reported.^[3]

CONCLUSION

Sowing time influenced the productivity of wheat. Early sowing of long duration wheat variety (PBW 343) by first week of November may be deferred till second week of November. Delayed sowing beyond III week of November proved deleterious. Short duration variety HUW 234 did not

perform well under early planting (I, II week of November) and late planting (II, III week of December) conditions. Second to third week of November for long duration wheat variety PBW 343 and fourth week of November to first week of December for short duration wheat variety HUW 234 should be preferred for sowing to get higher yield.

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