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# Effect of sowing dates and fertility levels on yield attributes and grain yield of wheat (*Tritium aestivum* L.) cv. GW-273

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## ABSTRACT

**Field experiment conducted at Gujarat revealed that, yield attributing characters of wheat were increased with 16th November sowing. However fertility levels 180-90 and 150-75 kg N-$P_2O_5$ $ha^{-1}$ did not show any remarkable difference in increasing the yield attributing characters of crop. Highest grain yield was recorded with 16th November sowing and fertilized with 150-75 kg N-$P_2O_5$ $ha^{-1}$. Significant reduction in grain yield was observed in early and subsequent sowing dates.16th November sowing proved remarkably superior to the rest of sowing dates which was 25.53 and 17.70 per cent higher over early and late sowings, respectively in grain yield production. Where as significant increase in grain yield was recorded with increased fertility level. Fertility levels 180-90 and 150-75 kg N-$P_2O_5$ $ha^{-1}$ produced appreciably higher grain yield to the extent of 41.32 and 40.43 over 90-45 kg N-$P_2O_5^{-1}$ ha and 21.85 and 21.07 per cent over 120-60 kg N-$P_2O_5^{-1}$ ha, respectively. Interaction between sowing date and fertility level was found significantly with 16th November sowing and highest level of fertility *i.e.* 180-90 kg N-$P_2O_5$ $ha^{-1}$.**

**Key words :** Wheat, Sowing dates, Fertility levels, Yield attributes, Yield.

## INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the important staple food crop followed by paddy in India. In Gujarat, wheat is cultivated under irrigated as well as rainfed conditions. Among the crop management factors sowing time is an important non-monitory crop production practice. It is well known that maximum yield can be obtained only, if the crop is sown in time. In addition to sowing time, fertilizer plays an important role in crop production, since the information on this aspect is meagre particularly for Gujarat. An attempt was made to find the, optimum sowing time and effect of different fertility levels on grain yield and related parameters of wheat variety GW-273.

## MATERIALS AND METHODS

The field experiment with wheat cv.GW-273 was conducted at Instructional Farm, Gujarat Agricultural University, Junagadh during *rabi* season of 1998-99 in slightly alkaline soil with 8.0 pH, 0.64% organic carbon and 273, 22.30 and 270 kg available N, $P_2O_5$ and $K_2O$ $ha^{-1}$, respectively. Twelve treatments combinations of three sowing dates (1st and 16th November and 1st December) in main plot and four fertility levels (90-45, 120-60, 150-75 and 180-90 kg N- $P_2O_5$ $ha^{-1}$) in sub plot were replicated four time in split plot design. The gross and net plot size were 4.50 x 3.60 m and 4.00 x 2.70 m, respectively. The crop was sown accordingly to their sowing schedule and fertilized with nitrogen and phosphorus as per treatments. The source of nitrogen and phosphorus was urea and single super phosphate, respectively.

## RESULTS AND DISCUSSION

### *Effect of sowing :*

Yield attributes *viz*. number of effective tillers per plant and number of spikes per meter row length increased remarkably under 16th November. Length of spike was appreciably more under 16th November sowing than rest of the sowings. Early and late sowing were at par in respect of length of spike. This could be due to vigorous growth of plants which was influenced by climatic parameters and favourable longer reproductive growth phase (Table 1). The results are in agreement with those of Nanda *et al*. (1988).

The 16th November sowing resulted in higher number of spikelets and grains per spike. This was due to increase in length of spike, which is a seat of spiklets and grains on spike. Same results were obtained by Bali *et al.* (1988).

Grain weight per spike and test weight recorded appreciably higher over 16th November sowing than rest of sowings. This was due to higher number of spikelets per spike and thereby increase number of grains per spike as well as favourable temperature prevailed for longer period from reproductive phase to grain filling stages. This results were also reported by Bali *et al.* (1988).

Grain yield of wheat was affected significantly by sowing dates (Table 1). Crop sown on 16th November gave significantly higher grain yield than early and late sowings. The increase in grain yield in 16th November

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**Table 1 : Effect of treatments on yield attributes and grain yield (kg ha$^{-1}$) of wheat**

| Treatment | Number of effective tillers/ plant | Number of spike/ meter row length | Length of spike (cm) | Number of spikelets/ spike | Number of grains/ spike | Grain weight of spike (gm) | Test weight (g) | Grain yield (kg ha$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| **Sowing dates** | | | | | | | | |
| 1st Nov. | 3.09 | 70.87 | 6.56 | 11.13 | 36.14 | 1.58 | 41.31 | 3131 |
| 16th Nov. | 4.52 | 84.84 | 8.98 | 13.93 | 42.41 | 1.78 | 49.47 | 3943 |
| 1st Dec. | 3.49 | 75.04 | 7.34 | 11.51 | 37.01 | 1.62 | 43.32 | 3350 |
| S.E. ± | 0.12 | 2.03 | 0.21 | 0.29 | 0.43 | 0.03 | 0.65 | 100.81 |
| C.D. (P=0.05) | 0.41 | 7.03 | 0.75 | 1.02 | 1.49 | 0.13 | 2.27 | 348.89 |
| **Fertility levels (N- $P_2O_5$ kg ha$^{-1}$)** | | | | | | | | |
| 90-45 | 2.76 | 65.92 | 6.40 | 11.53 | 33.83 | 1.53 | 41.28 | 2795 |
| 120-60 | 3.35 | 74.59 | 7.39 | 11.96 | 37.13 | 1.63 | 43.25 | 3242 |
| 150-75 | 4.23 | 82.41 | 8.20 | 12.93 | 41.11 | 1.73 | 46.69 | 3925 |
| 180-90 | 4.46 | 84.74 | 8.53 | 13.33 | 42.01 | 1.75 | 47.60 | 3950 |
| S.E. ± | 0.13 | 1.14 | 0.20 | 0.15 | 0.29 | 0.03 | 0.42 | 78.89 |
| C.D. (P=0.05) | 0.39 | 3.31 | 0.58 | 0.44 | 0.84 | 0.09 | 1.22 | 228.93 |

sowing was to the extent of 17.70 and 25.53 per cent over 1st December and 1st November sowing, respectively. The highest grain yield recorded under 16th November sowing has evidently resulted from appreciably increase in yield attributes *viz.*, number of effective tillers per plant, spikes per meter row length, length of spike, spikelets per spikes, grains per spike, grain weight and test weight.

Grain yield under 1st December sowing could be due to higher temperature prevailed at grain filling stage resulting into force maturity and consequently decreased the yield attributing characters. Similarly, the 1st November sowing resulted into poor grain yield as compare to 16th November sowing. This might be due to higher temperature prevailed at initial growth and tillering stage resulting into decrease the yield attributing characters and finally yield of wheat. These results are in accordance with those reported by Kumar *et al*. (1998) and Sardana *et al*. (1999).

***Effect of fertilizers:***

The data on yield attributes (Table 1) like number of effective tillers per plant, number of spikes per meter row length, length of spike, number of spike lets per spike, number of grains per spike, grain weight per spike and test weight revealed that the application of nitrogen and phosphorus has a profound effect on all these yield attributes. Yield attributes recorded under fertility level 180-90 and 150-75 kg N-$P_2O_5$ ha$^{-1}$ did not differ significantly but perceptibly higher over 90-45 and 120-60 kg N-$P_2O_5$ ha$^{-1}$. These results corroborate with findings of Patel *et al*. (1995) and Dubey and Sharma (1996).

The beneficial effect of nitrogen and phosphorus was observed in increased grain yield of wheat. Application of 180-90 and 150-75 kg N- $P_2O_5$ ha$^{-1}$ did not produce any remarkable difference in grain yield of wheat (Table 1). However, both these fertility levels produced appreciably higher grain yield to the extent of 41.32 and 40.43 over 90-45 kg N- $P_2O_5$ ha$^{-1}$ and 21.85 and 21.07 per cent over 120-60 kg N- $P_2O_5$ ha$^{-1}$, respectively. These increase in grain yield with higher levels of N- $P_2O_5$ application evidently resulted from higher yield attributing characters.

Nitrogen plays an important role in plant metabolism by virtue of being an essential constituent of diverse type of metabolically active compounds like amino acid, proteins, nucleic acid, enzymes, co-enzymes and alkaloids. The biological role of chlorophyll in harvesting solar energy, phosporylated compounds in energy translocations, nucleic acids in transfer of genetic information and regulations of cellular metabolism and biological catalysis have combined effect in increasing crop yield. Similar results were observed by Kanwar (1973) and Auti *et al*. (1999).

Similarly, phosphorus is a fascinating plant nutrient and involved in a wide range of plant processes from cell division to the development of a good root system and ensuring timely and uniform ripening of the crop. It is constituent of ADP and ATP, two of the most important substances in life processes (Tandon, 1987).

These all processes favourably improved with higher rates than the lower (90-45 and 120-60 kg ha$^{-1}$) rates of fertilizers application.

***Interaction effect:***

Interaction effect was observed only in case of

**Table 2 : Interaction effect between sowing dates and fertility levels on number of spikelets/spike**

| Treatment | Fertility levels (N- $P_2O_5$ kg $ha^{-1}$) | | | |
|---|---|---|---|---|
| Sowing Dates (D) | 90-45 ($F_1$) | 120-60 ($F_2$) | 150-75 ($F_3$) | |
| 1st Nov. (D1) | 9.80 | 10.50 | 11.92 | 12.30 |
| 16th Nov. (D2) | 12.60 | 13.30 | 14.70 | 15.10 |
| 1st Dec. (D3) | 9.19 | 12.07 | 12.18 | 12.58 |
| | S.E. ± 0.263 | C.D. (P=0.05) 0.763 | | |

number of spikelets per spike (Table 2). Treatment combination $D_2F_4$ (16th November sowing with use of 180-90 kg N-$P_2O_5$ $ha^{-1}$) produced maximum number of spikelets per spike, which was found to be significantly superior to rest of the treatments.

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