RESEARCH PAPER International Journal of Agricultural Sciences, Vol. 5 Issue 1, January to May, 2009 : 67-70

# Yield, quality and yield potential of wheat [*Triticum aestivum* (L.)] cv. GW-273 as influenced by sowing dates and fertility level

**H.P. PARDESHI*, K.V. JADHAV AND R.S. BAGUL**
Department of Agronomy, Gujarat Agricultural University, JUNAGADH (GUJARAT) INDIA

## ABSTRACT

**An experiment was conducted on slightly alkaline soil at Junagadh (Gujrat) revealed that, significantly higher grain yield 39.43 q/ha, protein content 12.16 per cent and maximum net realization of Rs.28424/ha was recorded with November 16 sowing date. This sowing date harvested 25.53 and 17.70 per cent higher grain yield over early and late sowings. The fertility level150-75 kg N-$P_2O_5$/ha harvested grain yield 39.25 q/ha, protein content 12.14 per cent and net realization of Rs.28005/ha. The highest benefit cost ratio of 3.82 and 3.72 per rupee invested were also recorded with November 16 sowing and fertilizing the crop with l50-75 kg N-$P_2O_5$/ha, respectively.**

**Key words :** Yield, Quality, Yield poteintial, Sowing dates, Fertility levels.

## INTRODUCTION

Wheat (*Triticum aestivum* L.) has been described as the 'Staff of life' or 'King of cereals' and one of the most important staple food crops cultivated in at least 43 countries of the world. This crop as its own outstanding importance as a human food, it is rich in carbohydrates and protein. About 35 per cent of the world's population directly or indirectly depends upon wheat for food and about 20 per cent of protein supply of the world comes from wheat alone. In Gujrat, wheat is cultivated under irrigated as well as rainfed conditions. Real cold period is hardly of 60 days which falls in middle of November to January.

The wheat cv. GW-273 recommended under timely sown conditions. Optimum temperature for good germination, which ranges from 20 to 25$^0$C is prevailing during the month of November under Gujrat 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. If wheat is taken as early sown crop, growths as well as tillering are adversely affected, while under the late sown conditions the higher temperature at grain filling stage resulted into shriveling of grains which reduce the yield.

In addition to sowing time, fertilizer plays an important role in crop production. It is well established fact that there is a positive correlation between fertilizer and productivity. In 1997-98 India's wheat production dropped by 35 million tones to 65.9 million tones due to bad weather, which result in late sowing and loss on yield (Singhal,1999).

It is therefore, a dire need to determine the optimum sowing time for wheat cv.GW-273 under Saurashtra region.

Therefore, supply of balanced nutrients is considered as one of the basic needs to achieve the potential yield. Fertilizer recommendation needs to be matched with genetic material and agro-climatic situation to exploit maximum yield potential of a crop. The present work was thus undertaken to study the effect of different sowing dates and fertility levels on wheat cv.GW-273.

## MATERIALS AND METHODS

The field experiment with wheat cv.GW-273 was conducted at Instructional Farm, Gujarat Agricultural University, Junagadh (21.5$^o$N Latitude and 70.5$^o$E Longitude with an altitude of 60.0 meters above the mean sea level) during *rabi* season of 1998-99. The climate of this region is sub-tropical with mean and maximum temperature of 42.7$^o$C and 13.0$^o$C, respectively. The soil samples were collected from each replication of the experimented plot to the soil depth of 0-15 and 15-30 cm before basal application of fertilizers and a composite sample was prepared and analyzed for physico-chemical properties of the soil. The soil was slightly alkaline with 8.0 pH, 0.64% organic carbon and 273, 22.30 and 270 kg available N, $P_2O_5$ and $K_2O$/ha, respectively. From the fertility point of view the soil was low in available nitrogen and phosphorus and high in available potash. Twelve treatments combinations of three sowing dates ($D_1$-November 1, $D_2$-November 16 and $D_3$-December 1) in main plot and four fertility levels ($F_1$-90-45, $F_2$-120-60, $F_3$-150-75 and $F_4$-180-90 kg N-$P_2O_5$/ha) in sub plot were replicated four times in split plot design. The gross and net plot size were 4.50 x 3.60 and 4.00 x 2.70 m, respectively. The seed rate was 100 Kg/ha and sowing

*** Author for correspondence.** Present Address : Department of Entomology, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

time was kept as per treatments. Furrows were opened manually in each plot at 22.5 cm apart. The crop was fertilized with nitrogen and phosphorus as per treatments. Half of the total nitrogen and full dose of phosphorus was applied as a basal application. Remaining half of the nitrogen was top dressed at 21 days after sowing. The source of nitrogen and phosphorus were urea (45% N) and Single super phosphate (16% $P_2O_5$), respectively.

$$\text{Harvest index} = \frac{\text{Grain yield}}{\text{Biological yield}} \times 100$$

Harvest index was calculated by using following formula :

Benefit cost ratio was worked out by dividing gross monetary returns to cost of cultivation. The protein content of the grain was worked out by multiplying nitrogen content to grain (per cent) with the factor 6.25. Benefit cost ratio was worked out by dividing gross monetary returns to cost of cultivation. The cost of cultivation was worked out by considering the expenses incurred from preparatory tillage to cleaning as well as the cost of inputs applied to each treatment. The gross realization was worked out by considering the yield of grain and straw and their respective price prevailing during the month of March 1999. The total cost of cultivation was deducted from the gross realization to work out net realization.

## RESULTS AND DISCUSSION

### *Effect of sowing :*

Crop sown on November 16 recorded significantly higher grain yield (39.43q/ha) as compared to early (31.41q/ha) and late (33.50q/ha) sowings. The results (Table 1) revealed that, the increase in grain yield in 16th November sowing was to the extent of 17.70 and 25.53 per cent over December 1 and November 1 sowings, respectively. The highest grain yield 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.

Decreased in grain yield under December 1 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 November 1 sowing resulted into poor grain yield as compare to November 16 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. The significantly highest straw yield 5992 kg/ha was recorded under November 16 sowing over early and late sowing. Higher straw yield could be attributes to higher nutrient uptake which resulted into higher values of growth parameters. These results are in accordance with those reported by Kumar *et al*. (1998) and Sardana *et al*. (1999).

Grain weight per spike and test weight recorded appreciably higher on 16th November sowing than rest of sowings this was due to higher number of spikelets per spike and thereby increased number of grains per spike as well as favorable temperature prevailed for longer period from reproductive phase to grain filling stages.

Sowing dates did not exert their significant influence on the harvest index. The protein content in grains was influenced significantly by different sowing dates. Highest protein content in grain was recorded with November 16 (12.46 per cent) over December 1 (11.39 per cent) and November 1 (10.89 per cent) sowings. This increase in protein content in grain could be due to higher nitrogen content in grain under November 16 sowing which is

**Table 1 : Influence of sowing dates and fertility levels on yield (q/ha) and protein content ( % ) of wheat**

| Treatment | No. of spikelets/ spike | No. of grains/ spike | Grain wt/ spike (g) | Test wt. (g) | Grain yield ( q/ha) | Straw yield ( q/ha) | Harvest index ( % ) | Protein content ( % ) |
|---|---|---|---|---|---|---|---|---|
| **Main plot – sowing dates (D)** | | | | | | | | |
| $D_1$ – November 1 | 11.13 | 36.14 | 1.58 | 41.31 | 31.41 | 47.79 | 39.68 | 10.89 |
| $D_2$ – November 16 | 13.93 | 42.41 | 1.78 | 49.47 | 39.43 | 59.92 | 39.67 | 12.46 |
| $D_3$ – December 1 | 11.51 | 37.01 | 1.62 | 43.32 | 33.50 | 50.91 | 39.69 | 11.39 |
| C.D. (P=0.05) | 1.02 | 1.09 | 0.13 | 2.27 | 3.48 | 4.50 | N.S. | 1.04 |
| **Subplot - Fertility levels (F) (N- $P_2O_5$ kg/ha)** | | | | | | | | |
| $F_1$ - 90-45 | 11.53 | 33.83 | 1.53 | 41.28 | 27.95 | 42.57 | 39.68 | 10.45 |
| $F_2$ - 120-60 | 11.96 | 37.13 | 1.63 | 43.25 | 32.42 | 49.19 | 39.70 | 11.40 |
| $F_3$ - 150-75 | 12.93 | 41.11 | 1.73 | 46.69 | 39.25 | 59.53 | 39.74 | 12.14 |
| $F_4$ - 180-90 | 13.33 | 42.01 | 1.75 | 47.60 | 39.50 | 60.21 | 39.64 | 12.33 |
| C.D. (P=0.05) | 0.44 | 0.84 | 0.09 | 1.22 | 2.28 | 2.86 | N.S. | 0.52 |

directly responsible for protein content in grain. The results of present study corroborate with findings of Sandhu *et al.* (1978).

Maximum net realization of Rs.28424/ hectare and benefit cost ratio Rs. 3.82 per rupee invested were realized when crop sown on November 16.

***Effect of fertilizers:***

Application of 180-90 kg N-$P_2O_5$/ha harvested higher grain yield (39.50 q/ha) as compared to 150-75 kg N-$P_2O_5$/ha .But both the fertility levels 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 per cent over 90-45 kg N-$P_2O_5$/ha and 21.85 and 21.07 per cent over 120-60 kg N-$P_2O_5$/ha, 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 favorably improved with higher rates than the lower (90-45 and 120-60 kg/ha) rates of fertilizers application.

Straw yield did not differ significantly with 180-90 and 150-75 kg N-$P_2O_5$/ha. Both these fertility levels produced 60.21 and 59.53 q/ha straw yield, respectively. However, both these levels produced considerably higher straw yield than lower levels of fertilizers. Profound increase in plant growth characters *viz.*, plant height and number of total tillers per plant resulted in higher straw yield. Appreciable higher N and $P_2O_5$ uptake by straw with higher fertility levels might have favorably modified the plant growth. The findings get support from the results of Vaghasi (1986) and Nayak *et al.* (1997).

Fertility levels did not exert their significant influence on the harvest index. Application of 180-90 and 150-75 kg N-$P_2O_5$/ha remains statistically at par but recorded remarkably higher protein content in grain over rest of the fertility levels. Higher content and uptake of nitrogen by grain under higher fertility levels could be the reason for higher protein content, as nitrogen is directly responsible for protein content. Similar results are also reported by Auti *et.al* (1999).

The results of (Table 2) revealed that, highest net realization of Rs.28005/hectare and benefit cost ratio of Rs.3.72/rupee invested were obtained with fertility level of 150-75 kg N-$P_2O_5$/ha.

**Table 2 : Effect of sowing dates and fertility levels on yield potential of wheat**

| Treatment | Gross realization ( Rs./ha) | Cost of cultivation (Rs./ha) | Net realization ( Rs./ha) | Benefit : Cost ratio |
|---|---|---|---|---|
| **Main plot - Sowing dates(D)** | | | | |
| $D_1$- November 1 | 30659 | 10059 | 20600 | 3.04 |
| $D_2$ - November 16 | 38483 | 10059 | 28424 | 3.82 |
| $D_3$ - December 1 | 32696 | 10059 | 22637 | 3.25 |
| **Sub plot - Fertility levels (kg N-$P_2O_5$/ha)** | | | | |
| $F_1$ - 90-45 | 27284 | 9346 | 17938 | 2.91 |
| $F_2$ - 120-60 | 31638 | 9821 | 21817 | 3.22 |
| $F_3$ - 150-75 | 38302 | 10297 | 28005 | 3.72 |
| $F_4$ - 180-90 | 38651 | 10772 | 27789 | 3.58 |

Market price of grain Rs. 9.00/kg and straw Rs.0.50/kg.

## REFERENCES

**Auti, A.K., Wadile, S.C. and Pawar, V.S (1999).** Yield, quality and nutrient removal of wheat (*Triticum aestivum* L.) as influenced by levels and sources of fertilizer. *Indian J. Agron.*, **44** (1) : 119-122.

**Kanwar, J.S. (1973).** Plant nutrients their functions and uptake. in : *Soil Fertilizer and Practices*. Published by ICAR, New Delhi, pp. 7-64.

**Kumar, R., Singh, S., Kumar, R. and Singh, S. (1998).** Effect of sowing date on wheat (*Triticum aestivum* L.) varieties under late sown irrigated condition. *Internat. J. Trop. Agric.*, **16** (1-4) : 165-166.

**Nayak, R., Chauhan, R.P.S. and Singh, G. (1997).** Effect of nitrogen and zinc on wheat (*Triticum aestivum* L.) yield and nutrient uptake under partially reclaimed sodic acid. *Indian J. Agron.*, **41** (1) : 293-296.

**Sandhu, H.S., Dhillon, S.S., Brar, S.S. and Gill, G.S.(1978).** Response of timely sown and late sown wheat to different levels of nitrogen. *Indian J. Agric. Sci.*, **48** (4) : 225-228.

**Sardana, V., Sharma, S.K., Randhawa, A.S. and Sardana, V. (1999).** Performance of wheat cultivars under different sowing dates and levels of nitrogen under different sowing dates and levels of nitrogen under rainfed conditions. *Annals. Agric. Res.*, **20** (1) : 60-63.

**Singhal, V. (1999).** *Indian Agriculture*. Indian Economic Data Research Centre, New Delhi, pp. 121.

**Tandon, H.L.S. (1987).** Phosphorus use efficiency. "Phosphorus Research and Agriculture Production in India." Fertilizer development and consultation organization, New Delhi, pp. 61-62.

**Vaghasia, P. M. (1986).** Response of wheat (*Triticum aestivum* L.) variety J-405 to dates of sowing and levels of nitrogen under South Gujarat conditions. M.Sc. (Ag.) Thesis, Gujarat Agricultural University, Sardar Krushinagar, Gujarat.

*Received : December, 2007; Accepted : October, 2008*