

## Scheduling of nitrogen and potash application in irrigated wheat (*Triticum aestivum* L.)

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### Article history

Received:28 August, 2014

Revised :01 December, 2014

Accepted:02 December, 2014

### Citation

Mathukia RK, JK Kapadiya and DM Panara. 2014. Scheduling of nitrogen and potash application in irrigated wheat (*Triticum aestivum* L.). *Journal of Wheat Research* 6(2):171-172

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### Abstract

A field experiment was conducted on clayey soil at Junagadh (Gujarat) during *rabi* 2012-13 to study the effect of application schedules of nitrogen and potassium on growth and yield of irrigated wheat. The results revealed that application of 40 kg N/ha as basal + 40 kg N/ha at 25 DAS + 40 kg N/ha at 45 DAS, being statistically at par with application of 30 kg N/ha as basal + 45 kg N/ha at 25 DAS + 45 kg N/ha at 45 DAS, significantly enhanced plant height, number of effective tillers and 1000-grain weight, and ultimately increased grain and straw yields over application of 60 kg N/ha as basal + 60 kg N/ha at 25 DAS. Application of 40 kg N/ha as basal + 40 kg N/ha at 25 DAS + 40 kg N/ha at 45 DAS accrued higher net returns (Rs. 37824/ha) and B:C (2.02). Significantly higher values of growth and yield attributes were registered with application of 60 kg K<sub>2</sub>O/ha either as basal or in two splits. Application of 60 kg K<sub>2</sub>O/ha either as basal or in two splits significantly increased grain and straw yields over control. Application of 30 kg K<sub>2</sub>O/ha as basal + 30 kg K<sub>2</sub>O/ha at 25 DAS gave higher net returns (Rs. 36050/ha) and B:C (1.96).

**Key words:** Wheat, nitrogen, potash, economics

### 1. Introduction

Wheat is the second most important staple food after rice consumed by 65% of the population in India and is likely to increase further due to changes in food habits. The fertilizer is essential and expensive input in agricultural production. Fertilizers play a leading role in increasing crop production by almost 41%. The current N fertilizer recommendation for wheat is 60 kg/ha as basal and 60 kg/ha as top-dressing at 20-30 days after sowing (DAS). Application of 60 kg N/ha as basal is seems to be wasteful owing to loss of applied N through leaching, volatilization, runoff and weed removal, which necessitates to reduce the basal dose. Further, crop requires N throughout the growth period, which also call for one more split application rather than only one split application. Despite medium to high status of potassium in soil, several studies indicated wheat response to potassium application. When applied in soil, potassium aggregate with clay particles and slowly release in soil. The requirement of potassium is also throughout the life cycle of crop. So, split application of potassium is also seems very important and essential to be studied for wheat crop.

### 2. Materials and methods

In view of the above facts, a field experiment was conducted on clayey soil at Department of Agronomy, College of

Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) in *rabi* season of 2012-13 to study the effect of application schedules of nitrogen and potassium on growth and yield of irrigated wheat. The experimental soil was clayey in texture and slightly alkaline in reaction with pH 7.9 and EC 0.34 dS/m. The soil was medium in available nitrogen (261 kg/ha), available phosphorus (30.7 kg/ha), available potash (207 kg/ha) and micro nutrients. The range of mean maximum and minimum temperature during the crop growth and development period was 28.2 to 39.7°C and 9.2 to 21.7°C, respectively. The other weather parameters *viz*, average relative humidity (26.0-57.0%), wind speed (3.1-6.6 km/h), bright sun shine (3.0-10.4 h) and daily evaporation (4.5-9.0 mm) were more or less congenial for growth and development of wheat. The experiment comprised 16 treatment combinations consisting of four application schedules of nitrogen (N<sub>1</sub>: 60 kg N/ha as basal + 60 kg N/ha at 25 DAS, N<sub>2</sub>: 30 kg N/ha as basal + 60 kg N/ha at 25 DAS + 30 kg N/ha at 45 DAS, N<sub>3</sub>: 30 kg N/ha as basal + 45 kg N/ha at 25 DAS + 45 kg N/ha at 45 DAS, and N<sub>4</sub>: 40 kg N/ha as basal + 40 kg N/ha at 25 DAS + 40 kg N/ha at 45 DAS) and four application schedules of potassium (K<sub>1</sub>: control, K<sub>2</sub>: 30 kg K<sub>2</sub>O/ha as basal, K<sub>3</sub>: 60 kg K<sub>2</sub>O/ha as basal, and K<sub>4</sub>: 30 kg K<sub>2</sub>O/ha as basal + 30 kg K<sub>2</sub>O/ha at 25 DAS). These treatments were replicated thrice in a randomized block design. The wheat variety GW 366'

was sown on November 27, 2012 at row spacing of 22.5 cm using seed rate of 120 kg/ha. The gross and net plot size was 5.0 m x 3.6 m and 4.0 m x 2.7 m, respectively. The entire dose of phosphorus i.e. 60 kg  $P_2O_5$ /ha was applied as basal application in form of diammonium phosphate at just before sowing in the furrows. Nitrogen and potassium were applied in form of urea and muriate of potash as per treatments. The crop was raised as per the standard package of practices. The expenses incurred for all the cultivation operations from preparatory tillage to harvesting including the cost of inputs viz., seeds, fertilizers, irrigation, pesticides, etc. applied to each treatment was calculated on the basis of prevailing local charges. The gross realization in terms of rupees per hectare was worked out taking into consideration the grain and straw yields from each treatment and local market prices. Net return of each treatment was calculated by deducting the total cost of cultivation from the gross returns. The benefit : cost ratio (B:C) was calculated by dividing gross return with cost of cultivation.

### 3. Results and discussion

**Nitrogen:** The results revealed that different application schedules of nitrogen manifested significant influence on growth and yield of wheat (Table 1). Application of 40 kg N/ha as basal + 40 kg N/ha at 25 DAS + 40 kg N/ha at 45 DAS ( $N_4$ ), being statistically at par with application of 30 kg N/ha as basal + 45 kg N/ha at 25 DAS + 45 kg N/ha at 45 DAS ( $N_3$ ), significantly enhanced growth and yield attributes viz., plant height, number of effective tillers and 1000-grain weight, and ultimately increased grain yield by 15.05 and 14.25% and straw yield by 21.46 and 16.97%, respectively over application of 60 kg N/ha as basal + 60 kg N/ha at 25 DAS ( $N_1$ ). Different application schedules of nitrogen did not influence the grain protein content. Application of 40 kg N/ha as basal + 40 kg N/ha at 25 DAS + 40 kg N/ha at 45 DAS ( $N_4$ ) accrued higher net returns (Rs. 37824/ha) and B:C (2.02), followed by application of 30 kg N/ha as basal + 45 kg N/ha at 25 DAS + 45 kg N/ha at 45 DAS ( $N_3$ ) having net returns of Rs. 36834/ha and B:C of 1.99 (Table 1). The improvement in growth and yield parameters with application of 40 kg N ha<sup>-1</sup> as basal + 40 kg N ha<sup>-1</sup> at 25 DAS + 40 kg N ha<sup>-1</sup> at 45 DAS ( $N_4$ ) and 30 kg N/ha as basal + 45 kg N/ha at 25 DAS + 45 kg N/ha at 45 DAS ( $N_3$ ) might have been attributed to better and timely availability of nitrogen for their utilization by plant as judged from nitrogen content in grain and straw. Similar results were also reported by Panchal *et al.* (2008), Madan and Munjal (2009) and Mahajan *et al.* (2010).

**Potassium:** Potassium fertilization did influence growth and yield of wheat (Table 1). Significantly higher values of growth and yield attributes viz., plant height, number of effective tillers and 1000-grain weight were registered with application of 30 kg  $K_2O$ /ha as basal + 30 kg  $K_2O$ /ha at 25 DAS ( $K_4$ ), which remained statistically at par with

application of 60 kg  $K_2O$ /ha as basal ( $K_3$ ). Application of 60 kg  $K_2O$ /ha either as basal ( $K_3$ ) or in two splits ( $K_4$ ) significantly increased grain yield by 14.21 and 11.77% and straw yield by 13.38 and 12.36%, respectively over control ( $K_1$ ). Potash scheduling has non-significant effect on grain protein content. Application of 30 kg  $K_2O$ /ha as basal + 30 kg  $K_2O$ /ha at 25 DAS ( $K_4$ ) gave higher net returns (Rs. 36050/ha) and B:C (1.96), closely followed by application of 60 kg  $K_2O$ /ha as basal ( $K_3$ ) with net returns of Rs. 34987/ha and B:C of 1.93. Adequate and timely supply of K might have favoured net assimilation and partitioning of photosynthates to various metabolic sinks, which ultimately increased growth and yield. The results are in conformity with those reported by Singh *et al.* (1989), Singh and Singh (2000) and Jat *et al.* (2013). Interaction between nitrogen and potash scheduling was found non-significant for all the characters under study.

For higher production and net returns of wheat (var. GW-366) apply 120 kg N ha<sup>-1</sup> in three equal splits i.e. at sowing, 25 DAS and 45 DAS and 60 kg  $K_2O$  ha<sup>-1</sup> in two equal splits i.e. at sowing and 25 DAS besides basal application of 60 kg  $P_2O_5$  ha<sup>-1</sup> on clayey soil having medium status of available N, P and K under South Saurashtra Agro-climatic Zone of Gujarat.

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