**Agriculture for Sustainable Development 2(1):36-38, 2014/Article** *ISSN 2347-5358 (Print)/ 2349-2228 (Online)*

**Agriculture for Sustainable Development**

http://www.sustainableagriculture.in

# GROWTH AND PRODUCTIVITY OF WHEAT (*TRITICUM AESTIVUM* L.) VARIETIES INFLUENCED BY POTASSIUM LEVELS IN CENTRAL UTTAR PRADESH

**SHRI PRAKASH MAURYA* AND S.K.VERMA[1]**

***Department of Agronomy, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (UP) – 208 002, India***

**Received: 24.02.2014** **Revised accepted: 13.03.2014**

## ABSTRACT

The field experiment was conducted during *rabi* season of 2011-12 at CSAUAT Kanpur in sandy loam soil to find out the effect of potassium levels on growth and productivity of wheat varieties. The treatments were consisted of three wheat varieties v*iz.* 'PBW-343', 'K-307' and 'K-402' and four potassium levels *viz.* 0, 40, 60 and 80 kg/ha in factorial randomized complete block design with 3 replications. Results revealed that the maximum yield attributing characters, grain yield (4889 kg/ha), gross returns (₹ 80041 /ha), net returns (₹ 37620/ha) and B: C ratio (1.88) was found in 'PBW-343'. Among potassium levels, application of 80 kg $K_2O$/ha recorded significantly the highest yield attributing characters, grain yield (5072 kg/ha) and economics over 40 kg $K_2O$/ha and control and it were at par with the application of 60 kg $K_2O$/ha

***Keywords:***

*Economics, Growth, Potassium levels, Varieties, Yield*

## INTRODUCTION

Wheat (*Triticum aestivum* L.*)* is most staple and second most important food crop after rice in country, which contributes nearly one-third of the total food grains production. The crop mostly grown under irrigated conditions in diverse crop rotations. Agricultural intensification through the use of high-yielding crop cultivars, chemical fertilizers, pesticides, irrigation, and mechanization has been responsible for drastic increase in grain production in developing countries during the past three decades. However, growing global challenge of meeting increased food demand while protecting environmental quality, and this challenge must especially be met in cropping systems that produce maize, rice, and wheat (Cassman *et al*., 2002). Intensive agriculture has dramatically increased grain production in developing countries, but yield records in the dominant food-producing regions indicate a large gap between the current and potential yields of wheat (Neumann *et al*., 2010) which is an important crop because it contributes to food security in the country. Obtaining an increased and sustainable wheat yield will probably require integrated measures that include K fertilization to maintain soil fertility. In reality, it has often been reported that continuous rice-wheat cropping with unbalanced fertilization has rapidly depleted the soil available K (Liu *et al*., 2000) and significant crops yield response to K fertilization occurred (Huang *et al*., 2009). K deficiency is a worldwide problem and the K status of agricultural soils is also decreasing across the globe (Tan *et al*., 2012). Although decreasing yields from withholding K usually have emerged slowly compared to nitrogen (N) and phosphorus (P) (Zhao *et al*., 2010), K nutrient management has become a major research topic. High-yielding crops with high biological yield absorb large amounts of nutrients to satisfy healthy plant growth (Sepat *et al*., 2010). The higher yields now commonly obtained must impose a greater drain on K reserves in the soil. Potassium is one of the essential nutrient elements for plants; it is involved in the processes of osmoregulation and cell extension, stomatal regulation, activation of enzymes, protein synthesis, photosynthesis, phloem loading, and transport and uptake (Pettigrew, 2008). It also enhances the plants ability to resist pest attack, moisture stress and cold condition. Adequate supply of this nutrient promotes the formation of fully developed grain with a high starch contents (Tahir *et al.*, 2008). Keeping above facts in mind, the present investigation was carried out to study the effect of K fertilization on growth, yield and economics of wheat varieties.

## MATERIALS AND METHODS

The field experiment was conducted at Students` Instructional Farm of college of agriculture at CSAUAT, Kanpur (UP) during *Rabi* season of 2011-12. The experimental farm falls under the Indo-Gangetic alluvial track in central Uttar Pradesh, located at an elevation of 125.9 m MSL in class II of land capability with irrigated conditions.

**Corresponding author email: shri_maurya@yahoo.com, [1]Deratment of Agronomy, I.Ag.Sc., BHU, Varanasi (UP)- 221 005, India*

The soil of the experimental site was sandy loam in texture, deep flat, slightly alkaline in reaction (pH 7.3), well drained and moderately fertile being low in OC (0.46%), available nitrogen (173 kg/ha) and phosphorus (16.8 kg/ha) and medium in available potassium (164 kg/ha). Experiment was laid out in a factorial randomized complete block design with three replications. Three varieties of wheat *viz.* 'PBW-343', 'K-307' and 'K-402' and four potassium levels *viz.* 0, 40, 60 and 80 kg/ha. Half amount of nitrogen with full amount of phosphorus and potassium were applied as basal by Urea, DAP and MOP, respectively. Remaining half dose of nitrogen was top dressed in to two equal split once at after first irrigation and second at 56 days after sowing. All the general crop management practices are performed for the better growth and development of crop during experimentation. The data on growth, yield attributing characters and yield was recorded at harvest and economics was computed using the prices of inputs and outputs as per prevailing in local market. Recorded data were analyzed as per standard statistical procedure to draw a valid conclusion.

## RESULTS AND DISCUSSION

### *Growth*

The data pertaining to plant height, dry weight/plant were not significantly influenced under different varietal treatments (Table-1). Growth parameters were widely fluctuated due to the different varietal treatments consistency during crop growth. The results are corroborated with the research findings (Amal, 2011). Among the K levels, significantly the highest plant height (86.5 cm) and dry weight/plant (19.6 g) was recorded with application of K 80 kg $K_2O$/ha over 40 kg $K_2O$/ha and it were at par with application of K 60 kg $K_2O$/ha. The plant height and dry weight of plant were influenced significantly due to the several biochemical pathways, osmotic potential, translocation process and growth and maintenance of a cell are dependent on potassium in the cell sap. The finding was also supported by (Mesbah, 2009; Aown *et al.*, 2012).

### *Yield attributes and yield*

Significantly the highest number of productive tillers $m^2$ (266), number of grains/spike (46.3), grain yield (4889 kg/ha), straw yield (6978 kg/ha) and harvest index (41.2%) was recorded in 'PBW-343'over the 'K-402' and 'K-307', whereas, effect of varieties test was not significant (Table-1). Yield attributes and yield characters differed due to varietal characters also reported (Tahir *et al.*, 2008; Polara *et al.*, 2009). Among the potassium levels, application of K 80 kg $K_2O$/ha recorded significantly the highest number of productive tillers $m^2$ (269.8), grains/spike (47.4), grain yield (5020 kg/ha), straw yield (7019 kg/ha) and harvest index (41.9%) over 40 kg $K_2O$/ha and it were at par with application of K 60 kg $K_2O$/ha. The results have close conformity with the research findings of Wu *et al.* (2007).

**Table 1 Effect of potassium levels on growth, yield attributes and yields of wheat**

| Treatment | Plant height (cm) | Effective tillers ($m^2$) | DM production (g) | Grains/ spike | Test weight (g) | Yield (kg/ha) | | Harvest index (%) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Grain | Straw | |
| ***Varieties*** | | | | | | | | |
| PBW 343 | 82.2 | 266 | 18.5 | 46.3 | 39.4 | 4889 | 6978 | 41.2 |
| K 402 | 84.6 | 245 | 19.2 | 41.7 | 39.1 | 4010 | 6050 | 39.9 |
| K 307 | 83.5 | 256 | 18.9 | 43.3 | 39.2 | 4377 | 6381 | 40.7 |
| SE ± | 1.31 | 2.40 | 0.31 | 0.8 | 0.21 | 98 | 138 | 0.29 |
| CD (*P*=0.05) | N.S. | 4.98 | N.S. | 1.74 | N.S. | 204 | 286 | 0.59 |
| ***Potassium levels (kg/ha)*** | | | | | | | | |
| Control | 79.3 | 237 | 17.9 | 39.4 | 38.5 | 3593 | 5692 | 38.7 |
| 40 | 82.6 | 254 | 18.8 | 41.8 | 39.3 | 4194 | 6223 | 40.3 |
| 60 | 85.2 | 264 | 19.3 | 46.3 | 39.5 | 4842 | 6945 | 41.1 |
| 80 | 86.5 | 269 | 19.6 | 47.4 | 39.7 | 5072 | 7019 | 41.9 |
| SE ± | 1.51 | 2.77 | 0.36 | 0.97 | 0.24 | 113 | 159 | 0.33 |
| CD (*P*=0.05) | 3.14 | 5.75 | 0.74 | 2.01 | 0.50 | 235 | 330 | 0.68 |

## ECONOMICS

Gross monetary returns (₹ 80041/ha), net monetary returns (₹ 37620/ha) and also benefit: cost ratio (1.88) was recorded significantly highest in 'PBW 343' mainly because of more yields over the 'K-402' and 'K-307'. From the economic point of view, each successive increment in potassium levels from 0 to 80 kg $K_2O$/ha increases the value of gross returns, net returns and B: C ratio (Table 2). Significantly the highest gross returns (₹ 83123/ha), net returns (₹ 39652 /ha) and B: C ratio (1.91) was recorded at with the application of 80 kg $K_2O$/ha as compared to other levels of potassium application.

**Table 2 Economics of wheat as influenced by the varieties and potassium levels**

| Treatment | Cost of cultivation | Gross returns (₹./ha) | Net monetary returns (₹) | B :C ratio |
|---|---|---|---|---|
| ***Varieties*** | | | | |
| PBW 343 | 42421 | 80041 | 37620 | 1.88 |
| K 402 | 42421 | 66307 | 23886 | 1.56 |
| K 307 | 42421 | 71923 | 29502 | 1.69 |
| SE ± | - | 632 | 1480 | 0.05 |
| CD (P=0.05) | - | 1311 | 3071 | 0.11 |
| ***Potassium levels (kg/ha)*** | | | | |
| Control | 41071 | 59886 | 18815 | 1.46 |
| 40 | 42271 | 69064 | 26793 | 1.63 |
| 60 | 42871 | 78956 | 36085 | 1.84 |
| 80 | 43471 | 83123 | 39652 | 1.91 |
| SE ± | - | 729 | 1723 | 0.06 |
| CD (P=0.05) | - | 1514 | 3567 | 0.12 |

## REFERENCES


Amal, G.A., Tavfik, M.M. and Hassanein M.S. 2011. Foliar feeding of potassium and urea for maximizing wheat productivity in sandy soil. *Australian Journal Basic and Applied Science.* **5** (5): 1197-1203.

Aown, M., Raza, S., Saleem, M.F., Anjum, S.A., Khaliq, T. and Wahid M.A. 2012. Foliar application of potassium under water deficit conditions improved the growth and yield of wheat. *Journal of Animal and Plant Science.* **22** (2): 431-437.

Cassman, K.G., Dobermann, A. and Walters D. 2002. Agroecosystems, nitrogen-use effi-ciency, and nitrogen management. *AMBIO a Journal of the Human Environment.* 31: 132–140.

Huang, S.W., Jin, J.Y. and Tan D.S. 2009. Crop response to long-term potassium application as affected by potassium-supplying power of the selected soils in Northern China. *Soil Science and Plant Analysis.* 40: 2833–2854.

Liu, R.L., Jin, J.Y., Wu, G.R. and Liang M.Z. 2000. The K balance in the soil and effect of potassium fertilizer for crop in North China. *Soil and Fertilizer Science.* 1: 9–11.

Mesbah, E.A.E. 2009. Effect of irrigation regimes and foliar spray of potassium on yield components and water use efficiency of wheat in sandy soils. *World Journal Agricultural Sciences.* **5** (6): 662-669.

Neumann, K., Verburg, P.H., Stehfest, E. and Müller C. 2010. The yield gap of global grain production: a spatial analysis. *Agricultural Systems.* 103: 316–326.

Pettigrew, W.T.2008. Potassium influences on yield and quality production for maize, wheat, soybean and cotton. *Physiologia Plantarum.* 133: 670–681.

Polara, K.B., Srdhara, R.V., Parmar, K.B., Babariya N.B. and Patel K.G. 2009. Effect of potassium on inflow rate of N, P, K, Ca, S, Fe, Zn and Mn at various growth stages of wheat. *Asian Journal of Soil Science.* **4** (2): 228-235.

Sepat, R.N., Rai, R.K. and Dhar S. 2010. Planting systems and integrated nutrient management for enhanced wheat (*Triticum aestivum*) productivity. *Indian Journal of Agronomy.* 55: 114–118.

Tahir, M., Tanveer, A. and Wasaya A. 2008. Growth and yield response of two wheat varieties to different potassium levels. *Pakistan Journal of Life and Social Science.* **6** (2): 92-95.

Tan, D., Jin, J., Jiang, L., Huang, S. and Liu Z., 2012. Potassium assessment of grain producing soils in North China. *Agriculture Ecosystems Environment.* 148: 65–71.

Wu, J.G., Xi, S., Wang, Y.Q., Chang, J.Y. and Xi H. 2007. Effect of potassium on grain yield and quality of strong gluten wheat. *Soil and Fertilizer Science China.* 2: 59-60.

Zhao, B.Q., Li, X.Y., Li, X.P., Shi, X.J., Huang, S.M., Wang, B.R., Zhu, P., Yang, X.Y., Liu, H., Chen, Y., Poulton, P., Powlson, D., Todd, A. and Payne R. 2010. Long-term fertilizer experiment network in China: crop yields and soil nutrient trends. *Agronomy Journal.* 102: 216–230.