

Research Paper :

Effect of potassium on inflow rate of N, P, K, Ca, S, Fe, Zn and Mn at various growth stages of wheat

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ABSTRACT

A pot experiment was conducted under net house condition to study the effect of four levels of potassium (K_0 , K_{60} , K_{90} and K_{120} mg $K\text{kg}^{-1}$) on grain yield, dry weight of root, root volume, total root length, nutrients content and inflow rate of nutrients in five wheat cultivars (Lok 1, GW 496, GW 273, GW 1139 and HI 8439) at different periods of wheat crop in factorial CRD with five replications. The grain yield of wheat was significantly increased due to application of potassium up to K_{90} treatment and further it was decreased with increased in level of K. Dry weight of root and root volume were significantly increased with increase in potassium levels up to 90 mg $K\text{kg}^{-1}$ at 100 DAS, but at 50 DAS, the root volume was recorded maximum under K_{120} treatment. Total root length was significantly increased with increase in K level and found maximum with K_{120} at all period of crop growth. The content of N, P, K, Ca, S, Fe, Mn and Zn in straw, root and grain were decreased with advancement of crop growth and were increased significantly with K levels at all the periods of crop growth. However, the content of Ca in straw, root and grain was significantly decreased with increasing potassium levels. Application of potassium significantly affected the inflow rate of N, P, K, Ca and S at 75 to 100 DAS and found maximum with K_{90} treatment. Similarly, inflow rate of P and Ca at 25 to 50 and 50 to 75 DAS were also significantly influenced due to the application of potassium. Inflow rate of Fe, Mn and Zn were affected significantly due to the application of potassium on all the period of crop growth, except Mn at 50 to 75 DAS. The different varieties produced their significant effect on yield and inflow rate of nutrients at different period of crop growth.

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Knowledge of relation between the rate absorption of nutrients by plant root and the concentration of ion external to the root is important for doing nutrient study for investing ion absorption mechanism and for evaluating mechanism of nutrient supply to plant root growing in soil. Uptake of nutrient is an essential part of growth process and if the uptake rate does not keep pace with the growth rate, the concentration of nutrient in plant tissue may decrease and plant may become deficient resulting in to poor yield. Much work has been done on the transport of nutrients through the soil to the root as an essential part of the over all rate process (Olsen and Kamper, 1968; Nye, 1969; Bartey, 1970).

Most of this work is formulated in term of uptake of nutrient per unit surface area or flux. However, it follows from the equation for diffusion to a cylinder that the degree of depletion around the absorbing root is, in fact, mainly determined by the uptake rate per unit root length or the root influx (Nye and Tinker, 1969; Brewster and Tinker, 1970). With the advancement in agriculture research a spectrum of new cultivars of wheat is recommended for the farmers. So, the study of nutritional requirement for the promising wheat cultivars is in a never ending process.

In view of this a pot trial was conducted to study the effect of different levels of potassium on inflow rate of nutrients at various growth stages of wheat cultivars.

MATERIALS AND METHODS

A pot experiment was conducted in a medium black, calcareous clay soil (*Vertisol*) during *rabi* season with four levels of potassium (0, 60, 90 and 120 mg $K\text{kg}^{-1}$) and five varieties of wheat (V_1 -Lok 1, V_2 -GW 496 V_3 -GW 273, V_4 -GW 1139 and V_5 -HI 8439) using five replications in a completely randomized factorial design. The experimental soil had pH 8.0, EC 0.58 dSm^{-1} , O.C. 6.6 g kg^{-1} and CEC 36.8 $\text{cmol}(\text{p}^+) \text{kg}^{-1}$ soil. The soil was clayey in texture and content 73.5, 19.4 and 116 mg kg^{-1} available N, P_2O_5 and K_2O , respectively. Polyethylene linked earthen pots were filled with 15 kg soils. Wheat crop was fertilized with 120 mg N kg^{-1} and 60 mg $\text{P}_2\text{O}_5 \text{kg}^{-1}$ in the form of urea and di-ammonium phosphate, respectively. Nitrogen was applied in two split and potassium was applied in form of muriate of potash as per the treatment. Ten bold and healthy seeds of five wheat varieties were dibbled in each pot and were irrigated immediately. A week after germination, seven plants per