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Short communication

Potassium response in forage oat (Avena sativa) in alluvial soils of Agra, Uttar Pradesh

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Oat (*Avena sativa*) is an important cereal crop mainly for fodder during rabi season. Oat provides a very nutrious fodder (proteins 13-15%) especially suited to milch animals. The ever-rising demand for fodder and seed for sustaining live stock production can be met through increasing productivity of foddef. Potassium is the most important essential nutrient after nitrogen and phosphorus and plays a vital role in plant cell sap, support enzymatic activity, photosynthesis and transportation of sugar, synthesis of protein and starch but dose not bounds with carbon or oxygen. It also develops tolerance to drought condition and enhances plant ability to resist attacks of pests and deseases. Inadequate information is available on the effect of potassium on oat in Agra region. The study was, therefore comducted to evaluate the effect of K on yield, quality and uptake of nutrients by oat.

A field experiment was conducted during rabi season of 2014 at Panwari village of Agra (U.P.). The experimental site falls under South-west semi-arid zone and characterized by semi-arid climate with extreme temperature during summer (45 to 48° C) and very low temperature during winter (as low as 2°C). The experimental soil was sandy loam in texture having pH 7.9, organic carbon 3.1 g kg^{-1}, available N 156 kg ha^{-1}, available P 9.0 kg ha^{-1} and available K 106 kg ha^{-1}. The experiment was laid out in randomized block design with four replications. The treatments consisted of six rates of K (0, 20, 40, 60 and 80 kg K_2O ha^{-1}). The oat crop was sown in first week of November 2015. A basal dose of 120 kg N and 60 kg P_2O_5 ha^{-1} was applied through urea and single superphoshate, respectively. Appropriate management practices were adopted to raise the crop. Crop was harvested after 60 days of sowing. Plant samples were digested in di-acid mixture of HNO_3: $HClO_4$ (10:4) and sulphur content was determined turbiditimetrically (Chesnin and Yien, 1951). Phosphorus and K in di-acid digest were determined by vanadomolybdate yellow colour method (Jackson, 1973) and flame photometer, respectively. Nitrogen content was estimated by modified Kjeldahl method and protein content was calculated by multiplying with a factor of 6.25. The uptake of nutrients was obtained as product of their concentrations and yield. Available K in post harvest soil was extracted with netural 1 N NH_4OAc and K was determined in exract with flame photometer.

Green foliage and dry matter yields of oat increased significantly with potassium application over control. The mean yield of green foliage and dry matter increased by 46.0 and 30.3 % over control owing to addition of 60 kg K_2O ha^{-1}, respectively. As K is essential for plant development, the favourable effect of high dose of K on growth was mainly responsible for higher yields. Singh *et al.* (2015), Singh *et al.* (2016), Chauhan *et al.* (2017) also reported similar results.

Increasing levels of K significantly increased the protein content in oat plants from 10.5 % at control to 11.3 % at 80 kg K_2O ha^{-1}. The increase in protein content with K levels may be attributed to role of K in nitrogen metabolism. Similar results were reported by Kumar *et al.* (2015) and Chauhan *et al.* (2017). The nitrogen uptake by oat crop increased significantly over control due to potassium application and maximum value was recorded at 60 kg K_2O ha^{-1} (Table 1).. This increase in N uptake by oat crop may be ascribed to higher dry matter production due to K application. Kumar *et al.* (2015) and Singh (2017) observed the same trend of results in wheat. The uptake of P by oat crop increased significantly with K addition over control. The maximum value of P uptake was recorded with 60 kg K_2O ha^{-1} followed by a reduction at 100 kg K^2O ha^{-1}. The results indicated a beneficial effect of K on the absorption of phosphorus by the crop. Similar results were reported by Singh *et al.* (2015). The K uptake by oat crop increased from 95.7 to 141.9 kg ha^{-1} as the dose of K was increased from 0 to 60 kg K_2O ha^{-1}. This increase in K uptake may be ascribed to higher dry matter yield and K content in plants. Singh *et al.* (2016) and Yadav *et al.* (212) reported similar results. Sulphur uptake by oat crop increased significantly with the increasing levels of potassium up to 60 kg K_2O ha^{-1} over control. Similar results were reported by Kumar *et al.* (2015) and Chauhan *et al.* (2017).

Table 1: Effect of potassium levels on yield, quality and uptake of nutrients by oat

Potassium (kg ha^{-1})	Yield (t ha^{-1})		Protein content (%)	N uptake (kg ha^{-1})	P uptake (kg ha^{-1})	K uptake (kg ha^{-1})	S uptake (kg ha^{-1})	Available K (kg ha^{-1})
	Green foliage	Dry matter						
0	30.6	6.6	10.5	111.5	13.8	95.7	7.3	102
20	34.7	7.4	10.8	128.0	16.2	112.4	9.6	110
40	40.2	8.0	11.0	140.8	19.2	126.4	11.2	115
60	44.7	8.6	11.1	154.0	21.5	141.9	12.9	125
80	43.3	7.9	11.3	144.8	19.1	136.0	11.2	132
SEm ±	2.41	0.78	0.07	1.55	0.27	3.31	0.05	1.11
CD (P=0.05)	5.27	1.71	0.15	3.39	0.59	7.25	0.11	2.43

The data (Table 1) revealed that decline in available K status in post harvest soil was noted in control or lower dose of K. Available K status increased significantly with increasing levels of K and maximum value was recorded with 80 kg K_2O ha^{-1}. Similar results were reported by Yadav *et al.* (2012) and Chauhan *et al.* (2017).

From the results, it can be concluded that 60 kg K_2O ha^{-1} is optimum dose of potassium to maintain soil K fertility and harvest optimum yield of oat crop in Agra region of Uttar Pradesh.

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