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RESEARCH ARTICLE

Effect of Potassium on Yield and Economics of Kabuli Chickpea

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Abstract

A field experiment was conducted during *rabi* season of 2009-10 to assess the response of Kabuli chickpea to potassium. After investigation, significant increase in the seed and straw yield of Kabuli chickpea and maximum gross and net monetary returns were observed with the application of N, P_2O_5 and K_2O as per soil STCR targeted yield for 25 q ha^{-1}

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of the most important *rabi* pulse crop of Maharashtra. Beside a good source of protein, amino acid, carbohydrates and minerals it has a high nutritional value. Fertilizer application plays a key role in enhancing the productivity levels. However, fertilizer recommendation practices for pulse crop have been paid less attention thus often resulting in low productivity. Pulse crops are able to meet nitrogen by N fixation and phosphorus fertilization is also being given importance. Whereas, potassium application is almost neglected resulting in imbalance of nutrient supply and low yields. Moreover, under intensive cropping systems, huge removal of potassium by different crops has led to depletion of soil K reservoir.

Application of 25 kg K_2O per ha enhanced the chickpea, pea and lentil grain yield by 21.4, 25.1 and 23.8 percent respectively on *Typicustocrepts* of Kanpur (Tiwari and Nigam, 1995). These could be due to well branched root system which can exploit soil K more efficiently. This stimulates that the pulses respond well to applied K_2O. Pulses being dryland crops are expected to respond well to potassium, as potassium plays an important role in water relation and water use efficiency and it is known to make the plant tolerant against extreme dry and wet season (Tandon, 1988).

With this background, a field experiment was carried during *rabi* season of 2009-10 to assess the response of Kabuli chickpea to potassium.

MATERIAL AND METHODS

A field experiment was conducted during rabi season of 2009-10 to assess the response of Kabuli chickpea to potassium at Farm of Agronomy Department, Mahatma Phule Krishi Vidyapeeth, Rahuri. The soils of experimental area are grouped under inceptisol order and belong to Pather (Sawargaon) soil series which comparises number of fine montomorillionite hyperthermic family of Vertichapulustepts. The soil of the experimental field was medium black with 60-90 cm depth, dominant type of clay mineral having high swelling

and shrinkage property. The field trial was laid out in Randomized Block Design with three replications. There were seven treatments, consist of T_1 (Absolute control), T_2 (GRDF : 25:50:0 kg NPK ha^{-1}), T_3 (N and P_2O_5 as per soil test + 0 kg K_2O ha^{-1}, 31.25:50:0 kg NPK ha^{-1}), T_4 (N and P_2O_5 as per soil test + 15 kg K_2O ha^{-1}, 31.25:50:15 kg NPK ha^{-1}), T_5 (N and P_2O_5 as per soil test + 30 kg K_2O ha^{-1}, 31.25:50:30 kg NPK ha^{-1}), T_6 (N and P_2O_5 as per soil test + 45 kg K_2O ha^{-1}, 31.25:50:45 kg NPK ha^{-1}) and T_7 (N, P_2O_5 and K_2O as per soil STCR targeted yield for 25 q ha^{-1},41.25:47.07:11.85 kg NPK ha^{-1}). The STCR equation is calculated as per following formula given by Patil *et al.* (2002).

$$F\ N = 5.25\ T - 0.46\ SN$$
$$F\ P_2O_5 = 3.87\ T - 2.77\ SP$$
$$F\ K_2O = 1.29\ T - 0.04\ SK$$

Where, F N, F P_2O_5, F K_2O are fertilizer N, P_2O_5, K_2O in kg ha^{-1}, respectively. T is targeted yield in q ha^{-1} and SN, SP, SK are soil available N, P_2O_5, K_2O in kg ha^{-1}.

RESULTS AND DISCUSSION

Effect of Potassium on Yield of Kabuli chickpea

The highest seed yield of 23.07 q ha^{-1} was obtained due to application at fertilizers according to the STCR targeted yield equation. It was superior over other treatments. However, it was at par with T_6 and T_5 treatments. Similar results were observed by Tamboli *et al.* (1996) and Shinde *et al.* (2000). The treatment T_7 (N, P_2O_5 and K_2O as per soil STCR targeted yield for 25 q ha^{-1}) recorded statistically significant straw yield than other treatments and at par with T_6 and T_5 treatments. Similar results were also recorded by Yahtya *et al.* (1995), Shinde *et al.* (2000) and Mali *et al.* (2001).

The positive effect of potassium on yield component might be due to its requirement in carbohydrate synthesis and translocation of photosynthesis from source to sink and its involvement in protein and fat synthesis which increased yield due to potassium application. This was also reported by Basith *et al.* (1995). Similar trend was also observed in case of biological yield.

Effect of Potassium on monetary returns from Kabuli chickpea

The gross and net monetary returns were recorded statistically higher values due to treatment T_7 (N, P_2O_5 and K_2O as per soil STCR targeted yield for 25 q ha^{-1}) and significantly superior over rest of the treatments except T_5 and T_6, which were at par with each other. Similar results were also recorded by Kar *et al.* (1989).

Effect of Potassium on available potassium in soil after harvest

The difference in available potassium in soil after harvest of the crop were statistically significant due to different treatments under study. Treatment T_6 (N, P_2O_5 as per soil test + 45 kg K_2O ha^{-1}) recorded significantly higher available potassium in soil after harvest as compare to rest of the treatments except treatment T_5 with which it shown at par values.

Table 1: Effect of Potassium application on yield of Kabuli chickpea, economics and available potassium in soil.

Treatments		Yield (qha^{-1})			Monetary returns (Rs.)		Available potassium in soil after harvest
		Seed yield	Straw yield	Biological yield	Gross	Net	
T_1	Absolute control	16.46	20.20	36.66	49890	9360	497.70
T_2	GRDF : 25:50:0 kg NPK ha^{-1}	19.53	24.12	43.65	58625	11664	506.68
T_3	N and P_2O_5 as per soil test + 0 kg K_2O ha^{-1}, 31.25:50:0 kg NPK ha^{-1}	19.92	24.58	44.50	60393	18397	509.68
T_4	N and P_2O_5 as per soil test + 15 kg K_2O ha^{-1}, 31.25:50:15 kg NPK ha^{-1}	21.23	26.06	47.23	64355	22354	511.78
T_5	N and P_2O_5 as per soil test + 30 kg K_2O ha^{-1}, 31.25:50:30 kg NPK ha^{-1}	21.53	27.24	48.77	66318	24092	513.75
T_6	N and P_2O_5 as per soil test + 45 kg K_2O ha^{-1}, 31.25:50:45 kg NPK ha^{-1}	22.40	27.49	49.89	67895	25669	514.17
T_7	N, P_2O_5 and K_2O as per soil STCR targeted yield for 25 q ha^{-1}, 41.25:47.07:11.85 kg NPK ha^{-1}	23.07	28.47	51.54	69936	27962	510.10

SE (m)±	0.58	0.68	1.09	1351.07	1343	0.74
CD at 0.05	1.76	2.08	3.34	4145.60	4121	2.26
GM	20.56	26.15	45.97	62487	19928	509.15

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