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Response of K Application to Different Crops Grown in Mendki Village of Dewas District

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ABSTRACT

Potassium is one of the three major essential nutrient elements required by plants. plants tolerant to drought and frost and resistant to a number of diseases and pests besides its impact on yield and quality. Today potassium (K) is an important limiting factor in crop production. The quantity of K absorbed by plants is much higher than nitrogen (N) for most of the cultivated crops. The five treatments were given to soybean-based cropping systems viz. Soybean-gram, soybean-wheat, soybean-potato, and soybean–garlic. The treatment given to these crops are T1: Control i.e. no fertilizer application; T2: 50% RDF of K; T3: 100% RDF of K; T4: 150% RDF of K; 200% RDF of K. The yield data and K uptake data is presented in Table. The long-term experimentation on vertisols in soybean-wheat-maize that the yield of soybean was increased by 6%.

Keywords: Potassium, crop yield, treatment

INTRODUCTION

One of the three main basic nutrients that plants need is potassium. Potassium, unlike nitrogen and phosphorus, does not make bonds with either carbon or oxygen, hence it is never incorporated into proteins or other organic molecules. Potassium is involved in practically all of the activities required to maintain plant life, despite the fact that it is not a component of any plant structures or compounds. The creation of protein, carbohydrates, and sugars as well as the activation of enzymes all depend on potassium, which is found in the cell sap. It is well recognized to improve crop performance when exposed to water stress by controlling how quickly plant stomata open and close. It is also well known for its function in providing plants with pest and disease resistance and lodging resistance. Potassium is frequently referred to as "the quality element" since it is involved in numerous metabolic pathways that influence crop quality (Hoeft et al.,2000).

In fact, potassium is crucial for conventional agriculture, horticulture, and vegetable crops since it increases plant tolerance to drought and cold as well as their resistance to a variety of diseases and pests. It also has an impact on productivity and quality (Romheld and Kirkby, 2010). Today, potassium (K) is a significant crop output limiting factor. For the majority of cultivated crops, plants absorb far more potassium (K) than nitrogen (N) SOPIB (2001). Layers of 2:1 type expanding clay minerals like vermiculite, smectite, and others can accommodate potassium ions. As a result, potassium from these places to higher plants is "not rapidly available," but it represents a significant reserve of progressively available potassium. Exchangeable Solution Plus forms make up 1% to 2% of the total. About 98 percent of these easily accessible forms are found in exchangeable cations, with the remaining 2 percent found in solutions (Srinivasarao*et al*. 2007; Tiwari *et al* 2007). Plants take up potassium in the ionic form K+. Typically, potassium is stated in terms of K_2O for fertilizer composition and plant nutrition. (Arvind and Muthusamy,1989).

Lalitha and Dhakshinamoorthy (2014) stated that Different kinds of potassium soil exist in the soil and are in constant equilibrium with one another. The four key types of potassium (K) in soil are mineral K (i), non-exchangeable K (ii), exchangeable K (iii), and soil solution (iv). According to Sharply (1989), the link between clay mineralogy and potassium forms can be utilized to anticipate K cycling, assess prospective soil K fertility, and assess plant uptake (Santhy*et al.* 1998; Sharma and Verma, 2000).

METHOD

To evaluate the effect of K application in different crops on the productivity and uptake of K by different crops five farmers were selected in the Village Medki of Dewas district on the field of these farmers' demonstrations were conducted. The five treatments were given to soybean-based cropping systems viz. Soybean-gram, soybean-wheat, soybean-potato, and soybean–garlic. The treatment given to these crops are T1: Control i.e. no fertilizer application; T2: 50% RDF of K; T3: 100% RDF of K; T4: 150% RDF of K; 200% RDF of K. The yield data and K uptake data are presented in Table 1. It is evident from these tables that although these soils are rich in K but still there are a response of K application to different Crops and this application of K also helped to enhance the K uptake considerably by all the crops. In the case of the soybean-gram cropping system soybean yield increased with the increase in K levels up to 200 % RDF. A similar increase in grain yield was observed in the case of gram also. This increase was 4.10- 9.80 % over control in the case of soybean and 3.25- 12.99% in the case of a gram. A higher response was observed in the case of gram than soybean. The K uptake increased considerably in both crops. In the case of soybean, the uptake was increased by 8.45 to 38.61% over control due to increasing in K levels. This increase was more in the case of a gram. A similar response was observed in Table 2, Table 3, and Table 4, of Soybean- wheat, soybean-potato, and soybean-garlic cropping systems. Due to the low productivity of these crops, the uptake of K is lesser. The productivity is low due to water stress and excess water which caused waterlogging and created oxygen stress which affected root growth and resulted in poor crop yields and uptake of K by soybean crop.

Table 1: Effect of K application on the yield and uptake of K in different cropping systems on Farmer's field in Dewas district Village Medki

Farmer 1: Vinod Thakur

K Treatments	Soybean		Gram	
	yield (kgha^{-1})	Uptake (kg ha-1)	yield (kgha^{-1})	Uptake (kg ha-1)
Control	1316	31.6	1540	18.5
50% (RDF)	1370 (4.10)	34.3 (8.54)	1590(3.25)	27.0(45.95)
100 %(RDF)	1420 (7.90)	42.6(34.81)	1670(8.44)	30.4(64.32)
150%(RDF)	1430(8.66)	43.0(36.08)	1710(11.04)	32.5(75.68)
200% (RDF)	1445(9.80)	43.8(38.61)	1740(12.99)	36.5(97.30)

Table2:

Farmer-2 :Dulhesingh Thakur

K Treatments	Soybean		Wheat	
	yield (kgha^{-1})	Uptake (kg ha-1)	yield (kgha^{-1})	Uptake (kg ha-1)
Control	1321	21.4	3420	45.8
50% (RDF)	1432 (8.40)	27.5 (28.50)	3620(5.85)	56.1(22.49)
100 %(RDF)	1510(14.31)	33.5(56.54)	4210(23.10)	66.9(46.07)
150%(RDF)	1520(15.06)	29.9(39.72)	4100(19.88)	70.1(53.06)
200% (RDF)	1543(16.81)	29.9(39.72)	4150(21.35)	75.1(63.97)

Table 3:

Farmer -3: Jitendra Singh Darbar

K Treatments	Soybean		Potato	
	yield ($kgha^{-1}$)	Uptake (kg ha-1)	yield ($kgha^{-1}$)	Uptake (kg ha-1)
Control	1430	30.7	19010	32.41
50% (RDF)	1503 (5.10)	38.3(24.76)	20134 (5.91)	43.85(35.30)
100 %(RDF)	1540(7.69)	51.6(68.08)	22130(16.41)	54.28(67.48)
150%(RDF)	1570(9.79)	52.6(71.34)	22401(17.84)	71.21(119.72)
200% (RDF)	1580(10.49)	57.7(87.95)	22601(18.89)	87.01(168.47)

Table 4:

Farmer-4 : Ashok Darbar

Treatment	Soybean		Garlic	
	Yield ($kgha^{-1}$)	Uptake (kg ha-1)	yield ($kgha^{-1}$)	Uptake (kg ha-1)
Control	1520	28.9	3521	18.01
50% (RDF)	1630 (7.24)	44.0 (52.25)	3654(3.78)	21.10 (17.16)
100 %(RDF)	1680(10.53)	50.4(74.39)	3895(10.62)	24.16(34.15)
150%(RDF)	1686(10.92)	48.9(69.20)	3733(6.02)	27.47(52.53)
200% (RDF)	1701(11.91)	44.2(52.94)	3689(4.77)	30.80(71.02)

RESULT

According to Nagre et al. (1991), the application of increasing amounts of NPK had a positive effect on soybean performance in black cotton soils of Akola during the "kharif" season in terms of yield attributing traits, yield, and quality (soil and protein content). Although it is challenging to calculate each participant's share of potassium in this study, potassium's contribution to the total reaction can be acknowledged.

According to Anuradha and Sharma (1995), adding potassium to soybeans boosted their soil content, nitrate reductase activity, seed protein, and chlorophyll content. At Amravati and Akola in Maharashtra State, Deshmukh et al. (1994) applied 60 kg K2O/ha and 90 kg K2O/ha, respectively, to produce the maximum soybean yield and oil content. In an experiment conducted by the International Potash Institute over a three-year period at Amlaha (M.P.) on vertisols, Magen (1997) found higher seed production, soil and protein contents, and nodulation. These findings provided more compelling evidence regarding the yield responses of soybean.

CONCLUSION

Long-term research on vertisols in Dewas (M.P.) in soybean-wheat-maize fodder showed that potassium application at recommended levels improved uptake of major, secondary, and some micronutrients in addition to increasing soybean production by 6%. The impact of applying K to the other crops in the rotation was comparable.

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