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YIELD AND ECONOMICS OF REDGRAM AS INFLUENCED BY SOIL AND FOLIAR APPLICATION OF POTASSIUM AND ZINC

R. REDDI MANOJA, Y. REDDI RAMU*, N. SUNITHA, M.V.S. NAIDU AND G. PRABHAKARA REDDY

Department of Agronomy, S.V. Agricultural College, ANGRAU, Tirupati-517 502, A.P.

ABSTRACT

A field experiment conducted during *kharif,* 2014 at S.V. Agricultural College, dryland farm, Tirupati to know thesoil and foliar application of potassium and zinc nutrition. The present study revealed that foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation and pod formation stage along with RDF *i.e.* 20 kg N and 50 kg P_2O_5 ha^{-1} recorded significantly higher seed yield and economic returns. Foliar application of potassium and zinc was more effective than soil application. The lower values of yield and economics were recorded with application of recommended dose of fertilizers (20-50-0 kg N, P_2O_5 and K_2O ha^{-1}).

KEYWORDS: Economics, Potassium, Redgram, Yield and Zinc.

INTRODUCTION

Pulse crops play a significant role in food production in India, which accounts for one third of global area under pulses (25 million hectares) and one fourth of production (19.25 million tonnes) with a productivity of 694 kg ha^{-1} during the year 2013-14. Among pulses, pigeonpea is one of the important pulse crops as a major source of protein in the diets of large section of vegetarian population in the developing countries in general and India, in particular. The lower yield of pigeonpea in India is mainly attributed to its cultivation on poor soils with inadequate and imbalanced nutrient application. Application of plant nutrients in balanced proportion and appropriate quantities is absolutely essential for improving the productivity of pulses (Sarkar, 1995). Significance of nitrogen and phosphorus fertilization on pulses is well known, but the need for potassium and zinc nutrition and their combination at different stages is not well documented. Potassium is one of the major nutrients associated with movement of water, nutrients and carbohydrates within the plant. It not only enhances the biological nitrogen fixation, but also improves the protein content, water use efficiency and resistance to pests and diseases. Application of zinc improved the yield appreciably and foliar application of zinc is more economical in pulses.

MATERIAL AND METHODS

A field experiment was carriedout during *kharif*, 2014 at S.V. Agricultural College, dryland farm, Tirupati. The experimental soil was sandy loam in texture, neutral in reaction (pH 6.9), low in organic carbon (0.4%), available nitrogen (210.0 kg ha^{-1}), available phosphorus (14.2 kg ha^{-1}), available potassium (144.4 kg ha^{-1}) and zinc (1.07 kg ha^{-1}). The experiment was laidout in a randomized block design and replicated thrice with ten treatments which include recommended dose of fertilizers (RDF) *i.e.* 20 kg N and 50 kg P_2O_5 ha^{-1} in the form of urea and single super phosphate. Potassium and zinc were applied basally in the form of muriate of potash and $ZnSO_4$. Foliar application of potassium and zinc in the form of KNO_3 @ 1.0 % and $ZnSO_4$ @ 0.2 % at flower bud initiation and pod formation stage. The redgram variety used in the present experiment was TRG-38, by adopting seed rate of 5 kg ha^{-1} and the crop was harvested on 11-02-2015. Chloripyriphos @ 2.5 ml l^{-1} of water was sprayed at flower bud initiation stage as a prophylactic measure against flower webber and thiodicarb @ 1 g l^{-1} of water was sprayed at pod formation stage to control pod borer (*Helicoverpa armigera*).

RESULTS AND DISCUSSION

The yield and economics of redgram was significantly influenced by soil and foliar nutrition of potassium and zinc. The highest seed and stalk yield of redgram was recorded with foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation and pod formation stage along with RDF, which was significantly superior over the rest of the nutrient management practices tried (Table 1). The foliar application of 1% KNO_3 + 0.2%

*Corresponding author, E-mail: ramuagro@rediffmail.com

Table 1. Seed yield, stalk yield (kg ha^{-1}), harvest index (%) and economics of redgram as influenced by soil and foliar application of potassium and zinc

Treatments	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Harvest index (%)	Net returns (Rs. ha^{-1})	Benefit cost-ratio
T_1 : Recommended dose of fertilizers (RDF) (20-50-0 kg N, P_2O_5 and K_2O ha^{-1})	680	2403	22.05	1773	1.10
T_2 : RDF + Soil application of 50 kg K_2O ha^{-1}	1052	3649	22.38	11155	1.57
T_3 : RDF + Soil application of 25 kg $ZnSO_4$ ha^{-1}	1065	3752	22.11	12200	1.62
T_4 : RDF + Soil application of 50 kg K_2O ha^{-1} + 25 kg $ZnSO_4$ ha^{-1}	1304	4531	22.35	17991	1.85
T_5 : RDF + Foliar application of KNO_3 @ 1% at flower bud initiation stage	800	2848	21.93	4767	1.25
T_6 : RDF + Foliar application of KNO_3 @ 1% at flower bud initiation and pod formation stage	1045	3613	22.43	11517	1.58
T_7 : RDF + Foliar application of $ZnSO_4$ @ 0.2% at flower bud initiation stage	887	3133	22.07	7939	1.43
T_8 : RDF + Foliar application of $ZnSO_4$ @ 0.2% at flower bud initiation and pod formation stage	1123	3888	22.42	14982	1.80
T_9 : RDF + Foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation stage	1257	4332	22.49	18437	1.96
T_{10} : RDF + Foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation and pod formation stage	1478	5007	22.80	23774	2.16
SEm±	39.8	259.3	-	1196.5	0.06
CD(P=0.05)	117	764	-	3529	0.18

$ZnSO_4$ at flower bud initiation and pod formation stage along with RDF resulted in 117.3 per cent higher seed yield compared to recommended dose of fertilizers *i.e.* 20 kg N and 50 kg P_2O_5 ha^{-1}. The superiority of foliar nutrition in this nutrient management practice might be due to coincidence of foliar application with peak nutrient requirement of the crop, moreover peak absorption of potassium occurs from flowering to early pod development, any deficiency of potassium during this period can result in yield loss without obvious foliar symptoms. The quantity of nutrients absorbed due to soil application of potassium and zinc may not be sufficient to meet the crop demands at pod development stage. Supplementing the nutrients through foliage at flowering and pod formation stages might have resulted in better nutrient uptake and thereby regaining the photosynthetic efficiency of the plant at post anthesis period resulted in increased yield attributes and seed yield of redgram (Reddy *et al.,* 1991). Soil application of 50 kg K_2O + 25 kg $ZnSO_4$ ha^{-1} along with RDF and foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation stage along with RDF were the next best nutrient management practices, which were comparable with each other. Application of recommended dose of fertilizers alone (20-50-0 kg N, P_2O_5 and K_20 ha^{-1}) recorded the lowest seed and stalk yield due to deficiency of potassium and zinc as the experimental soils, which are poor in available potassium (144.4 kg ha^{-1}) and available zinc (1.07 kg ha^{-1}). Similar results were also reported by Nalini *et al*. (2013) in blackgram.

The highest harvest index in redgram was recorded with foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation and pod formation stage along with RDF. This might be due to better absorption and translocation of all the nutrients in a balanced proportion leading to increased partitioning of photosynthates from source to developing seed, where foliar application coincides with the peak crop nutrient demand and thereby maintainance of better source-sink relationship. The lowest harvest index was recorded with application of recommended dose of fertilizers due to poor source-sink relationship.

The highest net returns and benefit cost ratio were obtained with foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation and pod formation stage along with RDF, which was significantly superior over other nutrient management practices. The increase in net returns might be due to increased seed yield and reduced cost of foliar application of potassium @ 1% and zinc sulphate @ 0.2% compared to soil application of 50 kg K_2O and 25 kg zinc sulphate ha^{-1}. The next best treatment was soil application of 50 kg K_2O ha^{-1} + 25 kg $ZnSO_4$ ha^{-1} along with RDF, which was however comparable with foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation stage along with RDF. The lowest net returns and benefit cost ratio were obtained with application of recommended dose of fertilizers. These results are in accordance with the findings of Babu *et al.* (2012), Anitha *et al.* (2005) and Shivay *et al.* (2014).

In conclusion, the present study revealed that RDF *i.e.* 20 kg N and 50 kg P_2O_5 ha^{-1} along with foliar application of 1% KNO_3 + 0.2% $ZnSO_4$ at flower bud initiation and pod formation stage resulted in increased seed yield and monetary returns in redgram on sandy loam soils of Southern Agroclimatic Zone of Andhra Pradesh.

LITERATURE CITED

Anitha, S., Sreenivasan, E and Purushothaman. 2005. Response of cowpea (*Vigna unguiculata* (L) Walp) to foliar nutrition of zinc and iron in the oxisols of Kerala. *Legume Research*. 28(4): 294-296.

Babu, S.P.N., Koppalkar, B.G., Desai, B.K., Nagalikar, V.P and Pramod Katti. 2012. Yield, yield components and economics of pigeonpea cultivation as influenced by organic manures and graded levels of zinc sulphate. *Karnataka Journal of Agricultural Sciences*. 25(4): 527-530.

Nalini, P., Gupta, B and Pathak, G.C. 2013. Foliar application of zinc at flowering stage improves plant's performance, yield and yield attributes of blackgram. *Indian Journal of Experimental Biology*. 51: 548-555.

Reddy, B.S., Reddy, S.R and Subbaiah, G. 1991. Effect of supplemental nutrition during post flowering phase of groundnut. *The Andhra Agricultural Journal*.38: 4-7.

Sarkar, A.K. 1995. Balanced fertilization with NPK for increasing production of pulses In: *Proceedings of Zonal Symposium on Balanced Fertilizer Use for Increasing Food Grain Production in Eastern States*. Orissa University of Agriculture and Technology. 42-85.

Shivay, Y.S., Prasad, R and Pal, M. 2014. Effect of zinc fertilization on grain and protein yield, nitrogen uptake and fertilizer use efficiency in chickpea. *Indian Journal of Fertilizers*. 10(3): 24-27.