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Impact of foliar application of water soluble NPK fertilizers on yield, nutrient uptake and quality of gram (*Cicer arietinum*. L)

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Abstract

The experiment was conducted at Agronomy block, School of Agricultural Sciences, G H Raisen University, Saikheda, Chhindwara during rabi of 2018 to study the impact of foliar application of water soluble NPK fertilizers on yield, nutrient uptake and quality of gram (*Cicer arietinum*. L). The experiment was laid out in 7 treatments replicated thrice in Randomized Complete Block Design. The results revealed that application foliar spray of water soluble fertilizer (19:19:19) at 2.0% concentration along with basal dose of (25:40:20 kg N, P₂O₅, K₂O) at flowering and pod development stage recorded significantly higher yield, higher nutrient uptake and higher protein content in gram cultivation.

Keywords: Water soluble fertilizers (WSF), foliar application, nutrient uptake, DAP, 19:19:19

Introduction

In India, main types of gram are cultivated is Desi and Kabuli in the ratio 3:1. Gram accounts for about 45% of total pulses, India is the major producing country for gram, contributing for over 75% of total production in the world. Gram is cultivated for its seeds. They are rich source of protein and form an important part of vegetarian diet. Gram seeds contain about 21% of protein. It is rich in minerals like calcium, phosphorus, iron etc. and also certain essential amino acids. Thus, inadequate intake of pulses could lead to serious consequences on human health.

Foliar application of nutrients is considered to be an efficient and economic method of supplementing the nutrient requirement of the crop which inturn leads to enhanced yield. In addition, foliar application of nutrient was found to be more advantageous than soil application with the elimination of losses through leaching and fixation. Foliar feeding is often the most effective and economical way to improve plant nutrient deficiency (Dixit and Elamathi, 2007). Supplemental nutrition plays a crucial role in increasing seed yield in pulses (Chandrashekar and Bangarusamy, 2003).

Materials and Methods

The present investigation was conducted at the Agricultural field, School of Agricultural Sciences, G.H.Raisen University, Saikheda, Chhindwara, M.P. during rabi 2018-2019. The experiment was conducted in Complete Randomized Block Design with variety Kiran. The soil of experimental site was red sandy loamy in texture and Ph was 6.5. A gram was sown on second fortnight of October and spacing with 30cm in row and 10cm in plant to plant. The experiment was laid out in Randomized Complete Block Design in 3 replications consists of 7 treatments. Application of basal dose of 25:40:20 kg ha⁻¹ NPK fertilizer to all respective plots. Treatments constituted with 19:19:19 water soluble fertilizer having concentration 0.5% - 2% and Di ammonium phosphate at 2%. Spraying was done at flowering and pod development stage as per treatments.

Results and Discussion

Impact of foliar application of water soluble NPK fertilizer on yield of gram

The present investigation revealed that, significantly with foliar application of 2 per cent WSF at flowering and pod development stages (T₇) recorded higher pod yield (2540 kg ha⁻¹), higher grain yield (1690 kg ha⁻¹), higher haulm yield of (2235 kg ha⁻¹). Lower in control (1990 kg ha⁻¹, 1250 kg ha⁻¹ and 1765 kg ha⁻¹) was obtained with no foliar spray.

Foliar spray of nutrients is the fastest way to boost up crop growth and yield because nutrients are available to plants in critical stages and the nutrients will reach the site of food synthesis directly leading reduce the requirement of fertilizers.

It is resulted in efficient absorption and usage which is economical than any other method of fertilization. Similar results are in close confirmation with the findings of Venkatesh *et al.* (2012) ^[12], Saravanan *et al.* (2012) ^[10] in cotton.

Impact of foliar application of water soluble NPK fertilizer on nutrient uptake of gram

Progressive increase in concentration of nutrient supply through foliar spray at different stages of crop growth significantly increased in seed yield and haulm yield in gram than only application by soil (control). It showed that the plots having basal dose of 25:40:20 kg ha⁻¹ NPK with foliar application of 2% water soluble fertilizer at flowering and pod development stage (T₇) recorded higher uptake of nutrient than control (T₁).

Supplying nutrients during period of crop growth by foliar application favoured increased availability for better utilization and nutrient uptake of crop. Similar results were reported by Kadam *et al.* (2005) ^[5] in soybean, Kocon (2010) ^[6] in fababeen and Yadav and Choudhary (2012) ^[14] in cowpea.

Table 1: Impact of foliar application of water soluble NPK fertilizer on yield of gram

Treatments	Pod Yield kg ha ⁻¹	Grain yield kg ha ⁻¹	Haulm yield kg ha ⁻¹	Harvest index
T ₁ Control	1990	1250	1765	0.40
T ₂ Water spray	1997	1321	1774.6	0.40
T ₃ 2.0% DAP	2250	1473	2055	0.41
T ₄ 0.5% WSF at flowering and pod development stage	2400	1498	1970	0.41
T ₅ 1.0% WSF at flowering and pod development stage	2470	1500	1230	0.42
T ₆ 1.5% WSF at flowering and pod development stage	2490	1597	2205	0.42
T ₇ 2.0% WSF at flowering and pod development stage	2540	1690	2235	0.42
SEm±	1.21	42.02	52.11	0.02
CD at 5%	0.89	89.94	111.5	NS

DAS- Days after sowing

NS – Not significant

WSF – Water soluble fertilizer

DAP – Di ammonium phosphate

Table 2: Uptake of nitrogen, phosphorus, potassium and protein content influenced by foliar application of water soluble fertilizers in gram.

Treatments	Nitrogen kg ha ⁻¹	Phosphorus kg ha ⁻¹	Potassium kg ha ⁻¹	Protein content (%)
T ₁ Control	85	9	10	20.8
T ₂ Water spray	87	9.2	12	20.23
T ₃ 2.0% DAP	94	15.58	15.033	21.5
T ₄ 0.5% WSF at flowering and pod development stage	92	11.5	14.6	20.4
T ₅ 1.0% WSF at flowering and pod development stage	94	12.1	15.06	20.11
T ₆ 1.5% WSF at flowering and pod development stage	97	14.2	16.9	21.16
T ₇ 2.0% WSF at flowering and pod development stage	98	14.6	17.46	23.21
SEm±	1.41	0.56	9.15	0.07
CD at 5%	3.01	1.19	2.08	0.003

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