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EFFECT OF FOLIAR NUTRITION ON PHYSIOLOGICAL AND BIOCHEMICAL PARAMETERS OF MUNG BEAN (*VIGNA MUNGO* (L.) HEPPER) UNDER IRRIGATED CONDITIONS

D. SIVA NAGESWARA RAO, T.C.M. NAIDU & Y. ASHOKA RANI

Department of Crop Physiology, Agricultural College, Bapatla, Andhra Pradesh, India

ABSTRACT

A field experiment was conducted during *Rabi* season of 2012-13 at Regional Agricultural Research Station, Lam, Guntur, with an aim to find out effect of foliar nutrition on physiological and biochemical parameters of mung bean (*vigna mungo* (L.) Hepper) under irrigated conditions. Among foliar nutrients Urea @ 2% recorded higher yield and proved superior over other foliar sprays. Urea @ 2% spray recorded more plant height, leaf area, shoot dry weight and by increasing total chlorophyll content, photosynthetic rate and total protein content.

KEYWORDS: Irrigated, Foliar Spray, Urea, Photosynthetic Rate, SCMR, Blackgram

INTRODUCTION

Blackgram (*Vigna mungo* (L.) Hepper) is the fourth important pulse crop in India and second most important in Andhra Pradesh in terms of extent of cultivation. It has been well established that most of the plant nutrients are absorbed through the leaves and absorption would be remarkably rapid and nearly complete. Moreover, foliar feeding practice would be more useful in early maturing crops, which could be combined with regular plant protection programmes. If foliar nutrition is applied it reduces the cost of cultivation which in turn reduces the amount of fertilizer thereby reducing the loss and also economizing crop production. Keeping this in view an investigation was carried to know the effect of foliar nutrition on physiological and biochemical parameters of mung bean under irrigated condition.

MATERIAL AND METHODS

A field experiment was conducted during *Rabi* season of 2012-13 at Regional Agricultural Research Station, Lam, with an aim to find out the response of blackgram to foliar nutrition (KNO_3 @ 1%, Urea @ 2%, DAP @ 2%, K_2SO_4 @ 1%, Triacontanol @ 1 ppm and water spray) in randomised block design and foliar sprays as sub treatments. Control (no spray) was also maintained along with foliar sprays. Supplemental irrigation for irrigated main plot was given at 33 DAS. Foliar spray was done during flowering and pod initiation stages.

Leaf area and shoot dry weight ware measured by destructive growth analysis. Total leaf area per plant (cm^2) was measured at regular time intervals by using LI-COR LI-3100C leaf area meter. Photosynthetic rate of leaves was measured by using LI-COR LI-6400XT portable photosynthetic system. Water potential of leaves was measured by using Wescor's water potential system (PSΨPRO) and expressed in Mpa. SCMR was recorded on 5^{th} or 6^{th} or 7^{th} leaf from top of each representative plant, between 10.00 a.m. and 12.00 noon of the day. The chlorophyll content in leaves was estimated calorimetrically by DMSO method of Ronen and Galun (1984). Total protein content in leaves was estimated by Lowry's

method (Lowry *et. al.,* 1958). The pods from each net plot were shelled and seed yield was expressed as Kg ha^{-1}.

RESULTS AND DISCUSSIONS

Effect on Plant Height, Leaf Area and Shoot Dry Weight

Foliar spray of urea @ 2% recorded highest plant height (21.29 cm), leaf area (520.83 cm^2 $plant^{-1}$) and shoot dry weight (4.83 g $plant^{-1}$) followed by KNO_3. Control recorded lower plant height (16.54 cm), lower leaf area (345.97 cm^2 $plant^{-1}$) and lower shoot dry weight (2.93 g $plant^{-1}$) followed by water spray. The results of increase in plant height, leaf area and shoot dry weight due to urea and KNO_3 were due to nitrogen and potassium. Nitrogen and potassium influences water relations which regulate cell division and elongation and nitrogen content of leaves is rapidly converted to protein and increases these characters. Similar results of increase in plant height, leaf area and shoot dry weight due to urea and KNO_3 was revealed by Kalilzadeh *et al*. (2012) and Mondal *et al*. (2011) in mung bean.

Effect on SCMR

Higher SCMR was recorded in urea spray @ 2 % (50.33) and lower SCMR was recorded in control (39.30). Addition of foliar spray like urea increases the leaf nitrogen content. As 'N' is a component of chlorophyll molecule, increase in leaf nitrogen content result in increase in chlorophyll content. Similar results of increase in SCMR due to foliar spray of urea were reported by Venkatesh *et al*., (2011) in chickpea.

Effect on Total Chlorophyll

Urea @ 2% recorded higher total chlorophyll content (1.183 mg g^{-1} FW) and lower total chlorophyll content was observed in control (0.952 mg g^{-1} FW). Addition of foliar spray like urea (or) KNO_3 increases the leaf nitrogen content. As 'N' is essential for chlorophyll synthesis, increase in leaf nitrogen content result in increase in chlorophyll content (Yildirin *et al*., 2007). Similar results of increase in total chlorophyll content due to foliar spray of KNO_3 or urea was reported by Sritharan *et al*., (2005) in mungbean, Kaur and Jagetiya (2005) in soybean and verma *et al*., (2009) in chickpea.

Effect on Water Potential

In case of water potential KNO_3 @ 1% spray recorded significantly higher water potential (-1.29 MPa) followed by K_2SO_4 @ 1% (-1.33 MPa). This might be due to major role of Potassium in the transport of water and nutrients.

Effect on Photosynthetic Rate

Urea @ 2% spray recorded maximum photosynthetic rate (43.94 µmol CO_2 m^{-2} s^{-1}) followed by DAP @ 2% spray (42.31 µmol CO_2 m^{-2} s^{-1}) which is on par with KNO_3 @ 1% (41.96 µmol CO_2 m^{-2} s^{-1}). Maximum stomatal conductance was recorded by urea @ 2% (1.13 mol m^{-2} s^{-1} H_2O) and DAP @ 2% (1.08 mol m^{-2} s^{-1} H_2O). Increase in photosynthetic rate was due to presence of more chlorophyll content and increase in stomatal conductivity.

Effect on Total Protein Content

KNO_3 @ 1% recorded significantly higher total protein content (42.53 mg g^{-1} FW) followed by Urea spray @ 2% (41.87 mg g^{-1} FW). Significantly lower total protein content was recorded by control (35.67 mg g^{-1} FW) followed by water spray (38.33 mg g^{-1} FW). This could be due to that the presence of high leaf nitrogen content by foliar spray might have

increased the protein synthesis. Similar results of increase in total protein content due to foliar spray of urea was reported by Sritharan *et al*. (2005) in mung bean and Kalarani and Jaykumar (1998) in soybean.

Effect on Seed Yield

Spray of urea @ 2% recorded significantly higher seed yield (792.17 kg ha^{-1}) followed by KNO_3 @ 1% (770.27 kg ha^{-1}). Lower seed yield was observed in control (609.0 kg ha^{-1}) followed by water spray (643.50 kg ha^{-1}). Similar results of increase in seed yield due to foliar spray of urea under normal irrigated condition was reported by Rajavel *et al.* (2009) in mung bean, Sritharan *et al.* (2005) in mung bean and Bahr (2007) in chickpea.

CONCLUSIONS

Foliar nutrients Urea @ 2% recorded higher yield and proved superior over other foliar sprays. Urea @ 2% spray recorded more plant height, leaf area, shoot dry weight and by increasing total chlorophyll content, photosynthetic rate and total protein content.

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APPENDICES

Table 1: Effect of Tratments on Growth, Physiological and Biochemical Parameters of Black Gram

Treatments	Plant Height (Cm)	Leaf Area (Cm^2 / Plant)	Shoot Dry Wt (G/Plant)	Water Potential (MPA)	Photosynthetic Rate (µmol M^{-2} S^{-1} CO_2)	Total Chlorophyll (SCMR)	Total Chlorophyll Content (Mg/G FW)	Protein Content (Mg/G FW)	Yield (Kg/Ha)
KNO_3 @ 1%	20.97	486.10	4.13	-1.29	41.96	49.33	1.155	42.53	770.27
Urea @ 2%	21.29	520.83	4.83	-1.55	43.94	50.33	1.183	41.87	792.17
DAP@ 2%	19.70	473.19	4.00	-1.49	42.31	49.00	1.126	39.10	755.92
K_2SO_4 @ 1%	20.46	437.60	4.07	-1.33	41.28	47.10	1.097	39.43	714.77
Tricantanol @ 1 ppm	20.00	444.95	3.70	-1.68	40.88	44.83	1.052	40.97	663.87
Water	17.87	378.53	3.35	-1.72	35.76	43.30	1.001	38.33	643.50
No spray	16.54	345.97	2.93	-1.90	33.45	39.30	0.952	35.67	609.00
SEM ±	0.27	1.27	0.63	0.02	0.32	0.47	0.025	0.13	1.54
CD	0.80	3.70	0.18	0.06	0.94	1.36	0.074	0.37	4.50
CV%	15.57	15.27	8.05	3.82	12.86	17.14	6.18	5.18	15.07