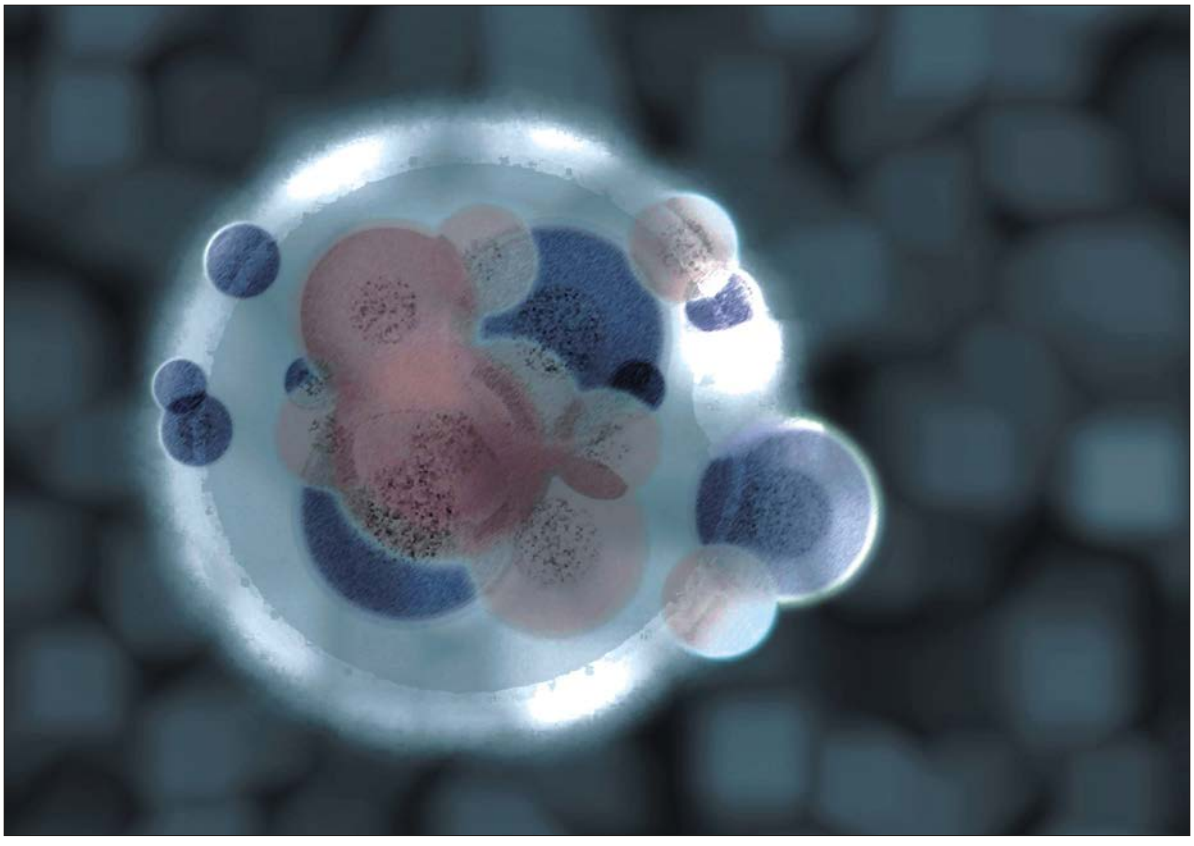

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Influence of Foliar Spray of Nutrients on Yield and Economics of Soybean (*Glycine max* L. Merill)

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Abstract: A field experiment was conducted to evaluate the influence of foliar spray of nutrients on yield and economics of soybean during rabi 2011 at Tamil Nadu Agricultural University, Coimbatore. The experiment was laid out in randomized block design replicated thrice. The results revealed that foliar spray of 2% DAP twice at flower initiation and pod formation stages of crop growth resulted in significantly higher number of pods^{-1} (62.50), number of seeds pods^{-1}, seed index and higher grain yield (1460 kg ha^{-1}). It was on par with 2% urea phosphate and TNAU pulse wonder spray. The foliar spray of 2% DAP also recorded significantly higher net return of Rs 20,090 with B:C ratio of 2.22.

Key words: Soybean, foliar spray, urea phosphate, DAP

INTRODUCTION

Pulses occupy a unique position in Indian agriculture by constituting the major high protein component to the average Indian diet. They also supply nutritive fodder and enable the land to restore its fertility so as to produce a reasonable yield of succeeding crops. The present average per capita consumption of pulses in India has decreased from 64 g in 1950 to 35 g day^{-1} in 2011 due to exploding population and low production (Anonymous, 2011). It is far below the recommended level of 104 g by the nutritionists. Continued population upsurge necessitates the need for the greater supply of plant protein which already has remained too short of its requirement.

Soybean (*Glycine max* L. Merill) is a dual purpose, most important rainy season crop to meet pulse and oil requirements. It has a great nutritional significance, with over 40% protein and 20% oil and has been recognized as a potential supplementary source of edible oil. It is also highly adaptable to varying soil and climatic conditions, giving fairly high yields compared to other pulse crops. Hence, soybean cultivation has to be popularized to meet the twin objectives of reducing the protein malnutrition and increasing the oil production. In India soybean is cultivated in an area of 10.27 million ha with production of 11.00 million tonnes and a productivity of 1070 kg ha^{-1} (Anonymous, 2012). In Tamil Nadu soybean is yet to catch the minds of the farmers. It is partly due to dearth of location specific production techniques on the crop and partly due to lack of adequate marketing and processing facilities.

Soil application of nutrients often results in lower efficiency of concerned nutrients. The soil applied nutrients undergo several changes and losses which occur through leaching and volatilization. Besides, adverse soil conditions like acidity, alkalinity, water logging, lack of adequate moisture would also result in non availability of nutrients. In order to avoid or minimize severity of such condition, foliar application of nutrients is imperative Foliar spray of nutrients is the fastest way to boost up crop growth because the nutrients are available to plants at the initial stages and critical stages. Under rainfed condition when the availability of moisture becomes scarce, the application of fertilizers as foliar spray resulted in efficient absorption and usage which are economical in respect the other methods of fertilization. Flower senescence and ill filling of pods are the major drawbacks in soybean, which can be managed through foliar application of nutrient and growth regulators. Keeping these views in mind, the present investigation was carried out to find out the influence of foliar spray of nutrients on yield and economics of soybean.

MATERIALS AND METHODS

Field experiment was conducted during rabi 2011 at Tamil Nadu Agricultural University, Coimbatore to find

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out the influence of foliar spray of nutrients on yield and economics of soybean. The soil of the experimental field was sandy clay loam with pH 7.8. The soil was medium in nitrogen and phosphorous and high in potassium. The experiment was conducted in a randomized block design with 10 treatments, replicated thrice. The treatments tried were T_1-Water spray (control) (500 L ha^{-1}), T_2-1% Urea (5 kg ha^{-1}), T_3-1% Urea Phosphate (5 kg ha^{-1}), T_4-2% Urea Phosphate (10 kg ha^{-1}), T_5-2% Di ammonium phosphate (10 kg ha^{-1}), T_6-0.5% Mono Ammonium Phosphate (2.5 kg ha^{-1}), T_7-1% Mono Ammonium Phosphate (5 kg ha^{-1}), T_8-TNAU Pulse Wonder (5 kg ha^{-1}), T_9-1% Potassium Sulphate (5 kg ha^{-1}) and T_{10}-2% Potassium Sulphate (10 kg ha^{-1}). Soybean variety Co (Soy) 3 was used for this study. In all the treatment recommended dose of fertilizers (20 kg N+80 kg P_2O_5+40 kg K_2O and 30 kg Sulphur ha^{-1}) was applied as basal. Foliar sprays were given both at flowering and pod formation stages.

RESULTS AND DISCUSSION

Yield attributes

Number of pods: Number of pods $plant^{-1}$ is an important yield component in soybean and all the treatments viz., urea, urea phosphate, DAP, mono ammonium phosphate, potassium sulphate and TNAU pulse wonder increased the number of pods $plant^{-1}$. However, foliar spray of 2% DAP twice at flowering and pod formation stages of crop growth resulted in significantly higher number of pods $plant^{-1}$ (62.75) than other foliar spray treatments (Table 1). The foliar application of nutrients through 2% DAP at flower initiation and pod formation stage might have reduced flower drop. This might have significantly increased the number pods $plan^{-1}$ as reported by Ganapathy *et al.* (2008). Higher supply of all nutrients at flower initiation and pod formation stages of crop growth might have caused efficient translocation of photosynthates from source to sink.

Decreased the flower drop due to prolonged assimilatory activity of leaves might be another possible reason for higher number of pods $plant^{-1}$. Further, the foliage applied nitrogen and phosphorus at the initial stages might have been effectively absorbed and translocated to the pods resulting in more number of pods $plant^{-1}$. The results obtained by Solaiappan *et al.* (2002) in redgram are concomitant to the present finding.

Number of seeds $pods^{-1}$ and seed index: Foliar application of 2% DAP twice at flower initiation and pod formation stages of crop growth significantly influenced the number of seeds pod^{-1} and 100 seed weight. This might be due to better absorption of nutrients applied through foliage leading to better activity of functional root nodules resulting in more leaf area, dry matter production and uptake of nutrients. This could have lead to more flower production and subsequently pod formation and other yield attributing characters. The increased 100 seed weight might be attributed to increased mobilization of metabolites to the reproductive sinks. Foliar spray of 2% DAP might have supplied nitrogen and phosphorus at the fag end of the crop and might have helped in effective translocation of the nutrients from one plant part to other. This result is in confirmation with the report of by Solaiappan *et al.* (2002) in rainfed red gram.

Grain yield: Foliar application of different nutrients had significant variation in the grain yield of soybean. Among the treatments, foliar application of 2% DAP twice at flower initiation and pod formation stages of crop growth significantly recorded higher grain yield (1460 kg ha^{-1}). It was comparable with 2% urea phosphate spray and TNAU pulse wonder spray.

The increased yield might be due to enhanced yield attributes like number of pods $plant^{-1}$, number of seeds pod^{-1} due to increased uptake of nutrients by soybean by effective translocation of nutrients from sink to reproductive area of crop. The positive effect of P in

Table 1: Effect of foliar spray of nutrients on the yield parameters, yield and economics of soybean

Treatment	No. of pods $plant^{-1}$	No. of seeds pod^{-1}	Seed index (g)	Grain yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
T_1-water spray (control) (500 L ha^{-1})	39.58	2.06	8.20	810	2731	20250	4000	1.25
T_2-1% urea (5 kg ha^{-1})	52.79	2.67	11.75	1185	3497	29625	13317	1.82
T_3-1% urea phosphate (5 kg ha^{-1})	51.73	2.64	11.22	1136	3477	28400	11570	1.69
T_4-2% urea phosphate (10 kg ha^{-1})	53.36	2.88	13.62	1246	3947	31150	13740	1.79
$T_5$2% Di ammonium phosphate (10 kg ha^{-1})	62.75	2.96	14.62	1460	4027	36500	20090	2.22
T_6-0.5% mono ammonium phosphate (2.5 kg ha^{-1})	49.01	2.36	10.86	1040	3405	26000	8800	1.51
T_7-1% mono ammonium phosphate (5 kg ha^{-1})	50.33	2.40	11.34	1080	3422	27000	8850	1.49
T_8-TNAU pulse wonder (5 kg ha^{-1})	53.85	2.86	13.68	1325	3958	33125	15675	1.90
T_9-1% potassium sulphate (5 kg ha^{-1})	50.89	2.42	11.49	1117	3434	27925	10475	1.60
T_{10}-2% potassium sulphate (10 kg ha^{-1})	49.15	2.38	11.12	1015	3413	25375	6725	1.36
SEd	4.48	0.12	1.05	101	261	-	-	-
CD (p = 0.05)	9.41	0.25	2.20	212	547	-	-	-

increasing the grain yield of soybean as reported by Abbas *et al.* (1994) and Mathan *et al.* (1996) in blackgram is in support of the present finding.

Haulm yield: Foliar application of various nutrients had significant influence on the haulm yield. Among the treatments, foliar application of 2% DAP spray twice at flower initiation and pod formation stages of crop growth recorded significantly higher haulm yield of 4027 kg ha^{-1} and was on par with 2% urea phosphate spray and TNAU pulse wonder spray twice at flower initiation and pod formation stage of crop growth. The haulm yield enhancement due to the different treatments might be due to continuous supply of nutrients which in turn increased the leaf area and dry matter production resulting in higher haulm yield. This is also attributed to the higher nutrient uptake throughout the crop growth period. Similar result of increased haulm yield by soil and foliar application of nutrients has been reported by Ghosh and Joseph (2008) in green gram.

Economics: Foliar spray of 2% DAP twice at flower initiation and pod formation stages of crop growth recorded higher gross returns (Rs. 36,500) and net returns (Rs. 20,090) followed by foliar spray of TNAU pulse wonder twice at flower initiation and pod formation stages of crop growth with gross returns of Rs. 33,125 and net returns of Rs. 15,675. Water spray treatment (control) recorded the least gross returns (Rs. 20,250) and net returns (Rs. 4,000).

With respect of B:C ratio, foliar application of 2% DAP twice at flower initiation and pod formation stages of crop growth registered higher B:C ratio (2.22) followed by foliar application of TNAU pulse wonder (T_8) twice at flower initiation and pod formation stages of crop growth (1.90) and the lowest B:C ratio (1.25) was recorded under the water spray treatment. Similar result of improvement in the grain yield and net income with high B:C ratio due to foliar applications of 2% DAP has been reported earlier by Chandrasekhar and Bangarusamy (2003). The report of Yakadri and Ramesh (2002) who reported that foliar application of 2% DAP in black gram recorded the highest B:C ratio of 3.78 compared to control is concomitant to the present result.

CONCLUSION

The results of the present investigation revealed that foliar application of 2% DAP twice at flower initiation and pod formation stages of crop growth recorded better yield parameters, yield and economic returns in soybean.

REFERENCES

Abbas, M., M.P. Singh, K.P. Nigam and V.S. Kandalkar, 1994. Effect of phosphorus, plant density and plant type on yield attributing characters of soybean (*Glycine max*). Indian J. Agron., 39: 249-255.

Anonymous, 2011. Per capita net availability of food grains (per day) in India. Department of Agriculture and Co-Operation, Directorate of Economics and Statistics

Anonymous, 2012. Directors report and summary tables of experiments 2012. All India Coordinated Research Project on Soybean, Directorate of soybean Research, Indore, Madhya Prdesh

Chandrasekhar C.N. and U. Bangarusamy, 2003. Maximizing the yield of mung bean by foliar application of growth regulating chemicals and nutrients. Madras Agric. J., 90: 142-145.

Ganapathy, M., G. Baradhan and N. Ramesh, 2008. Effect of foliar nutrition on reproductive efficiency and grain yield of rice fallow pulses. Legume Res., 31: 142-144.

Ghosh, M.K. and S.A. Joseph, 2008. Influence of biofertilizers, foliar application of DAP and sulphur sources on yield and yield attributes of summer greengram (*Vigna radiate* L.Wilczek). Legume Res., 31: 232-233.

Mathan, K.K., J. Honora Francis and B.P. Ramanathan, 1996. Response of blackgram (*Phaseolus mungo*) to fertilization and Rhizobium inoculation. Indian J. Agron., 41: 74-77.

Solaiappan, U., V.K. Paulpandi and N. Chellaiah, 2002. Effect of graded levels of phosphorus and foliar fertilization on short duration redgram in rainfed vertisol. Madras Agric. J., 87: 451-454.

Yakadri, M. and T. Ramesh, 2002. Effect of soil application of potassium and DAP spray in blackgram (*Vigna mungo* L.). Madras Agric. J., 89: 147-149.