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Foliar Application of Nutrients and Growth Regulators on Yield and Economics of Greengram

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A field experiment was conducted to evaluate the influence of foliar nutrition and growth regulators on the yield and economics of greengram during summer at Tamil Nadu Agricultural University farm, Coimbatore. The experiment was laid out in a randomized block design with ten treatments in which urea, DAP, salicylic acid and sodium molybdate were applied either alone or in combination and replicated thrice. The results revealed that foliar applications of 2% DAP+100 ppm salicylic acid + 0.05% sodium molybdate twice at vegetative and flowering stages of crop growth recorded better yield parameters and economics. However, all the yield attributing parameters recorded under 2% urea+100 ppm salicylic acid + 0.05% sodium molybdate twice were on par with 2% DAP+100 ppm salicylic acid + 0.05% sodium molybdate twice.

Key words: Greengram, urea, DAP, salicylic acid, sodium molybdate.

Greengram is a nutritionally rich pulse (24% protein) and important source of dietary protein. India is producing 14.8 mt of pulse from an area of 23.6 m ha (Economic Survey, 2008-09). The area under greengram is 2.73 million hectares with an annual production of 1.1 million tones. In Tamil Nadu, the area under greengram is 0.13 million hectares with an annual production of 53,315 t. The average yield is 0.42 tonnes per hectare. The reasons for low yield of green gram are the slow rate of dry matter accumulation during the pre-flowering phase, poor pod setting, onset of leaf senescence during the period of pod development and low partitioning efficiency of assimilates to grain (Pawar and Bhatia, 1980). Moreover, greengram being cultivated under rainfed/summer season with low soil moisture, even application of fertilizer at right time and right quantity may not be efficient due to less soil moisture. When availability of moisture becomes scarce, application of fertilizers through foliar spray resulted in efficient absorption. Though foliar spray is not a substitute to soil application, it can certainly be considered as a supplement to soil application (Upadhyay *et al.,* 1992). But, the research work on the response of greengram for foliar spray of nutrients as individual and in combination is scanty. Hence, this study was undertaken to find out the influence of foliar nutrition on yield parameters and yield of greengram during summer.

Materials and Methods

A field experiment was conducted during summer 2006 at Tamil Nadu Agricultural University farm Coimbatore to study the influence of foliar nutrition on yield attributes, yield and economics of greengram. The soil of the experimental site was sandy loam with high pH (8.7). The experiment was conducted in a Randomized Block Design with 10 treatments and three replications. The treatments tried were, T_1- No spray (control), T_2 -2 % urea spray, T_3 - 2 % DAP spray, T_4 - 0.05% sodium molybdate spray ,T_5 -100 ppm salicylic acid spray ,T_6- 2% urea +100 ppm salicylic acid spray, T_7 - 2% DAP + 100 ppm salicylic acid spray, T_8 - 0.05% sodium molybdate + 2 % Urea + 100 ppm salicylic acid spray, T_9 - 0.05% sodium molybdate +2% DAP +100 ppm salicylic spray, T_{10} - water spray. All these sprays were given both at 30 and 45 DAS. Greengram variety Co6 was used for this study. In all the plots recommended dose of fertilizers were applied at basal (25 kg N + 50 kg P_2O_5 + 25 kg K_2O /ha)

The spray solution of urea and DAP were prepared by dissolving 20 g of urea and DAP in one litre of water to get 2% concentration. DAP granules were dissolved in little quantity of water and allowed to settle overnight and the supernatant solution was taken for spraying after dilution with remaining quantity of water. For getting 100 ppm salicylic acid, 0.1 g of salicylic acid was dissolved in little amount of alcohol and mixed with one litre of water since salicylic acid does not dissolve in water. Sodium molybdate at 0.05% was prepared by dissolving 0.5 g in one litre of water.

Yield attributes

Number of pods

Foliar spray of 2% DAP+ 100 ppm salicylic acid + 0.05% sodium molybdate twice at vegetative and flowering stages of crop growth (T_9) resulted in significantly higher number of pods plant^{-1} (34) than

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other foliar spray treatments (Table1). Number of pods plant^{-1} is an important yield component in greengram and it was found that all the treatments *viz*., individual and combined use of urea, DAP, salicylic acid and sodium molybdate increased number of pods plant^{-1} (21 to 35). This might be due to nutrient supply through foliage and supply of all nutrients at vegetative and flowering stages of crop growth, which might have caused more number of pods by efficient translocation of photosynthates from source to sink as observed earlier by Rajendran (1984).

No. of seeds pod^{-1} and 100 seed weight

Table 1. Effect of foliar nutrition on the yield parameters, yield and economics of greengram

Treatment	No. of pods plant^{-1}	No. of seeds pod^{-1}	100 seed weight (g)	Grain yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Net income (Rs ha^{-1})	Benefit cost ratio
T_1- No spray (control)	21.0	7.6	3.04	712	939	7587	2.14
T_2- 2% urea spray	26.0	10.0	3.81	793	976	9440	2.30
T_3- 2% DAP spray	27.0	10.3	3.68	817	1014	9817	2.33
T_4- 0.05% sodium molybdate spray	26.0	10.0	3.84	813	993	7676	1.81
T_5- 100 ppm salicylic acid	27.0	11.0	3.71	818	975	9991	2.39
T_6- T_2 + T_5	29.0	10.6	3.91	852	1073	10693	2.48
T_7- T_3 + T_5	30.0	11.0	3.81	877	1100	11130	2.53
T_8- T_4+ T_6	32.0	11.3	4.14	895	1104	10873	2.36
T_9- T_4 + T_7	34.0	11.6	4.20	928	1230	11519	2.45
T_{10}- Water spray	23.0	8.6	3.26	765	870	8928	2.25
SEd	0.9	0.6	0.09	22	61	-	-
CD (P=0.05)	1.9	1.3	0.19	46	128	-	-

Foliar applications of 2% DAP +100 ppm salicylic acid + 0.05% sodium molybdate twice at vegetative and flowering stages of crop growth significantly influenced the number of seeds pod^{-1} and 100 seed weight. This might be due to the combination of nutrients 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 led 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. Salicylic acid has been reported to increase the 100 seed weight due to mobilization of reserve food materials to the sink for grain filling process through increase of hydrolyzing and oxidizing enzyme activities (Uma Devi, 1998) in sesamum.

Grain yield

The results of the experiment showed a significant increase in grain yield by the application of growth regulators and fertilizers.The maximum grain yield (928 kg ha^{-1})was recorded by foliar application of 2% DAP +100 ppm salicylic acid + 0.05% sodium molybdate spray followed by 2% urea +100 ppm salicylic acid + 0.05% sodium molybdate (895 kg ha^{-1}). The percentage yield increase over control was of 30.3.

Haulm yield

Foliar spray of 2% DAP+ 100 ppm salicylic acid +0.05% sodium molybadate twice at vegetative stage and flowering stages of crop growth resulted in the enhancement of haulm yield by 42% over control. The yield enhancement due to the adoption of different treatments ranged from 939 to 1230 kg ha^{-1}over control. This might be due to continuous supply of nutrients which could have incraesed the leaf area and dry matter resulting in higher haulm yield. Similar result of increased haulm yield by soil and foliar application of nutrients has been reported by Elizabeth Syriac *et al.* (1998) in blackgram and Kuruvilla Varughese and Pathak (1987) in chickpea.

Economics

Foliar application of 2% DAP+100 ppm salicylic acid +0.05% sodium molybdate twice proved to be the most promising nutrient management practice for summer greengram in terms of economic returns *viz.*, gross return and net return. Foliar application of 2% DAP+100 ppm salicylic acid twice showed the highest BC ratio followed by 2% urea+100 ppm salicylic acid (2.48) and 2% DAP + 100 ppm salicylic acid + 0.05% sodium molybdate (2.45). This might due to less cost of inputs under 2% DAP + 100 ppm salicylic acid compared to 2% DAP+ 100 ppm salicylic acid + 0.05% sodium molybdate.

Foliar application of 2% DAP has improved the grain yield and net income with high BC ratio in redgram (Solaiappan *et al.*, 2002). Yakadri and Ramesh Thatikunta (2002) reported that foliar application of 2% DAP in blackgram recorded the highest BC ratio of 3.78 compared to control. Sujatha (2001) reported that foliar application of salicylic acid (100 ppm) improved the BC ratio in greengram. The lower benefit cost ratio recorded by sodium molybdate treatment (1.81) was because of high cost of nutrient compared to all other treatments.

Conclusion

The results revealed that foliar applications of 2% DAP+100 ppm salicylic acid + 0.05% sodium molybdate twice at vegetative and flowering stages of crop growth recorded better yield parameters and yield of greengram. Concluding the experiment, combined application of nutrients (Urea, DAP and Sodium molybdate) along with growth regulator (Salicylic acid) as foliar spray at vegetative stage (30 DAS) and flowering stage (45 DAS) enhanced the yield and BC ratio of greengram.

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