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Impact of foliar nutrition on the yield and economics of greengram (*Vigna radiata*)

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Abstract
The experiment was conducted at Anbil Dharma lingam Agricultural College and Research Institute, Trichy during summer season of 2018-19 to study the effect of foliar nutrition on the productivity of green gram. The experiment was laid out in Randomized Block Design and replicated thrice with eight treatments comprising of T_1- Control + T_2- Foliar spray of DAP 2% + T_3- Foliar spray of KCl 2% + T_4- Foliar spray of Pulse wonder @ 2 kg ac^{-1} + T_5- Foliar spray of Panchakavya 5% + T_6- Foliar spray of Cow urine 5% + T_7- Foliar spray of Vermiwash 5% + T_8 – Foliar spray of PPFM 2%. The yield attributes and yield were recorded and worked out the economic analysis using BCR. The results revealed that the foliar application of TNAU Pulse wonder @ 2 kg ac^{-1} significantly recorded the highest yield attributes *viz.*, no. of pods/plant, no. of seeds/pod, test weight and grain yield of 839 kg ha^{-1} Which is on par with Panchakavya 5% which registered 834 kg ha^{-1}. From the above results, it has been concluded that TNAU Pulse wonder @ 2 kg ac^{-1} to enhance the productivity in green gram with the B: C ratio of 2.34.

Keywords: Grain yield, BCR, foliar spray, pulse wonder, Panchakavya

Introduction
The production of pulse crops in India in general and especially green gram in particular is not enough to meet the domestic demand of the ever growing population. The potential yield of green gram is very low because of the fact that the crop is mainly grown in rainfed conditions with poor management practices and also due to various physiological, biochemical as well as inherent factors associated with the crop. Apart from the genetic makeup, the physiological factor *viz*, insufficient partitioning of assimilates, poor pod setting due to the flower abscission and lack of nutrients during critical stages of crop growth, coupled with a number of diseases and pests were the reasons for the poor yield.

Foliar feeding is often the most effective and economical way to improve plant nutrient deficiency in green gram (Dixit and Elamathi, 2007). Supplement nutrition plays acrucial role in increasing seed yield of pulses (Chandrasekar and Bangarusamy, 2003). In addition, foliar application increases photosynthetic rate and nutrient translocation from the leaves to the developing seeds (Manonmani and Srimathi, 2009). Under rainfed condition when the availability of moisture becomes scarce the application of fertilizers as foliar spray resulted in efficient absorption and utilization of nutrients.

Foliar spray is not a substitute to the soil application but it certainly being considered as a supplement to the soil application. Among the different methods of fertilizer applications, foliar nutrition is recognized as an important method of fertilization, since foliar nutrients usually penetrate the leaf cuticle or stomata and enters the cell facilitating easy and rapid utilization of nutrients (Latha and Nadanassababady, 2003). Nutrient availability to plant is very low in soil application. In this circumstance application of nutrients through foliar spray may be beneficial to Green gram to enhance the productivity.

Materials and Methods
The field experiment was conducted at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirapalli during summer season 2018-19 to study the effect of foliar application of nutrients on green gram variety (VBN 2) under sodic soil. The farm is situated at 10^0 45, latitude, 78^0 36, longitude at an altitude of 85 m above mean sea level. The experimental soil is clay and moderately drained.

The experiment was laidout in Randomized Block Design (RBD) with eight treatments and three replications. The entire dose of recommended dose of fertilizer of 20:40:20:20 kg ha^{-} N: P_2O_5:K_2O: S is applied as basal. Urea, Di-ammonium phosphate, Murate of potash and Phosphogypsum were used as sources of nitrogen, phosphorous, potassium and sulphur, respectively. The treatments consisted of control foliar application of water spray (T_1), DAP @ 2% (T_2), KCl @ 2% (T_3), TNAU Pulse wonder @ 2 kg/ac (T_4), Panchagavya @ 5% (T_5), Cow urine @ 5% (T_6), Vermiwash @ 5% (T_7), PPFM 2% (T_8) was given. First spray was given at flower initiation and second spray at 15 days after the first spray. As per the schedule the treatments were imposed. Recommended plant protection measures and other management practices were followed as per the Crop Production Guide. The biometric observations were taken and analysed the data statistically.

Results and Discussion

Yield Attributes and Yield

The observation on yield attributes and yield were taken at harvest stage (Table1). Foliar application of nutrient brought significant variation in pods per plant and varied from 25.58 to 28.22. A close examination of data indicated that maximum number of pods per plant (28.18), maximum number of seeds per pod (10.12), highest 100 seed weight (3.2 g) were recorded with application of TNAU Pulse wonder @ 2kg/ac (T_4) followed by Panchagavya 5% (T_5). This might due to the presence major and minor nutrients coupled with growth regulators in Pulse wonder which enhanced number of floral buds, prevented the floral shedding by maintaining optimum bio-physiological conditions in plants. The findings in the present study are in conformity with Hamayun and Chaudhary (2004) and Muhammad Hamayun *et al*., (2011). The lowest number of pods per plant (25.58), Number of seeds per pod (8.11), 100 seed weight (2.87g) were recorded in without foliar spray (control).

Similarly TNAU Pulse wonder @ 2kg/ac (T_4) produced significantly highest grain yield (839kg /ha) and haulm yield (1358 kg /ha)..Followed by Panchagavya 5%(T_5)(834 kg/ha) and (1236 kg/ha). The lowest grain yield was obtained in absolute control (T_1) (949 kg/ha). This might be due to increased yield attributes led by reduced flower droppings, improved pod formation and seed setting percentage The findings in the present study are in conformity with Muhammad Hamayun, (2011) and (Mir *et al*., 2010).

Table 1: Effect of foliar spray on Yield attributes and yield of green gram

	Treatment	No of Pods/plant	No of seeds/pod	Test weight (g)	Seed yield (Kg/ha)	Haulm yield (Kg/ha)
T_1	Absolute control	25.58	8.11	2.87	757	949
T_2	DAP 2%	27.30	9.43	3.17	820	1122
T_3	KCL 2%	26.64	8.30	2.87	779	969
T_4	TNAU Pulse Wonder @ 2 kg/ac	28.22	10.12	3.2	839	1358
T_5	Panchagavya 5%	28.18	9.98	3.17	834	1236
T_6	Cow urine 5%	26.96	9.23	2.97	782	1051
T_7	Vermiwash 5%	27.15	9.39	3.03	795	1119
T_8	PPFM	27.44	9.99	3.13	831	1143
	SEd	0.27	0.15	0.16	15.9	31.6
	CD (5%)	0.58	0.33	NS	34.3	66

Table 2: Effect of foliar spray on economics of Green gram

	Treatment	Cost of Cultivation (Rs.)	Gross Income (Rs.)	Net income (Rs.)	Benefit Cost Ratio
T_1	Absolute control	21907	48247	26340	2.20
T_2	DAP 2%	22147	49180	27033	2.22
T_3	KCL 2%	22081	49646	27565	2.25
T_4	TNAU Pulse Wonder @ 2 kg/ac	22907	54434	31527	2.38
T_5	Panchagavya 5%	22907	53749	30842	2.35
T_6	Cow urine 5%	23407	50092	26685	2.14
T_7	Vermiwash 5%	22157	51058	28901	2.30
T_8	PPFM	26907	5309	26402	1.98

Economics

Highest cost of cultivation was obtained with PPFM 1% (T_8) (Rs 26907/ha) While the minimum cost of cultivation (Rs 21907/ha) was found in without foliar spray (T_1) (Absolute control). Highest gross return and Net return were obtained with TNAU pulse wonder @ 2kg/ac (T_4) (Rs 54434/ha and 31527/ha) which is followed by Panchagavya 5% (T_5) (Rs 53749 and 30842). While the minimum gross return and net return (Rs 21907/ha and Rs 26340/ha) were found in without foliar spray (T_1)(Absolute control).TNAU Pulse wonder @ 2kg/ac (T_4) recorded the highest benefit: cost ratio (2.38) followed by Panchagavya 5% (T_5) (2.35). The lowest benefit: cost ratio was recorded in PPFM 1% spray (T_8) (1.98).

Conclusion

From the above results, it has been concluded that TNAU Pulse Wonder @ 2 kg ac^{-1} at flowering enhances the productivity as well as economically viable with more BCR in green gram. Moreover, this study gives the option to the farmers *i.e.*, if the farmer likes inorganic foliar nutrition (TNAU pulse wonder) and Organic nutrition (Panchgavya @ 5%) would be adopted.

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