

## Impact of various organic and inorganic liquid fertilizer sources on yield attributes, yield and economics of greengram

Tejaswini V<sup>1</sup>, M. Meyyappan<sup>2</sup>, M. Ganapathy<sup>3</sup> and A. Angayarkanni<sup>4</sup>

Annamalai University, Annamalai Nagar, Chidambaram-608002 (India)

### Abstract

A field experiment was conducted during *kharif* season 2021 at Cherukumpalem village, Atchempet Mandal, Guntur District in Andhra Pradesh state. The experiment was laid out in randomized block design with ten treatments and replicated thrice. Among the various treatments tested, foliar application of Panchagavya @ 3% with 75 per cent recommended dose of fertilizer was found to be the best and had a significant impact on yield attributes and yield of greengram. The lengthiest pod (10.6 cm), maximum number of pods plant<sup>-1</sup> (25.6), seeds per pod<sup>-1</sup> (9.32), seed yield (1365 kg ha<sup>-1</sup>), haulm yield (3091 kg ha<sup>-1</sup>) were recorded in this best performed treatment.

**G**reen gram is third important pulse crop accounts for 16 and 10 per cent out of the total pulse area and production in India, respectively. Greengram is India's third-most significant pulse crop after redgram and chickpea. It has easy digestibility behaviour. Sprouting in greengram boosts the food's content of thiamine, niacin and ascorbic acid and is gaining popularity in vegetarian diets. Additionally prevalent are minerals, pro-vitamins A and B complex and ascorbic acid. For a well-rounded diet for people, it is a fantastic addition to rice. According to the third advance projections for 2020-21, the state of Andhra Pradesh in India ranks sixth in terms of green gram cultivation, with an area of 1.13 lakh ha and an output of 0.83 lakh tonnes with a productivity of 735 kg ha<sup>-1</sup>. Panchagavya used as a foliar spray, as soil application along with irrigation water, seed or seedling treatment,

*etc.* to increase the yield of crops<sup>4</sup>. Foliar application is regarded as the most efficient, advantageous, and cost-effective tactic, and it has grown in popularity over the past few decades in an effort to reduce soil application losses and soil and water contamination. For crops with short lifespans and early maturation, foliar feeding would be more advantageous because these crops might not fully utilise soil-applied fertiliser until the crop is developed. The application of nutrients through top dressing or placement is more challenging for rabi pulses<sup>5</sup>, hence foliar fertilization is preferred. Since less fertilizer is needed, there are fewer losses and crop production is more efficient, all of which lower the cultivation costs. The provision of nutrients to the leaves can increase photosynthetic efficiency by postponing the beginning of leaf senescence because it increases absorption efficiency. The

growth and crop output were significantly increased as a result of foliar nutrition application.

A field experiment was conducted from 2<sup>nd</sup> July to 4<sup>th</sup> September 2021 at Cherukumpalem village, Atchempet Mandal of Guntur district in Andhra Pradesh state. The experimental field is geographically located at 16° 68' N latitude and 80° 11' E longitude and at an altitude of 97 meters above mean sea level. The maximum and minimum temperature ranged from 30°C to 35.57°C and 25.57°C to 27.85°C. The total amount of rain that fell during the cropping season was 292.5 mm in 24 rainy days. The experimental field soil has Sandy Clay Loam in texture. The soil is medium in available nitrogen (201 kg ha<sup>-1</sup>), high in available phosphorus (67 kg ha<sup>-1</sup>) and medium in available potassium (209 kg ha<sup>-1</sup>). A randomized block design with three replications were used to set up the experiment. The variety chosen for study was IPM 2-14 (Shreya) with spacing of 30×10 cm. The recommended dose of fertilizers 25:50:0 kg NPK was adopted for 100% recommended dose from which 75% (18.75:37.5:0 kg NPK) was calculated and applied to plots as per treatment schedule. The treatments comprised were T<sub>1</sub> - 100% Recommended dose of fertilizers, T<sub>2</sub> - 75% Recommended dose of fertilizers, T<sub>3</sub> - T<sub>2</sub> + Fish meal extract spray @ 3% on 25 and 40 DAS, T<sub>4</sub> - T<sub>2</sub> + Panchagavya spray @ 3% on 25 and 40 DAS, T<sub>5</sub> - T<sub>2</sub> + Bokashi spray @ 5% on 25 and 40 DAS, T<sub>6</sub> - T<sub>2</sub> + Banana pseudo stem extract spray @ 2% on 25 and 40 DAS, T<sub>7</sub> - T<sub>2</sub> + Karpura karaisal spray @ 10% on 25 and 40 DAS, T<sub>8</sub> - T<sub>2</sub> + Polyfeed spray @ 1% on 25 and 40 DAS, T<sub>9</sub> - T<sub>2</sub> + Nano urea spray @

0.5% on 25 and 40 DAS, T<sub>10</sub> - T<sub>2</sub> + DAP @ 2% + NAA @ 40 ppm spray on 25 and 40 DAS.

#### *Yield attributes and yield :*

The yield attributes and yield viz., pod length, number of pods plant<sup>-1</sup>, seeds per pod<sup>-1</sup>, seed yield and haulm yield were strongly influenced by foliar application of various organic and inorganic liquid fertilizer sources. Among the various treatments tested, T<sub>4</sub>- T<sub>2</sub> + panchagavya spray @ 3% on 25 and 40 DAS recorded lengthiest pod (10.6 cm), maximum values of number of pods plant<sup>-1</sup> (25.6), seeds per pod<sup>-1</sup> (9.32), seed yield (1365 kg ha<sup>-1</sup>) and haulm yield (3091 kg ha<sup>-1</sup>). This might be due to the application of NPK and the availability of the same from the soil. Nitrogen is needed for chlorophyll pigment synthesis which is important for photosynthesis. Phosphorus is needed for root growth which might have improved the root volume and helped in taking more nutrients and water from the soil. Application of potassium might have improved the various physiological process with in the plant and seed development. Further, panchagavya contains several nutrients *i.e.* macronutrients like nitrogen, phosphorus, potassium and micronutrients which are required for the growth and development of plants and also contains various amino acids, vitamins, growth regulators like Auxins, Gibberellins and also beneficial microorganisms like *Pseudomonas*, *Azotobacter* and *Phosphobacteria* which might have influenced the yield of greengram. Smaller quantities of IAA and GA present in panchagavya when foliar sprayed could have stimulated the growth and development leading to increased number

of pods plant<sup>-1</sup>, seeds pod<sup>-1</sup> and test weight (g) which were the important yield attributes having a significant positive correlation with seed yield and haulm yield. The present results were similar to the findings of Somasundaram *et al.*<sup>7</sup> Mudigoudra and Balikai<sup>2</sup> and Gopal Lal Choudhary *et al.*<sup>3</sup>. Further, panchagavya helped in efficient photosynthesis which might have improved the yield. The second best treatment in terms of yield was noticed due to nanourea application @ 0.5% on 25 and 40 DAS along with 75% recommended NPK which increased the pod length (2.5 cm), number of pods plant<sup>-1</sup> (8.7), number of seeds pod<sup>-1</sup> (2.20), grain yield (225 kg ha<sup>-1</sup>) and haulm yield (610 kg ha<sup>-1</sup>) over 75 per cent recommended NPK application alone. The reason might be due to nano fertilizers are easily absorbed by the epidermis of leaves translocated to stems which facilitated the uptake of active molecules and enhanced growth and productivity. Nano fertilizer have large surface area and particle size less than the pore size of leaves of the plant which can increase penetration into the plant tissues from applied surface and improved the uptake and nutrient use efficiency. The positive effect of foliar applied nitrogen, phosphorus, and potassium to sustain proper leaf nutrition as well as carbon balance, and might have improved the photosynthetic capacity. Similar finding of improved yield was earlier reported by Abdel-Aziz *et al.*,<sup>1</sup>. This was followed by application of RDF @ 75 per cent + DAP @ 2% + NAA @ 40 ppm on 25 and 40 DAS recorded with increased values of pod length (2.4 cm), number of pods plant<sup>-1</sup> (8.3), number of seeds pod<sup>-1</sup> (2.05), grain yield (175 kg ha<sup>-1</sup>) and haulm yield (345 kg ha<sup>-1</sup>) over 75 per cent recommended NPK application alone. The increase in yield attributes might

be due to supplementation of nutrients at the critical stage without physiological stress. Foliar application of nutrients enhanced the number of floral buds, prevented the floral shedding by maintaining optimum biophysiological conditions in plants. The present finding is in line with the reports of Uma and Karthik<sup>8</sup>. The growth regulating chemical NAA might have improved the physiological efficiency including the photosynthetic ability of crops and played a significant role in improving the productive potential of the crop. The same result was earlier reported by Ramesh & Ramprasad<sup>6</sup>.

Application of 25 per cent less than recommended NPK reduced the pod length upto 1.6 cm, number of pods plant<sup>-1</sup> upto 8.7, number of seeds pod<sup>-1</sup> upto 2.20, grain yield upto 225 kg ha<sup>-1</sup> and haulm yield upto 610 kg ha<sup>-1</sup> over 75 per cent recommended NPK application alone. However, this reduction was improved from 0.3 to 3.0 cm (pod length), 1.1 to 11.6 (number of pods plant<sup>-1</sup>), 0.23 to 2.50 (number of seeds pod<sup>-1</sup>), 60 to 300 kg ha<sup>-1</sup> (seed yield) and 0.49 to 27.83 per cent (haulm yield) in T<sub>4</sub> - T<sub>2</sub> + Panchagavya spray @ 3% on 25 and 40 DAS.

#### *Economics :*

The effectiveness of any production is eventually estimated based on its economic returns. Among the treatments, the highest gross return (₹ 101504) and net returns (₹ 65479) and BCR (2.81) was obtained in T<sub>4</sub> – Foliar application of panchagavya @ 3% on 25 and 40 DAS along with 75 per cent recommended NPK. The performance of other treatments are in the order of nano urea, DAP + NAA, polyfeed, bokashi, banana

Table-1. Effect of foliar application of various liquid organic and inorganic fertilizer sources on yield attributes, yield and economics of greengram

Treat-ments	Pod length (cm)	Number of pods plant <sup>-1</sup>	Number of seeds pod <sup>-1</sup>	Seed yield (Kg ha <sup>-1</sup> )	Haulm yield (Kg ha <sup>-1</sup> )	Total cost of cultivation (₹ ha <sup>-1</sup> )	Gross returns (₹ ha <sup>-1</sup> )	Net returns (₹ ha <sup>-1</sup> )	BCR
T <sub>1</sub>	9.2	20.4	8.15	1215	2668	35514	90336	54822	2.54
T <sub>2</sub>	7.6	14.0	6.82	1065	2418	33625	79196	45571	2.35
T <sub>3</sub>	8.7	19.3	8.09	1190	2581	38725	88472	49747	2.28
T <sub>4</sub>	10.6	25.6	9.32	1365	3091	36025	101504	65479	2.81
T <sub>5</sub>	8.5	17.2	7.83	1161	2550	34725	86322	51596	2.48
T <sub>6</sub>	8.1	16.2	7.26	1138	2529	34625	84616	49991	2.44
T <sub>7</sub>	7.9	15.1	7.05	1125	2430	36225	83638	47413	2.30
T <sub>8</sub>	9.5	21.1	8.52	1205	2620	35625	89589	53963	2.51
T <sub>9</sub>	10.1	22.6	9.02	1290	3028	35825	95944	60119	2.67
T <sub>10</sub>	10.1	22.2	8.87	1240	2763	36625	92202	55576	2.52
SEm±	0.16	0.43	0.06	35.34	52.5				
CD (p=0.05)	0.55	1.20	0.21	118.8	167.6				

T<sub>1</sub> - 100% Recommended dose of fertilizers, T<sub>2</sub> - 75% Recommended dose of fertilizers, T<sub>3</sub> - T<sub>2</sub> + Fish meal extract spray @ 3% on 25 and 40 DAS, T<sub>4</sub> - T<sub>2</sub> + Panchagavya spray @ 3% on 25 and 40 DAS, T<sub>5</sub> - T<sub>2</sub> + Bokashi spray @ 5% on 25 and 40 DAS, T<sub>6</sub> - T<sub>2</sub> + Banana pseudo stem extract spray @ 2% on 25 and 40 DAS, T<sub>7</sub> - T<sub>2</sub> + Karpura karaisal spray @ 10% on 25 and 40 DAS, T<sub>8</sub> - T<sub>2</sub> + Polyfeed spray @ 1% on 25 and 40 DAS, T<sub>9</sub> - T<sub>2</sub> + Nano urea spray @ 0.5% on 25 and 40 DAS, T<sub>10</sub> - T<sub>2</sub> + DAP @ 2% + NAA @ 40 ppm spray on 25 and 40 DAS.

pseudostem extract, 75 per cent NPK, karpura karaisal and fish meal extract. The cost reduced due to reduction in 25% recommended NPK ₹ 1888. The two new products tried along with 75% recommended NPK namely bokashi and banana pseudostem extract involved a cost of ₹ 600 and ₹ 1400 and gave benefit in terms of net returns ₹ 51596 and ₹ 49991 respectively.

Based on the above results of the field experiment conducted, it could be concluded that application of 75 per cent recommended NPK + panchagavya spray @ 3% on 25 and 40 DAS holds viable and economical combination for improved crop production of greengram and gave higher economic returns to the farmers.

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