Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2019; 8(5): 931-933
Received: 10-07-2019
Accepted: 12-08-2019

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# Effect of basal and foliar nutrient on growth parameters and yield of summer greengram

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**Abstract**
A field experiment was conducted during Summer season of 2017 at Instructional Cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). Effect of growth parameters and yield with basal and foliar nutrition on summer greengram (*Vigna radiata* L.) grown under Vertisols of Chhattisgarh plain. The treatments comprised of 7 (seven) basal and foliar nutrient application practices viz, RDF ($T_1$), RDF + Rhizobium + PSB + multi micronutrient at flower initiation ($T_2$), $T_2$ + 2% DAP at pod initiation stage ($T_3$), $T_2$ + 2% DAP twice at branching & pod initiation ($T_4$), $T_2$ + 1% NPK 19:19:19 at pod initiation stage ($T_5$), $T_2$ + 1% NPK 19:19:19 twice at branching and pod initiation ($T_6$) and Absolute control ($T_7$). The basal and foliar application of nutrient was found significantly impact on growth parameters (Plant height (cm), Number of branches plant$^{-1}$, Dry weight of nodules plant$^{-1}$ (mg), Number of nodules plant$^{-1}$, Dry weight of nodules plant$^{-1}$ (mg) and Leaf area index plant$^{-1}$ under $T_6$ ($T_2$ +1% NPK 19:19:19 twice at branching and pod initiation), which was at par recorded under $T_5$ ($T_2$ +1% NPK 19:19:19 at pod initiation stage), $T_4$ ($T_2$ +2% DAP twice at branching & pod initiation) and $T_3$ ($T_2$ + 2% DAP at pod initiation stage). Significantly highest grain yield and stover yield was noticed in $T_6$ ($T_2$ + 1% NPK 19:19:19 twice at branching and pod initiation) over rest of the treatment, which was at par under recorded $T_4$ ($T_2$ +2% DAP twice at branching & pod initiation) in stover yield. Non significant variation was observed in harvest index.

**Keywords:** DAP, NPK, plant, yield, basal and foliar

## Introduction
Greengram (*Vigna radiata* L.) is an important pulse crop of India. It is warm weather crop and cultivated in rainy, winter and summer season in various parts of the country. Greengram is one of the most important pulse crops for protein supplement in subtropical zones of the world. It is widely grown in Indian subcontinent as a short duration catch crop between two principal crops. Greengram contains 51% carbohydrate, 24-26% protein, 4% minerals and 3% vitamins. It is consumed in different ways, as *dal*, *halwa*, *snack* and so many other preparations. Sprouted seeds of greengram contain good amount of riboflavin, thiamine and ascorbic acid (Vitamin C). Besides providing protein in the diet, greengram has the remarkable quality of helping the symbiotic root rhizobia to fix atmospheric nitrogen and hence to enrich soil fertility**.** It is also used as a green manure crop. It also provides an excellent green fodder for the animals. Being a short duration crop, it fits well in various multiple and inter-cropping system**.** Pulses have been reported to fix about 14.35 million tonnes of N per year. Most of the grain legumes area giving N advantage of 30.5 kg ha$^{-1}$ to succeeding cereal crop. Apart from it, non-legumes are also benefitted by legume in association because of N transfer to the legumes directly through decomposing root, leaves and stubbles (Singh, 1992) [5].

The foliar application of 2% DAP produced significantly increased the grain yield in greengram. The impact of the foliar nutrients to meet the nutrient demand of the crop at the critical stage on-site, where they are needed without stress, would have resulted in better growth and development of the crop and ultimately the yield attributing characters and yield. These favorable effects might have attributed for higher yield of greengram under the foliar spray of nutrients and growth regulators. (Manivannan *et al.*, 2002) [3].

NPK 19:19:19 is a complete water soluble, ideal fertilizer which provides all major macronutrients N-P-K in a balanced ratio to the plants through foliar spray or fertigation at the time of maximum requirement with the lowest losses. N P K 19:19:19 can fulfill any deficiency of one or all three major plant nutrients and minimizes the cost on basal fertilizers. Basal application to soil and foliar sprays of Zn, B and Mo, and foliar sprays of Fe and Mn have been recommended as the most suitable methods for correcting such deficiencies in crops. Foliar application of macro and micro nutrients was more beneficial to legumes (Zayed *et al.*, 2011) [7]. The being cultivated under 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.

## Material Methods

A field experiment was conducted during summer season of 2017 at Instructional Cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The soil of the experimental site was clay (Vertisols) in nature and locally known as "Kanhar". It was low in nitrogen, medium in phosphorus and high in potassium content. The soil was neutral in reaction. The experiment was laid out in randomized block design (RBD) with three replications. The treatments comprised of 7 (seven) basal and foliar nutrient application practices viz, RDF ($T_1$), RDF + Rhizobium + PSB + multi micronutrient at flower initiation ($T_2$), $T_2$ + 2% DAP at pod initiation stage ($T_3$), $T_2$ + 2% DAP twice at branching & pod initiation ($T_4$), $T_2$ + 1% NPK 19:19:19 at pod initiation stage ($T_5$), $T_2$ + 1% NPK 19:19:19 twice at branching and pod initiation ($T_6$) and Absolute control ($T_7$). Fertilizers were applied at the rate of 20:50:20 NPK kg ha$^{-1}$, respectively in the form of urea, single super phosphate and muriate of potash as basal and foliar spray of 2% DAP (branching stage), multi micronutrient (flower initiation) and 1% NPK (19:19:19) (pod initiation stage) applied with help of Knapsack sprayer at 30, 45 and 50 DAS. The crop was grown under summer season for basically need the crop requirement through flood irrigation, total irrigation was applied in 5 or 6 irrigation for the crop duration. In order to prevent the crop from seeds were treated with Rhizobium and PSB culture @ 5.0 g kg$^{-1}$seed before sowing. The crop was sown as per sowing dates by drilling the seed through line sowing. The row to row and plant to plant spacing was 30 cm x 10 cm with a seed rate of 20 kg ha$^{-1}$. The plant protection measures are application of chlorpyriphos @ 30 EC for 1.5 lit ha$^{-1}$, controlling the bugs.

## Results and Discussion

### Growth parameter of greengram as influenced by basal and foliar nutrition

The basal and foliar applications of nutrient were found significant impact on green gram crop. The data of growth parameter recorded in Table 1. The statically higher significant Plant height (cm), Number of branches plant$^{-1}$, Dry weight of nodules plant$^{-1}$ (mg), Number of nodules plant$^{-1}$ Dry weight of nodules plant$^{-1}$ (mg) and leaf area index plant$^{-1}$ observed under $T_6$ ($T_2$ +1% NPK 19:19:19 twice at branching and pod initiation), which was at par under recorded $T_5$ ($T_2$ +1% NPK 19:19:19 at pod initiation stage) and $T_4$ ($T_2$ +2% DAP twice at branching & pod initiation). However, lowest parameter recorded under $T_7$ (Absolute control). Foliar application of micronutrient also helpful to absorb more quantity of macronutrients, such as N, P and K. They have a major role in cell division and development of meristematic tissues, plant height, photosynthesis, respiration and acceleration of crop physiology when the plant does not absorb necessary nutrients through root in greengram. Similar results findings these are Sujatha (2001) [6].

**Table 1:** Plant height (cm), Number of branches plant$^{-1}$, Dry weight of nodules plant$^{-1}$ (mg), Number of nodules plant$^{-1}$, Dry weight of nodules plant$^{-1}$ (mg) and Leaf area index plant$^{-1}$ of green gram as influenced by basal and foliar nutrition

| | Treatment | Plant height (cm) | Number of branches plant$^{-1}$ | Dry matter accumulation (g plant$^{-1}$) | Number of nodules plant$^{-1}$ | Dry weight of nodules plant$^{-1}$ (mg) | Leaf area index plant$^{-1}$ |
|---|---|---|---|---|---|---|---|
| | | At harvest | 60 DAS | At harvest | 60 DAS | 60 DAS | 40 DAS |
| $T_1$ | RDF | 42.93 | 6.52 | 38.09 | 19.48 | 13.84 | 1.44 |
| $T_2$ | RDF + Rhizobium + PSB + multi micronutrient at flower initiation | 44.64 | 6.85 | 38.15 | 20.15 | 14.17 | 1.65 |
| $T_3$ | $T_2$ + 2% DAP at pod initiation stage | 44.92 | 7.17 | 39.12 | 21.56 | 15.26 | 1.71 |
| $T_4$ | $T_2$ +2% DAP twice at branching & pod initiation | 46.94 | 7.93 | 41.10 | 25.52 | 17.46 | 1.82 |
| $T_5$ | $T_2$ +1% NPK 19:19:19 at pod initiation stage | 45.92 | 7.45 | 40.18 | 23.02 | 17.01 | 1.79 |
| $T_6$ | $T_2$ +1% NPK 19:19:19 twice at branching and pod initiation | 46.96 | 8.06 | 43.34 | 27.35 | 18.25 | 1.85 |
| $T_7$ | Absolute control | 38.54 | 5.10 | 35.36 | 14.24 | 10.62 | 1.09 |
| SEm± | | 0.73 | 0.33 | 0.73 | 1.44 | 0.85 | 0.09 |
| CD (P=0.05) | | 2.27 | 1.02 | 2.27 | 4.44 | 2.64 | 0.28 |

### Seed, Stover yield and Harvest index of greengram as influenced by basal and foliar nutrition

The data pertaining to seed yield is presented in Table 2. The data showed that there was a significant difference recorded due to various treatments. Significantly highest grain yield (842.31 kg ha$^{-1}$) was noticed in $T_6$ ($T_2$ + 1% NPK 19:19:19 twice at branching and pod initiation) over rest of the treatment. However, lowest grain yield (401.30 kg ha$^{-1}$) was recorded in $T_7$ (Absolute control). The causes for the increase in yield were the increased dry matter production and efficient assimilate translocation to the developing sink leading to increased pods and higher grain yield. These results are in line with the findings of Revathy *et al.* (1997). Application of 2% NPK (19-19-19) spray over basal dose of fertilizer application and 2% DAP spray over basal dose of fertilizer application. Similar type of findings were also reported by Dixit and Elamathi (2007) [1] and Ghosh and Joseph (2008) [2].

In stover yield significantly highest among all the treatments $T_6$ ($T_2$ + 1% NPK 19:19:19 twice at branching and pod initiation) produced the maximum stover yield (1420.12 kg ha$^{-1}$). Which was superior to rest of the treatments but it was at par with $T_4$ ($T_2$ +2% DAP twice at branching & pod initiation). The lowest stover yield was recorded under $T_7$ (Absolute control). The stover yield of 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 highest stover yield. This is also attributes to highest nutrient uptake throughout the crop growth period. Similar results findings these are Gosh and Joshep (2008) [2] in greengram.

The data on harvest index are presented in Table 2. Non significant variation was observed in harvest index. Maximum harvest index was recorded under $T_6$ ($T_2$ + 1% NPK 19:19:19 twice at branching and pod initiation due to different basal and foliar nutrition. However, lowest harvest index was found under $T_7$ (Absolute control).

**Table 2:** Seed, Stover yield and Harvest index of greengram as influenced by basal and foliar nutrition

| | Treatment | Seed yield (kg ha$^{-1}$) | Stover yield (kg ha$^{-1}$) | Harvest Index (%) |
|---|---|---|---|---|
| T1 | RDF | 535.46 | 989.92 | 34.79 |
| $T_2$ | RDF + Rhizobium + PSB + multi micronutrient at flower initiation | 652.72 | 1006.37 | 39.42 |
| $T_3$ | $T_2$ + 2% DAP at pod initiation stage | 690.42 | 1134.40 | 37.86 |
| $T_4$ | $T_2$ +2% DAP twice at branching & pod initiation | 729.02 | 1304.03 | 35.88 |
| $T_5$ | $T_2$ +1% NPK 19:19:19 at pod initiation stage | 716.15 | 1139.66 | 38.61 |
| $T_6$ | $T_2$ +1% NPK 19:19:19 twice at branching and podinitiation | 842.31 | 1420.12 | 37.21 |
| $T_7$ | Absolute control | 401.30 | 762.10 | 34.72 |
| SEm± | | 33.16 | 38.18 | 1.77 |
| CD (P=0.05) | | 102.18 | 117.65 | NS |

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