

RESPONSE OF GREENGRAM [*VIGNA RADIATA* (L.) WILCZEK] CULTIVARS TO INTEGRATED NUTRIENT MANAGEMENT

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ABSTRACT

A field experiment was conducted during *kharif*, 2014 at Agronomy Instructional Farm, C.P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study the response of greengram [*Vigna radiata* (L.) Wilczek] cultivars to integrated nutrient management. The results revealed that greengram cultivar Meha performed better by recording 17.3 and 15.3 per cent higher seed and stover yield, respectively over GM 4. Higher uptake of nitrogen and phosphorus was also registered with cultivar Meha. Combined application of 75% RDF from urea+2 t FYM/ha + *Rhizobium* + PSB recorded higher values for plant height, number of branches per plant, pods per plant, fresh and dry weight of root nodules, number of seeds per pod, pod length, 1000-seeds weight, seed yield and stover yield over other combination and sole application of organic and inorganic source of nitrogen. Maximum nitrogen and phosphorus uptake by crop were registered when crop was fertilized with 75% RDF + 2 t FYM/ha + *Rhizobium* + PSB. Hence, it can be concluded that the maximum production from *kharif* greengram in loamy sand soil can be secured by growing variety Meha and fertilized with 75% RDF (20:40:0 kg NPK/ha) + 2 t FYM/ha + *Rhizobium* + PSB. The conjunctive use of organic manure, inorganic fertilizers and biofertilizer may be suggested for higher productivity along with overall betterment.

INTRODUCTION

Contribution of pulses to agriculture and daily life has been tremendous besides being one of the important constituent of our diet. Greengram is one of the most ancient and extensively grown pulse crops of India. The agronomical importance of greengram is linked to its high protein content and other essential minerals, especially micronutrients. The productivity of greengram in India is very low and far below the other greengram-growing countries. Development of short duration as well as photo and thermo insensitive as well as yellow vein mosaic resistant varieties provided excellent opportunity for greengram cultivation. The adoption of modern farming practices and integrated nutrient management is essential to produce crops in line with the observed global standards of quantity and quality.

The high cost of chemical nitrogen fertilizer and low purchasing power of Indian farmers restricts its use on proper amounts, hampering crop production. Reliance on the increased use of chemical fertilizers and associated hazards put back attention on organic sources which are effective in promoting health and productivity of the soil. In addition to supply of nutrients, organic source improves the physical condition and biological health of soil, which improves the availability of applied and native nutrients (Dick and Gregorich, 2004). With a view to reduce the losses and indiscriminate use of chemical fertilizers, substitution of part of the chemical fertilizer by locally available organic sources of nutrients (Farmyard manure) and biofertilizers (*Rhizobium* and PSB) is

inevitable. Therefore, in the present context, a judicious combination of organic, inorganic fertilizers and biofertilizers helps to maintain soil and crop productivity. The lack of information on these aspects under *kharif* conditions made as impetus to undertake the present study.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* season of 2014 at Agronomy Instructional Farm, Department of Agronomy, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, to study the "Response of greengram (*Vigna radiata* (L.) Wilczek) cultivars to integrated nutrient management practices in *kharif* season". The soil of the experimental field was loamy sand in texture, low in organic carbon (0.17 %) and available nitrogen (160.7 kg/ha), medium in available phosphorus (38.9 kg/ha) and available potash (286.0 kg/ha) with 7.2 soil pH. Fourteen treatment combinations comprising of two varieties of greengram viz., Meha and GM 4 and seven treatments of integrated nutrient management viz., 100% RDF(20:40:0 kg NPK/ha), 75% RDF + 2 t FYM/ha, 75% RDF + *Rhizobium* + PSB, 75% RDF + 2 t FYM/ha + *Rhizobium* + PSB, 50% RDF + 4 t FYM/ha, 50% RDF + *Rhizobium* + PSB and 50% RDF + 4 t FYM/ha + *Rhizobium* + PSB) were evaluated in factorial randomized block design replicating three times. Recommended dose of phosphorus @ 40 kg P₂O₅/ha was applied at the time of sowing. Urea and Diammonium phosphate were used for nitrogen

and phosphorus sources.

All other cultural practices were performed uniformly for all treatments. Greengram varieties were sown manually on 3rd July, 2014 using recommended seed rate of 18 kg/ha and keeping 45 cm distance between two rows at the depth of about 4-5 cm. Weeding and plant protection measures were undertaken as per the need and the required plant population was maintained.

The observations were recorded during course of study including plant height, number of branches / plant, number of pods / plant and seed yield /plant, seed yield, stover yield and nutrient. The collected data for various parameters were statistically analyzed using Fishers' analysis of variance (ANOVA) technique and the treatments were compared at 5% level of significance.

RESULTS

Effect of varieties

Growth, yield attributes and yield of greengram were significantly influenced due to different varieties. Variety GM 4 recorded significantly higher plant height (54.66 cm), weight of fresh (0.37 g) and dry (0.094 g) nodules per plant, length of pod (6.76 cm), number of seeds per pod (9.78) and 1000 seeds weight (39.36 g) as compared to variety Meha, but more number of branches per plant (7.24), number of pods per plant (25.61) and seed yield per plant (5.14 g) was noted with Meha as compared to GM 4 (Table 1). The variety Meha registered significantly higher seed (656 kg/ha) and stover yields (1693 kg/ha) as compared to variety GM 4 (Table 2). The uptake of N and P were affected significantly due to different varieties. Variety Meha registered significantly higher uptake of N (34.42 kg/ha) and P (7.97 kg/ha) over variety GM 4 (Table 2).

Effect of integrated nutrient management

Application of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB registered maximum plant height (58.20 cm), branches per plant (7.73), fresh (0.48 g) and dry (0.122 g) weight of root nodules, pods per plant (26.00), length of pod (6.95 cm), no of seeds per pod (10.23) and seed yield per plant (5.97 g) over rest of the treatment combinations (Table 1).

Maximum seed (746 kg/ha) and stover yield (1806 kg/ha) of greengram were recorded from plot fertilized with treatment combination of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB followed by 50% RDF + 4 t FYM/ha + *Rhizobium* + PSB (Table 2). Different integrated nutrient management treatment did not express significant influence on 1000 seeds weight of greengram.

Nitrogen and phosphorus uptake were affected significantly due to different integrated nutrient management treatment. Maximum nitrogen uptake (41.21 kg/ha) and phosphorus uptake (9.36 kg/ha) by crop were registered when crop fertilized with 75% RDF + 2 t FYM/ha + *Rhizobium* + PSB followed by 50% RDF + 4 t FYM/ha + *Rhizobium* + PSB (Table 2).

DISCUSSION

Effect of varieties

Variety GM 4 recorded significantly higher growth, yield attributes and yield of greengram as compared to variety Meha, except number of branches and pods per plant as well as seed yield per plant. This difference in yield attributing characters between two varieties might be due to genetic constitution of these varieties. Variety Meha increased the seed and stover yield to the tune of 17.3 and 15.3 per cent over variety GM 4. This might be due to a variety of crop differed in its genetic built up and registered more numbers of pods per plant and seed yield per plant hence resulted in the yield potential. The above findings are in complete agreement with earlier work of Uddin *et al.* (2009), Patel *et al.* (2013), Gorade *et al.* (2014) and Rathod *et al.* (2014).

Variety Meha registered significantly 11.03 and 28.96 per cent higher uptake of N and P over variety GM 4, respectively. These differential uptakes by different varieties were might be due to the significant yield variation between varieties. Similar results were also reported by Patel *et al.* (2013) and Gorade *et al.* (2014).

Effect of integrated nutrient management

Application of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB registered maximum yield attributing characters over rest of the treatment combinations. Maximum seed (746 kg/ha) and

Table 1: Growth and Yield attributes of greengram as influenced by integrated nutrient management treatments

| Treatment | Plant Height (cm) | No. of branches / plant | Weight of Root Nodules (g) Fresh | Dry | No. of Pods/ plant | Pod length (cm) | No. of seeds / pod |
|--|-------------------|-------------------------|-------------------------------------|-------|--------------------|-----------------|--------------------|
| [A] Varieties | | | | | | | |
| Meha | 50.96 | 7.24 | 0.35 | 0.089 | 25.61 | 6.26 | 9.34 |
| GM 4 | 54.66 | 6.83 | 0.37 | 0.094 | 21.22 | 6.76 | 9.78 |
| C.D.(P=0.05) | 2.93 | 0.40 | 0.017 | 0.005 | 1.48 | 0.21 | 0.41 |
| [B] Integrated nutrient management | | | | | | | |
| 100% RDF(20:40:0 kg NPK/ha) | 51.47 | 6.27 | 0.27 | 0.068 | 23.10 | 6.41 | 9.40 |
| 75% RDF + 2 t FYM/ha | 52.60 | 6.68 | 0.22 | 0.056 | 23.57 | 6.43 | 9.23 |
| 75% RDF + <i>Rhizobium</i> + PSB | 52.10 | 7.13 | 0.44 | 0.112 | 23.23 | 6.49 | 9.70 |
| 75% RDF + 2t FYM/ha + <i>Rhizobium</i> + PSB | 58.20 | 7.73 | 0.48 | 0.122 | 26.00 | 6.95 | 10.23 |
| 50% RDF + 4 t FYM/ha | 50.33 | 6.93 | 0.26 | 0.066 | 21.60 | 6.31 | 9.20 |
| 50% RDF + <i>Rhizobium</i> + PSB | 49.37 | 7.03 | 0.43 | 0.109 | 21.73 | 6.30 | 9.17 |
| 50% RDF + 4t FYM/ha + <i>Rhizobium</i> + PSB | 55.60 | 7.47 | 0.42 | 0.106 | 24.67 | 6.67 | 10.00 |
| C.D.(P=0.05) | 5.49 | 0.75 | 0.03 | 0.009 | 2.78 | 0.40 | 0.76 |

Table 2: Yield attributes, yield and uptake of greengram as influenced by integrated nutrient managements.

| Treatment | Seed yield/ plant(g) | 1000 seed weight (g) | Seed yield (kg/ha) | Stover yield (kg/ha) | Nitrogen uptake (kg/ha) | Phosphorus uptake (kg/ha) |
|---|-------------------------|-------------------------|-----------------------|-------------------------|----------------------------|------------------------------|
| [A] Varieties | | | | | | |
| Meha | 5.14 | 37.64 | 656 | 1693 | 34.42 | 7.97 |
| GM 4 | 4.60 | 39.36 | 559 | 1468 | 31.01 | 6.19 |
| C.D.(P=0.05) | 0.24 | 1.11 | 39 | 120 | 1.91 | 0.51 |
| [B] Integrated nutrient management | | | | | | |
| 100% RDF(20:40:0 kg NPK/ha) | 4.53 | 37.79 | 565 | 1528 | 29.85 | 5.93 |
| 75% RDF + 2 t FYM/ha | 4.97 | 38.55 | 624 | 1621 | 32.09 | 6.25 |
| 75% RDF + <i>Rhizobium</i> + PSB | 4.81 | 38.55 | 602 | 1559 | 32.73 | 7.47 |
| 75% RDF + 2tFYM/ha + <i>Rhizobium</i> + PSB | 5.97 | 39.55 | 746 | 1806 | 41.21 | 9.36 |
| 50% RDF + 4 t FYM/ha | 4.49 | 37.60 | 543 | 1404 | 27.79 | 6.03 |
| 50% RDF + <i>Rhizobium</i> + PSB | 4.02 | 38.14 | 499 | 1435 | 27.97 | 6.29 |
| 50% RDF + 4tFYM/ha + <i>Rhizobium</i> + PSB | 5.27 | 39.35 | 675 | 1713 | 37.35 | 8.20 |
| C.D.(P=0.05) | 0.44 | NS | 73 | 225 | 3.58 | 0.96 |

stover yield (1806 kg/ha) of greengram were recorded from plot fertilized with treatment combination of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB followed by 50% RDF + 4 t FYM/ha + *Rhizobium* + PSB (Table 2). The highest seed yield per hectare gained in application of 75 % RDF + 2 t FYM / ha + *Rhizobium* + PSB might be due to chemical fertilizer in conjunction with FYM and bio fertilizers might have provided favorable soil environment and nourishment for better plant growth resulted in maximum seed yield per hectare. Positive response in terms of yield attributes to integrated nutrient management have also been reported by Rajkhowa *et al.* (2002), Yakadri *et al.* (2002), Chaudhary *et al.* (2003), Reddy *et al.*, (2011), Patel *et al.* (2013), Prasad, *et al.* (2014), Saini *et al.* (2014), Tyagi *et al.* (2014) and Amruta *et al.* (2015)

Maximum nitrogen uptake and phosphorus uptake by crop were registered when crop fertilized with 75% RDF + 2 t FYM/ha + *Rhizobium* + PSB. This increased uptake by seed and stover might be due to increased yield of seed and stover under the treatment 75% RDF + 2 t FYM/ha + *Rhizobium* + PSB. These results are in accordance with the results of those reported by Ghanshyam *et al.* (2010), Jat *et al.* (2012) and Patel *et al.* (2013) with respect to N and P content as well as uptake.

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