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# Study on Selective Mechanization in *Kharif* Greengram (*Vigna radiata* L.)

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## ABSTRACT

**Background:** Greengram is an important short duration crop for rainfed area of Telangana state. Green gram is grown widely for human diet which contains 25% protein, 60% carbohydrate, 1.3% fat and several essential amino acid including lysine and easily digestable. It is also rich in Vitamin A, B1, B2 C and calcium, phosphorus and potassium. Sowing of seed, application of fertilizers and intercultivation operations should be done timely to get the higher yields and monetary returns besides saving of time and labour, which is possible through only by mechanization in greengram.

**Methods:** This experiment was conducted during *Kharif* season of 2017 and 2018 at Agricultural Research Station, Madhira farm, Professor Jayashankar Telangana Agricultural University, Hyderabad (Telangana). The soil of the experimental field was clay loam soil in texture, having alkaline reaction (pH=8.3), EC=0.33 ds $m^{-1}$, low organic carbon (0.18%) and having low available nitrogen (153 kg $ha^{-1}$), medium in available phosphorus (42 kg $ha^{-1}$) and high in available potassium (538 kg $ha^{-1}$). This experiment comprising of two treatments *i.e*., selective mechanization and normal practice, which was tested by simple t-test at 5% level of significance, non-replicated.

**Result:** Sowing of seed and fertilizer application through seed cum fertilizer drill and intercultivation by tractor drawn implements has shown in good crop growth inturn to get the higher yields and monetary returns besides saving of labour and time in greengram cultivation.


**Key words:** Grain yield, Net returns, Selective mechanization, Seed-cum-fertilizer drill.

## INTRODUCTION

Green gram (*Vigna radiata* L.) has been grown in India since ancient times. It is also known as mungbean and golden gram. It is important short duration, predominantly rainy season pulse crop grown in many part of India. Green gram reported to be originated in India. India is producing 19 lakh tons of greengram from an area of 41 lakh hectare. In Telangana, greengram production of 0.65 lakh tons from an area of 0.99 lakh hectares. Green gram is grown widely for use as a human food. Largely consumed as dal in India, it is supposed to be easily digestible. It contains about 25% protein, 60% carbohydrate, 1.3% fat and several essential amino acid including lysine, which is generally found deficient in cereals and providing protein rich diet to vegetarian population of the country. It is also rich in Vitamin A, B1, B2 C and calcium, phosphorus and potassium (Singh, 1998). It plays an important role not only in human diet, but also in improving the soil fertility through biological nitrogen fixation with Rhyzobium (Upadhyay *et al*. 1999).

However, about 2-3 million tons of pulses are imported annually to meet the domestic consumption requirement. Thus, there is need to increase production and productivity of pulses in the country by more intensive interventions. Farm mechanization is necessary to increase agricultural production and productivity by efficiently and effectively utilizing scarce resources and costly farm inputs improving timeliness factor, reducing labour cost and human drudgery *etc*. Sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. There was technology gap in fertilizer management in legumes (Subbaiah and Jyothi, 2019) hence, to achieve optimum yields through the proper placement of fertilizers in relation to seeds is important for efficient utilization of nutrients. Application of fertilizers directly above or below the seed is not much effective as fertilizer so placed may move into the seed zone with movement of water that takes place mostly in vertical direction. Line sowing is the most efficient means of sowing the crops and most ideal for crop management (Devnani, 1989). It facilitates manual and mechanical weeding between rows, optimum plant population. The use of improved seeding machines such as seed-cum-fertilizer

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drill reduced the cost of operation and increased the net income over the local practice used by the farmers. Hence, this experiment was conducted on mechanization for sowing, fertilizer application and intercultivation practices in greengram.

## MATERIALS AND METHODS

The experiment was carried out at the Agricultural Research Station, Madhira farm of Professor Jayashankar Telangana Agricultural University, Hyderabad (Telangana) during *kharif*, 2017-18 and 2018-19. The experimental field is located at latitude of 16.922 North and longitude of 80.362 East and at an altitude of 38 meters above the mean sea level. The soil of the experimental field was clay loam soil in texture, having alkaline reaction (pH=8.3), EC=0.33 ds $m^{-1}$, low organic carbon (0.18%) and having low available nitrogen (153 kg $ha^{-1}$), medium in available phosphorus (42 kg $ha^{-1}$) and high in available potassium (538 kg $ha^{-1}$). This experiment comprising of two treatments *i.e*., selective mechanization and normal practice, which was tested by simple t-test at 5% level of significance, non-replicated and each treatmental plot considered as 0.5 acres. Seeds of greengram variety MGG-295 were sown on July 27, 2017 and July 23, 2018 at spacing of 30 cm × 10 cm and crop was harvested on October 10, 2017 and October 07, 2018 respectively.

The recommended dose of fertilizers (20 kg N and 50 kg $P_2O_5$) applied as basal through Urea and di-ammonium phosphate (DAP). Sowing and fertilizer application was done through seed cum fertilizer drill, intercultivation by tractor drawn implement and harvested the crop with machine harvester under mechanization and in normal practice, sowing was done through bullock drawn implement, weeding was done through intercultivation by bullock drawn implement followed by manual weeding and manually harvested the crop. Agronomic and plant protection measures were adopted as per recommendations to raise the crop. The data on test weight (g), grain and haulm yield, gross and net returns, cost benefit ratio and cost of agricultural operations were collected, processed and subjected to statistical analysis by t test as suggested by William Sealy Gosset (Fisher and Guinness Fisher, 1987). Statistical analysis was carried out by analyze the difference between two treatments using the 't' test of significance. Finally, the calculated 't' value is compared with the theoretical value from a't' table at 5 per cent probability level.

Recorded the data on test weight (g) as the seed samples from the produce of each plot were taken and samples comprising of 100 seeds were drawn irrespective by shape and size from the produce and weight of these seeds was recorded.

The grain yield (kg $ha^{-1}$) was noted as the plants were harvested net plot-wise and then threshed after the sun drying.

The haulm yield (kg $ha^{-1}$) recorded the produce after harvesting was left in the field then tied the bundles of each net plot for sun drying. The stover and stick yield of each net plot was obtained in kg/plot by subtracting the seed yield of respective plot from the weight of these bundles.

Net monetary returns (Rs $ha^{-1}$) were obtained by subtracting cost of cultivation from gross monetary returns. Net monetary returns are considered to be a good indicator of suitability of a particular cropping system as this represents the accrued net income to the farmer.

Net monetary returns (Rs $ha^{-1}$) =

Gross monetary return (Rs $ha^{-1}$) - Cost of cultivation (Rs $ha^{-1}$)

The Cost benefit ratio (B: C) is the ratio of gross return to cost of cultivation and is expressed as returns per rupee invested.

$$\text{Cost benefit ratio} = \frac{\text{Gross monetary return (Rs ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs ha}^{-1}\text{)}}$$

## RESULTS AND DISCUSSION

During *kharif*, 2017-18, in greengram test weight (g) was higher with selective mechanization (35) than normal practice (34) which resulted as to get the higher grain (1351 kg $ha^{-1}$) and haulm yield (2013 kg $ha^{-1}$) than normal practice (1227 and 1724 kg $ha^{-1}$ respectively). During *Kharif*, 2018-19 in greengram, test weight (g) was higher in normal practice (34) than selective mechanization (33) similar trend was reflected on to get the grain and haulm yield which were higher in normal practice (1316 and 1796 kg $ha^{-1}$) than selective mechanization (1285 and 1779 kg $ha^{-1}$) which might be due to excess moisture stress due to rain observed in selective mechanization crop growth was retarded for few days later it grown as normal. In greengram pooled study over two years, during *Kharif* season test weight (g) was significantly higher in selective mechanization (33.7) than normal practice (33.1) inturn resulted as significantly higher grain and haulm yields in selective mechanization (1318 and 1896 kg $ha^{-1}$) than normal practice (1271 and 1760 kg $ha^{-1}$) (Table 1). In two years of study higher test weight, grain and haulm yields were recorded due to sowing, application of fertilizers and intercultivation was done timely with the help of tractor drawn implements which might be encouraged in healthy growth of crop and it obtained through avoidance of weed

**Table 1:** Influence of selective mechanization on yield attributes and yields of *kharif* greengram.

| Treatments | Test weight (g) | | | Grain yield (kg $ha^{-1}$) | | | Haulm yield (kg $ha^{-1}$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2017-18 | 2018-19 | Pool | 2017-18 | 2018-19 | Pool | 2017-18 | 2018-19 | Pool |
| Selective Mechanization | 35 | 33 | 33.7 | 1351 | 1285 | 1318* | 2013 | 1779 | 1896* |
| Normal practice | 34 | 34 | 33.1 | 1227 | 1316 | 1271 | 1724 | 1796 | 1760 |
| t-cal | 0.39 | 0.18 | 0.32 | 0.01 | 0.17 | 0.03 | 0.01 | 0.37 | 0.001 |

*Significantly higher at 5% level of significance.

**Table 2:** Influence of selective mechanization on economics of *kharif* greengram.

| Treatments | Gross returns (Rs. ha$^{-1}$) | | | Net returns (Rs. ha$^{-1}$) | | | Cost benefit ratio | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2017-18 | 2018-19 | Pool | 2017-18 | 2018-19 | Pool | 2017-18 | 2018-19 | Pool |
| Selective Mechanization | 51615 | 56052 | 53833 | 12654 | 39437 | 26045 | 1.3 | 2.4 | 1.9 |
| Normal practice | 46860 | 57372 | 52116 | 3999 | 34648 | 19323 | 1.1 | 1.5 | 1.3 |

competition at critical stage of the crop. In normal practice manual operations of sowing, fertilizer application and weeding was consumed more time hence the crop could not escape immediately from the competition of weeds in turn resulted as lower yields. Dhakad and Khedkar (2014) and Dixit *et al.* (2004) supported as seed cum fertilizer drill has increased the yield than conventional method in soybean.

Monetary results in greengram, during *Kharif*, 2017-18 selective mechanization recorded as significantly higher gross and net returns (51615 and 12654 Rs ha$^{-1}$) than normal practice (46860 and 3999 Rs ha$^{-1}$) inturn resulted as significantly higher cost benefit ratio recorded in selective mechanization (1.3) than normal practice (1.1). During second year of study (*Kharif*, 2018-19), contrarily higher gross returns (Rs ha$^{-1}$) were recorded in normal practice (57372) than selective mechanization (56052) this might be due to higher grain and haulm yields were recorded in normal practice. Net returns (Rs ha$^{-1}$) were significantly higher in selective mechanization (39437) than normal practice (34648). This might be due to lower cost of cultivation (Rs. 38961 ha$^{-1}$) than normal practice (Rs. 42861 ha$^{-1}$). Cost benefit ratio was recorded as significantly higher in selective mechanization (2.4) than normal practice (1.5). Pooled data over two years of study, higher gross returns, net returns and cost benefit ratio was recorded in selective mechanization (53833, 26045 and 1.9 respectively) than normal practice (52116, 19323 and 1.3 respectively) (Table 2). Higher monetory returns resulted in selective mechanization than normal practice due to higher grain and haulm yields, lower cost of expenditure for agricultural operations *i.e*., sowing of seed, application of fertilizers and intercultivation practices. Nimje *et al.* (2002) and Dhakad and Khedkar (2014) also reported as net income of soybean was increased due to seed-cum-fertilizer drill.

## CONCLUSION

Under mechanization, sowing of seed and fertilizer application by seed cum fertilizer drill and intercultivation by tractor drawn implements is suitable for better crop growth inturn to get higher yields and monetary returns besides saving of time and labour for greengram cultivation in rainfed areas.

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