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RESEARCH PAPER

Impact of front line demonstration of new groundnut (*Arachis hypogaea* L.) variety GKVK-5 in Kolar district, Karnataka

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Abstract : Groundnut is one of the major crops of Kolar district and its productivity is very low both in Kolar and Karnataka compared to other major groundnut producing states in the country. Thus with the intention of enhancing the yield of groundnut the present front line demonstration was carried out to evaluate the improved groundnut variety *i.e.* GKVK-5 at farmers field level with scientific package of practice. The FLD was conducted with 20 demonstrations with 20 individual farmers during 2017-18 at Nellahalli village, Malur Taluk of Kolar district. The results revealed that the introduction of new variety significantly increased the average yield from 11.88 (check) to 15.81 q/ha, while the net returns increased from Rs. 10379.63 to Rs. 30994.38 with new technology. The new variety GKVK-5 performed significantly better (1.51) in terms of cost - benefit ratio over the existing local variety (1.21). The per cent increase in yield over the farmers practice was about 33.08 per cent. Besides this the new variety showed promising in terms of number of pods per plant, pod weight per plant and lower incidence of tikka disease, thus, has a more fodder, which is very much important in dry areas. The demonstration showed the economic viability of the technology demonstrated.

Key Words : Front line demonstration (FLD), Groundut, GKVK-5, Pod yield, Net returns, Cost benefit ratio (B:C ratio)

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INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is the king of oil seeds and is one of the important legume crop grown in order to enhance the soil fertility. Karnataka is one of the major ground nut producing state in India. In southern parts of Karnataka, it is cultivated extensively as rain fed crop, while in north it is cultivated with protected irrigation. Groundnut is a major source for oil industry, since it contains almost half of its weight (45-50 %) as oil on dry weight basis apart from this it is also rich in carbohydrates (18%), proteins (24%), vitamins and one third of it as minerals. The left over material during the groundnut oil production is used as a very nutritious feed for animals especially for mulching animals. Thus, due to its multiple uses and benefits, this crop is considered as one of the important crop in rain fed areas because of its role in enhancing the soil fertility (Madhusudhana, 2013 and Veeranna and Shreenivasa, 2013).

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Karnataka is the fourth largest groundnut producing state in India with an area of 969 thousand hectares, and stands third among all the states in the country with respect to production. The average yield (productivity) per hectare is very much low with 766 kg/ha, which is very much below the national average of 1194 kg/ha. The highest productivity was recorded in the state of Tamil Naidu with average yield of 1634 kg/ha. From this we can confirm that the yield of groundnut in Karnataka is 26.93 per cent less than the national average and 53.12 per cent less than the neighbouring state of Tamil Naidu, thus it emphasises that there is lot of scope in terms of yield improvement in groundnut (Madhusudhana, 2013). Thus by keeping this in mind and with the objective of yield improvement both in terms of variety and overall crop management this demonstration was undertaken at farmers level to bring awareness about the new technology. Since the cluster FLD is a powerful extension technique to demonstrate the new variety about its production potential of this oil seed crop at field level (Suresh Patil *et al.*, 2019 and Pawar *et al.*, 2018).

The newly introduced variety was considered as demo variety. The demo variety GKVK-5 (Gandhi Krishi Vigyana Kendra -5) is from the University of Agricultural Science (UAS), Bengaluru which was released during 2016-17. This variety has the potential yield of 28 – 29 q/ha under irrigation. Thus, with such a higher yield potential, it is better than the local variety. Thus, with the objective of knowing the performance of the new variety at farmers field level this FLD was designed and executed at KVK, Kolar.

MATERIAL AND METHODS

Demo was conducted to assess the impact of technology transfer by the scientists of Krishi Vigyan Kendra (KVK), Kolar at the Nellahalli village, Tekal Hobli, Malur taluk of Kolar district in Karnataka. The FLD was carried out with 20 farmers comprising of 20 demonstrations units each with one acre (0.5 ac demo unit and 0.5 ac check). The locally available and commonly used variety was considered as check (TMV-2). Before the demonstration field survey was conducted in the village in collaboration with staff of Department of Agriculture. Timely group meeting, training, method demonstration, field day was conducted to bring awareness about the importance of technology and for the smooth implementation of the demonstration. Apart from this regular field visits were made to know the status and performance of the crop and also to address any crop related problems not only related to groundnut but also other crops as well.

The details of the technology demonstrated at the farmers field is as follows:

All other operations include application of farm yard manure, weeding, intercultural operations etc. were carried out in according to the stage of the crop and whenever required.

Soil properties and precipitation during the demonstration:

The initial soil analysis was carried out by collecting the soil samples before sowing and before the application of FYM. The analysis was carried out according to the standard procedures. The fertilizer application was

Table A: Technology details used for the demonstration

Sr. No.	Operation	Check	Demo
1.	Farming situation	Rain fed	Rain fed
2.	Variety	TMV-2	GKVK-5
3.	Bio fertilizers (Soil application with FYM)	*Rhizobium* - 250 g/Ac Phosphorus solubilizing bacteria (PSB)- 250 g/Ac	*Rhizobium* - 250 g/Ac Phosphorus solubilizing bacteria (PSB) - 250 g/Ac
4.	Fertilizer (N-P_2O_5-K_2O)	25-50-25 kg/ha	25-50-25 kg/ha
5.	Gypsum application (Before sowing or 30-45 days after sowing)	200 kg/Ac	200 kg/Ac
6.	Micro nutrients (Before sowing or 30-45 days after sowing)	Zinc sulphate – 4 kg/Ac Boric acid – 4 kg/Ac	Zinc sulphate – 4 kg/Ac Boric acid – 4 kg/Ac
7.	Late leaf spot, pest and disease incidence LLS (PDI)	LLS (PDI) was recorded	LLS (PDI) was recorded

modified according to the soil test values. The results of the soil analysis along with the total annual rainfall and its distribution is given in the Table 1 and Fig. 1.

Germination (%):

The seed germination was calculated by taking in to the account of number of seeds sown to the number of seeds germinated in 2 * 2 Sq ft area in each farmers plot, average of twenty fields is expressed in percentage.

Plant observations:

The growth and performance of the variety was observed by taking the parameters like the plant height (cm), number of branches per plant, fresh weight of the plant (g), number of pods per plant, fresh pod weight per plant (g), pod filling (% on dry weight basis) and late leaf spot, pest and disease incidence LLS (PDI) (%). All these observations were recorded in five replications in each of the twenty farmers' plots.

Yield parameters:

The final yield of both groundnut (q/ha) and the haulm (t/ha) was recorded from the farmers feedback.

Net return and B: C ratio calculation:

All operations in sequence starting from the initial land preparation to the groundnut harvest along with their costs were recorded on acre basis and they were used to calculate the net returns, cost - benefit ratio (B:C ratio). From the recorded basic information collected the performance of FLD was analysed. The different parameters were also calculated to find out the performance of the technology and the gaps that exist (Pawar *et al.*, 2018).

$$\frac{\text{Extension gap index}}{\text{Demonstration index}} = \frac{\text{Demo yield} - \text{Check yield}}{\text{Demo yield}} \times 100$$

$$\text{Technology index} = \frac{(\text{Potential yield} - \text{Demonstration yield})}{\text{Potential yield}} \times 100$$

Additional return = Demonstration return – Farmer's practice return

Statistical analysis:

Statistical analysis's' test was done to know whether the two varieties used in the demonstration are statistically different or not as previously described (Mahandrakumar *et al.*, 2009).

RESULTS AND DISCUSSION

For the soil analysis, samples were collected from farmers' fields by method demonstration or training on "collection of field soil sample for soil analysis". Besides they were made aware about the importance of soil analysis and its role in fertilizer recommendation with special emphasis to groundnut. Thus, we suggested fertilizer recommendation based on soil test values. The results of the soil analysis (Table 1) shows that the soil pH is neutral, EC is low, available nitrogen is low, available phosphorus and potassium is medium. Thus, suggested to apply 20 per cent more nitrogen than the

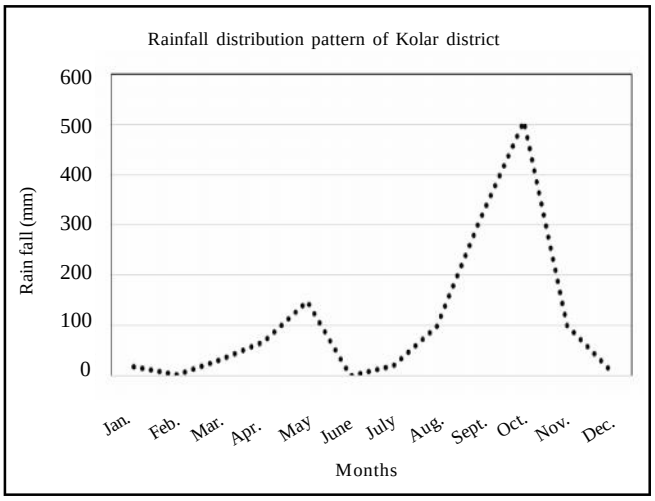

Fig. 1 : Annual rainfall distribution pattern of Kolar district during the year 2017-18

Table 1 : Soil characteristics of the farmers field

Sr.No.	Parameters	Actual values	Method used
1.	Soil texture	Red sandy loam	Hydrometer method
2.	pH	7.02	pH meter (1:2.5 ratio)
3.	EC (dS m^{-1})	0.27	EC meter (1:2.5 ratio)
4.	Available nitrogen (kg/ha)	226.85	Alkaline potassium permanganate with Kjeldahl distillation
5.	Available phosphorus (kg/ha)	28.56	Olsen's with spectrophotometer
6.	Available potash (kg/ha)	216.00	Neutral normal ammonium acetate with flame photometer
7.	Kolar district total rainfall	1317 mm	Rain gauge

recommended dose of fertilizer (RDF), while phosphorus and potassium were applied same as RDF for groundnut. The total annual rainfall during the cropping period was 1317 mm, which is more than the normal rainfall of the . . . . . *et al.*, 2017). Though the rainfall is more than the annual average rainfall but the distribution is not normal (Fig.1). From the rainfall distribution pattern we can understand that there was a shortage of rainfall during the early stages of the crop, while there was more than the normal rainfall during all other stages of crop.

The results of the technology demonstrated are given in Table 1 and 2. The results reveal that though there was slight variation in germination between the varieties but they were not significantly different.

The low germination might be due to the low pod filling, (our own results have showed that there is low filling of pods) that might have increased swirl seeds, thus causing the lower germination. The plant height observations showed that the new variety was slightly shorter than the local variety *i.e*. 54.97 cm and 59.75 cm

Fig. 2 : Pod bearing capacity of check (left) vs demo variety *i.e.* GKVK-5 (Right)

for demo and check variety, respectively but were not significantly different. The number of pods per plant shows there was a highly significant difference between check and the demo with 29.68 and 71.32 pods/plant, respectively. This shows that the new variety has a high

Table 2 : Growth and performance of new variety GKVK-5 over the local variety

Sr. No.	Parameters	Check	Demo
1.	Germination (%)	85.25	80.30
2.	Plant height (cm)	59.75	54.97
3.	No. of pods /plant (no.)	29.68	71.32*
4.	Pod yield/plant (fresh wt. in g)	50.41	131.87*
5.	Haulm yield/plant (g)	368.20	1122.05*
6.	Total pod yield (q/ha) (On dry weight basis)	11.88	15.81*
7.	No. of branches per plant	8.25	19.50*
8.	Net Income (Rs./ha)	10379.63	30994.38*
9.	LLS (PDI)	49.89	21.22*
10.	Pod filling (%, on dry weight basis)	61.21	48.70*
11.	B:C ratio	1.21	1.51*
12.	Extension gap index / Demonstration index (%)	43.54	
13.	Technology gap index (%)	24.86	
14.	Additional return due to new technology (Rupees)	20614.75	
15.	Potential yield of the demo variety GKVK-5 (under normal climatic conditions)	28 q/ha	

* - the demo average values are statistically different from the check at 5% levels

Table 3 : Yield performance of new variety GKVK-5 over the local variety/check

Yield obtained (q/ha)						Yield increase over check (%)	Net returns increase over check (%)
Check (TMV-2)			Demo (GKVK-5)				
Max.	Min.	Av.	Max.	Min.	Av.		
15.75	4.55	11.88	21.00	6.13	15.81	33.07	198.61%

pod bearing capacity (Fig. 2), which is one of the positive sign of the variety. Similarly the haulm weight of the two varieties showed that the haulm weight was significantly higher in demo variety (1122.05 g/plant) compared to the check variety (368.20 g/plant). The increase in haulm weight is due to the increase in number of branches per plant (19.50 vs 8.25) and significant lower incidence of LLS (PDI) in demo variety (21.22%) compared to the check (49.89%), respectively (Fig. 3). There was significant increase in fresh pod weight/plant in demo variety (131.87 g) over the check (50.41 g). The pod filling was significantly lower in the demo variety (48.70 %) over the check (61.21 %).

The yield results of the two varieties showed that the yield of GKVK-5 variety ranged from 6.13 to 21.0 q/ha and for check it ranged from 4.55 to 15.75 q/ha, with average for the same varieties was 15.81 and 11.88 q/ha, respectively. The results showed that there was significant increase in the yield of new demo variety and the increase in yield of new variety over the local was 33.07 per cent. Similar results were reported with the introduction of new groundnut variety GPBD-4 over the local check, where the new variety recorded 20.90 per cent higher yield over the check (TMV-2) (Veeranna and Shreenivasa, 2013). Comparable outcomes were reported with the introduction of new groundnut variety in demonstration which augmented the yield over the local check (Madhusudhana, 2013; Suresh Patil *et al.*, 2019; Raghava and Rao, 2013 and Veeranna and Shreenivasa, 2013). The increase in yield results in increase in net returns. The net return results showed that the net returns of the check (Rs.10379.63) and the GKVK-5 (Rs. 30994.38) which are significantly different with the additional income for the farmers of Rs. 20614.75 (198.61% increase over local variety). The demon outcomes are in corroboration with observations made by other authors, who reported that the newly introduced varieties improved the gross returns and net returns (Naveen *et al.*, 2017; Raghava and Rao, 2013 and Pawar *et al.*, 2018). Thus, the increased B: C ratio in the demo variety (1.51) compared to the check (1.21), which was significantly different. Comparable outcomes were reported with new groundnut variety GPBD-4 introduction compared to the local check (TMV-2) with the B: C ratio of 3.0 and 2.41, respectively (Veeranna and Shreenivasa, 2013). Few other demonstration with the introduction of new variety increased the B:C ratio over the farmers variety (Naveen *et al.*, 2017; Raghava and Rao, 2013 and Pawar *et al.*, 2018).

Fig. 3: Incidence of LLC PDI of check (left) vs demo variety *i.e.* GKVK-5 (Right)

Fig. 4 : Field day of the newly demonstrated groundnut variety ie GKVK-5

The demonstration index or the extension gap index for the demonstration is around 43.54, this shows that there is still scope for the improvement in the groundnut yield. The results shows that the potentiality of the new technology. The maximum yield potential of the GKVK-5 variety is 28 q/ha. The technology gap might be due to the fact that there was very less rain in the initial stages of crop and at the same time excess rain during the later periods of the crop might have caused lower pod filling due to low mobilisation of the nutrient due to the excess soil moisture or the rain (Johansson *et al.*, 2015).

In conclusion the present demonstration revealed that groundnut variety, GKVK-5 released by UAS, Bengaluru gave significantly higher pod number per plant

(high bearing capacity), higher pod weight per plant, higher yield/ha, higher net returns/ha, superior B: C ratio with significantly lower LLS (PDI). Significantly better haulm yield due to high branch number. Thus, indicating that the new variety is either resistant or tolerant to tikka disease. The findings at the farmers level demonstration disclose that this variety is beneficial for farmers in getting better yield with higher income. One drawback of this variety is that it has lower pod filling, if this weakness is addressed this variety will has a lot of scope in the days to come. Thus, it can be concluded that FLD programme was successfully implemented and the technology intervention enhanced the productivity of groundnut and thus, have improved net returns and better B:C ratio over the local check.

Conflict of interest:

None, declared.

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