Int.J.Curr.Microbiol.App.Sci (2019) *8*(12): 3093-3097

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 12 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.812.360

Yield Maximization of Groundnut (*Arachis hypogaea* L.) through Nutrient Management Practices

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Keywords

Groundnut, FYM and Recommended Dose of Fertilizers

Article Info

Accepted:
24 November 2019
Available Online:
10 December 2019

A B S T R A C T

The field experiment was conducted at Agricultural Research Station, Kadiri, Scarce Rainfall Zone of Andhra Pradesh during *rabi-summer season* during 2009-10, 2010-11 and 2011-12 to study yield maximization of groundnut (*Arachis hypogaea* L.) through nutrient management practices. The factors considered were application of Farm Yard Manure (FYM) and Recommended Dose of Fertilizers (RDF) in various combinations. Application of 150% RDF as basal + FYM @ 7.5 t ha^{-1} recorded significantly higher pod yield and haulm yield (2775, 4787 kg^{-1}ha, respectively) over 100% RDF as basal (2361, 4420 kg/ha, respectively). Significantly higher number of pods per plant and hundred pod weight, hundred kernel weight, Shelling %, SMK was also recorded with application of 150% RDF as basal + FYM @ 7.5 t ha^{-1}.

Introduction

The Groundnut (*Arachis hypogaea L.*) is considered to be the one of the most important oilseed crop as well as food legume in the world. It is grown in over 100 countries of the world and plays a crucial role in the world economy. The impact of groundnut crop in the oilseed scenario of India and its reflection on the country' seconomy has been highly significant. Groundnut is dominating other oilseeds of the country by sharing 35 to 45 % of the total area under oilseeds and 45 to55 % of the total oilseeds production. Intensification of food grain production resulted in excessive removal of plant nutrients from the soil and hence corrective measures are necessary for sustainability. Groundnut needs large amount of N, P, K and Ca and various micronutrients. Amount of N fixed by root nodules, N content of the soil and cost: benefit ratio of N application determines rate of nitrogen application (Kathmale and Kambale, 2010). Groundnut is an unpredictable legume, since its response to nutrient application is always not optimistic. The review is aimed to have better understanding on optimizing the nutrient requirement and uptake in increasing the pod yield of groundnut and benefits of interactions between the organic and inorganic fertilizers. The optimization of the mineral nutrition is the key to optimize the production of groundnut, as it has very high nutrient

requirement and the recently released high yielding groundnut varieties remove still more nutrients from the soil. On contrary groundnut farmers, most part of the semi-arid region use very less nutrient fertilizer and sometime only one or two nutrients resulting in severe mineral nutrient deficiencies due to inadequate and imbalance use of nutrients is one of the major factors responsible for low yield in groundnut. India is the world's largest producer of groundnut where nutritional disorders cause yield reduction from 30-70 percent depending upon the soil types.

Laxminarayana and Patiram (2005) reported that the integrated use of inorganic and organic manures in combination with farmyard manure gave the highest pod and haulm yields. Thus it is high time to look into the mineral nutrition aspects of groundnut for achieving high yield and advocate the suitable package of practices for optimization of yield. Thus the present study was under taken to assess the production maximization of groundnut through nutrient management practices.

Materials and Methods

Field experiment was conducted at Agricultural research station, ANGRAU, Kadiri, during three consecutive *rabi-summer* seasons from 2010 to 2012. The soil is sandy loan in nature and contains 0.87 % organic carbon, 176, 28, 299 kg ha^{-1} available N, P and K respectively.

The experiment was conducted in randomized complete block design in three replications with ten treatments consisting of different combinations of nutrient management. The recommended dose of fertilizers is 20-40-50 $N\text{-}P_2O_5\text{-}K_2O$ kg ha^{-1}. Groundnut was sown @150 kg seed/ha in rows 22.5 cm apart and 10 cm plant to plant spacing. Urea, SSP and MOP ws as used as a source for Nitrogen, Phosphorus and Potassium during all the three years of study. These plants were harvested at maturity separately for assessing per plant yield attributes.

Results and Discussion

Different fertilizer combination had a significant effect on pod yield of groundnut. The data presented in table 1 revealed that application of 150% RDF as basal + FYM @ 7.5 t ha-1 recorded significantly higher pod yield and haulm yield (2775, 4787 kg/ha, respectively) over 100% RDF as basal (2361, 4420 kg/ha, respectively).

Significantly higher number of pods per plant and hundred pod weight, hundred kernel weight, shelling % and sound matured kernel percentage (SMK) was recorded with application of 150% RDF as basal + FYM @ 7.5 t ha^{-1}. The treatments containing 100 % RDF (completely as basal) did not vary significantly with the treatments having combination of 100 % RDF (75 % as basal dose + 25 % as top dressing at 30 DAS) +FYM (7.5 t/ha) but it is significantly lower than the combination of RDF (100 %) + FYM (7.5 t/ha).

Rests of the treatments were at par with each other and there were no significant differences among these treatments with respect to pod yield. Farmyard manure improved the physicochemical condition of the soil, provided favourable environment, stimulated the uptake of nutrients and increased the yield over the treatments where FYM was not added and the results are in confirmation to Mohapatra & Dixit, 2010. The results were in confirmation to results obtained by Rao & Shaktawat (2002). The optimization of the mineral nutrition is the key to optimize the production 0of groundnut (Veeramani *et al.*, 2012).

Table.1 Yield and yield attributes of groundnut as influenced by different nutrient treatments

Treatments	Pod yield (kg/ha)	Haulm yield (kg/ha)	No of pods per plant	Hundred pod weight (g)	Hundred kernel weight(g)	Shelling (%)	S.M.K %
T1: RDF (100 %) as basal	2361	4420	16.5	83.6	37.6	70.3	89.5
T2: T1 + FYM @ 7.5 t/ha	2588	4745	18.7	81.7	37.8	70.4	87.2
T3: RDF (75 %) as basal + RDF (25 %) as top dressing at 30 DAS	2401	4502	17.7	88.0	36.8	71.1	86.5
T4: T3+ FYM @ 7.5 t/ha	2674	4726	18.2	82.5	37.3	68.9	90.9
T5: RDF 150 % as basal	2681	4787	19.8	85.7	38.5	71.9	89.6
T6: RDF 150 % as basal + FYM @ 7.5 t/ha	2775	4573	20.2	78.3	37.5	70.2	87.9
T7:RDF (100 %) as basal + RDF (50 %) as top dressing at 30 DAS	2434	4565	18.0	85.7	37.7	71.6	88.9
T8: T7+ FYM @ 7.5 t /ha	2587	4718	18.5	86.6	38.3	70.7	88.9
T9: RDF (75 %) as basal + RDF (75 %) as top dressing at 30 DAS	2540	4566	18.1	84.9	39.1	68.4	90.3
T10: T9+ FYM @ 7.5 t/ha	2602	4607	18.5	84.2	38.3	70.2	88.8
CV %	16.8	15.4	18.0	9.8	14.2	13.2	11.6
SEm±	122	136	1.70	3.0	3.3	2.4	3.6
CD (P=0.05)	264	295	NS	NS	NS	NS	NS

Table.2 Yield and yield attributes of groundnut as influenced by different nutrient treatments

Treatments	Cost of Cultivation	Gross Returns	Net returns	B:C Ratio
T1: RDF (100 %) as basal	49669	67725	18056	1.36
T2: T1 + FYM @ 7.5 t/ha	57449	74147	16698	1.29
T3: RDF (75 %) as basal + RDF (25 %) as top dressing at 30 DAS	50176	68879	18703	1.37
T4: T3+ FYM @ 7.5 t/ha	57713	76451	18738	1.32
T5: RDF 150 % as basal	50204	76503	26299	1.52
T6: RDF 150 % as basal + FYM @ 7.5 t/ha	51171	79233	28062	1.55
T7:RDF (100 %) as basal + RDF (50 %) as top dressing at 30 DAS	50471	69827	19356	1.38
T8: T7+ FYM @ 7.5 t /ha	58435	74095	15660	1.27
T9: RDF (75 %) as basal + RDF (75 %) as top dressing at 30 DAS	50371	72689	22318	1.44
T10: T9+ FYM @ 7.5 t/ha	58578	74400	15822	1.27

Highest gross monetary returns (Rs. 79233 ha^{-1}) were recorded with the treatment having RDF 150 % as basal + FYM @ 7.5 tha^{-1} followed by RDF 150 % as basal. Here increase in net monetary return (NMR) is due to increase in GMR (Patil *et al.,* 2003) (Diwivedi & Rawat, 2013). Benefit cost ratio refers to monetary gain over each rupee of investment under the particular treatment. Thus from this study, it was revealed from the present investigation that integration of proper treatment combinations will definitely increase the pod yield (kg/ha) and profitability of groundnut crop and application of 150% RDF as basal + FYM @ 7.5 t ha^{-1} recorded significantly higher pod yield, haulm yield and net returns.

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How to cite this article:

Sampath Kumar, D. 2019. Yield Maximization of Groundnut (*Arachis hypogaea* L.) through Nutrient Management Practices. *Int.J.Curr.Microbiol.App.Sci.* 8(12): 3093-3097.
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