The Pharma Innovation Journal 2022; 11(2): 1088-1090

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 1088-1090

www.thepharmajournal.com
Received: 17-11-2021
Accepted: 28-12-2021

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Yield trends changes in groundnut under different sources of nutrients management

Rajesh Chaudhri and Roshan Choudhary

Abstract
An field experiment was conducted during kharif season of 2011 and 2012 at S.K.N College of Agriculture, Jobner to study the effect of integrated nutrient management levels on growth parameters and yield of groundnut (*Arachis hypogaea* L.) Treatments consisted of the eight levels of organic manures and fertilizers in main plots (control, RDF(25kg, N+45kg P2O5 kg ha^{-1}), FYM 15 t ha^{-1}, FYM 7.5 t ha^{-1}+1/2 RDF, Poultry manure 6 t ha^{-1}, Poultry manure 3 t ha^{-1}+1/2 RDF, vermicompost 5 t ha-1, and vermicompost 2.5 t ha-1+1/2 RDF] and four levels of iron in sub plots [0.0, 5.0,10.0 and 15.0 kg ha^{-1}] were compared. Application of poultry manure 3 t+1/2 RDF was recorded significantly higher dry matter accumulation, branches per plant, pod yield and stover yield of groundnut over rest of the treatments during both the years of study. Iron levels up to 10 kg/ha also significantly increased the dry matter accumulation, branches per plant, Leaf Area Index (LAI), chlorophyll content, dry weight of nodules pod and stover yield of groundnut over control upto 10 kg Fe/ha but was found at par with 15 kg Fe/ha during both the years of study as well as on pooled basis.

Keywords: Poultry manure, vermicompost, iron, yield

Introduction
Groundnut (*Arachis hypogaea* L.) is an annual legume crop and it's native from South America. Groundnut has a useful role in offspring deficiencies as a rich source of edible oil and protein which play an important position in Indian diet. Hence groundnut is known as king of oilseed crops (Sathya Priya *et al*. 2013) [11]. Commercially it is thirteenth most important food crop, fourth most important source of vegetable oil and third main source of vegetable protein in the world. India is one of the major producers and rank second in groundnut production after China. During the year 2018-19 in India, area under summer groundnut is 7.902 lakh ha, with the total production of 15.286 lakh tonnes and productivity of 1934 kg ha^{-1} and area under kharif groundnut is 40.634 lakh ha, with the total production of 54.410 lakh tonnes and productivity of 1339 kg ha^{-1} (Anonymus, 2019). The plant nutrients which play most important role in the nutrition of groundnut crop are nitrogen, phosphorus and potassium. Groundnut is highly responsive to fertilizer application, although groundnut being a legume is capable of fixing atmospheric nitrogen. Application of higher dose of nitrogen may reduce nodule number and nodule growth and thus adversely affects the nitrogen fixation capacity (Veeramani *et al.* 2012) [13]. The optimization of the mineral nutrition has key role in optimizing the production of groundnut because it has very high nutrients requirement. On Contrary groundnut frames use very less fertilizers resulting in severe mineral nutrients deficiencies dut to inadequate and imbalance use of nutrients is one of the major factors responsible for low yield groundnut for achieving high yield and advocate the suitable keeping in view the above facts, the present investigation was aimed to maximize the yield in groundnut through different nutrients management practices.

Materials and Methods
The field experiment was conducted during kharif season of 2011 and 2012 at S.K.N College of Agriculture, Jobner. The soil of the experimental field was loamy sand, low in organic carbon (013 and 0.15%) as analyzed by walkley and Black's rapid titration method (Jeckson, 1973) available nitrogen 130.3 and 130.7 kg ha^{-1}) by alkaline permanganate method (Subbiah and Asija, 1956), phosphours (16.5 and 16.5 kg ha^{-1}) by Olsen's method (Olsen *et al*., 1954) [9] and iron (2.2 and 2.4 mg kg^{-1}) by Lindsay and Norvell (1978) but medium in potassium content (175.2 and 175.3) as analayzed by Flame photometer method (Metson, 1956) [7] and alkaline in reaction (8.2).

The seed treatment was done with bavistin @ 2 g/kg followed by Rhizobium culture as per treatments. The amount of rainfall during the crop growth period was 281.6 mm and 533.6 mm in 2011 and 2012, respectively. Nutrient content in plant samples were analyzed as per procedure suggested by Snell and Snell (1959). The data were statistically analyzed as procedure given by Gomez and Gomez (1989) and presented on pooled basis for both the years of study.

Results and Discussion

All the inorganic, organic and micronutrients evaluated with different levels of NPK fertilizers significantly increased the growth characters of groundnut. Data (Table.1) indicated that plant height of groundnut increased significantly by application of different manure and fertilizer treatments during both the years and on pooled basis. Application of vermicompost @ 2.5 t + ½ RDF recorded the highest plant height and proved superior to no fertilizer (T0) and FYM @ 15 t (T2) at 70, 105 DAS and at harvest while remained at par with other treatments. Application of FYM @ 15 t/ha also significantly increased the plant height over control (T0) and represented an increase of 17.1, 12.8 and 10.6%, respectively, on pooled basis at 70, 105 DAS and at harvest. A critical examination of results (Table.1) indicated that the integrated use of manures and fertilizer failed to bring significant improvement in number of branches per plant at 35 DAS but perceptible increase was observed during later stages. Application of poultry manure @ 3 t + ½ RDF (T5) recorded the maximum number of branches per plant and remained at par with vermicompost @ 2.5 t + ½ RDF on pooled analysis. On the basis of pooled mean, treatment (T5) represented an increase of 30.9, 18.5, 14.6, 14.1, 6.6 and 6.5% at harvest over control (T0) FYM @ 15 t (T2), FYM @ 7.5t+½ RDF (T3), RDF 25-45 (T1), vermicompost @ 5 t (T6) and poultry manure @ 6 t (T4), respectively. However, application of poultry manure @ 6 t also being at par with vermicompost @ 5 t and superior to T1, T3, T2 and T0 on pooled mean basis. A perusal of data (Table 2) indicated that the increase in dry weight of nodules due to application of poultry manure @ 3 t + ½ RDF (T5) was 15.6, 8.9, 8.2, 7.7, 7.0 and 6.8% higher over control (T0), FYM @ 15 t (T2), FYM @ 7.5 t + ½ RDF (T3), RDF 25-45 (T1), poultry manure @ 6 t (T4) and vermicompost @ 5 t (T6), respectively, on pooled mean basis. The increased value in growth characters might be due to the combined effect of organic and inorganic fertilizers on the increased nutrient availability and microbial activity resulting in better nutrient absorption and growth of crops.

A perusal of data (Table 1) showed that combined use of manures and fertilizers caused a significant effect on pod yield over their sole application and control, wherein application of poultry manure @ 3 t + ½ RDF (T5) being at par with vermicompost @ 2.5 t + ½ RDF (T7) and produced significantly higher pod yield of groundnut over rest of the treatments and represented an increase of 58.6, 41.4, 31.1, 30.1, 18.2 and 17.9% over control (T0), FYM @ 15 t (T2), FYM @ 7.5 t + ½ RDF (T3), RDF 25- 45 (T1), poultry manure @ 6 t (T4) and vermicompost @ 5 t (T6), respectively, on pooled mean basis. However, application of poultry manure at 6 t/ha (T4) being at par with vermicompost @ 5 t/ha (T6) also significantly increased pod yield as compared to control (T0), FYM 15 t (T2), FYM @ 7.5 t + ½ RDF (T3) and RDF 25-45 (T1) during both the years as well as in pooled analysis and registered a significant increase of 34.0, 19.5, 10.8 and 10.4% over T0, T2, T3 and T1, respectively. Critically examined data (Table 2) also indicated that the combined application of manures and fertilizers significantly enhanced the stover yield over their sole application wherein application of poultry manure @ 3 t+½ RDF (T5) gave the maximum stover yield and proved superior to control (T0), FYM @ 15 t (T2), FYM @ 7.5 t+½ RDF (T3), RDF 25-45 (T1), vermicompost @ 5 t (T6), poultry manure @ 6 t (T4) but remained at par with vermicompost @ 2.5 t + ½ RDF (T7) during both the years. On the basis of pooled mean, the increase in stover yield due to treatment T5 was 37.0, 29.9, 24.1, 22.3, 15.3 and 15.3% higher over T0, T2, T3, T1, T6 and T4, respectively. Based on pooled analysis the enhancement in stover yield due to either vermicompost or poultry manure alone over control, FYM 15 t and FYM 7.5 t+½ RDF was 18.8, 12.6 and 7.6%, respectively. Data revealed that increasing levels of Fe up to 10 kg/ha significantly increased the pod yield of groundnut over control and 5 kg Fe/ha but was found at par with 15 kg Fe/ ha during both the years as well as in pooled analysis and represented an increase of 23.0 and 9.5% over control and 5 kg Fe/ha, respectively, on pooled mean basis. The same trend was observed in stover yield also. Increase in stover yield due to 10 kg Fe/ha over that of control and 5 kg Fe/ha was 14.2 and 8.5%, respectively, on pooled mean basis. The favorable influence of applied Fe on plant height, dry matter accumulation and number of branches per plant may be explained to its catalytic or stimulatory effect on most of the physiological and metabolic processes of plant. Application of Fe might have increased the availability and steady supply of nutrients for plant metabolism and photosynthetic activity resulting in optimum growth and development of the crop. The overall growth of plant increased in terms of plant height and leaf area which contributed for higher dry matter production (Lokanath and Malligawad, 2010) [6].

Table 1: Effect of integrated use of organic manures and fertilizers under varying levels of iron on growth parameters and yield of groundnut (Pooled basis)

Treatments	Plant height (cm)			Dry matter accumulation (g per plant)			Pod yield (kg/ha)	Stover yield (kg/ha)
	70 DAS	105 DAS	At harvest	70 DAS	105 DAS	At harvest		
Manures and fertilizers								
T_0 -No fertilizer (control)	10.5	14.0	18.8	18.6	27.5	49.7	1806	3185
T_1 -RDF (25-45)	12.6	16.0	21.1	21.6	30.6	55.0	2193	3570
T_2 -FYM 15 t	12.3	15.8	20.8	21.3	30.4	54.7	2026	3361
T_3 -FYM 7.5 t + ½ RDF	12.7	16.1	21.3	21.6	30.7	55.1	2185	3518
T_4 -Poultry manure 6 t	13.0	16.5	21.7	23.8	33.6	59.9	2421	3785
T_5 -Poultry manure 3 t + ½ RDF	13.2	16.7	21.8	26.0	36.9	65.0	2863	4365
T_6 -Vermicompost 5 t	12.9	16.3	21.5	23.8	33.6	59.7	2427	3785
T_7 -Vermicompost 2.5 t + ½ RDF	13.3	16.9	21.9	25.8	36.6	64.8	2810	4241

S.Em +	0.24	0.30	0.34	0.44	0.63	1.04	51	88.38
CD (P = 0.05)	0.71	0.87	0.98	1.29	1.83	3.00	147	255.97
Fe (kg/ha)								
0	11.0	14.8	19.6	20.9	29.9	54.0	2038	3456
5	12.3	15.9	20.9	22.4	32.0	57.1	2329	3636
10	13.4	16.7	21.8	23.9	33.5	59.8	2461	3868
15	13.7	17.0	22.2	24.1	34.6	61.1	2538	3946
S.Em +	0.15	0.20	0.22	0.33	0.45	0.78	34	52.64
CD (*P*< 0.05)	0.43	0.56	0.62	0.93	1.26	2.19	97	147.77

FYM= Farm yard manure, RDF= Recommended dose of fertilizer NS = non significant

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