Growth and production of Groundnuts as affected by application of Organic, Inorganic and Foliar grade fertilizers

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ABSTRACT

Optimizing mineral nutrition is crucial to boosting groundnut output since groundnuts have a high nutritional requirement and the recently released high yielding varieties further absorb nutrients from the soil. On the other hand, farmers that grow groundnuts sometimes employ only one or two nutrient-rich fertilizers, which results in severe mineral deficits. One of the primary reasons for low groundnut productivity is inadequate and imbalanced nutrient usage. At the Oilseeds Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India, a field experiment was carried out in the summer to assess the effects of organic, inorganic, and foliar grade fertilizers on the growth and yield of groundnut. The integration of organic, inorganic, and foliar grade fertilizers considerably improves growth and yield qualities, according to experimental data. The findings showed that the application of FYM @ 7.5 t ha^{-1}+100% RDF 25:75:25 NPK kg ha^{-1} considerably improved plant growth characteristics, such as yield and benefit: cost ratio. Starter dose (11:36:24 NPK + trace element) + booster dose (8:16:39 NPK + trace elements) applied topically. It was determined that integration of organic (7.5 t ha^{-1}), inorganic fertilizer (100% RDF), and water soluble grade fertilizer recorded, highest dry pods yield and getting maximum economic return from summer groundnut. This treatment was closely followed by treatment FYM @ 7.5 t ha-1+100 % RDNPK, which recorded significant pod yield (27.18 qt ha^{-1}), net monetary return (79464 Rs. ha^{-1}) and benefit: cost ratio (2.77).

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KEYWORDS: Growth, Production, Organic, Inorganic, Foliar grade fertilizer, Groundnut

1. INTRODUCTION

Originating in the Northwest Argentina region of South America, the groundnut (*Arachis hypogaea* L.) is a species in the legume family (Fabaceae) and is currently grown in 108 nations worldwide. Asia, which makes up 63.4% of the world's total land, produces 71.7% of the world's groundnuts, with Africa coming in second. With a productivity of 996 kg per hectare and a production of 4.74 million tons, it is grown on 4.76 million ha in India. In terms of groundnut production, India is ranked second globally (Anonymous, 2014). Other names for groundnuts include peanuts, jack nuts, g-nuts, earthnuts, and monkey nuts. Throughout India, groundnuts are mostly farmed throughout the kharif and summer seasons. Depending on the kind of soil, nutritional problems can reduce groundnut productivity by 30 to 70%. Maharashtra, India is the world's largest producer of this important oilseed

Comment [KS7]: write either short form of both like m ha crop. NPK fertilizer—nitrogen, phosphorus, and potassium—is applied as directed, although the yield falls short of the national goal. A lack of secondary and micronutrients is caused by intensive farming. Given its high nutrient requirements and the recent emergence of high yielding groundnut genotypes that draw even more nutrients from the soil, optimizing the mineral nutrition is essential to maximizing groundnut productivity. On the other hand, most groundnut farmers in the semi-arid region use very little nutrient fertilizer sometimes even just one or two nutrients which leads to severe mineral nutrient deficiencies. Inadequate and unbalanced nutrient use is one of the main causes of low groundnut yield. It is therefore necessary to investigate the groundnut's mineral nutrition in order to get a high yield and to recommend the best set of methods for yield optimization (Singh 2004). Because of its consistently pessimistic reaction to fertilizer administration, groundnuts are an unexpected legume. Overuse of potassium and nitrogen frequently led to very vigorous vegetative growth. It is imperative to use an appropriate technique and time for applying nutrients, taking into account the availability of the primary elements in the soil and the amount of losses anticipated from leaching and/or fixation of the individual elements. Given these facts, a focused investigation into the potential for more efficient nutrient usage in divided dosages, such as basal and foliar spray, is warranted. After considering the aforementioned information, the Oilseeds Research Unit at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola launched an experiment to investigate the "Organic, inorganic and foliar grade fertilizer effects on growth and yield of groundnut.

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2. MATERIALS AND METHODS

Eight treatments of soil application (20, 40, and 60 kg ha^{-1}) of multi-nutrient fertilizer mixture (MMM) for groundnut were included in a field experiment that was designed using a randomized block design and replicated three times. The Oilseeds Research Unit at Dr. Panjabrao Deshmukh Krishi Vidyapeeth in Akola, Maharashtra, India, was the site of the summer experiment . The soil at the experimental site had a texture of clay loam; it was low in available nitrogen (134.28 kg ha^{-1}), medium in available phosphorus (12.10 kg ha^{-1}), fairly rich in potassium (260 kg ha^{-1}), and low in zinc (0.5 mg kg^{-1} soil), ferrous iron (4.4 mg kg^{-1} soil), boron (0.8 mg kg $^{-1}$ soil), sulfur (9.8 mg kg^{-1} soil), and magnesium (1.89 mg kg^{-1} soil) micro nutrients. In terms of reaction pH (8.10) and electrical conductivity (0.12 dsm^{-1}), the soil was somewhat alkaline. The organic carbon content was low (0.46 %). There were eight treatments that were compared: T1 (complete control), T2 (100% RDF 25:75:25 NPK kg per ha), T3 (foliar application of starter dose (11:36:24 NPK + trace element) + foliar application of booster dose (8:16:39 NPK + trace elements), T4 (100 % RDNPK + T3), T5 (FYM @ 7.5 t ha^{-1} + 100% RDNPK), T6 (FYM @ 7.5 t ha^{-1} + 100% RDNPK + T3), T7 (FYM @ 7.5 t ha^{-1} + 85% RDNPK), and T8 (FYM @ 7.5 t ha-1 + 85% RDNPK + T3). The dimensions of the gross and net plots were 3.60 x 3.0 m^2 and 3.0 x 2.80 m^2, respectively. The seed size for the crop variety TAG 24 was 30 × 10 cm2. The fertilizer dose that was recommended was 25:75:25 N.P.K. kg ha^{-1}. Nitrogen

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(25 kg ha^{-1}), phosphorus (75 kg ha^{-1}), and muriate of potash (25 kg ha^{-1}) were applied as a baseline. The initial dosage for the booster dose is 8:16:39 + trace element soluble grade fertilizers applied foliarly at a rate of 2% as a starter dose at 45 and 60 DAS, and the starting dosage is 11:36:24 + these fertilizers applied foliarly at a rate of 2% at 30 DAS. Thus, 46 percent N of urea and 16 percent SSP (P2O5) and 60 percent K20 of MOP were used.

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2.1 Data collection

Following crop maturity, data on a variety of factors, including growth and yield parameters, were gathered from the experimental plot's central rows. The characteristics include plant height (cm), number of primary branches, number of secondary branches, number of root nodules, weight of shoots (g), weight of root (g), total dry weight (g), number of undeveloped pods, dry pod yield (kg^{-1}), haulm yield (kg ha^{-1}), oil (%), total uptake of N, total uptake of P, total uptake of K, cost of cultivation, gross return, and net return.

2.2 Budget Analysis

The average seed yield was corrected by 10% to account for the discrepancy between the experimental output and the yield that farmers would typically receive from the same treatment, in accordance with CIMMYT (1988). Economic analysis was conducted to examine the treatments' viability from an economic standpoint. All treatments were assumed to have constant input costs, such as labor and fertilizer.

2.3 Data analysis:

Analysis of variance (ANOVA) was performed on the measured data in accordance with the General Linear Model (GLM) of Gen Stat software version 15 (2012). The mean comparison for the important parameters was performed using the LSD (least significant difference) test at the 5% and 1% probability levels.

3. RESULTS AND DISCUSSION

The results showed in table 1 and 2 respectively, that under treatments T6 (FYM @ 7.5 t ha^{-1} + 100% RDNPK + foliar spray of starting dose and booster dosage), T5 (FYM @ 7.5 t ha^{-1} + 100% RDNPK), and T7 (FYM @ 7.5 t ha^{-1} + 85% RDNPK), plant height was significantly higher at harvest. Treatment T6 (FYM @ 7.5 t h^{a-1} + 100% RDNPK + foliar application of starter dose and booster dosage) had a considerably higher mean number of branches (primary and secondary) per plant than treatment T5, T7, T8, and T2. Treatment T6 had a considerably higher total dry matter up to harvest than treatments T5, T7, and T5. At 60 and 90 DAS, the number of nodules per plant increased dramatically. At harvest, nodules under treatment T6 were recorded and compared favorably to T5, T7, and T8. It was discovered that at 90 DAS, there were the most root nodules. The treatment T6 sprayed with FYM @ 7.5 t ha^{-1} + 100% RDNPK + foliar application of starting dose and booster dosage resulted in a significantly higher number of developing pods. Conversely, the treatment of FYM @ 7.5 t ha^{-1} + 100% RDNPK + foliar application of starter dose and booster dosage (T6)

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Treatment T6 (FYM @ 7.5 t ha^{-1} + 100% RDNPK + foliar application of starter dose and booster dosage) showed the highest benefit in terms of cost ratio and gross monetary return, whereas treatment T5 (FYM @ 7.5 t ha^{-1} + 100%RDNPK) came in second. It was discovered that the application of 100% RDF, foliar grade fertilizer, and organic fertilizer (7.5 t ha^{-1}) combined was more effective than RDF alone. The application of FYM @ 7.5 t ha^{-1} +100% RDNPK (T5) was the next treatment to record the maximum pod yield (28.90 q ha^{-1}) and net monetary return (84263 Rs. ha^{-1}) and benefit: cost ratio (2.84). Substantial pod yield (27.18 q ha^{-1}), benefit: cost ratio (2.77) and net monetary return (79464 Rs. ha^{-1}) were reported.

4. CONCLUSION

The integration of water soluble grade fertilizer (100% RDF), inorganic fertilizer (7.5 t ha^{-1}), and organic fertilizer resulted in the best dry pod yield and maximum economic return from summer groundnut.

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5. REFERENCES

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Table 1: Pooled values of different growth attributes as influenced by various treatments

Treatments	Plant height (cm)	No. of primary branches	No. of secondary branches	No. of root nodules	Weight of shoots (g)	Weight of roots (g)	Total dry weight (g)	Days to 50% flowering
T_1- Absolute control	12.09	5.05	29.85	25.57	19.11	0.67	19.78	43.17
T_2- 100% RDF	13.53	5.53	28.71	27.50	19.67	0.66	20.33	42.68
T_3- Foliar application of starter dose and booster dose	13.20	5.42	32.24	26.43	19.87	0.67	20.54	40.66
T_4- 100% RDF NPK+T_3	12.53	5.53	30.58	26.63	19.80	0.66	20.46	40.15
T_5- FYM @7.5 t ha^{-1} + 100% RDNPK	13.62	5.67	31.14	28.44	22.61	0.74	23.35	40.54
T_6- FYM @7.5 t ha^{-1} + 100% RDNPK+ T_3	15.07	6.13	34.70	30.43	22.67	0.78	23.45	39.31
T_7- FYM @7.5 t ha^{-1} + 85 % RDNPK	15.00	5.87	32.48	28.60	22.33	0.65	22.98	41.30
T_8- FYM @7.5 t ha^{-1} + 85% RDNPK+ T_3	12.77	5.49	30.12	27.23	19.70	0.67	20.37	40.70
S.E.(M) ±	0.44	0.19	1.07	0.87	0.68	0.023	0.71	0.55
C.D. at 5%	1.36	0.58	3.26	2.61	2.06	0.069	2.16	1.68
GM	13.47	5.59	31.23	27.60	20.72	0.69	21.41	41.06

*and ** - significance at 5 and 1% probability levels, respectively (where is * and ** in the table?)

Table 2: Pooled values for different yields attributes and economics as influenced by various treatments												
Treatments	**No of developed pods**	**No of undeveloped pods**	**Dry pod yield (kg ha^{-1})**	**Haulm yield (kg ha^{-1})**	**Oil %**	**Total uptake of N**	**Total uptake of P**	**Total uptake of K**	**Cost of cultivation**	**Gross return**	**Net return**	**B:C ratio**
T_1- Absolute control	14.33	9.40	1732.78	2876.9	48.98	96.34	11.93	45.55	39124	68077	28953	1.78
T_2- 100 % RDF	17.53	9.40	2605.78	3849.2	49.94	163.23	24.3	77.55	42804	111718	68914	2.61
T_3- Foliar application of starter dose and booster dose	17.60	7.07	1984.10	3472.2	49.39	120.84	16.4	60.92	40904	98280	57376	2.40
T_4- 100% RDF NPK+T3	18.30	7.33	2658.69	3968.2	49.60	154.07	22.9	74.71	43704	119641	75937	2.73
T_5- FYM @7.5 t ha^{-1} + 100% RDFNPK	19.30	7.60	2718.22	4629.6	49.73	186.72	29.6	97.81	44895	124359	79464	2.77
T_6- FYM @7.5 t ha^{-1} + 100% RDFNPK+ T_3	21.20	6.20	2890.17	5290.9	51.60	209.63	35.0	112.18	45795	130058	84263	2.84
T_7- FYM @7.5 t ha^{-1} + 85% RDFNPK	17.80	6.87	2195.74	3571.4	50.20	137.47	20.6	70.29	44695	112844	68149	2.52
T_8- FYM @7.5 t ha^{-1} + 8% RDFNPK+ T_3	17.00	8.07	2262.65	3637.5	50.61	134.02	18.1	66.72	45595	115177	69582	2.52
S.E.(M) ±	0.61	0.26	80.10	350.15	0.41	4.79	0.67	2.38	-	3888	2365	-
C.D. at 5%	1.85	0.81	242.97	1049.80	1.24	14.54	2.06	7.22	-	11795	7175	-
GM	17.88	7.55	2381.02	3912.0	50.00	149.84	22.35	75.77	43439	68077	66579	2.52

*and ** - significance at 5 and 1% probability levels, respectively (where is * and ** in the table?)