



INFLUENCE OF ORGANIC MANURES AND ORGANIC FOLIAR SPRAYS ON GROWTH AND YIELD OF GROUNDNUT (*Arachis hypogaea* L.)

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ABSTRACT

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A field experiment was conducted during *rabi*, 2023-24 at S.V. Agricultural College Farm, Tirupati. The experiment was laid out in a split-plot design and replicated thrice. The main plots contain four treatments *viz.*, Control (M₁), 100 % RDN through farmyard manure (M₂), 100 % RDN through poultry manure (M₃) and 50 % RDN through farmyard manure + 50 % RDN through poultry manure (M₄) as organic manures and sub plots contain four treatments *viz.*, Control (S₁), Sea weed extract @ 1.0 % (S₂), Aerated panchagavya @ 3.0 % (S₃) and Fish amino acid @ 1.0 % (S₄) as foliar sprays at 20, 40, 60 DAS. The test variety of groundnut was 'Visishta'. Among the soil application of organic manures, 100 % RDN through poultry manure resulted higher in terms of growth and yield of groundnut. Among the organic foliar sprays, growth and yield of groundnut were higher with the application of sea weed extract @ 1 % however it was at par with aerated panchagavya @ 3% foliar spray.

KEYWORDS: Aerated panchagavya, Organic foliar sprays, Organic manures, Pod yield of Groundnut.

INTRODUCTION

Groundnut, also known as peanut, is a highly valuable oilseed and food crop due to its rich energy content. Approximately 50% of the groundnut produce is utilized for confectionery products such as roasted and salted peanuts, groundnut candy, and peanut butter (Rajagopal *et al.*, 2000). Globally, groundnut is grown in an area of 327 lakh hectares, with a total production of 539 lakh tonnes and an average productivity of 1,648 kg per hectare (FAOSTAT, 2021). India leads in groundnut cultivation area, covering 54.2 lakh hectares annually, and is the second-largest producer worldwide with a production of 101 lakh tonnes and a productivity of 1,863 kg per hectare for the year 2021-22 (agricoop.nic.in). Groundnut is the most widely cultivated oilseed crop in India, accounting for over 40% of the total acreage and 60% of national production (Sridhar *et al.*, 2020). In Andhra Pradesh, groundnut cultivation is in 8.23 lakh hectares, yielding about 5.19 lakh tonnes with a productivity of 625 kg per hectare for the year 2021-22 (des.ap.gov.in).

To maximize the soil biological activity and sustain long-term soil fertility, organic production emphasizes management techniques that focus on soil regeneration. This approach involves composting and utilization of organically accepted nutrient sources to nourish the soil and supply the plants with essential nutrients. Addition of organic manures to the soil not only improves its physico-chemical properties, water and nutrient retention and both micro and macro nutrient availability, but also

enhances the microbial activity. Integration of organic liquid products such as Panchagavya, Fish Amino Acid (FAA) and Seaweed Extract (SWE) with organic manures like Farmyard Manure (FYM) and Poultry Manure (PM) represents a cost-effective, eco-friendly and efficient method for nutrient management. These practices are advantageous for maintaining soil health and promoting plant growth. In contrast, conventional soil application of fertilizers often leads to low nutrient recovery, increased production costs and environmental pollution. Foliar application of nutrients offers a more efficient alternative, improving nutrient use efficiency and quality while reducing environmental impact by minimizing the amount of fertilizer applied to the soil. This method enhances nutrient absorption directly through plant leaves, thus optimizing growth and reduces the pollution.

MATERIAL AND METHODS

The field experiment was conducted at S.V. Agricultural College, Tirupati campus of Acharya N.G. Ranga Agricultural University, Andhra Pradesh during *rabi*, 2023-24. The soil of the experimental site was sandy loam in texture, neutral in reaction, low in organic carbon (0.27%) and nitrogen (148 kg ha⁻¹), high in available phosphorus (29 kg ha⁻¹) and medium in available potassium (192 kg ha⁻¹). The experiment was laid out in a split-plot design and replicated thrice. The treatments consisted of soil application of organic manures (4) *viz.*, Control (M₁), 100 % RDN through FYM (M₂), 100 % RDN through Poultry manure (M₃)

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and 50 % RDN through FYM + 50 % RDN (M₄) through Poultry manure which were assigned to main plots and organic foliar sprays (4) at 20, 40 and 60 DAS viz., Control (S₁), Sea weed extract @ 1.0 % (S₂), Aerated panchagavya @ 3.0 % (S₃) and Fish amino acid @ 1.0 % (S₄) which were allotted to sub plots. The test variety used in the present experiment was Visishta by adopting a spacing of 22.5 cm x 10 cm.

RESULTS AND DISCUSSION

Growth parameters as influenced by Organic manures and Organic foliar sprays.

Growth parameters viz., plant height, leaf area index and dry matter production were significantly influenced by organic manures and organic foliar nutrition in groundnut during *rabi* 2023-24. However, interaction was found to be non-significant.

Among the organic manures, soil application of 100% RDN through poultry manure resulted in higher plant height, leaf area index and dry matter production of groundnut and in case organic foliar sprays, application of sea weed extract @ 1% recorded higher plant height, leaf area index and dry matter production which was on par with aerated panchagavya @ 3%.

The steady supply of nutrients for plant metabolism and photosynthetic activity with application of poultry manure might have triggered the production of higher number of leaves with more leaf size which in turn resulted in the higher leaf area index as reported by Chaudhri *et al.* (2017). Maximum dry matter production noticed with poultry manure was mainly due to subsequent supply of adequate quantity of nutrients, which in turn enhanced the overall growth of plant that resulted in increased plant height and leaf area and thus the higher dry matter

Table 1. Growth parameters of groundnut as influenced by organic manures and organic foliar sprays

Treatments	Plant height (cm)	Leaf area index	Dry matter production (kg ha ⁻¹)
Soil application of organic manures			
M ₁ : Control	16.9	1.65	6558
M ₂ : 100% RDN through FYM	20.3	1.91	7040
M ₃ : 100% RDN through poultry manure	25.1	2.51	8059
M ₄ : 50% RDN through FYM + 50 % RDN through poultry manure	22.7	2.21	7580
SEm±	0.65	0.072	156.4
CD (P = 0.05)	2.2	0.25	469
Organic foliar sprays at 20, 40 and 60 DAS			
S ₁ : Control	17.0	1.60	6735
S ₂ : Sea weed extract @ 1.0%	24.4	2.40	7721
S ₃ : Aerated panchagavya @ 3.0%	23.3	2.25	7680
S ₄ : Fish amino acid @ 1.0%	20.4	2.03	7232
SEm±	0.65	0.071	141.9
CD (P = 0.05)	1.9	0.20	414
Interaction			
M at S			
SEm±	1.29	0.143	291.4
CD (P = 0.05)	NS	NS	NS
S at M			
SEm±	1.30	0.143	283.8
CD (P = 0.05)	NS	NS	NS

Table 2. Pod and haulm yield (kg ha⁻¹) of groundnut as influenced by organic manures and organic foliar sprays

Treatments	Pod yield	Haulm yield
Soil application of organic manures		
M ₁ : Control	2050	2565
M ₂ : 100% RDN through FYM	2653	3125
M ₃ : 100% RDN through poultry manure	3288	3808
M ₄ : 50% RDN through FYM + 50 % RDN through poultry manure	3005	3521
SEm±	63.2	74.4
CD (P = 0.05)	218	257
Organic foliar sprays at 20, 40 and 60 DAS		
S ₁ : Control	1963	2435
S ₂ : Sea weed extract @ 1.0%	3261	3783
S ₃ : Aerated panchagavya @ 3.0%	3156	3687
S ₄ : Fish amino acid @ 1.0%	2616	3115
SEm±	59.8	70.8
CD (P = 0.05)	174	206
Interaction		
M at S		
SEm±	121.3	143.6
CD (P = 0.05)	372	440
S at M		
SEm±	119.6	141.7
CD (P = 0.05)	349	413

production. This corroborates the findings of Chaudhari and Bhanwaria (2018) and Chaudhari and Choudhary (2022).

Sea weed extract is a condensed source of plant hormones and gives rise to nutrient mobilization as well as cell growth and enlargement, growth of a strong root-system, increased chlorophyll content and leaf area and senescence retardation in the plant system which might have resulted in increased plant height. These results are in conformity with Shekh *et al.* (2018). Higher leaf area index observed with sea weed extract might be attributed to the fact that auxins content in the seaweed extract have an effective role in cell division and enlargement. These findings are similar with those of Zidubule (2021). The higher dry matter was noticed with sea weed extract may be ascribed due to the presence of various growth regulators such as cytokinins, auxins, gibberellins, and betaines as well as macro-nutrients like Ca, K, P, and micro-nutrients like Fe, Cu, Zn, B, Mn, Co and Mo which in turn have increased the plant growth, resulting in higher dry matter production. These observations were similar to the findings of Shankar *et al.* (2020) and Bahekar *et al.* (2024).

Aerated panchagavya spray was known to produce bioactive substances secreted by beneficial microorganisms like *Pseudomonas*, *Azotobacter* and *Phosphobacteria*. These growth promoting secretions might have contributed to improved growth which in turn increase the dry matter production of groundnut. These results are in agreement with the findings of Anusha *et al.* (2018) and Chandra and Mehera (2022).

Pod and haulm yield as influenced by organic manures and organic foliar sprays

Biological yield (pod yield and haulm yield) was significantly influenced by organic manures and organic foliar nutrition and their interaction in groundnut during rabi, 2023-24.

Among the organic manures, soil application of 100 % RDN through Poultry manure resulted in higher pod and haulm yield of groundnut and in case organic foliar sprays, application of sea weed extract @ 1 % recorded higher pod and haulm yield. However, it was on par with aerated panchagavya @ 3%.

Table 2a. Pod yield (kg ha⁻¹) of groundnut as influenced by interaction between organic manures and organic foliar sprays

Main/Sub	S ₁	S ₂	S ₃	S ₄	Mean
M₁	1442	2395	2333	2031	2050
M₂	1980	3112	2925	2595	2653
M₃	2403	3800	3738	3213	3288
M₄	2027	3737	3627	2628	2628
Mean	1963	3261	3156	2616	
M at S			S at M		
SEm±	121.3		SEm±	119.6	
CD (P = 0.05)	372		CD (P = 0.05)	349	

Significantly higher pod yield was recorded with the application poultry manure might be due to adequate supply of nutrients through organic sources enhanced the biological nitrogen fixation which might facilitates better root proliferation and increased the pod yield. Poultry manure improves the number of pods per plant, pod yield in groundnut. Higher economical and biological yields in poultry manure might be due to ammonium-N (NH₄-N) is a significant part of total N in poultry manure, which additionally contains uric acid. Uric acid metabolizes rapidly to NH₄-N in most soils, and the net result of the high NH₄-N and uric acid contents in poultry waste is that a large percentage of N can be converted to nitrate-N (NO₃-N) within a few weeks. These results are in conformity with Nagaraj *et al.* (2018) and Pareek *et al.* (2024).

Among the organic foliar sprays, sea weed extract resulted in higher pod yield. The positive response of sea weed extract suggest the role of phyto-hormones and plant growth regulators like gibberellins, auxins and cytokinins. Yield increases in seaweed-treated plants are thought to be associated with the hormonal substances present in the extracts, especially cytokinins. Cytokinins in vegetative plant organs are associated with nutrient partitioning; whereas in reproductive organs, high levels of cytokinins may be linked with nutrient mobilization. Additionally, seaweed sap contains a lot of potassium and phosphorus. Within a few hours of the application when used as a foliar spray, it is immediately assimilated by crop leaves. The maximum improvement in economical and biological yield with aerated panchagavya spray might be associated with increased yield attributes due to concomitant increase in dry matter accumulation, chlorophyll content, nitrate reductase activity and supply of all the plant nutrients. The maximum improvement

Table 2b. Haulm yield (kg ha⁻¹) of groundnut as influenced by interaction between organic manures and organic foliar sprays

Main/Sub	S ₁	S ₂	S ₃	S ₄	Mean
M₁	1952	2877	2888	2542	2565
M₂	2386	3602	3403	3111	3125
M₃	2891	4335	4286	3719	3808
M₄	2511	4316	4170	3089	3521
Mean	2435	3738	3687	3115	
M at S			S at M		
SEm±	143.6		SEm±	141	
CD (P = 0.05)	440		CD (P = 0.05)	413	

in economical and biological yield with aerated panchagavya spray might be associated with increased yield attributes due to concomitant increase in dry matter accumulation, chlorophyll content, nitrate reductase activity and supply of all the plant nutrients. Similar results were reported by Selvam and Sivakumar (2014), Choudhary *et al.* (2018) and Bahekar *et al.* (2024).

Significant and higher haulm yield was recorded with poultry manure. As poultry waste contains a high concentration of nutrients, addition of small quantity of it in an integrated nutrient management system could meet the shortage of FYM to some extent. The increment in supply of essential nutrients to plant and their availability, acquisition, mobilization and influx into the plant tissue increased and thus enhances yield components and finally the yield. Similar results were reported by Nagaraj *et al.* (2018), Reddy and Singh (2018) and Pareek *et al.* (2024).

Among the organic foliar sprays, sea weed extract recorded higher haulm yield, which was on par with aerated panchagavya. The easy transfer of nutrients to plant through foliar spray with aerated panchagavya, which contains several nutrients *viz.*, macronutrients like nitrogen, phosphorus, potassium and micronutrients required for the growth and development of plants, various amino acids, vitamins and growth regulators like auxins, gibberellins might have influenced the necessary growth and development in plants which lead to higher pod yield and haulm yield. Mavarkar *et al.* (2016), Anusha *et al.* (2018) and Bahekar *et al.* (2024).

Interaction between the organic manures and organic foliar sprays was found to be significant. Soil application of 100 % RDN through poultry manure (M₃)

along with foliar spray of sea weed extract @ 1.0 % (S₂) and aerated panchagavya @ 3.0 % (S₃) registered significantly higher pod and haulm yield of groundnut. The lowest values were noticed with both the controls (M₁) (S₁).

In conclusion, soil application of 100% RDN through poultry manure along with foliar spray of sea weed extract @ 1 % at 20, 40 and 60 DAS resulted higher growth parameters *viz.*, plant height, leaf area index, dry matter production and pod and haulm yield in groundnut followed by soil application of 100% RDN through poultry manure along with foliar spray of aerated panchagavya @ 3 % at 20, 40 and 60 DAS.

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