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Effect of tillage and nutrient management on groundnut (*Arachis hypogaea* L.)

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Abstract
A field experiment was conducted during the *Kharif* 2024 season at the Research Farm, Department of Agriculture, Suresh Gyan Vihar University, Jaipur (Rajasthan) on loamy sand soil to study the "Effect of tillage and nutrient management on groundnut (*Arachis hypogaea* L.)". Among tillage practices, conventional tillage recorded the highest number of pods per plant (28.06), which was significantly superior to moderate tillage (23.96) and statistically at par with deep tillage (26.96). Conventional tillage also resulted in the highest pod yield, haulm yield, and biological yield, which were comparable to deep tillage and significantly higher than moderate tillage. The maximum net returns (Rs. 1,70,625 ha^{-1}) were obtained under conventional tillage, followed by deep tillage (Rs. 1,60,137 ha^{-1}), with the lowest returns under moderate tillage (Rs. 1,33,373 ha^{-1}).

Regarding nutrient management, the highest number of pods per plant and seed index were observed with the application of 75% RDF + 2.5 t/ha vermicompost (VC) + PSB, which was statistically at par with 50% RDF + 2.5 t/ha VC + PSB. However, the number of kernels per pod and test weight were not significantly influenced by different nutrient management treatments. The maximum pod yield, haulm yield, and biological yield were recorded under the treatment 75% RDF + 2.5 t/ha VC + PSB, which was statistically at par with 50% RDF + 2.5 t/ha VC + PSB. This treatment also led to significantly higher net returns compared to the other nutrient management practices, including control, 100% RDF, and 75% RDF + 2.5 t/ha VC alone.

Keywords: Haulm, Pod, RDF, tillage, vermicompost

Introduction
Groundnut (*Arachis hypogaea* L.), often referred to as the *"poor man's almond"*, is the world's fourth most important source of edible oil and the third most important source of vegetable protein. The seeds contain approximately 40–45% oil, 25% protein, and 18% carbohydrates, along with essential minerals and vitamins.

India plays a leading role in the global oilseed sector, cultivating groundnut across 5.75 million hectares, with a total production of 10.30 million tonnes and an average productivity of 1.75 tonnes/ha (Anonymous, 2023–24) [1]. In Rajasthan, groundnut is grown on 0.80 million hectares, producing 1.70 million tonnes, which accounts for 16.81% of the national output (Anonymous, 2023–24). [1] Tillage plays a vital role in crop establishment, growth, and yield. Effective soil management not only minimizes erosion caused by water and wind but also ensures a weed-free seedbed, breaks compacted soil layers (hardpans) that restrict root growth, and helps maintain or improve soil organic matter content (Wright *et al*., 2008) [12]. Groundnut is a nutrient-exhaustive crop, extracting significant amounts of both macro- and micronutrients from the soil. This nutrient demand cannot be fulfilled by a single source. Therefore, the integrated application of biofertilizers, organic sources (like vermicompost), and inorganic fertilizers is considered the most effective approach to enhance productivity and sustain soil health. While chemical fertilizers continue to play an important role, integrated nutrient management (INM) offers a balanced and sustainable solution for maintaining optimal crop productivity (Tiwari, 2002) [11].

Methods and Materials

The experiment was carried out during the *Kharif* season of 2024 at the Agronomy Farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur. The experimental site is geographically situated at 75°48′84″ E longitude and 26°82′47″ N latitude, falling under the Agro-Climatic Zone III A (Semi-Arid Eastern Plain Zone) of Rajasthan. The eighteen treatment combinations consisting of main plot (moderate, deep and conventional tillage) and nutrient management (control, 100% RDF, 75% RDF + 2.5 t/vermicompost, 50% RDF + 5 t/vermicompost, 50% RDF + 2.5 t/vermicompost + PSB and 75% RDF + 2.5 t/vermicompost + PSB) were tested in split plot design with three replications.

Results and Discussion

Effect of tillage

The highest mean number of pods per plant (28.06) was recorded under conventional tillage, which was significantly superior to moderate tillage (23.96) and statistically at par with deep tillage (26.96). Conventional tillage also resulted in a higher seed index compared to deep and moderate tillage. Increased branching observed under this treatment likely contributed to the higher number of pods per plant, aligning with the findings reported by Kumar *et al.* (2006) [5]. The significant improvement in pod and haulm yield under conventional tillage can be attributed to enhanced dry matter accumulation per plant, which may be due to a more favorable soil and plant environment. This, in turn, likely improved photosynthetic efficiency, leading to better overall plant performance—a result also supported by Poonia *et al.* (2022) [8]. In terms of economics, the highest net returns (₹1,70,625 ha^{-1}) were obtained under conventional tillage, followed by deep tillage (₹1,60,137 ha^{-1}), while moderate tillage recorded the lowest returns (₹1,33,373 ha^{-1}). These results are consistent with the findings of Dixit *et al.* (2014) [2] and Mishra *et al.* (2014) [7].

Effect of Nutrient management

The number of pods per plant increased by 42.63%, 40.31%, and 27.27% with the application of 50% RDF + 2.5 t/ha vermicompost (VC) + PSB, 75% RDF + 2.5 t/ha VC + PSB, and 50% RDF + 5 t/ha VC, respectively, compared to the control. This enhancement in pod formation can be attributed to improved root development, increased nodulation, and greater nutrient availability, particularly available phosphorus, which contributed to vigorous plant growth, enhanced flowering, and ultimately, increased pod formation. These results are consistent with the findings of Singh *et al.* (2010) [10] and Dutta and Bandyopadhyay (2009) [3]. The highest pod yield (2947 kg/ha) was recorded with 75% RDF + 2.5 t/ha VC + PSB, which was statistically at par with 50% RDF + 2.5 t/ha VC + PSB (2884 kg/ha). In contrast, the lowest pod yield (2041 kg/ha) was obtained under the control treatment. The yield improvement may be due to vigorous root growth, enhanced nitrogen fixation, and better overall plant development, which together contributed to greater photosynthetic efficiency and efficient translocation of assimilates to reproductive parts, resulting in improved yield attributes and ultimately higher pod yield. Similar observations were reported by Meghvansi *et al.* (2008) [6]. Economically, the highest net return (₹178,139/ha) was achieved under 75% RDF + 2.5 t/ha VC + PSB, which was statistically at par with 50% RDF + 2.5 t/ha VC + PSB (₹172,766/ha). The lowest net return (₹116,685/ha) was observed under the control treatment. The superior economic returns under integrated nutrient management practices can be attributed to enhanced nutrient availability, improved soil health, and increased crop productivity, which collectively resulted in higher marketable yields and better input-use efficiency, as also reported by Kumar *et al.* (2018) [4] and Ramesh *et al.* (2020) [9].

Table 1: Effect of tillage and nutrient management on yields attributes

Treatments	Number of pods per plant	Number of kernels per pod	Seed index (g)
Tillage practices			
Moderate	23.96	1.53	46.12
Deep tillage	26.96	1.70	50.00
Conventional	28.06	1.80	50.86
S.Em±	0.56	0.11	0.84
CD (P=0.05)	2.20	NS	2.58
Nutrient management			
Control	20.85	1.30	44.71
100% RDF	25.45	1.56	48.46
75% RDF + 2.5 t/VC	26.12	1.70	49.15
50% RDF + 5 t VC	26.54	1.81	49.72
50% RDF + 2.5 t VC + PSB	29.74	1.84	50.75
75% RDF + 2.5 t VC + PSB	29.26	1.85	51.19
S.Em±	0.48	0.31	0.82
CD (P=0.05)	1.39	NS	2.32

Table 2: Effect of tillage and nutrient management on yields

Treatments	Pod yield (kg/ha	Haulm yield (kg/ha)	Biological yield
Tillage practices			
Moderate	2352	4854	7206
Deep tillage	2734	5647	8381
Conventional	2856	6022	8878
S.Em±	43	128	169
CD (P=0.05)	171	504	662
Control	2041	4181	6222
100% RDF	2570	5283	7853
75% RDF + 2.5 t/VC	2655	5484	8139
50% RDF + 5 t VC	2786	5828	8615
50% RDF + 2.5 t VC + PSB	2884	6085	8969
75% RDF + 2.5 t VC + PSB	2947	6184	9132
S.Em±	43	118	153
CD (P=0.05)	125	341	395

Table 3: Effect of tillage and nutrient management on economics (Rs/ha)

Treatment	Gross return	Net return	B: C ratio
Tillage practices			
Moderate	189054	133373	2.42
Deep tillage	219817	160137	2.69
Conventional	230306	170625	2.87
S.Em±	3667	3667	0.16
CD (P=0.05)	14399	14399	0.64
Nutrient management			
Control	163852	116685	2.47
100% RDF	206479	153993	2.93
75% RDF + 2.5 t/VC	213452	152222	2.48
50% RDF + 5 t VC	224440	154464	2.20
50% RDF + 2.5 t VC + PSB	232614	172766	2.88
75% RDF + 2.5 t VC + PSB	237517	178139	2.99
S.Em±	3519	3519	0.15
CD (P=0.05)	10163	10163	0.43

References

1. Anonymous. Annual Progressive Report, 2005-06, NRCG, Junagadh, Pp.1-4. 2024.

2. Dixit AK, Kumar S, Rai AK, Kumar TK. Tillage and irrigation management in chickpea (*Cicer aritinum*)- fodder sorghum (*Sorghum bicolar*) cropping system under semi-arid conditions of India. Indian Journal of Agronomy. 2014;59(4):575-80.
3. Dutta D, Bandyopadhyay P. Performance of chickpea (*Cicer arientinum* L.) to application of phosphorus and bio-fertilizer in laterite soil. Archives of Agronomy and Soil Science. 2009;55:147-55.
4. Kumar N, Kumar A, Shukla A, Ram A, Bahadur R, Chaturvedi OP. Effect of application of bio-Inoculants on growth and yield of *Arachis hypogaea* L. and *Sesamum indicum* L. International Journal of Current Microbiology and Applied Sciences. 2018;7(1):2869–75.
5. Kumar R, Arya RL, Mishra JP. Effect of seed priming and tillage management on productivity of chickpea genotype under rainfed conditions. Indian Journal of Agronomy. 2006;51(1):54-6.
6. Meghvansi MK, Prasad K, Harwani D, Mahna SK. Response of soybean cultivars toward inoculation with three arbuscular mycorrhizal fungi and *Bradyrhizobium japonicum* in the alluvial soil. European Journal of Soil Biology. 2008;44:316–23.
7. Mishra JS, Thakur NS, Singh P, Kubsab VS, Kalpana R, Alse UN, *et al*. Tillage and Integrated Nutrient Management in Rainy season Grain Sorghum (Sorghum bicolor). Indian Journal of Agronomy. 2014;59(4):619-23.
8. Poonia T, Kumar S, Kumawat SM. Effect of Tillage and Integrated Nutrient Management on Yield and Nutrient Uptake in Groundnut (*Arachis hypogaea* L.). Biological Forum– An International Journal. 2022;14(1):565-70.
9. Ramesh K, Singh RD, Patra AK. Role of biofertilizers and organic amendments in soil fertility and nutrient dynamics: A review. Journal of Soil Science and Plant Nutrition. 2020;20(3):2553–70.
10. Singh G, Aggarwal N, Khanna V. Integrated nutrient management in lentil with organic manures, chemical fertilizers and biofertilizers. Journal of Food Legumes. 2010;23:149-51.
11. Tiwari KN. Nutrient management for sustainable agriculture. J. Ind. Soc. Soil Sci. 2002;50:374-7.
12. Wright D, Marois J, Rich J, Sprenkel R. Field Corn Production Guide-SS-AGR-85. http://www.floridafarmers.com/corn-production-guide.pdf. 2008.