

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 6; June 2026; Page No. 41-43

Received: 08-03-2026

Accepted: 15-04-2026

Indexed Journal

Peer Reviewed Journal

Effect of Plant Spacing on Yield attributes, yield and Economics of Groundnut (*Arachis hypogaea* L.) Varieties

¹Mettu Somanadh Reddy, ²Rajesh Singh, ³Kumar Raj and ⁴Akankhya Pradha¹M.Sc. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India²Professor, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India³Ph.D. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India⁴Ph.D. Scholar, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, IndiaDOI: <https://www.doi.org/10.33545/26180723.2026.v9.i6a.3658>

Corresponding Author: Mettu Somanadh Reddy

Abstract

A field experiment was conducted during *kharif* season 2025 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences. To determine “Effect of Plant Spacing on Yield attributes, yield and Economics of Groundnut (*Arachis hypogaea* L.) Varieties”. The treatments consisted of 3 levels of Varieties (Kadiri 6, Kadiri 1812 and TAG 24) and Spacing (30 x 10 cm, 30 x 15 cm and 45 x 10 cm). The experiment was laid out in a Randomized Block Design with 9 treatments and replication thrice. The result revealed that Treatment – 9 (TAG 24 + 45 x 10 cm) recorded Significantly maximum number of pods/plant (23.31), Kernels/pod (2.20), Seed index (55.09 g), Kernel yield (1747.55 kg/ha), Haulm yield (4106.37 kg/ha). Were recorded in treatment 9 (TAG 24 + 45 x 10 cm), was found to be productive as well as economically feasible. Maximum gross return (INR 1,13,065.93/ha), net return (INR 84,335.93/ha) and B:C ratio(2.94) were also recorded in treatment 9 TAG 24 + 45 x 10 cm.

Key words: Groundnut, Economics, Growth, Spacing, and yield.

Introduction

Groundnut (*Arachis hypogaea* L.), also known as peanut, goober, or monkey nut, valued for its protein-rich. It is an important oilseed crop and legume grown mainly for its edible seeds (Raju *et al.*, 2022) ^[7]. India ranks among the leading producers of oilseeds globally and plays a significant role in the country's agricultural economy. Groundnut is particularly important for both food and oil production and is one of the most significant cash and food crops in the country. Owing to its high economic and nutritional value, groundnut is often referred to as “King of oilseeds” in India (Palsande *et al.*, 2019; Kalaria & Gediya 2025) ^[8].

Globally, groundnut covers 315 lakh hectares with the production of 536 lakh tonnes with the productivity of 1701 kg/ha (FAOSTAT, 2020). In India, groundnut is grown over an area about

55.71 lakh ha with a production of 102.10 lakh tonnes and productivity of 1671 kg/ha under 2020- 21(GOI, 2020). During 2019-20 total area coverage under groundnut in Uttar Pradesh 93822.00 hectares with a production of 88371 tonnes and the productivity 940 kg/ha (DAC, 2020). According to government fourth advance estimates groundnut production in 2021-22 is at 101.06 lakh tonnes.

Groundnut seeds contain 45-50% high-quality edible oil, 25-30% digestible protein, around 20% carbs and roughly 5% fiber and ash making them an important addition to human nutrition (Raju *et al.*, 2022) ^[7]. Biological value of groundnut protein is among the highest among vegetable proteins and is comparable to that of casein. Except for vitamin B12, groundnut is a rich source of all B-complex vitamins and also provide vitamin E, riboflavin, and thiamine. Oil cake remaining after oil extraction serves as an excellent organic manure and livestock feed, containing approximately 7-8% nitrogen, 1.5% P₂O₅, and 1.5% K₂O. Being a legume, groundnut enhances soil fertility by fixing atmospheric nitrogen through root nodules, contributing about 12-40 kg N/ha and also acts as an effective cover crop in erosion-prone areas. Groundnut haulms are highly valued as nutritious fodder for livestock. Thus, crop serves a four-fold purpose as food, fodder, feed, and bio-fertiliser (Howlader *et al.*, 2009) ^[9].

Spacing is a key agronomic and non-monetary management method that has a major impact on crop growth and production. Proper planting geometry ensures optimum plant population and efficient utilization of sunlight, water, nutrients, and other inputs. In groundnut, plants compete both above and below ground, and inappropriate spacing

may lead to excessive competition, reduced branching, and poor pod development. Planting geometry varies with cultivar, soil type, and agro-climatic conditions, and therefore requires careful optimisation for specific regions (Waghmode *et al.*, 2017)^[10]. Appropriate spacing facilitates better canopy development, improved aeration, and enhanced photosynthate translocation, ultimately leading to higher yield and quality of groundnut.

Materials and Methods

A field experiment to study the “Effect of Plant Spacing on Yield attributes, yield and Economics of Groundnut (*Arachis hypogaea* L.) Varieties” was conducted during the Kharif season of 2025–2026 at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj. The site is geographically located at 25°24'42"N latitude, 81°50'56"E longitude, and an altitude of 98 meters above mean sea level. It lies about 5 km from Prayagraj city on the right bank of the Yamuna River, adjacent to the Prayagraj–Rewa Road. A composite soil sample was collected from a depth of 0–30 cm before initiating the experiment. The experimental plot size for each treatment was 3 × 3 meters with Treatment Combinations (T1) Kadiri 6 + 30 × 10 cm, (T2) Kadiri 1812 + 30 × 10 cm, (T3) TAG 24 + 30 × 10 cm, (T4) Kadiri 6 + 30 × 15 cm, (T5) Kadiri 1812 + 30 × 15 cm, (T6) TAG 24 + 30 × 15 cm, (T7) Kadiri 6 + 45 × 10 cm, (T8) Kadiri 1812 + 45 × 10 cm, (T9)

TAG 24 + 45 × 10 cm. The sample was air-dried, crushed, and analyzed for its physical and chemical properties. The soil was classified as sandy clay loam with a pH of 7.6. Organic carbon content was 0.69% (equivalent to 0.72% organic matter). Available nitrogen content was 152.7 kg/ha, phosphorus 10.4 kg/ha, and potassium 174.0 kg/ha. Sulfur content was 7.2 mg/kg, zinc 0.72 mg/kg, and boron 0.56 mg/kg.

Results and Discussion: Number of Pods per Plant:

Significant and highest pods per plant (23.31) was recorded in treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (22.71) was statistically at par with Treatment (9) [TAG 24 + 45 × 10 cm]. Significant and maximum number of pods/plant was recorded with the spacing (30 cm × 10 cm) which might be due to the sufficient space between rows which encouraged more plants and also lesser interplant competition for space, light, nutrient and moisture. Similar results were also reported by Chandrasekaran *et al.* (2007)^[4].

Number of Kernels per Pod:

The perusal of the data of number of kernels per pod was recorded at harvest, is presented in Table 1. The data reveals that there was significant effect among different treatments on number of kernels per pod. Significant and highest kernels per pod (2.20) was recorded in treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (2.13) was statistically at par with Treatment (9) [TAG 24 + 45 × 10 cm]. Significant and maximum number of kernels per pod was observed with optimum spacing which might be due to plant spacing with 25 cm × 25 cm provides favourable microclimate to crop for Optimal utilization of available moisture, nutrient and its early adoption leads to better partitioning of sugars to

reproductive parts there by recording better Yield attributes, yield and Economics attributes. Similar results were also reported by Ram *et al.* (2014).

Seed Index (g)

There was no significant difference among the treatments statistically, highest Seed index (55.09 g) was recorded in treatment 9 [TAG 24 + 45 × 10 cm].

Kernel Yield (kg/ha)

Significant and higher kernel yield (1747.55 kg/ha) was recorded in treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (1626.50 kg/ha) was statistically at par with treatment 9 [TAG 24 + 45 × 10 cm]. Significant and higher Seed Yield was observed with the spacing (30 cm × 10 cm) which might be due to the better spacing making water and nutrients more easily accessible to the plants. Plants were able to reach their full growth potential and produce a higher yield because to increased surface area exposed to air, better cultural practices, and more efficient weed management. These findings were also corroborated by Meena *et al.* (2011)^[5].

Haulm Yield (kg/ha)

Significant and higher haulm yield (4106.37 kg/ha) was recorded in treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (3931.90 kg/ha) was statistically at par with treatment 9 [TAG 24 + 45 × 10 cm]. The significant and maximum haulm yield was observed in spacing (30 cm × 10 cm) which might be due to optimum row spacing have effectively utilized the growth resources, particularly solar radiation. Similar results were also agreed by Bhairappanavar *et al.* (2005); Murade *et al.* (2014).

Harvest index (%)

There was significant difference among the treatments statistically highest harvest index (30.46 %) was recorded in treatment 5 [Kadiri 1812 + 30 × 15 cm].

Economics

Cost of cultivation (INR/ha)

Cost of cultivation (INR/ha) (28,730.00 INR/ha) was found to be higher in the treatment 9 [TAG 24 + 45 × 10 cm].

Gross return (INR/ha)

Gross return (INR/ha) (1,13,065.93 INR/ha) was found to be higher in the treatment 9 [TAG 24 + 45 × 10 cm].

Net returns (INR/ha)

Net return (INR/ha) (84,335.93 INR/ha) was found to be higher in the treatment 9 [TAG 24 + 45 × 10 cm]

Benefit cost ratio (B:C)

Benefit cost ratio (2.94) was found to be higher in the treatment 9 [TAG 24 + 45 × 10 cm]. Maximum benefit-cost ratio was recorded with Plant geometry 45 × 10 cm observed maximum benefit cost ratio, this could be due to it allows adequate plant stand with sufficient aeration and sunlight interception, promoting higher tillering which improve the yield without proportionally increasing the cost of cultivation, thereby resulting in a higher economics return.

Table 1: Response of plant spacing and varieties on yield attributes and yield of groundnut

S. No.	Pods/plant	Kernels/pod	Seed index (g)	Kernel yield (kg/ha)	Haulm yield (kg/ha)	Harvest index
T1.	18.67	1.87	49.88	927.46	3706.67	19.90
T2.	18.01	1.53	49.87	1063.37	3358.87	24.05
T3.	19.85	1.87	47.99	1019.11	3353.57	23.29
T4.	19.95	1.93	52.52	1458.90	3723.97	28.20
T5.	20.70	1.47	43.96	1426.86	3263.90	30.46
T6.	21.94	1.60	45.71	1370.60	3878.10	26.01
T7.	22.30	1.80	44.63	1478.84	3587.10	29.18
T8.	22.71	2.13	48.90	1626.50	3931.90	29.29
T9.	23.31	2.20	55.09	1747.55	4106.37	29.78
S. Em (±)	0.30	0.14	2.12	83.42	93.53	1.04
CD (p = 0.05)	0.90	0.41	-	250.10	280.41	3.12
F test	S	S	NS	S	S	S

Table 2: Response of plant spacing and varieties on Economics of groundnut

S.no	Cost of cultivation (INR/ha)	Gross returns (INR/ha)	Net returns (INR/ha)	B:C ratio
T1.	29930	63,060.93	33,130.93	1.11
T2.	29930	70,520.13	40,590.13	1.36
T3.	29930	67,853.53	37,923.53	1.27
T4.	29930	94,982.13	65,052.13	2.17
T5.	29930	92,139.20	62,209.20	2.08
T6.	29930	89,992.00	60,062.00	2.01
T7.	28730	95,904.60	67,174.60	2.34
T8.	28730	1,05,453.80	76,723.80	2.67
T9.	28730	1,13,065.93	84,335.93	2.94

Conclusion

It was concluded that for obtaining higher yield components with better quality of groundnut in the treatment combination of spacing 45 × 10 cm along with variety TAG 24 was recorded significantly higher number of Pods/Plant, Kernels/Pod, Kernel Yield, and Benefit Cost Ratio as compared to other treatments. Since, the finding based on the research done in one season.

Acknowledgement

The authors are thankful to Department of Agronomy, Naini Agricultural Institute, Prayagraj, Sam Higginbottom University of Agriculture Technology and sciences, (U.P) India for providing necessary facilities to undertake the studies.

References

- Awal MA, Aktar L. Effect of row spacing on the yield attributes, yield and economics of peanut (*Arachis hypogaea* L.) stands. International Journal of Agriculture, Forestry and Fisheries. 2015;3(1):7–11.
- Pandey A, Singh R. Effect of spacing on yield and economics of varieties of black gram (*Vigna mungo* L.). International Journal of Plant & Soil Science. 2022;34(15):37–42.
- Bouyoucos GJ. Hydrometer method improved for making particle size analysis of soils. Agronomy Journal. 1962;54:464–465.
- Chandrasekaran EM, Somasundaram M, Amanullah K, Thirukumaran K, Sathyamoorthi K. Influence of varieties and plant spacing on the yield attributes, yield and economics of confectionery groundnut (*Arachis hypogaea* L.). India Research Journal of Agricultural Biological Sciences. 2007;3(5):525–528.
- Meena BP, Kumawat SM, Yadav RS. Effect of planting geometry and nitrogen management on groundnut (*Arachis hypogaea*) in loamy sand soil of Rajasthan. Indian Journal of Agricultural Sciences. 2011;81(1):86–88.
- Meena B, Hulihalli UK, Kumar BNA, Meena MK. Biomass production, its distribution and yield of hybrid pigeonpea as influenced by plant geometries and fertility levels. Research Journal of Agricultural Sciences. 2011;2(4):833–836.
- Raju GV, Umesha C, Reddy SM, Krishna PV. Effect of spacing and organic manures on growth and yield of groundnut (*Arachis hypogaea* L.). The Pharma Innovation Journal. 2022.
- Palsande VN, Nagrale MR, Kasture MC, Gokhale NB, Dhekale JS, Salvi VG. Growth, yield and quality of kharif groundnut (*Arachis hypogaea* L.) as affected by different levels of nitrogen, potassium and zinc in lateritic soils of Konkan. Journal of Pharmacognosy and Phytochemistry. 2019;8(5):790–794.
- Howlader SH, Bashar HMK, Islam MS, Mamun MH, Jahan SMH. Effect of plant spacings on the yield and yield attributes of groundnut. International Journal of Sustainable Crop Production. 2009;4(1):41–44.
- Waghmode BD, Kambale AS, Navhale VC, Chendge PD, Mahadkar UV. Effect of plant population and fertilizer doses on yield attributes, yield and economics of summer groundnut. International Journal of Current Microbiology and Applied Sciences. 2017;6(11):2670–2675.