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Effect of plant spacing on growth and yield of groundnut (*Arachis hypogaea* L.) varieties

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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 Growth and Yield 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 higher Plant height (50.60 cm), Number of nodules per plant (26.73), Plant dry weight (50.24 g/plant), 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.

Keywords: Groundnut, K1812, TAG24, Kadiri 6, growth, spacing, and yield

Introduction

Groundnut is an important crop due to their high protein (26%), soluble carbohydrate (24%-22%), and mineral content. Hydrogenated vegetable oil makes up between 45.1% and 51.1% of this product. Because of its adaptability, it may be found in a wide variety of products, from shampoo and soap to food and even construction materials. The high protein content of groundnut cake makes it a valuable organic waste and animal feed. There might be anything from 8% to 1% nitrogen, 1.5% to 1% phosphorus, and 8% potassium (Dileep *et al.*, 2021) ^[8]. Groundnut ranks first in area and second in terms of production after soyabean and is grown in almost all parts of the country over wide range of agro- climatic condition. While groundnut oil contains several unsaturated fatty acids, oleic acid (50-65%) and linoleic acid (18-30%) make up the bulk of these fats. Groundnuts may contain the amino acid cysteine, which is crucial for protein synthesis.

Plant density is the ratio of plant cover to the total area. Maintaining the necessary plant population and participating in intercultural activities to get a higher yield are both dependent on having enough spacing in line planting. The physiological processes of the crop may be disrupted if the plants were too close together or too far apart. When there are too many plants in an area, they will fight tooth and nail for food and water. Increasing or lowering spacing has the same negative effect on production since both strategies result in the loss of planting space. When your crop is fully grown, its canopy should be thick enough to block off more than 95% of the light. Plants with uniform spacing may produce more seeds because they face less competition from their neighbors (Awal and Aktar 2015) ^[1]. TAG 24 is an early duration Spanish bunch type groundnut variety with an erect and semi-dwarf growth habit. It matures within 95-105 days and is characterized by light rose coloured kernels, medium-sized pods and an oil content of about 47-50%. The variety possesses moderate tolerance to leaf spot and bud necrosis diseases and performs well under both Kharif and summer irrigated conditions. Due to its early maturity and stable performance, TAG 24 is widely preferred for short-duration cultivation systems. Kadiri 6 (K-6) is a Spanish bunch type groundnut variety having erect growth habit and medium plant height. It matures within 95-100 days and produces small to

medium-sized pod with rose-coloured kernels. The variety has an oil content of around 48-50% and exhibits moderate tolerance to drought and foliar diseases. Kadiri 6 is highly popular among farmers, particularly in Andhra Pradesh, because of its stable yield performance, adaptability and suitability for both Kharif and irrigated conditions. Kadiri Lepakshi (K-1812) is a high-yielding Spanish bunch type groundnut variety with vigorous and erect growth habit. It has a duration of 107-113 days and produces bold pods with light pink kernels and relatively higher oil content. The variety shows better adaptability across different agro-climatic conditions and is suitable for both Kharif and Rabi seasons. Due to its higher yield potential, better plant vigour and wider adaptability, K-1812 is gaining importance among groundnut growers. (oilseeds.dac.gov.in)

Materials and Methods

A field experiment to study the “Effect of Plant Spacing on Growth and Yield 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. The treatments consisted of 3 levels of Varieties (Kadiri 6, Kadiri 1812 and TAG 24) and Spacing (30 × 10 cm, 30 × 15 cm and 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

Plant height

At 100 DAS, significant and taller plant height (50.60 cm) was recorded in treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (49.59 cm) was found to be statistically at par with treatment 9 [TAG 24 + 45 × 10 cm]. Similar findings were also reported by significant and higher plant height was observed with the spacing (30 cm × 10 cm) which might be due to that wider spacing gave the opportunity for all the resources to be available readily to the individual plants such as nutrients, light, space, moisture and thus resulting in higher growth rate of the plant (Chilakala *et al.*, 2023) ^[9].

Plant dry weight

Significant and higher plant dry weight (50.24 gm) was recorded in treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (49.11 gm) was found to be statistically at par with treatment 9 [TAG 24 + 45 × 10 cm]. Significantly higher plant dry weight was observed with appropriate spacing 45cm × 10 cm which might be due to better photosynthetic activity attributed to greater exposure to light and increased availability of nutrients, resulted in higher plant dry weight. Similar finding was observed by Pandey *et al.* (2022) ^[2].

Number of nodules per plant

Maximum number of Nodules per plant (26.73) was recorded in

treatment 9 [TAG 24 + 45 × 10 cm]. However, treatment 8 [Kadiri 1812 + 45 × 10 cm] (24.67) was found to be statistically at par with treatment 9 [TAG 24 + 45 × 10 cm]. Because of increased availability to growth nutrients and more effective use of those resources throughout the crop's development, the spacing (30 cm × 10 cm) resulted in much more nodules/plants. These results were corroborated by Birendra *et al.* (2017) ^[4].

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/plants was recorded with the spacing (30 cm × 10 cm), Higher number of pods/plants might have been possible due to more vigour and strength attained by the plants as a result of better photosynthetic activities with sufficient availability of light, and supply of nutrients in balanced quantity of the plants at growing stages Hamakareem *et al.* (2016) ^[5]

Number of Kernels per Pod

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 growth and yield 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) ^[6].

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 Murade *et al.* (2014) ^[10].

Table 1: Response of plant spacing and varieties on growth of groundnut

Treatment	Plant height	Plant dry weight (g)	Number of nodules per plant
1.	47.77	44.13	15.33
2.	48.52	41.09	14.00
3.	47.18	40.24	15.87
4.	48.30	43.78	16.07
5.	47.58	42.36	14.13
6.	46.82	45.51	17.20
7.	48.68	46.00	19.13
8.	49.59	49.11	24.67
9.	50.60	50.24	26.73
S. Em ($\pm$)	0.51	0.61	1.12
CD ($p = 0.05$)	1.54	1.83	3.37
F test	S	S	S

Table 2: Response of plant spacing and varieties on yield attributes and yield of groundnut

Treatment	Pods/ plant	Kernels/ pod	Seed Index (g)	Kernel yield (kg/ha)	Haulm yield (kg/ha)
1.	18.67	1.87	49.88	927.46	3706.67
2.	18.01	1.53	49.87	1063.37	3358.87
3.	19.85	1.87	47.99	1019.11	3353.57
4.	19.95	1.93	52.52	1458.90	3723.97
5.	20.70	1.47	43.96	1426.86	3263.90
6.	21.94	1.60	45.71	1370.60	3878.10
7.	22.30	1.80	44.63	1478.84	3587.10
8.	22.71	2.13	48.90	1626.50	3931.90
9.	23.31	2.20	55.09	1747.55	4106.37
S. Em ($\pm$)	0.30	0.14	2.12	83.42	93.53
CD ($p = 0.05$)	0.90	0.41	-	250.10	280.41
F test	S	S	NS	S	S

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.

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