E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(1): 237-239
Received: 02-10-2025
Accepted: 05-11-2025

RS Singh
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

A Narayan
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Tanweer Alam
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

RB Sharma
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

CS Choudhary
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Ravikant
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Amalendu Kumar
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Corresponding Author:
RS Singh
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India

Effect of planting density and crop geometry on yield, yield attributes and economics of taro [*Colocasia esculenta* var. *antiquorum* (L.) Schott.]

RS Singh, A Narayan, Tanweer Alam, RB Sharma, CS Choudhary, Ravikant and Amalendu Kumar

DOI: https://www.doi.org/10.33545/2618060X.2026.v9.i1d.4628

Abstract
An experiment on planting density and crop geometry in taro was conducted during 2025 on loamy soil in randomized block design at Regional Research Station, Madhopur, West Champaran (Bihar) under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar) to find out the effect of planting density and crop geometry on yield, yield attributes and economics of taro. It was found that the number of cormels per plant and cormel yield per plant due to high planting density and crop geometry was reduced significantly and the reductions were 1.19 to 25.61 and 3.14 to 30.24 per cent, respectively with respect to normal planting in taro but total cormel yield per hectare and gross return were significantly increased and the increase was to the tune of 4.37 to 23.39 per cent as compared to normal planting. Similarly, net return and B:C ratio due to high density planting increased to the tune of 3.81 to 29.89 and 2.2 to 15.81 per cent, respectively with respect to normal planting. Increase in yield due to high density planting in mother corm ranged from 6.08 to 49.95 per cent with respect to normal planting.

Keywords: Taro, planting density, crop geometry, cormel yield, economics

Introduction

Taro [*Colocasia esculenta* var. *antiquorum* (L.) Schott.] is one of the most important tuber crops of India as well as other parts of the tropical and subtropical countries. It is also an important tuber crop grown in Bihar particularly in the districts of northern Bihar. Taro is a primary carbohydrate source for people living in many tropical areas and certain subtropical regions. The economically valuable parts of the taro plant are the corms, cormels and leaves, which are rich in starch, minerals and vitamins. In the present situation of changing climate scenario, declining cultivable land areas and farmers income, it has become imperative to produce more from the lesser arable land and increase the farmers income as well.

In general, plants with closer spacing compete for light, nutrients, moisture and space more than those with broader spacing, which affect the yield attributes and ultimately yield of individual plants but increase the yield on per unit area and time basis (Singh *et al*., 2023) [5]. Crops that are densely planted hinder healthy growth and development (Mathan, Bhattacharya, & Ranjan, 2016) [2]. Wider spacing guarantees the fundamental needs but lowers both the overall number of plants and their yield. The number of suckers (shoots) per plant increases at lower planting densities and enhances cormel yield per plant. However, higher planting densities reduce sucker production but increased total cormel yield per hectare and balances plant competition and productivity (Tsedalu *et al*., 2014) [6].

Diverse plant spacing results in diverse responses from yield characteristics. Lower plant spacing increases cormel yield per plant until a certain point is reached where additional increase in inputs only marginally boost productivity. There have been reports of similar production increase in other crops when plant space is reduced. However, when distance between plant is reduced, the average cormel weight falls. Because of competition for water in the soil, nutrients, and light, taro plant spacing has an impact on taro growth, corm formation and production (Boampong *et al*., 2020) [1]. Higher yields per unit area might result from high-density planting, which is crucial in situations when there is a shortage of arable land (Wambui *et al.*, 2023) [8]. Growing more crops on fewer plots may be possible with high-density planting, which would increase farming's sustainability. High-density planting may have an effect on how resources (such as sunshine, water, and nutrients) are used. Growth factors like -plant height, leaf size, and tuber development can be impacted by plant competition in high-density planting (Boampong *et al.*, 2020) [1]. Keeping the above facts in view, this experiment was undertaken to evaluate the effect of planting density and crop geometry on yield, yield attributes and economics of taro.

Materials and Methods

The experiment was conducted at the Research Farm of Regional Research Station, Madhopur, West Champaran under Dr. Rajendra Prasad Central Agricultural University, Pusa (Bihar) during 2025-26 on loamy soil. There were nine treatments i.e., T_1-Normal planting at 50x30 cm (66666 plants/ha), T_2- Lesser density planting at 50x45 cm (44444 lants/ha), T_3- High density planting (HDP) at 50x20 cm (100000 plants/ha), T_4 (HDP) at 45x30 cm (74074 plants/ha), T_5 (HDP-double row) at 50/30x30 cm (83333 plants/ha), T_6 (HDP-double row) at 60/20x30 cm (83333 plants/ha), T_7 (HDP-double row) at 60/30x30 cm (74074 plants/ha), T_8 (paired row) at 70/30 cm (66666 plants/ha) and T_9 (HDP-Triple row) at 60/20x30 cm (100000 plants/ha) with three replications and the test variety was Rajendra Arvi-1. Cormel and mother corm weight of five plants was taken randomly treatment wise after harvesting and cleaning of cormels and mother corms and then were calculated on hectare basis (t/ha). All other standard package of practices were followed and analysis was done following standard statistical procedures.

Results and Discussion

Different treatments of planting densities produced significant effect on yield, yield attributes and economics (table 1). Number of cormels per plant and yield of cormels per plant observed in T_2 where planting density was the lowest was significantly higher than the treatments of T_3, T_5, T_6, T_7 and T_9 where planting densities was higher in the range of 66.67 to 125.00 per cent. Significantly lowest number of cormels per plant and yield of cormels per plant were recorded in T_9 where the planting density was highest with the crop geometry of 60/20x30 in triple rows than T_1, T_2 and T_4 may be due to lesser competition for growth factors because of comparatively wider spacings in T_1, T_2 and T_8 that provided nutrient, moisture, light and space in appropriate quantity to plants than the plants in the treatments of higher planting densities. Similar results were also reported by Singh *et al.* (2023) [5], Boampong *et al.* (2020) [1], Sen *et al.* (2018) [4] and Tumuhimbise (2015) [7]. Even number of cormels per plant and yield of cormels per plant in T_2 (lowest planting density) were higher to the tune of 19.09 and 8.21 per cent as compared to normal planting (T_1). Planting density in T_5 and T_6 is same but due to different crop geometry, number of cormels and yield of cormels per plant were higher in T_6 by 1.17 and 4.35 per cent, respectively may be due to better utilisation of resources and growth factors by plants in T_6 (table 1).

Table 1: Yield, yield attributes and economics as influenced by planting densities and crop geometries in taro.

Treatments	No. of cormels /plant	Yield of cormels/ plant (g)	Yield of cormels (t/ha)	Yield of mother corms (t/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
T_1	8.38	222.75	14.32	4.82	572859	364461	1.75
T_2	9.98	241.03	11.08	3.21	443194	268129	1.53
T_3	6.71	162.83	17.20	7.23	688034	429635	1.66
T_4	8.28	206.82	15.32	5.36	612800	393290	1.79
T_5	7.67	206.76	17.23	6.03	689202	455803	1.95
T_6	7.76	215.76	17.67	6.12	706800	473401	2.03
T_7	7.94	201.69	14.95	5.11	597867	378357	1.72
T_8	8.17	207.15	13.81	4.67	552400	344002	1.65
T_9	6.23	155.39	16.76	7.02	670537	412138	1.60
SEm (±)	0.66	16.70	1.29	0.40	51639	51639	0.13
CD(p=0.05	1.98	50.49	3.90	1.21	156145	156103	0.39
CV(%)	14.36	14.26	14.54	12.63	14.55	22.87	12.94

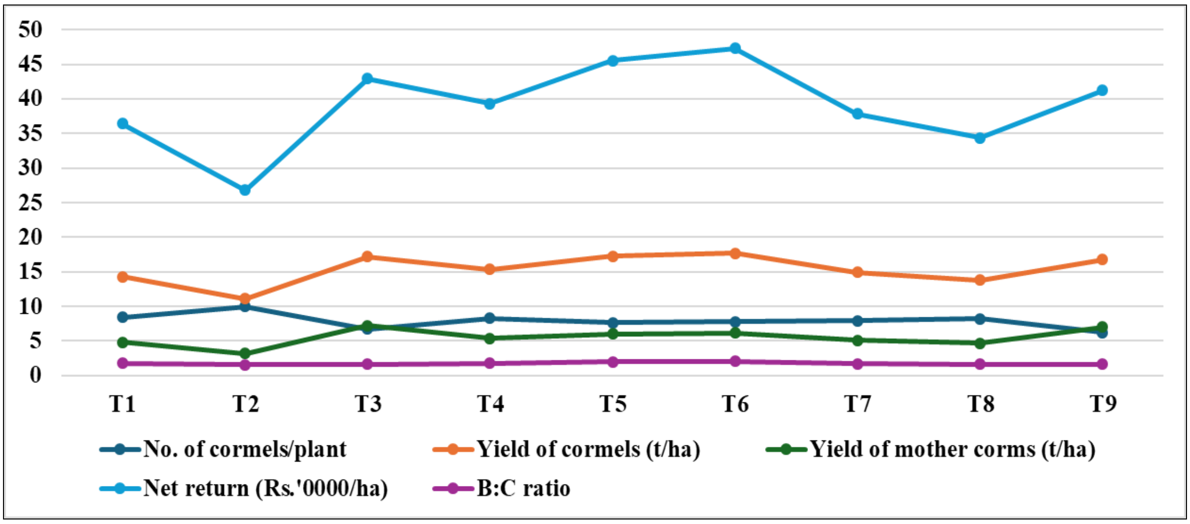

Fig 1: Yield, yield attributes and economics as influenced by planting densities and crop geometries in taro.

Yield of cormels was also significantly affected by planting densities and crop geometries. Although the number of cormels and yield of cormels per plant was highest in T_2 but this treatment has recorded the significant lowest value of cormel yield than all other treatments having higher planting densities except T_1 and T_8 which have normal planting density. Significant highest cormel yield was recorded in T_6 than T_1, T_2 and T_8 and it was found at par with rest of the treatments obviously may be due higher plant population and comparatively better use efficiency of resources and other growth factors by the total plants and not by the individual plant basis. These results were in conformity with the findings of Singh *et al*. (2023) [5], Reddy *et al*. (2018), Tumuhimbise (2015) [7] and Sen *et al*.. Yield increase due to higher planting densities ranged from 4.37 to 23.39 per cent with respect to normal planting density. Yield of mother corm was also affected significantly by different planting densities and crop geometries. Significant highest and lowest yield of mother corm were recorded in T_3 and T_2, respectively clearly due to plant population.

Gross return, net return and B:C ratio were also significantly influenced by different planting densities and crop geometries (table 1). Gross return followed similar trend as was noticed in cormel yield may be due to the direct correlation with the cormel yield. Significant highest and lowest value of net return and B:C ratios were calculated in T_6 and T_2 may be due to highest and lowest values of gross returns and comparatively lower cost of cultivation. Similar findings were also reported by Singh *et al*. (2023) [5] in elephant foot yam and Wambui *et al.* (2023) [8] in taro.

Conclusion

High planting density (83333 plants/ha) than normal planting density (66666 plants/ha) with suitable crop geometry (double row planting at 60/20x30 cm) is need of the hour and it can be suggested to farmers for getting higher cormel yield and net income.

References

1. Boampong R, Boateng SK, Adu Amoah R, Adu Gyamfi B, Aboagye LM, Ansah EO. Growth and yield of taro (*Colocasia esculenta* (L.) Schott.) as affected by planting distance. International Journal of Agronomy. 2020;2020(1):Article ID 8863099.
2. Mathan J, Bhattacharya J, Ranjan A. Enhancing crop yield by optimizing plant developmental features. Development. 2016;143(18):3283-3294.
3. Reddy MT, Sarla N, Reddy PM. High-density planting studies in vegetable crops: a review. Journal of Horticultural Science. 2018;13(1):1-12.
4. Sen D, Mishra HN, Behera B. Growth and yield of taro as influenced by planting density. Indian Journal of Agricultural Research. 2018;52(5):555-558.
5. Singh RS, Narayan A, Giri GS, Alam T, Nandini S. Response of high-density planting on growth, yield and economics of elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson). The Pharma Innovation Journal. 2023;12(3):5193-5199.
6. Tsedalu M, Tesfaye B, Goa Y. Effect of type of planting material and population density on corm yield and yield components of taro (*Colocasia esculenta* L.). Journal of Biology, Agriculture and Healthcare. 2014;4(17):125-137.
7. Tumuhimbise R. Plant spacing and planting depth effects on corm yield of taro (*Colocasia esculenta* (L.) Schott). Journal of Crop Improvement. 2015;29(6):747-757.
8. Wambui Njuguna J, Karuma AN, Onwonga R, Gicheru P. Effects of watering regimes and planting density on taro (*Colocasia esculenta*) growth, yield, and yield components in Embu, Kenya. International Journal of Agronomy. 2023;2023:1-9.