International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating: 5.29
IJABR 2025; 9(7): 529-533
www.biochemjournal.com
Received: 26-04-2025
Accepted: 29-05-2025

Bahekar PM
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Badnapur, Maharashtra, India

Chavan PG
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Badnapur, Maharashtra, India

Pagar PA
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Badnapur, Maharashtra, India

Araj AR
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Badnapur, Maharashtra, India

Gawande GM
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Badnapur, Maharashtra, India

Corresponding Author:
Bahekar PM
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, College of Agriculture, Badnapur, Maharashtra, India

Yield and economics of pigeonpea (*Cajanus cajan* L Millsp.) as influenced by different dates of sowing and nipping

Bahekar PM, Chavan PG, Pagar PA, Araj AR and Gawande GM

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i7g.4785

Abstract

The present study was carried on the deep black soil of College of Agriculture, Badnapur during *kharif* 2022-23 on pigeonpea variety BDN 711 in split plot design with 3 replications and 12 treatment combinations. The main plots were comprising of three different dates of sowing i.e., D1 (26th meteorological week), D2 (28th meteorological week), D3 (31th meteorological week) as a main plots and sub plots were N0 (no nipping) N1 (Nipping at 45 DAS), N2 (Nipping at 60 DAS) and N3 (Nipping at 45 and 60 DAS) nipping at 45 and 60 DAS (N3) increased yield-attributing traits and overall productivity in pigeonpea. The D1N3 (26th M.W. with nipping at 45 and 60 DAS) treatment consistently produced the highest grain, stalk, and biological yields, while The D3N0 (31st M.W. with no nipping) had the lowest values, indicating the significance of timely sowing and nipping for maximum yields. As well as 26th M.W. sowing (D1) and nipping at 45 & 60 DAS (N3) resulted in the highest gross monetary returns (GMR) and benefit-cost (B:C) ratio. While these treatments improved yield and profitability, their interaction did not significantly affect net monetary returns (NMR) or the B:C ratio.

Keywords: Pigeonpea, sowing dates, nipping, yield, profitability, split plot design

Introduction

Pigeonpea (*Cajanus cajan* L. Millsp.) is a significant pulse crop in the tropical and subtropical regions, known as red gram, tur, or arhar in India. This hardy crop exhibits unique characteristics such as hypogeal germination and deep root system. Pigeonpea is a C3 plant, short-day crop, often cross-pollinated, and highly drought-tolerant, making it a valuable grain legume in India. Evidence suggests that pigeonpea originated in peninsular India, while the term 'Pigeonpea' is believed to have originated in the Americas. It is predominantly grown during the kharif season as a sole crop or intercropped in various agroecological regions. Its deep root system and drought tolerance make it a successful and profitable crop in areas with limited and erratic rainfall. Pigeonpea's nitrogen-fixing ability and contribution of organic matter to the soil enhance its appeal as a crop rotation option. As a legume crop, it plays a crucial role in restoring nitrogen to the soil, making it a valuable component in sustainable agricultural practices.

The effect of different sowing dates on pigeon pea cultivation varies based on factors like climate, soil, and region. Early sowings typically result in higher yields due to extended growth periods; plants get more time to develop and mature result in larger and healthier plant, Early sowing may enable harvesting before the onset of adverse weather condition. but they may be vulnerable to certain pests and diseases. Late sowings might be advantageous in regions with erratic weather patterns or to avoid specific pest incidence, reduce risk of waterlogging or excess water stress, especially in region prone to heavy rainfall but shorter growing period may limit yield potential and crop growth. Selecting the optimal sowing date requires considering local conditions and desired harvest timelines for optimal crop performance and yield. Additionally, adopting practices such as crop rotation, intercropping and integrated pest management can further enhance the resilience and productivity of pigeon pea cultivation across different sowing dates.

Nipping in pigeonpea is a crucial practice for enhancing yield and yield-contributing characters. According to Tegelli *et al.* (2020) [11], foliage nipping in the early stages of the crop can increase the number of branches while controlling excessive vegetative growth, thus promoting yield. Additionally, nipping at various stages has been shown to increase the number of branches and pods, ultimately boosting pigeonpea yield (Panda *et al.*, 2020) [5]. Veeranna *et al.* (2020) [12] found that topping pigeonpea at various water deficit stages led to increased plant height and the number of pod-bearing branches. This is because restricting vertical development stimulates lateral branch growth. In various crops like chickpea, cotton, castor, and chrysanthemum, cutting terminal buds is a common practice to induce additional auxiliary branches. When implementing nipping in pigeonpea, factors such as nipping duration, frequency, and economic viability for increased yield should be carefully considered.

Overall, the interaction between sowing dates and nipping in pigeon pea cultivation underscores the importance of strategic management practices in maximizing crop productivity. By appropriate nipping activities to complement specific growth stages across different sowing dates, farmers can optimize yield potential and achieve favorable outcomes in pigeon pea farming. With this view, an investigation entitled "Yield and economics of pigeonpea (*Cajanus cajan* L Millsp.) as influenced by different dates of sowing and nipping" was conducted

Materials and methods

The field experiment was conducted during the Kharif season of 2023-24 at the Agronomy Farm, College of Agriculture, Badnapur, affiliated to Vasantrao Naik Marathwada Krishi Vidyapeeth (VNMKV), Parbhani. The experimental site is geographically situated at 19.84° N latitude and 75.73° E longitude, with an elevation of approximately 414 meters above mean sea level. The soil of the experimental plot was classified as Vertisol, characterized by medium black clay, good moisture retention, and well-drained properties.

Physicochemical analysis revealed the soil to be neutral in reaction (pH 7.2), low in available nitrogen (231.65 kg ha^{-1}), medium in available phosphorus (17.45 kg ha^{-1}), and high in available potassium (415.20 kg ha^{-1}). The organic carbon content was 0.52%, and electrical conductivity was within normal limits. Meteorological data recorded during the cropping period showed that the experiment received a total rainfall of 598.93 mm, mostly concentrated between June and September.

The experimental plot was laid out in Split plot design with twelve treatment combinations and three replications. The main plots were consisted of three different dates of sowing i.e., D1 (26^{th} meteorological week), D2 (28th meteorological week), D3 (31th meteorological week) and sub plots were N0 (no nipping) N1 (Nipping at 45 DAS), N2 (Nipping at 60 DAS) and N3 (Nipping at 45 and 60 DAS)

Each plot measured 5.4 m × 4.5 m (gross size), and net plot size was maintained after accounting for border rows. The pigeonpea variety BDN-711, known for medium duration and high yield p otential, was sown by dibbling method at 90 cm × 20 cm spacing.

Results and Discussion

Effect of different treatments on yield attributing characters

A) Effect of different sowing dates

As reveled in table 1 Different sowing dates significantly influenced the number of pods, pod weight, and grain yield in pigeonpea. The highest number of pods per plant (440.38), pod weight (222.84 g), and grain yield (205.43) were observed in the 26th M.W. (D1) sowing, with a progressive decrease in D2 and D3. The lowest values were recorded in the 31st M.W. (D3) sowing, highlighting the importance of earlier sowing for optimal yield.

B) Effect of nipping

Nipping treatments also had a significant impact on pod production and yield. Nipping at 45 and 60 DAS (N3) resulted in the highest number of pods (437.33), pod weight (221.89 g), and grain yield per plant (202.44 g). In contrast, no nipping (N0) led to the lowest values for these parameters, indicating that nipping promotes better productivity in pigeonpea.

Table 1: Yield attributing characters of pigeonpea influenced by different treatments

Treatment	Number of pods plant-1	Pod yield plant-1 (g)	Grain yield plant-1 (g)	Number of grains pod-1	Seed index (g)
Different Sowing Dates (D)					
D1: (26^{th} M.W.) 23 June-1 Jul	446.58	222.84	205.43	3.51	10.60
D2: (28^{th} M.W.) 09 Jul-15 Jul	396.45	197.97	179.02	3.47	10.68
D3: (31^{th} M.W.) 30 Jul-05 Aug	360.20	182.90	163.12	3.46	10.60
SE (m)±	9.44	4.14	4.18	0.07	0.09
CD at 5%	37.06	16.25	16.43	NS	NS
Nipping (N)					
N0: No Nipping	328.02	171.23	158.08	3.51	10.63
N1: Nipping at 45 DAS	404.52	198.83	184.58	3.50	10.65
N2: Nipping at 60 DAS	385.26	193.16	175.04	3.46	10.47
N3: Nipping at 45 & 60 DAS	437.33	221.89	202.44	3.48	10.68
SE (m)±	7.90	4.01	3.70	0.05	0.09
CD at 5%	23.49	11.93	11.07	NS	NS
Interaction D x N					

C) Interaction effect of treatments

The interaction effect of different sowing dates and nipping treatments significantly influenced the number of pods $plant^{-1}$, pod weight $plant^{-1}$, and grain yield $plant^{-1}$ in pigeonpea (Table 2.1, 2.2 and 2.3). The combination of D1N3 (26th M.W. with nipping at 45 & 60 DAS) consistently produced superior results across all parameters, except D1N1 (26th M.W. with nipping at 45 DAS) which was at par to D1N3. In contrast, the lowest values were recorded in D3N0 (31st M.W. with no nipping) and D3N2 (31st M.W. with nipping at 60 DAS), indicating that earlier sowing with timely nipping results in higher productivity.

Interaction effect of treatments on number of pods plant-1

	N0	N1	N2	N3
D1	401.64	468.39	409.28	506.83
D2	382.91	389.80	404.25	408.86
D3	342.52	355.37	349.27	396.31
SE (m)±		14.48		
CD at 5%		43.03		

Interaction effect of treatments on weight of pods plant-1

	N0	N1	N2	N3
D1	203.17	217.83	205.83	264.54
D2	193.54	194.74	199.76	203.82
D3	173.65	183.91	176.74	197.31
SE (m)±		6.95		
CD at 5%		20.66		

Interaction effect of treatments on grain yield plant-1

	N0	N1	N2	N3
D1	182.93	208.25	189.91	240.57
D2	169.58	180.59	180.13	185.80
D3	152.28	164.29	154.97	180.95
SE (m)±		6.41		
CD at 5%		19.06		

Table 2: Effect of different treatments on yield of pigeonpea

Treatment	Grain yield (q ha-1)	Stalk yield (q ha-1)	Biological yield (q ha-1)	Harvest Index (%)
Different Sowing Dates (D)				
D1: (26th M.W.) 23 June-1 Jul	13.86	26.93	40.73	33.92
D2: (28th M.W.) 09 Jul-15 Jul	11.67	24.17	35.83	32.63
D3: (31th M.W.) 30 Jul-05 Aug	7.45	17.31	24.70	30.17
SE (m)±	0.37	0.65	0.99	0.80
CD at 5%	1.46	2.57	3.89	NS
Nipping (N)				
N0: No Nipping	9.25	19.54	28.78	31.95
N1: Nipping at 45 DAS	11.52	23.79	35.13	32.21
N2: Nipping at 60 DAS	10.53	21.60	32.09	32.63
N3: Nipping at 45 & 60 DAS	12.62	26.32	38.91	32.19
SE (m)±	0.23	0.48	0.66	0.77
CD at 5%	0.71	1.43	1.97	NS
Interaction D x N				
CD at 5%	Sig	Sig	Sig	NS
GM	10.98	22.81	33.75	32.24

Effect of different treatments on yield of pigeonpea.

A) Effect of different sowing dates

The grain, stalk and biological yield q ha-^{1} of pigeonpea were significantly influenced by different sowing dates during the kharif season of 2023. The data revealed (Table 2) a progressive decrease in grain yield from D1 to D3, primarily due to a reduction in the number of primary and secondary branches, fewer pods per plant, and grains per plant in later-sown crops. Similar findings were observed by Kumar *et al.* (2023) [3], Pokhrel *et al.* (2023) [7], Pawar *et al.* (2020) [6]

B) Effect of nipping

Nipping treatments also had a significant effect on grain, stalk, and biological yields. The treatment involving nipping at 45 and 60 days after sowing (N3) produced the highest grain yield of 12.62 q ha^{-1}, as well as the maximum stalk yield of 26.32 q ha^{-1} and biological yield of 38.91 q ha^{-1}. In contrast, the control treatment without nipping (N0) produced the lowest yields across all parameters, with the grain yield at 9.25 q ha^{-1}, stalk yield at 19.54 q ha^{-1}, and biological yield at 28.78 q ha^{-1}. These results were consistent with previous studies by Kolhe *et al.* (2020) [4], Panda *et al.* (2020) [5], Teggelli *et al.* (2020) [11], and Veeranna *et al.* (2020) [12].

C) Interaction effect of treatments

Interaction effect of both treatments had significantly influenced the grain, stalk and biological yield q ha-^{1} which is showed in table 2.1, 2.2 and 2.3. The superior treatment combination was D1N3 (26th M.W. with nipping at 45 & 60 DAS), which resulted in the highest yields across all parameters. This was followed by D1N1 (26th M.W. with nipping at 45 DAS). In contrast, the lowest grain, stalk, and biological yields were recorded in the D3N0 (31st M.W. with no nipping) treatment combination. The interaction effect of these treatments notably influenced the overall performance, with D1N3 consistently producing superior results.

Table 2.1: Interaction effect of treatments on grain yield q ha-1 of pigeonpea

	N0	N1	N2	N3
D1	11.397	14.820	12.780	16.203
D2	9.983	12.077	11.407	13.303
D3	6.390	7.663	7.420	8.360
SE (m)±		6.41		
CD at 5%		19.06		

Table 2.2: Interaction effect of treatments on stalk yield q ha-1 of pigeonpea

	N0	N1	N2	N3
D1	22.57	27.66	25.14	32.37
D2	21.04	25.50	22.48	27.66
D3	14.96	18.23	17.19	18.94
SE (m)±		0.83		
CD at 5%		2.48		

Table 2.3: Interaction effect of treatments on biological yield q ha-1 of pigeonpea

	N0	N1	N2	N3
D1	33.963	42.480	37.923	48.577
D2	31.027	37.567	33.887	40.870
D3	21.350	25.893	24.277	27.303
SE (m)±		1.15		
CD at 5%		3.41		

Effect of different treatments on economics of pigeonpea.

The pigeonpea cultivated in present investigation, was analyzed economically in terms of gross monetary returns (₹ ha^{-1}), net monetary returns (₹ ha^{-1}) and B:C ratio which is presented in Table 3.

A) Effect of different sowing dates on GMR, NMR and B:C ratio

The current investigation clearly highlighted that the sowing date plays a significant role in influencing the gross monetary returns (GMR), net monetary returns (NMR), and benefit-cost (B:C) ratio of pigeonpea as showed in table 3. The highest GMR was observed in the 26th Meteorological Week (M.W.) sowing (D1), followed by the 28th M.W. sowing (D2), while the lowest GMR was recorded in the

31st M.W. sowing (D3). This was primarily due to the fact that the 26th M.W. sowing (D1) produced superior grain and stalk yields (q ha-1), which directly contributed to the higher gross returns (₹ ha-1) in that treatment. Similarly, net monetary returns (NMR) were significantly higher in D1 compared to D2 and D3, further demonstrating the financial benefits of sowing during the 26th

M.W. The increased gross returns from D1 were a key factor in the higher net returns, which also resulted in the best benefit-cost (B:C) ratio. This higher B:C ratio reflects the better economic efficiency of pigeonpea cultivation in the 26th M.W. sowing, where the combination of higher yields and returns optimized profitability. These findings are consistent with the research conducted by Venkata Rao *et al.* (2016) [13] and Godwa and Halikatti (2011-12), which also emphasized the positive impact of early sowing on both yield and economic returns. The results of the current study provide strong evidence that sowing pigeonpea in the 26th M.W. (D1) not only maximizes yield but also significantly enhances financial profitability, making it the most advantageous sowing window for achieving higher returns and optimal economic efficiency in pigeonpea cultivation.

Table 3: Influenced of different treatments on GMR, NMR & B:C ratio

Treatment	Gross returns (₹ ha-1)	Net Returns (₹ ha-1)	B: C ratio
Different Sowing Dates (D)			
D1: (26th M.W.) 23 June-1 Jul	90442.86	43653.60	1.99
D2: (28th M.W.) 09 Jul-15 Jul	76776.70	32854.58	1.69
D3: (31th M.W.) 30 Jul-05 Aug	49041.93	8444.90	1.08
SE (m)±	2403.41	4161.40	0.05
CD at 5%	9435.42	16336.36	0.20
Nipping (N)			
N0: No Nipping	60726.56	21497.91	1.39
N1: Nipping at 45 DAS	75602.55	34430.76	1.67
N2: Nipping at 60 DAS	69161.15	24840.30	1.52
N3: Nipping at 45& 60 DAS	82849.86	32501.93	1.77
SE (m)±	1562.38	4143.22	0.03
CD at 5%	4642.86	NS	0.10

B) Effect nipping on GMR, NMR and B:C ratio

Different nipping treatments significantly influenced the gross returns (₹ ha⁻¹), with the highest returns recorded in the treatment where nipping was done at 45 and 60 days after sowing (DAS) (N3), amounting to ₹82,849.86 ha⁻¹. This treatment outperformed other nipping treatments, including no nipping (N0), nipping at 45 DAS (N1), and nipping at 60 DAS (N2), which all produced lower returns. The lowest gross returns of ₹60,726.56 ha⁻¹ were observed in the no nipping (N0) treatment. While nipping treatments did not significantly affect the net monetary returns, the benefit-cost (B:C) ratio was notably higher in the 45 & 60 DAS nipping treatment (N3), with a B:C ratio of 1.77, compared to the lower B:C ratio of 1.39 in the no nipping treatment (N0). The improved growth, yield attributes, and overall yield in the N3 treatment led to these higher gross returns and a more favorable B:C ratio. These results are consistent with findings from previous studies by Kolhe *et al.* (2020) [4], Panda *et al.* (2020) [5], as well as Sharma *et al.* (2001) [9], who reported similar benefits of nipping on the productivity and economic returns of pigeonpea.

C) Interaction effect of treatments on GMR, NMR and B:C ratio

The interaction between sowing dates and nipping treatments had a significant impact on the gross monetary returns (GMR) of pigeonpea. The combination of 26th M.W. sowing with nipping at 45 and 60 DAS (D1N3) resulted in the highest gross returns, outperforming all other treatment combinations. In contrast, the lowest gross returns were observed in the treatment combination of 31st M.W. sowing with no nipping (D3N0). However, nipping treatments did not have a significant effect on the net monetary returns (NMR), and the interaction of sowing dates and nipping treatments also had no significant impact on the benefit-cost (B:C) ratio of pigeonpea.

Table 3.1: Interaction effect of treatments on GMR

	N0	N1	N2	N3
D1	74662.733	97066.867	83823.600	106216.67
D2	65509.767	79321.867	74857.067	87394.133
D3	42007.200	50418.933	48802.800	54938.800
SE (m)±		2706.13		
CD at 5%		8040.63		

Conclusion

The study demonstrated that different sowing dates and nipping treatments significantly influenced the growth, yield attributes, and overall productivity of pigeonpea. Early sowing (26th M.W.) produced superior yield attributes like pod number plant^{-1}, pod weight plant^{-1}, and grain yield plant^{-1}, compared to later sowing dates. Nipping at 45 and 60 DAS (N3) also resulted in enhanced yield, promoting higher pod production, and higher grain yield. The interaction of early sowing and nipping (D1N3) consistently delivered the highest growth and yield parameters, while late sowing without nipping (D3N0) yielded the lowest results. In case of economics 26th M.W. sowing (D1) and nipping at 45 & 60 DAS (N3) resulted in the highest gross monetary returns (GMR) and benefit-cost (B:C) ratio. While these treatments improved yield and profitability, their interaction did not significantly affect net monetary returns (NMR) or the B:C ratio. These findings highlight the importance of early sowing and timely nipping for optimizing pigeonpea productivity.

Reference

1. Anonymous. E-pulses data book. Indian Institute of Pulses Research ICAR; 2019.
2. Anonymous. Dietary guidelines for Indians. Indian Council of Medical Research; 2024.
3. Kumar Rajesh, Niwas Ram, Khichar ML, Leharwan M. Assessment of sowing time and cultivars on growth, development and yield parameters of pigeonpea. Legume Res. 2023;46(5):604-608. DOI: 10.18805/LR-4380.
4. Kolhe RR, Paralwar ND, Jiotode DJ, Khawale VS, Chavan TA, Samtutwar RI. Influence of nipping and growth retardants on yield and yield parameters and economics of pigeon pea. J Soil Crops. 2020;30(1):99-102.
5. Panda PK, Mohapatra PM, Bal SS, Mishra OP, Senapati N, Panigrahi RK, Prusti A.M. Effect of nipping and row spacing on crop growth and productivity of medium duration pigeonpea. Int J Curr Microbiol Appl Sci. 2020;9(8):1832-1837.
6. Pawar GR, Gokhale DN, Mirza I.A.B. Performance of different sowing dates and cropping systems on yield attributes and yield of pigeonpea (*Cajanus cajan* L.)

under rainfed condition. Int J Curr Microbiol Appl Sci. 2020;11:63-73. Available from: http://www.ijcmas.com

7. Pokhrel A, Manandhar S, Dangi SR. Effect of sowing date and variety on pigeonpea production in Nepal. Asian J Res Crop Sci. 2022;8(3):173-178. https://doi.org/10.9734/ajrcs/2023/v8i3177
8. Satale BM, Mirza I.A.B., Madagoudra YB. Effect of different sowing dates on the growth of pigeonpea (*Cajanus cajan* L. Millsp.) varieties. J Exp Agric Int. 2024;46(7):861-867. https://doi.org/10.9734/jeai/2024/v46i72639
9. Sharma S, Potdar MP, Pujari BT, Dharmaraj P.S. Studies on response of pigeon pea to canopy modification and plant geometry. Karnataka J Agric Sci. 2001;16(1):65-71.
10. Srinivasan G, Gobi R, Balasubramanian A, Sathiyamurthi S. Influence of nipping and nutrient management practices on growth, yield attributes and yield in pigeonpea. Plant Arch. 2019;19(1):737-740.
11. Teggelli RG, Zaheer AB, Yusufali N, Patil MC. Influence of nipping technology on growth, yield and economics of pigeonpea cultivated under rainfed situation. J Pharmacogn Phytochem. 2020;9(2):886-888.
12. Veeranna G, Pallavi CH, Mahesh N, Rao JM, Padmaja G, Fatima T, Reddy RR. Performance of pigeonpea under rain fed condition of Telangana through nipping technology. Int J Curr Microbiol Appl Sci. 2020;9(5):3489-3496.
13. Venkata Rao P, Subbarami Reddy A, Sateesh Babu J, Ramana MV. Effect of sowing time and supplemental irrigation on yield and economics of rabi pigeonpea (*Cajanus cajan* L. Millsp.). Int J Res Agric Sci. 2017;3(6):2348-3997.