Biological Forum – An International Journal **13(4): 796-799(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Performance of Nipping on Growth and yield of Pigeonpea (*Cajanus cajan* (L.) Millsp) under Rainfed Conditions of Karnataka

Vivek S. Devaranavadagi[1], Shubha S.[2] and Mallappa B.[3]*
[1]Scientist (Agril. Engg.), ICAR- Krishi Vigyana Kendra, VIjayapur, UAS Dharwad, (Karnataka), India.
[2]Senior Scientist and Head, ICAR- Krishi Vigyana Kendra, VIjayapur, UAS Dharwad, (Karnataka), India.
[3]Farm Manager, ICAR- Krishi Vigyana Kendra, VIjayapur, UAS Dharwad, (Karnataka), India.

(Corresponding author: Vivek S. Devaranavadagi)*
(Received 16 September 2021, Accepted 11 November, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A two-year field trial was conducted at Arakeri village, Vijayapur district in Vertisols during *Kharif* 2019-20 and 2020-21 to study the effect of nipping on pigeonpea under rainfed conditions of north Karnataka with the aim of finding profitable stage for nipping. Adopting nipping using solar operated tool and hand nipping increased the grain yield by 36.80, 13.61 per cent for 2019-20 and 36.14, 20.48 percent for 2020-21 respectively over farmer's practice. Significant reduction in plant height was seen in nipped plots than farmer's practice. The increase in grain yield indicates that nipping using solar operated tool could be effective treatment for pigeonpea in Vertisols. Higher gross and net returns with greater BC ratio was observed with nipping using solar operated tool followed by hand nipping technology.

Keywords: Solar operated nipping tool, Pigeonpea, Hand nipping, Rainfed areas, Vertisols.

INTRODUCTION

Pigeonpea is a crop for rainfed environments endowed with several features to thrive harsh climate. It is also known by its popular names, such as redgram and tur, and is India's second most significant pulse crop after chickpea. India maintains a virtual monopoly in the production of pigeonpea, accounting for 90% of global production. Pigeonpea is a protein-rich legume crop native to the semi-arid and subtropical regions, and it requires special attention due to lack of other pulses to meet domestic demand. Pigeonpea has the privilege of being the first legume planted in *kharif* in terms of both area and productivity. In comparison to other grain legumes such as beans, peas, and chickpeas, pigeonpea ranks sixth in terms of area and output in the world, but it is used in a wider range of ways. Pigeonpea is grown on 5.42 million hectares in India, with a yield of 4.02 million tones and a productivity of 909 kg per hectare. As a source of protein, pulses are an essential component of our daily diet.

Pulse crops also have the unique ability to form a symbiotic relationship with *Rhizobium* sp. and fix nitrogen from the atmosphere, enriching the soil. In recent years, pulse production has remained virtually unchanged at roughly 13-14 million tones. Pulses per capita availability has declined sharply in recent years as a result of rising population, falling to fewer than 40 grammes per day, compared to a normal requirement of 69 grams per day.

Nipping is a significant agronomic strategy that involves removing the apical bud, which helps to diminish apical dominance, increase the number of branches, % pod set, and achieve a better source sink relationship, all of which improves the plant's production. Rainfed agriculture is used to grow the majority of the crop. To maximise yield potential, its agronomic methods must be standardized. The primary elements controlling the yield are the optimal plant population and improvement in the reproductive sink/plant. Application of 125% recommended Dose of Fertilizer + Nipping + Micronutrient mixture recorded maximum plant growth, yield attributes, yield and economics in pigeonpea (Srinivasan *et al.,* 2019).

According to Reddy and Narayanan (1987), pinching a sesamum terminal bud stimulated latent lateral buds to create new branches, resulting in increased production. Nipping is a key agronomic procedure that aids in reducing apical dominance by eliminating the tendrils. These tendrils operate as a sink in the plant, altering photosynthetic transfer to reproductive organs. Nipping tendrils has been observed to enhance the number of branches, the percentage of pods set, and the source-sink relationship, all of which improve plant production (Sharma *et al.,* 2003). According to Aslam *et al.,* (2008), under water deficiency systems, the height and quantity of pod-bearing branches of chickpea rose at various levels. The formation of lateral branches is triggered when the plant's vertical growth, i.e., the apical bud, is slowed or stopped. Cotton, castor, field peas, chickpea, and chrysanthemum have their terminal buds cut to encourage new auxiliary branches. This field experiment attempts to determine the optimal stage of plant growth in terms of 55 DAS for pigeonpea nipping so that production can be maximized with minimal changes.

MATERIALS AND METHOD

A field demonstration was carried out during the rainy *(kharif)* season of 2019-20 and 2020-21 under northern dryzone of Karnataka at Arakeri village of Vijayapur district (situated at 16°39′N latitude, 75°27′E longitude and at an altitude of about 633 m above mean sea level). The demonstration was carried out with 3 treatments (T_1= Farmers practice, T_2= Hand nipping and T_3= Nipping using solar operated tool) and 10 replications under randomized complete block design in the farmer's field. The land was brought to optimum tilth by plowing twice with tractor drawn mould board plow. The soils of demonstration field for evaluating pigeonpea crop under different nipping practices in deep clay soil with pH 7.52, available organic carbon 0.37 per cent, available N, P and K were 246.8, 37.4 and 451.6 kg ha^{-1}, respectively. Land preparation started with medium tillage during second fortnight of April 2019 in all the ten selected farmer's fields.

Sowing of pigeonpea was taken up in two consecutive years on 26th June 2019 and 27th June 2020 at farmer's field. Seeds of pigeonpea variety (TS 3R) was sown in line using *pora* method (dropping the seeds in furrow behind the plough) of sowing and seed rate of pigeonpea was 10 kg ha^{-1} in all two cropping systems. Weeds were controlled through one hoeing at 20 days after sowing and one manual weeding. The recommended rate of N (25 kg ha^{-1}) and P_2O_5 (50 kg ha^{-1}) was applied at the time of sowing. Nipping (cutting of growing shoots 10 cm top) at 55 DAS was undertaken using solar operated nipping tool which consist of solar panel (12 V, 5 W) built on top of the helmet and a DC motor (12 V). Crop was harvested during 29th January 2019 and 5th February 2020 at physiological maturity. Five randomly selected plants from three sites in each treatment were harvested. Standard procedures were used to measure the growth attributes and yield parameters of pigeonpea. Variables were analyzed and least significance difference (LSD) test was carried out. Analyzed mean square errors using Web Based Agricultural Statistics software Package (WASP 2.0). Significance and non-significance difference between treatments was derived through procedure provided for a single LSD value (Gomez and Gomez 1984). Correlation studies among the yield components of pigeonpea was done using XLSTAT package.

RESULT AND DISCUSSION

A. Effect on plant height

Growth parameters like plant height and branches were significantly influenced by nipping stages. The plant height was significantly higher with control *i.e.*, plants without nipping compared to the nipping treatments. Nipping has direct impact on growth and branching of pigeonpea. Nipping using solar operated tool at 55 DAS followed by hand nipping produced significantly higher number of branches and reduced plant height. No. of branches per plant was significantly higher in plants nipped using solar operated tool at 55 days after sowing followed by hand nipping, while there is manual pinching it lead to increase in the lateral branches underneath it by reducing the apical dominance, leading to increase in the no. of branches at the time of nipping than control.

The plant height increased continuously up to harvest. Data presented in Table 1 revealed that plant height was significantly influenced due to different nippings. Farmer's practice recorded significantly maximum plant height (218.65 cm and 210.50 cm) as compared with nipping using solar operated tool (155.45 cm and 148.90) and hand nipping (142.44 cm and 135.80) for 2019 and 2020 respectively. Farmer's practice significantly increased the plant height by 40.65 and 53.50 per cent over the nipping using solar operated tool and hand nipping treatments. In pigeonpea, Sharma *et al.*, (2003) found that a reduction in plant height and an increase in the number of primary and secondary branches and pods per plant resulted in an increase in seed yield. Himayatullah *et al.*, (1989); Aurangzeb *et al.*, (1996) both came up with similar results (1996).

Table 1: Plant height (cm) of pigeonpea as influenced periodically by different treatments.

Treatments	Days after sowing						At harvest	
	45 DAS		90 DAS		135 DAS			
	2019	2020	2019	2020	2019	2020	2019	2020
Farmers practice (T_1)	43.50	45.65	92.40	96.45	165.80	174.35	210.50	218.65
Hand nipping (T_2)	44.82	46.20	62.80	60.55	105.90	100.42	135.80	142.44
Nipping using solar operated tool (T_3)	44.60	45.95	68.90	70.45	115.80	119.74	148.90	155.45
SEm ±	0.162	0.163	11.04	7.413	13.74	19.44	19.37	19.10
CD (0.05)	0.481	0.493	33.12	22.31	41.23	53.52	58.12	57.32

B. Effect on number of branches

Pigeonpea growth and development were monitored on a regular basis in order to determine crop growth parameters. The terminal outcome of growth was the vegetative and reproductive development of the crop, culminating in economic yield, which was influenced by the constant interaction formed between the environment and plant physiological processes. The maximum number of branches per plant was observed in nipping using solar operated tool treatment which is on-par with hand nipping treatment (Table 2). Nipping using solar operated tool treatment significantly increased the number of branches per plant by 31.50 and 32.81 per cent over the farmer's practice treatment for 2019 and 2020 respectively.

Nipping at 45 DAS resulted in considerably more branches per plant than nipping at 60 DAS or no nipping treatments. It's possible that this is due to the nipping of the terminal bud, which encouraged lateral branching and, as a result, increased the number of branches per plant. Sharma *et al.,* (2003) had similar findings.

Table 2: Number of branches plant^{-1} of pigeonpea as influenced periodically by different treatments.

Treatments	Days after sowing						At harvest	
	45 DAS		90 DAS		135 DAS			
	2019	2020	2019	2020	2019	2020	2019	2020
Farmers practice (T_1)	6.55	7.12	13.45	13.02	15.65	16.00	15.65	16.00
Hand nipping (T_2)	6.70	7.40	14.65	14.82	17.80	18.55	17.80	18.55
Nipping using solar operated tool (T_3)	6.85	7.55	16.12	16.00	20.58	21.25	20.58	21.25
SEm ±	0.076	0.053	0.543	0.773	0.951	1.041	1.373	1.265
CD (0.05)	0.234	0.165	1.621	2.324	2.857	3.125	4.124	3.780

C. Effect on yield and economics

In present investigation, perusal of data presented in (Table 3) revealed that among the different nipping treatments the highest yield was registered in nipping using solar operated tool treatment 11.15 q/ha (2019) and 11.30 q/ha (2020) which is on-par with hand nipping treatment 9.26 q/ha (2019) and 10.00 q/ha (2020) respectively (Table 3). Hand nipping increased the yield by 13.64 per cent (2019) and 20.48 per cent (2020) over the farmer's practice treatment. Whereas nipping using solar operated tool produced the yield increase by 36.80 per cent (2019) and 36.14 per cent (2020) over the farmer's practice treatment.

We found higher gross returns of Rs. 65380 ha^{-1} (2019) and Rs. 67105 ha^{-1} (2020) with more net returns of Rs. 40580 ha^{-1} (2019) and Rs. 42895 ha^{-1} (2020) was observed in nipping using solar operated tool treatment which is on-par with hand nipping treatment. Nipping using solar operated tool increased the gross returns, net returns and BC ratio by 25.47, 44.74 and 34.80 per cent for 2019 and 26.48, 47.34 and 42.57 per cent for 2020 over farmer's practice respectively (Table 3). Dhaka *et al.*, (2020), reported that nipping of apical bud at start of branching is economically viable agronomical practice to enhance seed yield of pigeonpea due to significant improvement in primary and secondary branches. Apical bud pinching leads to production of side shoots or branches thus increased canopy size and photosynthetic activity and accumulation of more photosynthates resulting in increased seed size and yield (Lakshmi *et al.*, 2015; Vasudevan *et al.*, 2008).

Table 3: Yield and economics of pigeonpea as influenced periodically by different treatments.

Treatments	Yield (Q ha^{-1})		Gross return (Rs ha^{-1})		Net return (Rs ha^{-1})		B:C ratio	
	2019	2020	2019	2020	2019	2020	2019	2020
Farmers practice (T_1)	8.15	8.30	52105	53055	28035	29112	2.04	2.02
Hand nipping (T_2)	9.26	10.00	59555	61045	32055	31022	2.42	2.55
Nipping using solar operated tool (T_3)	11.15	11.30	65380	67105	40580	42895	2.75	2.88
SEm ±	0.716	0.616	2375	2716	3434	4034.6	0.173	0.215
CD (0.05)	2.152	1.854	7125	8150	10302	12104	0.524	0.632

CONCLUSION

In conclusion, under rainfed conditions of northern Karnataka nipping was found significant in enhancing the productivity of pigeonpea. Nipping using solar operated tool at 55 DAS was found to be profitable. Nipping using solar operated tool gave best results as compared to hand nipping. As nipping plays significant role in nodulation and branching, nipped demonstration plots gave superior results over farmer's practice.

Acknowdgement. I would like to express my heartiest gratitude and indebtedness to the ATARI, Bengaluru for financial assistance provided to conduct the demonstrations and also to the host organization University of Agricultural Sciences, Dharwad.

Conflict of Interest. None.

REFERENCES

Aurangzeb, M., Naeem, U. R., and Ikramullah, A. (1996). Causes of low gram productivity in rainfed areas. *Journal of rural development admin*, *28*: 91-98.

Aslam, M., Khalil, A. H., Himayatullah, K., Ayaz, M., Ejaz, M., and Arshad, M. (2008). Effect of available soil moisture depletion levels and topping treatments on growth rate and total dry biomass in chickpea. *Journal of Agricultural Research*, *46*(3): 229-243.

Dhaka, A. K., Kumar, S., Singh, B., Singh, K., Kumar, A., & Kumar, N. (2020). Nitrogen use efficiency, economic return and yield performance of Pigeonpea [*Cajanus cajan* (L.) Millsp.] as influenced by nipping and fertility levels. *Legume Research-An International Journal*, *43*(1), 105-110.

Himayatullah, Parveen, S., and Muneer Ahmed (1989). Factors related to low chickpea productivity in rainfed Bannu: results from farm level survey. *Sharhad Journal of Agriculture*, *5*: 29-32.

Lakshmi, J., Gowda, R., Parashivamurthy, Narayanaswamy, S., and Shivanandan, V. N. (2015). Influence of pre-flowering pinching and Maleic hydrazide spray on plant growth, seed yield and quality attributes in fenugreek. *Legume Research*, *38*(3): 353–357.

Reddy, K. B., and Narayanan, A. (1987). Dry matter production and nutrient uptake in sesame (*sesamum indicum*) genotypes. *Sesamum and Saflower news letter*, pp.35.

Sharma, A., Potdar, M. P., Pujari, B. T., & Dharmaraj, P. S. (2003). Studies on response of pigeonpea to canopy modification and plant geometry. *Karnataka Journal of Agricultural Sciences*, *16*(1): 1-3.

Srinivasan, G., Gobi, R., Balasubramanian, A., and Sathiyamurthy, S. (2019). Influence of nipping and nutrient management practices on growth, yield attributes and yield in pigeonpea. *Plant Archives*, 19(1): pp. 737-740.

Vasudevan, S. N., Sudarshan, J. S., Kurdikeri, M. B. and Dharmatti, P.R. (2008). Influence of pinching of apical bud and chemical sprays on seed yield and quality of fenugreek. *Karnataka Journal of Agricultural Sciences*, *21*(1): 26–29.

How to cite this article: Devaranavadagi, V.S.; Shubha, S. and Mallappa, B. (2021). Performance of Nipping on Growth and yield of Pigeonpea (*Cajanus cajan* (L.) Millsp) under Rainfed conditions of Karnataka. *Biological Forum – An International Journal*, *13*(4): 796-799.