

EFFECT OF NITROGEN LEVELS ON GROWTH PERFORMANCE OF CARDAMOM (*Elettaria cardamomum* M.) CV. MUDIGERE-1

Abstract

The present experiment entitled “Effect of nitrogen levels on growth performance of cardamom (*Elettaria cardamomum* M.) cv. Mudigere-1” was carried out during the year 2023-24 at the Nursery No. 4, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India. The seven treatments replicated thrice comprising of various nitrogen levels (75, 100, 125, 150, 175 and 200 kg/ha/year) with constant level of phosphorus (75 kg/ha/year) and potassium (200 kg/ha/year) and RDF of Kerala Agriculture University as control were tested under Randomized Block Design. The result obtained from the present experiment revealed that different nitrogen levels along with the constant phosphorus and potassium levels significantly affected the growth attributes of cardamom plants. At the end of the experiment (360 days after fertilizer application), the growth attributes *viz.*, plant height (222.92 cm), plant spread (NS- 231.43 cm and EW- 215.44 cm), number of tillers (36.33) and number of leaves per tiller (16.00) were obtained maximum in treatment T₅ (N: P₂O₅:K₂O @ 150:75:200 kg/ha/year).

Keywords: cardamom, fertilizer, nitrogen, growth

1. Introduction

Cardamom is the dried capsule obtained from herbaceous perennial plant *Elettaria cardamomum* M. called as lesser cardamom or Chhota elaichi. The spices which entered the spice market of the West, cardamom is the one of them. Cardamom is popularly known as ‘Queen of spices’. Cardamom principally is a sciophyte, means it requires lot of shade tree leaf litter that shed is helpful in enriching the soil atmosphere, still fertilizer application plays an important role. Inadequate application of manures or fertilizers is one of the reasons behind low yield in cardamom. Since cardamom is a surface feeder deep placement of fertilizer is not advisable.

In cardamom plants, nitrogen is involved in the protein synthesis mechanism. It is also important for production of new tillers, vegetative growth of young tillers. Nitrogen is responsible for the luxuriant green colour development of the capsule. General paling, chlorosis of new leaf, young tillers, poor green colour of capsules are the symptoms of nitrogen

deficiency results into necrosis starting at the tips of older leaves. 'N' availability can be influenced by the soil pH [8]. To enhance the nutrient use efficiency of acidic cardamom soils ammonical forms of nitrogen sources are the best. Inadequate supply of nutrients, leaching losses of nutrients resulted in low yields of cardamom. Hence fertilizer application is become a standard practice for cardamom cultivation. As we know climatic conditions of Konkan region are suitable for cardamom cultivation. But there is no standard recommended dose of fertilizer for cardamom plants in this region. Fertilizers play crucial role in crop production by supplying essential elements responsible for various metabolic processes. So, keeping this view present investigation was undertaken.

2. Material and Methods

An experiment was conducted at Plot No. 14, Nursery No. 4, College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India during the year 2023-24. The experiment was comprised of seven treatments replicated thrice and laid out in Randomized Block Design (RBD). The cardamom plantation was 2-year-old hence the 50 % of dose was applied in 2nd year of planting. Inorganic fertilizers were applied in the form of Urea, Single Super Phosphate and Muriate of Potash. Fertilizers were applied in two split doses by ring method. For assessing the growth performance of cardamom and effect of nitrogen on the growth performance of cardamom; all plants were selected for recording growth attributing characters. The observations were recorded throughout the growth period of plants up to 360 days at 60 days interval. The data were statistically analysed by method suggested by Panse and Sukhatme [6]. The treatment details are given below:

Treatments	Fertilizer Dose
T ₁	: N: P ₂ O ₅ : K ₂ O @ 75:75:150 kg/ha/year (KAU RDF)-Control
T ₂	: N: P ₂ O ₅ : K ₂ O @ 75:75:200 kg/ha/year
T ₃	: N: P ₂ O ₅ : K ₂ O @ 100:75:200 kg/ha/year
T ₄	: N: P ₂ O ₅ : K ₂ O @ 125:75:200 kg/ha/year
T ₅	: N: P ₂ O ₅ : K ₂ O @ 150:75:200 kg/ha/year
T ₆	: N: P ₂ O ₅ : K ₂ O @ 175:75:200 kg/ha/year
T ₇	: N: P ₂ O ₅ : K ₂ O @ 200:75:200 kg/ha/year

3. Result and Discussion

3.1 Plant height

According to the results of present investigation, the height of plant was significantly influenced by different nitrogen levels. In present study application of nitrogen up to 150 kg/ha with constant P₂O₅ and K₂O recorded the maximum plant height over other treatments. The highest plant height (222.92 cm) was recorded in treatment T₅ (N: P₂O₅:K₂O @ 150:75:200 kg/ha/year) and it was significantly superior over rest of the treatments including control. The minimum plant height (155.45 cm) was found in control treatment T₁ (N: P₂O₅:K₂O @ 75:75:150 kg/ha/year). This might be due to increased availability of nitrogen up to optimum level to the plants. Plants tend to grow taller to capture more of sunlight. Similar results were

obtained by Korikanthimath et al. [2], Chidambara [1] in cardamom and Leua et al. [3] in turmeric. Further, it was noticed that the higher level of nitrogen (175 and 200 kg N/ha) did not produce maximum height over 150 kg N/ha. This showed that increased dose of nitrogen beyond certain level does not respond well to plant growth because plant absorb the N up to optimum level required for their growth and development.

3.2 Plant spread (NS) and (EW)

In present study, significantly the maximum NS and EW plant spread was recorded with application of nitrogen up to 150 kg/ha with constant P₂O₅ and K₂O. Nautiyal [5] recorded the maximum plant spread with 150 kg N/ha in turmeric. Similar findings were reported by Shahi et al. [10] in brinjal with 150 kg N/ha, Rajan et al. [7] in chrysanthemum and Mahantesh et al. [4] in Japanese mint.

3.3 Number of tillers per plant

The maximum number of tillers per plant (36.33) was recorded in T₅ (N: P₂O₅:K₂O @ 150:75:200 kg/ha/year) which was significantly superior over rest of treatments including control. The minimum number of tillers (13.83) obtained in control treatment. This might be due to nitrogen supply increases the number of meristematic cells and their growth leads to formation of tillers. In case of spice crops, more the number of tillers, more will be the reproductive growth. Similar results were observed by Shinde et al. [11] in turmeric, Chidambara [1] in cardamom and Seyie et al. [9] in ginger.

3.4 Number of leaves per tiller

In present experiment, the maximum number of leaves per tiller (16.00) were obtained with application of nitrogen up to 150 kg/ha with constant P₂O₅ and K₂O in treatment T₅ (N: P₂O₅:K₂O @ 150:75:200 kg/ha/year) which was followed by T₄ - N: P₂O₅:K₂O @ 125:75:200 kg/ha/year (14.50). Nitrogen directly or indirectly responsible for enlargement and division of new cells and production of new tissues which in turn resulted in increase in growth in terms of number of leaves per tiller. The increased number of leaves would synthesize more carbohydrates and act as a substrate for the growth and development of rhizomes. Results are in accordance with Korikanthimath et al. [2] in cardamom, Leua et al. [3] and Shinde et al. [11] in turmeric.

Table 5: Effect of nitrogen levels on number of leaves per tiller of cardamom

Treatments	Number of leaves per tiller					
	Days after fertilizer application					
	60	120	180	240	300	360
T ₁ : N: P ₂ O ₅ :K ₂ O @ 75:75:150 kg/ha/year (Control)	7.00	8.83	10.50	11.17	12.00	13.00
T ₂ : N: P ₂ O ₅ :K ₂ O @ 75:75:200 kg/ha/year	7.17	9.17	10.17	11.33	12.17	13.17
T ₃ : N: P ₂ O ₅ :K ₂ O @ 100:75:200 kg/ha/year	8.17	10.17	11.33	12.17	13.17	14.17
T ₄ : N: P ₂ O ₅ :K ₂ O @ 125:75:200 kg/ha/year	9.83	10.83	11.83	12.67	13.50	14.50
T ₅ : N: P ₂ O ₅ :K ₂ O @ 150:75:200 kg/ha/year	10.83	12.17	13.50	14.33	15.17	16.00
T ₆ : N: P ₂ O ₅ :K ₂ O @ 175:75:200 kg/ha/year	8.33	10.00	11.17	12.17	13.33	14.33
T ₇ : N: P ₂ O ₅ :K ₂ O @ 200:75:200 kg/ha/year	7.00	9.17	10.67	11.33	12.33	13.33
Mean	8.33	10.05	11.31	12.17	13.10	14.07
S. Em (±)	0.24	0.44	0.51	0.61	0.62	0.55
CD @5%	0.73	1.36	1.58	1.89	1.90	1.68
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.

4. Conclusion

According to the results of present investigation, application of N: P₂O₅:K₂O @ 150:75:200 kg/ha/year (T₅) recorded highest values for plant height (222.92 cm), plant spread (NS- 231.43 cm and EW- 215.44 cm), number of tillers per plant (36.33) and number of leaves per tiller (16.00). Hence, it can be concluded that application of 150:75:200 kg/ha/year N: P₂O₅: K₂O is suggested for overall growth performance of cardamom. However, the experiment conducted first time in this region, it will be worthwhile to explore these possibilities again for 2-3 years to arrive at specific recommendation.

Disclaimer (Artificial Intelligence)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOYT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

References

1. Chidambara, K. P. (1989). Effect of different levels of shade and nitrogen, phosphorus and potassium on growth of cardamom (*Elettaria cardamomum* Maton.) at primary nursery stage. M. Sc. (Hort.) Thesis submitted to the University of Agricultural Sciences, Bangalore.
2. Korikanthimath, V. S., Hegde, R., Mulge, R. and Hosmani, M. M. (1998). Growth and yield parameters of cardamom (*Elettaria cardamomum* Maton) as influenced by nutrition and planting density. *J. Spices and Aromatic Crops*, **7**(1): 39-42.
3. Leua, H. N., Patel, M. M., Satodia, B. N., Parmar, R. S. and Patel, B. J. (2012). Effect of different levels of nitrogen and phosphorus on growth and yield of turmeric (*Curcuma longa* L.) cv. Kesar under north Gujarat condition. *The Asian J. Horticulture*, **7**(1): 98-100.
4. Mahantesh, P. S., Gangadharappa, P. M., Hiremath, J. S., Shivakumar, K. M., Ravi, Y. and Bhat, D. S. (2018). Influence of row spacing and nitrogen levels on growth rate and nitrogen uptake in japanese mint (*Mentha arvensis* L.). *International J. Current Microbiology Applied Science*, **7**(6): 1297-1302.
5. Nautiyal, Nikki. (2015). Effect of nitrogen levels and plant spacing on growth and yield of turmeric (*Curcuma longa* L.). M. Sc. (Hort.) Thesis submitted to the VCSG Uttarakhand University of Horticulture and Forestry, Bharsar-246 123 (Pauri Garhwal), Uttarakhand, India.
6. Panse, V. G. and Sukhatme, P. V. (1995). *Statistical Methods for Agriculture Workers*. ICAR, New Delhi.
7. Rajan Kitty, Bhatt Dipal, S., Chawla, S. L., Bhatt, S. T. and Sangeetha Priya, S. (2019). Effect of nitrogen and phosphorus on growth, flowering and yield of cut chrysanthemum cv. Thai Chen Queen. *Current Agriculture Research J.*, **7**(3): 337-342.
8. Ranganathan, V. and Natesan, S. (1985). Cardamom soils and manuring. *Planters Chronicle*, **80**(7): 233-236.
9. Seyie, A., Naruka, I. S., Singh, P. P. and Kushwah, S.S. (2013). Nutrient management and its effect on growth, yield and quality of ginger cultivars. *Indian J. Horticulture*, **70**(1): 65-70.
10. Shahi, R., Yadav, A., Shekhar, C. and Kumar, S. (2021). Effect of different doses of nitrogen on growth and yield of brinjal (*Solanum melongena* L.) cv. Pusa purple long Kanpur, India. *The Pharma Innovation J.*, **10**(9): 1228-1230.
11. Shinde, V. V., Gavade, R. T., Dubale, J. J. and Chavan, S. S. (2016). Influence of fertilizer management to turmeric (*Curcuma longa* L.) cv. Salem under Konkan condition. *International J. Current Research*, **8**(2): 26548-26550.