



ISSN (E): 2277-7695

ISSN (P): 2349-8242

NAAS Rating: 5.23

TPI 2023; 12(12): 316-319

© 2023 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 02-09-2023

Accepted: 12-11-2023

**AP Kharde**

M.Sc. Scholar, Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

**RC Gajbhiye**

Professor (CAS), Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

**RG Khandekar**

Associate Dean, College of Horticulture, Mulde, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

**SS More**

Assistant Professor, Department of Soil Science and Agricultural Chemistry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

**KV Malshe**

Agronomist, Regional Coconut Research Station, Bhatye, Ratnagiri, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

**Corresponding Author:**

**AP Kharde**

M.Sc. Scholar, Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India.

## Growth performance of cardamom (*Elettaria cardamomum* M.) cv. Mudigere-1 to varying levels of potassium

AP Kharde, RC Gajbhiye, RG Khandekar, SS More and KV Malshe

### Abstract

The present investigation entitled “Effect of potassium levels on growth performance of cardamom (*Elettaria cardamomum* M.) cv. Mudigere-1” was carried out during the year 2022-23 at College of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri. The seven treatments consisting of constant Nitrogen level (75 kg/ha/year), Phosphorous level (75 kg/ha/year) and changing Potassium levels from 100, 125, 150, 175, 200, 225 and 250 kg/ha/year with control as RDF of Kerala Agricultural University. Among the different treatments tried, the highest plant height (266.50 cm), number of tillers (17), total number of leaves (111.67) and stem diameter (31.27 mm) were recorded at 360 days after fertilizer application with application of treatment T<sub>5</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year).

**Keywords:** Cardamom, fertilizer, potassium, N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, Mudigere-1

### 1. Introduction

Cardamom (*Elettaria cardamomum* M.) popularly known as the “Queen of Spices”, belonging to family Zingiberaceae native to the Western Ghats of India and one of the most valuable spice crops. Among the several factors responsible for low yield in cardamom, inadequate application of manures or fertilizers and dry spells are the major ones. The crop growing soil has several drawbacks such as leaching of applied nutrients due to heavy rainfall, high P fixation, low nutrient and water holding capacity of the soil renders very low nutrient use efficiency. Cardamom principally is a Sciophytes, requiring lot of shade tree leaf litter that shed is helpful in enriching the soil atmosphere, still fertilizer application plays a decisive role in the maintenance of resilience in production. Mostly the cardamom cultivation in Maharashtra is confined to the Konkan region.

Potassium is a key element necessary for the growth and development mechanism of cardamom plant. K may reduce susceptibility to disease and it improves the quality of fruits and other storage organs like swollen roots and tubers. A balanced N to K ratio is particularly important in plant nutrition, as K tends to reduce the adverse effects of excessive N. Potassium is very mobile within the plant and deficiency symptoms consequently appear first in older tissue, as K is translocated to the newer tissue where it is most needed. Generally, the soils selected for cardamom are mostly low to very low content in soil available potassium. Potassium is important for enhancing the size and quality of capsule, in terms of seed weight and essential oil content and cardamom plant has high requirement of potassium. Further, there is no standard recommended dose for cardamom. So, keeping with this view the present study has been planned with objective to study the effect of potassium levels on growth performance of cardamom.

### 2. Material and Methods

The field trial was conducted at Nursery No. 4, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during the year 2022-23. The experiment was laid out in Randomized Block Design (RBD) with seven treatments replicated thrice. The treatments details are given in Table I. The data were statistically analyzed by method suggested by Panse and Sukhatme (1995) [8].

Table I Treatment details for the field experiment

Treatment	Fertilizer Dose
T <sub>1</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:100 kg/ha/year
T <sub>2</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:125 kg/ha/year
T <sub>3</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:150 kg/ha/year (KAU RDF)- Control
T <sub>4</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:175 kg/ha/year
T <sub>5</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:200 kg/ha/year
T <sub>6</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:225 kg/ha/year
T <sub>7</sub>	N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:250 kg/ha/year

## Results and Discussion

### Height of plant (cm)

In present study, the maximum plant height (266.50 cm) was

recorded significantly highest in treatment T<sub>5</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year) and minimum (230.57 cm) in treatment T<sub>1</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:100 kg/ha/year). It may be due to uptake of nitrogen along with potassium fertilizers from the soil and further it is distributed to the different growing parts of the plants. An increasing trend of growth was observed for the constant N, P levels and changing K levels up to 200 kg K/ha, the response of nutrients after this level was found decreasing and the height was recorded less. The results are in accordance with Korikanthimath *et al.* (1998) [6] in cardamom, Rethinavel (1983) [9] in turmeric, Balashanmugam and Subramanian (1991) [4] in turmeric and Thimmarayappa *et al.* (2000) [11] in cardamom.

Table 1: Effect of potassium levels on height of cardamom (cm)

Treatments	Height of plant (cm)					
	Days after fertilizer application					
	60	120	180	240	300	360
T <sub>1</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:100 kg/ha/year	59.20	101.23	136.10	185.93	202.07	230.57
T <sub>2</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:125 kg/ha/year	67.37	111.13	147.10	191.10	210.27	239.63
T <sub>3</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:150 kg/ha/year (KAU RDF)- Control	77.10	120.33	158.83	204.13	223.17	249.83
T <sub>4</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:175 kg/ha/year	85.17	131.83	176.97	213.50	233.13	258.47
T <sub>5</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:200 kg/ha/year	90.50	140.80	187.20	219.17	236.83	266.50
T <sub>6</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:225 kg/ha/year	84.80	127.93	165.63	210.80	232.87	255.53
T <sub>7</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:250 kg/ha/year	80.23	123.60	159.90	206.93	227.67	252.50
Mean	77.77	122.41	161.68	204.51	223.71	250.43
S.Em (±)	1.08	0.95	1.21	1.23	0.64	0.90
CD at 5%	3.32	2.92	3.73	3.79	1.98	2.79
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.

### Number of tillers

The highest number of tillers (17) were recorded in treatment T<sub>5</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year). The lowest number of tillers (8.50) were found in treatment T<sub>1</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:100 kg/ha/year). The readily available nutrients in soil helped the crop to perform well in inorganic

fertilized treatments for enhancing the crop growth and development. The present findings are in accordance with results reported by Shanthaveerabhadraiah *et al.* (1997) in cardamom, Rethinavel (1983) [9] in turmeric, Balashanmugam and Subramanian (1991) [4] in turmeric, Korikanthimath *et al.* (1998) [6] in cardamom.

Table 2: Effect of potassium levels on number of tillers of cardamom

Treatments	Number of tillers					
	Days after fertilizer application					
	60	120	180	240	300	360
T <sub>1</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:100 kg/ha/year	3.00	4.17	5.50	8.00	8.17	8.50
T <sub>2</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:125 kg/ha/year	3.33	4.67	6.50	8.17	8.33	8.67
T <sub>3</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:150 kg/ha/year (KAU RDF)-Control	4.17	5.33	7.00	9.00	9.50	9.83
T <sub>4</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:175 kg/ha/year	5.33	7.83	10.33	11.00	13.00	14.00
T <sub>5</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:200 kg/ha/year	5.83	8.67	12.83	15.33	15.50	17.00
T <sub>6</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:225 kg/ha/year	5.17	7.67	9.17	10.00	12.33	12.00
T <sub>7</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:250 kg/ha/year	4.50	6.67	8.17	9.17	10.83	10.50
Mean	4.48	6.43	8.50	10.10	11.10	11.50
S.Em (±)	0.65	0.34	0.50	1.05	0.46	0.37
CD at 5%	-	1.04	1.55	3.24	1.41	1.14
'F' test	NS	Sig.	Sig.	Sig.	Sig.	Sig.

**Total number of leaves:** The highest total number of leaves (111.67) were found in the treatment T<sub>5</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year). The lowest total number of leaves (38.00) were found in the treatment T<sub>1</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:100 kg/ha/year). The beneficial influence of applied N and K on total number of leaves may be due to increased

translocation of more photosynthates towards the sink as a result of increased availability of N and K nutrients for the actively growing plants (Haque *et al.*, 2007; Ahirwar *et al.*, 2010 and Pandey *et al.*, 2012) [5, 1, 7]. Similar outcomes were reported by Korikanthimath *et al.* (1998) [6], Venkatesh *et al.* (1995) [12] in cardamom.

**Table 3:** Effect of potassium levels on total number of leaves of cardamom

Treatments	Total number of leaves					
	Days after fertilizer application					
	60	120	180	240	300	360
T <sub>1</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:100 kg/ha/year	19.33	24.83	30.33	34.33	36.17	38.00
T <sub>2</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:125 kg/ha/year	21.17	29.00	36.17	41.17	46.00	49.33
T <sub>3</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:150 kg/ha/year (KAU RDF)- Control	25.33	36.00	45.00	51.17	57.33	62.17
T <sub>4</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:175 kg/ha/year	34.67	54.67	69.17	80.33	84.67	92.67
T <sub>5</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:200 kg/ha/year	40.67	64.00	82.33	95.67	104.33	111.67
T <sub>6</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:225 kg/ha/year	30.67	47.00	58.83	68.33	74.67	79.17
T <sub>7</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:250 kg/ha/year	27.00	41.17	50.33	59.50	64.67	69.17
Mean	28.40	42.38	53.17	61.50	66.83	71.74
S.Em (±)	1.17	1.18	0.60	0.69	0.70	0.79
CD at 5%	3.59	3.62	1.86	2.13	2.16	2.43
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.

**Stem diameter (mm)**

At 360 days after fertilizer application, there was a significant difference among all the treatments and the maximum stem diameter (31.27 mm) was recorded in the treatment T<sub>5</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year). The minimum stem diameter (23.27 mm) was found in the treatment T<sub>1</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:100 kg/ha/year). An increasing trend of stem diameter was observed for the constant N, P levels and

increasing K levels up to 200 kg K/ha, the response of nutrients after this level was decreasing and the stem diameter was gradually reduced. This may be due to uptake of dose of nutrients up to their maximum level and thereafter the uptake was found less resulted in the reduction of growth in terms of stem diameter (mm). Similar results were observed by Bahadur *et al.* (2000)<sup>[3]</sup> in turmeric. Badgujar *et al.* (2004)<sup>[2]</sup> in cv. Grand Naine.

**Table 4:** Effect of potassium levels on stem diameter (mm) of cardamom

Treatments	Stem diameter (mm)					
	Days after fertilizer application					
	60	120	180	240	300	360
T <sub>1</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:100 kg/ha/year	8.61	12.67	16.70	20.65	22.07	23.27
T <sub>2</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:125 kg/ha/year	8.86	13.09	18.04	21.18	22.56	24.53
T <sub>3</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:150 kg/ha/year (KAU RDF)- Control	9.18	14.44	18.70	21.54	23.03	25.65
T <sub>4</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:175 kg/ha/year	11.11	16.84	20.04	23.05	26.09	28.44
T <sub>5</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:200 kg/ha/year	12.67	18.12	22.07	26.02	28.16	31.27
T <sub>6</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:225 kg/ha/year	10.65	15.56	19.99	22.85	24.00	27.37
T <sub>7</sub> : N: P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O @ 75:75:250 kg/ha/year	9.72	14.85	19.40	22.08	23.51	26.94
Mean	10.11	15.08	19.28	22.48	24.20	26.78
S.Em (±)	0.63	1.20	0.42	0.63	0.55	0.59
CD at 5%	1.95	-	1.29	1.93	1.69	1.83
'F' test	Sig.	NS	Sig.	Sig.	Sig.	Sig.

**Conclusion**

Among different treatments, application of N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year (T<sub>5</sub>) recorded the maximum plant height, number of tillers, total number of leaves and stem diameter. Thus, on the basis of results revealed from above investigation, it can be concluded that treatment, T<sub>5</sub> (N: P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O @ 75:75:200 kg/ha/year) gives best results for better growth performance of cardamom. However, since the experiment was conducted for the first time, it will be worthwhile to explore this possibility again for 2-3 years to arrive at specific conclusion.

**References**

- Ahirwar K, Singh J, Kumar MM. Effect on nitrogen and potassium on growth and yield of turmeric. *Annals of Plant and Soil Research*. 2010;12(1):71-72.
- Badgujar C, Dusane SM, Desmukh S. Influence of plant spacing on growth, maturity and yield of Grand Naine banana, *South Indian Horticulture*. 2004;52(1-6):13-17.
- Bahadur MM, Azad AKM, Hakim MA, Hossain SMM, Sikder SP. Effect of different spacing and potassium levels on the growth and yield of turmeric var. Sinduri. *Pak. J Biol. Sci*. 2000;3(4):593-595.
- Balashanmugam PV, Subramanian KS. Effect of split application of potassium on turmeric. *South Indian Horticulture*. 1991;39(3):139-142.
- Haque MM, Rahman AK, Ahmed MM, Masud MM, Sarker MMR. Effect of nitrogen and potassium on the yield and quality of turmeric in hill slope. *Int. J Sustain. Crop Prod*. 2007;2(6):10-14.
- Korikanthimath VS, Hegde R, Hosmani MM. Effect of NPK nutrients on growth and tiller production in cardamom. *Karnataka J Agric. Sci*. 1998;11(3):747-750.
- Pandey G, Pandey R, Ahirwar K, Namdeo KN. Effect of organic and inorganic sources of nutrients on growth and yield of turmeric (*Curcuma longa* L.). *Crop Research*. 2012;44(1&2):246-249.
- Panase VG, Sukhatme PV. *Statistical Methods for Agriculture Workers*. ICAR, New Delhi, 1995.
- Rethinavel M. Effect of Potash application and time of harvest on growth, yield and quality of turmeric. M.Sc (Ag) Thesis. TNAU, Coimbatore, 1983.
- Shanthaveerabhadraiah SM, Chandrappa HM, Jagannath B. Response of cardamom (*Elettaria cardamomum* Maton.) to NPK under uniform shade. *J Spices and Aromatic crops*. 1997;6(2):115-118.

11. Thimmarayappa M, Shivashankar KT, Shanthaveerabhadraiah SM. Effect of organic manure and inorganic fertilizers on growth, yield attributes and yield of cardamom (*Elettaria cardamomum* Maton). J Spices and Aromatic Crops. 2000;9(1):57-59.
12. Venkatesh J, Pattanshetti HV, Khan MM. Indian cocoa, Arecanut and Spices J. 1995. p. 5-7.