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Effect of organic manure and inorganic fertilizers on growth, yield attributes and yield of cardamom (*Elettaria cardamomum* Maton)

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Abstract

Experiments conducted at Mudigere (Karnataka, India) to study the effect of organic manure and inorganic fertilizers alone and in combination in cardamom (*Elettaria cardamomum*) indicated that application of 100% inorganic fertilizers increased the number of bearing suckers. Application of 100% inorganic fertilizers resulted in highest panicle production per clump (23.15) and green capsule yield (707 kg/ha). Though 100% inorganic fertilizers gave maximum yield which gave a higher benefit cost ratio of 4.19, integrated nutrient management with 25% organic manure + 75% inorganic fertilizers and 50% organic manure + 50% inorganic fertilizers also recorded yields at par with this treatment (609 and 602 kg/ha, respectively) with benefit cost ratios of 3.22 and 3.04, respectively.

Key words: cardamom, *Elettaria cardamomum*, inorganic fertilizers, organic manure, yield.

Abbreviations: IF : Inorganic fertilizer; OM : Organic manure

In India, the average yield of cardamom (*Elettaria cardamomum* Maton) in Karnataka is low (62 kg/ha) compared to Kerala (145 kg/ha) and Tamil Nadu (170 kg/ha) (Spices Board 1996). There are many factors responsible for the low yield in cardamom, among which inadequate application of manures either in the organic or inorganic form is important. To meet the nutrient requirements of cardamom, it is necessary to integrate both organic and inorganic fertilizers to obtain higher yields and also to maintain soil health and fertility. Application of 3–4 t of well rotten cattle or sheep manure apart from 30 kg each of N, P_2O_5 and 40 kg K_2O/acre greatly enhanced the yields in cardamom (Shanmugavelu & Rao 1977).

An experiment was conducted at the Regional Research Station, Mudigere (Karnataka, India) during May 1997 to January 1998 to study the effect of organic and inorganic fertilizers on yield of cardamom. The soils in the experimental site were red loamy with a pH of 5.1. The treatments included 100% OM ; 75% OM + 25% IF; 50% OM + 50% IF; 25% OM + 75% IF; 100% IF and control (without OM and IF)

The quantity of OM (farm yard manure) to be applied to each plot was calculated based on the nitrogen content in FYM (organic carbon 0.6%). Similarly, the quantity of nitrogen, phosphorus and potash required for each treatment was calculated based on the recommended package of practices for the crop (75:75:150 NPK kg/ha) (UAS 1997). Accordingly, quantities of IF for 100%, 75%, 50% and 25% NPK were calculated. The treatments were imposed on existing 3 year old cardamom plants (var. Mudigere-1) in a randomised block design with four replications. In each plot there were 12 plants with a spacing of 1.8 m x 1.8 m. The OM and IF were applied in two equal splits durig June and September. Observations on growth and yield parameters and yield of cardamom were recorded.

Growth parameters

The number of bearing suckers per clump was significantly higher where 100% IF was supplied (9.96) followed by 75% OM + 25% IF (9.08) when compared to 100% OM (7.47) and control (6.49). The increase in number of suckers in plants supplied with only IF and in combination with

Table 1. Effect of organic manure and inorganic fertilizers on growth of cardamom

Treatment	Growth parameter			
	No. of bearing suckers	Plant height (cm)	Leaf area/clump (cm^2)	Leaf area index
T_1 - 100% OM	7.47	214.00	35689.00	1.10
T_2 - 75% OM + 25% IF	9.08	225.75	36255.50	1.11
T_3 - 50% OM + 50% IF	8.29	225.00	40732.75	1.25
T_4 - 25% OM + 75% IF	8.41	214.75	39884.00	1.23
T_5 - 100% IF	9.96	212.00	51233.00	1.58
T_6 - Control	6.49	230.25	28757.50	0.88
SE±m	0.59	8.12	7933.00	-
CD (P<0.05)	1.78	NS	NS	-
CV%	14.26	7.37	40.94	-

OM = Organic manure; IF = Inorganic fertilizers
NS = Not significant

OM may be attributed to release of adequate quantity of nutrients at appropriate times for better production of suckers compared to plants supplied only with organic manure (ICAR 1963; Mahalkal & Gupta 1973; Sharma & Roy 1973). However, other growth parameters like plant height, leaf area and leaf area index did not vary much between treatments (Table 1).

Yield parameters and yield

Application of IF alone or in combination with OM significantly influenced production of panicles per clump (Table 2). Application of 100% IF resulted in significantly higher panicle production per clump(23.15). Application of 75% OM + 25% IF recorded higher number of capsules per clump (342) followed by 100% IF (307). Application of IF and its combination with OM had a positive influence on cardamom production. However, the highest yield of 707 green capsules per ha was recorded in the treatment where 100% IF were applied followed by 75% OM + 25% IF (624 kg). Similar results were obtained earlier by NRCS (1986), Sulikeri (1986), Natarajan & Srinivasan (1989) and Shanthaveerabhadraiah *et al.* (1997).

Table 2. Effect of organic manure and inorganic fertilizers on yield components and yield of cardamom

Treatment	No. of panicles/ clump	No. of capsules/ clump	Green yield (kg/ha)	Dry yield (kg/ha)
T_1 - 100% OM	17.02	196	479	124
T_2 - 75% OM + 25% IF	20.15	342	624	165
T_3 - 50% OM + 50% IF	19.41	241	602	157
T_4 - 25% OM + 75% IF	21.47	303	609	156
T_5 - 100% IF	23.15	307	707	184
T_6 - Control	13.04	203	401	105
SE±m	1.59	33	63	-
CD (P<0.05)	4.80	100	190	-
CV%	16.75	25	22	-

OM = Organic manure; IF = Inorganic fertilizers

Table 3. Benefit cost ratio for integrated nutrient management in cardamom

Treatment	Cost of nutrients Rs.		Cost of cultivation (Rs/ha)	Dry yield (kg/ha)	Total returns (Rs.)	Net returns (Rs.)	BC ratio
	OM	IF					
T_1 - 100% OM	6250.00	-	17,418.98	124	37,191.00	19,772.02	2.13
T_2 - 75% OM + 25% IF	4687.50	579.00	16,427.46	165	49,443.00	33,015.54	3.00
T_3 - 50% OM + 50% IF	3125.00	1160.00	15,455.24	157	47,019.00	31,563.76	3.04
T_4 - 25% OM + 75% IF	1562.00	1738.00	14,474.02	156	46,710.00	32,235.98	3.22
T_5 - 100% IF	-	2315.00	13,454.21	184	55,092.00	41,637.79	4.19
T_6 - Control	-	-	11,168.98	105	31,518.00	20,349.07	2.82

OM = Organic manure; IF = Inorganic fetilizers
Cost of fertilizers/manure: Urea - Rs. 3.66/kg; RP - Rs. 2.16/kg; MP - Rs. 3.70/kg; OM (FYM) - Rs 500/t
Price of cardamom: Rs. 300/kg dry capsules

The economics for integrated nutrient management in cardamom was also worked out (Table 3). Though 100% IF gave maximum yield (707 kg/ha) which gave a higher benefit cost ratio of 4.19, integrated nutrient management with 25% OM + 75% IF, 50% OM + 50% IF were at par recording 609 kg and 602 kg green capsules/ha, with benefit cost ratios of 3.22 and 3.04, respectively.

Sustainable yield in cardamom over a period of time can be achieved only by improving soil fertility through regular application of organic manures along with nutrients through fertilizers. Hence, treatment combinations involving both organic and inorganic manures may prove to be more beneficial in the long run.

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References

Indian Council of Agricultural Research (ICAR) 1963 Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi.

Mahalkal K & Gupta P K 1973 Effect of N alone and in combination with P and K on growth of Basrai banana (*Musa cavendish*). PKV Res. J. 1 : 188-190.

Natarajan P & Srinivasan K 1989 Effect of varying levels of nitrogen, phosphorus and potassium on yield attributes and yield of cardamom. South Indian Hort. 37 : 97-100

National Research Centre for Spices (NRCS) 1986 Annual Report for 1986. National Research Centre for Spices, Calicut.

Shanmugavelu K G & Madhava Rao V N 1977 Spices and Plantation Crops. Popular Book Depot, Madras.

Shanthaveerabhadraiah S M, Chandrappa H M & Jagannath B 1997 Response of cardamom (*Elettaria cardamomum* Maton) to NPK under uniform shade. J. Spices Aromatic Crops 6 : 115-118.

Sharma A K & Roy A R 1973 Fertilizer cum spacing trial on banana (*Musa paradisiaca* L.). Indian J. Agric. Sci. 41 : 493-498.

Spices Board 1996 Report of the Expert Committee. Spices Board, Cochin.

Sulikeri G S 1986 Effects of light intensity and soil moisture levels on growth and yields of cardamom. PhD (Hort.) Thesis. University of Agricultural Science, Bangalore.

University of Agricultural Sciences Bangalore (UAS) 1997 Package of Practices for Fruits and Plantation Crops. University of Agricultural Sciences, Bangalore.