

Soil Test Based Fertilizer Application in Small Cardamom for Sustainable Production



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Cardamom being a heavy feeder, fertilizer application rate is 25 per cent more than the recommended dose in Idukki district. Indiscriminate use of chemical fertilizers, mostly nitrogenous fertilizers, is becoming a threat to sustainable farming. Soil of Idukki district, being acidic in nature, is high in organic carbon, nitrogen and phosphorus. Indiscriminate use of nitrogenous fertilizers is increasing the soil acidity causing unavailability of other nutrients to the plant which leads to low yield. The situation is much critical in cardamom growing tracks as the amount of nutrients consumed by

cardamom is high. In this context use of fertilizers based on soil test value may ensure balanced nutrition to the crop and also prevent the high expenditure on chemical fertilizers.

An on farm trial was conducted in Udumbanchola taluk of Idukki district for understanding the soil fertility status in cardamom tracts. The study showed high acidity due to low pH and widespread deficiency of calcium, magnesium, potassium, zinc, and boron was identified as the major constraint in cardamom soils. Poor nutrient management

strategies have resulted in poor nutrient status thereby deteriorating the productivity as well as quality of soil. Adoption of soil test based fertilizer application will aid in enhancing the productivity and the efficiency of fertilizer use in cardamom fields. It was found in the study that application of fertilizers in cardamom based on soil test increased the yield to 10.74 per cent and 7.07 per cent compared with farmers' and recommended practices respectively.

Category of soil acidity and nutrients

Soil testing is a scientific technique which provides information on nutrients and nutrient supplying capacity of the soil. It helps to make decision about the requirements of fertilizers and soil amendments. Soil test determines pH, available Nitrogen (N), Phosphorous (P), and Potassium (K) status of soil. Soil acidity is rated from ultra acidic to slightly acidic depending upon the pH value. Based on the estimated value, soils are categorized into Very low, Low, Moderate, Moderately high, High, and Very high with respect to particular nutrients. The rating value of soil acidity and soil nutrients is given in Table 1.

Table 1: pH value chart

pH	Class	Lime Kg/Ha
3.5- 4.5	Extremely acidic	850
4.5- 5.0	Very extremely acidic	600
5.0 – 5.5	Strongly acidic	350
5.5 – 6.0	Moderately acidic	250

Field trial on soil test based fertilizer recommendation

An on farm trial was conducted in different locations of Idukki district. Soil samples were collected during

the month of March and April from different locations of Udumbanchola taluk. Soils of the experimental sites were tested in the KVK, Santhanpara soil testing laboratory and rated as per Table 2. Organic carbon was found invariably high in all the locations. Available nitrogen status of the soil was very high. Available phosphorus was very high, available potassium varied widely falling under very low to moderate rating. Soil reaction was found under the category of strongly acidic to extremely acidic (Table 3).

Three treatments were laid out in these trials in order to make a comparison of the performance of existing practices with soil test based fertilizer application techniques. The treatment details are given vide Table 4.

Recommendation of lime and fertilizers based on soil test

Recommendation of fertilizers can be made either by reducing or increasing the general recommended dose to 25 - 50 per cent depending upon the soil test as in Table 2. Soil containing up to 400 kg nitrogen, 21 kg phosphorous and 200 kg potassium per ha was considered as marginally medium under this trial and therefore, 100 per cent of the recommended dose was suggested. The pH level had increased from 4.5 to 5.5, so lime application was reduced from 600 kg/ha to 350 kg/ha. The organic carbon was very high in all locations.

Yield and Economics

The yield and economics of production is shown in Table-5.

Table 2: Rating chart of soil nutrient

Category	Org. Carbon	N(Kg/ha)	P(Kg/ha)	K(Kg/ha)	% Increase / decrease of recommended dose
Very low	<0.2	<140	<7	<100	50% more of recommended dose
Low	0.21-0.4	141-280	7-14	101-150	25% more of recommended dose
Moderate	0.41-0.6	281-420	15-21	151-200	100% of recommended dose
Moderately high	0.61-0.8	421-560	22-28	201-250	100% of recommended dose
High	0.81-1.0	561-700	29-35	251-300	25% less of recommended dose
Very high	>1.0	>700	>35	>300	50% less of recommended dose

Table 3: Fertility status of the soils of selected locations (average of 10 locations) in Idukki

Parameters	Initial status		Fertility status after yield		
	Range	Mean	FP	RP	STB
pH	3.5-5.5	4.5	4.9	5.0	5.5
Organic Carbon (%)	1.11-2.0	1.56	1.52	1.56	1.60
Available Nitrogen (Kg / Ha)	281-420	350.5	402	388	400
Available Phosphorous (Kg / Ha)	22-35	28.5	34	30	21
Available Potassium (Kg / Ha)	100-200	150	101	150	200

(FP - Farmers' Practice; RP- Recommended Practice; STB - Soil Test Based Fertilizer Application)

Table 4: Treatment details

Treatment	Treatment details
Farmers' practice	100:100:50 (NPK) through urea , rajphos, muriate of potash + 10 t FYM / ha
Recommended practice	75: 75:150 (NPK) through urea , rajphos, muriate of potash + 5 t FYM / ha
Soil test based fertilizer application	Application of recommended dose of NPK and FYM based on soil test value.

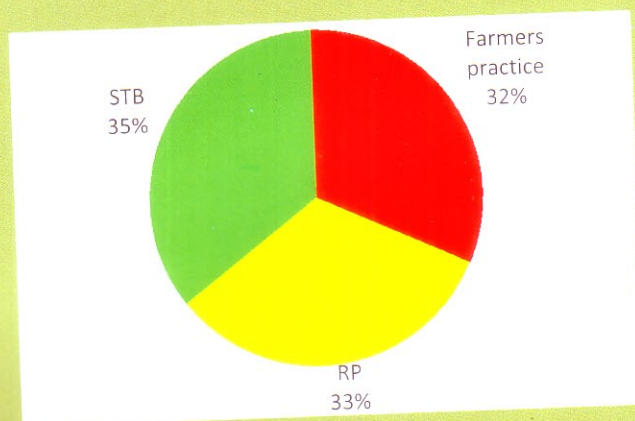


Fig 1. Yield status

Table 5: Yield and production economics

Treatments	Yield (kg/ha)	Cost of cultivation (Rs)	Gross returns (Rs)	Net returns (Rs)	B:C ratio
Farmers' practice	645.00	289600.00	645000	355400.00	1:2.22
Recommended practice	667.11	286345.00	667110.00	380765.00	1:2.32
Soil test based fertilizer application	714.28	279605.00	714280.00	434677.00	1:2.55

The highest yield in cardamom (714.28 kg/ha) was recorded in soil test based fertilizer applied plot. Soil test based application of fertilizers showed 10.74 and 7.07 per cent more yield than farmers' practice and recommended practice respectively. Net returns were 22.3 per cent and 14.15 per cent more than farmers' and recommended practice respectively. Similarly, B:C ratio was also highest in the plot where fertilizer was applied based on the soil test results. The cost of cultivation in farmers' practice was high due to higher fertilizer use which lowers the net returns.

The trial on 'soil test based fertilizer application in small cardamom for sustainable production' made it clear that fertility status of the soil was maintained after the harvest in plots where fertilizer was applied

based on soil test results. It was also noted that this method made it possible to increase the net returns per ha without deteriorating the productive quality of the soil. This practice can be adopted by entire cardamom growing areas for profitable increase in total net returns. Farmers can make use of several well established soil testing laboratories in their vicinity including that of District Soil Testing Laboratory at Thodupuzha, Krishi Vigyan Kendra, Santhanpara and Indian Cardamom Research Institute, Myladumpara and efficiently manage the use of fertilizers. Location specific fertilizer recommendations are vital for sustainable farming hence this facility can be effectively utilized by farmers for enhancing productivity and improving soil quality.