Boosting Spice Production under Coconut Gardens of Kerala: Yield Maximization of Ginger with Balanced Fertilization

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Field experiments were undertaken for two years on ginger intercropped under partial shade of coconut. A standardized, most profitable nutrient recommendation is provided for this unique and highly valuable cropping system. Results indicate ginger will respond to higher fertilization levels than are usually recommended.

India is the land of spices, and ginger is one of the important spices grown in the country for export. It is currently cultivated on 70,900 ha, producing 283,000 tonnes of dry ginger, or 3.99 t/ha. World demand is expected to rise by 30 to 40 percent during the coming five years. Present estimates indicate India will need to double production in order to meet growing demands of internal as well as export markets.

Kerala state accounts for more than 50 percent of India's 1.9 million ha under coconut. As such, coconut palm actually utilizes only 25 percent of the land area. Hence, there is ample opportunity for the remaining shaded area of coconut gardens to grow intercrops such as ginger and turmeric, which are shade loving/tolerant and highly profitable. There is a need to develop fertilization and cultural practices that are agronomically sound and economically viable.

Ginger cultivation under coconut gardens is highly profitable when grown with adequate nutrients.

Saraswat (1972) reported the yield benefits in ginger from nitrogen (N), phosphorus (P), and potassium (K) under open field conditions. Kerala Agricultural University (KAU) has also formulated recommendations based on trials conducted in open field conditions (KAU, 1996). However, the nutrient requirement of ginger under artificial shade was found to be higher. Preliminary studies conducted under open and shaded situations at Vellayani, Kerala, indicated a significant difference in nutritional requirement. Thus, the

present study was planned to standardize the nutritional requirement of ginger in coconut gardens. Existing state fertilizer recommendations are 75-50-50 kg N-P_2O_5-K_2O/ha.

Field experiments were conducted at Vellayani during 1998-2000. The experimental site was lateritic, sandy clay loam in texture, pH 5.0, low in available N, K, boron (B), and below optimum in available P and sulfur (S). The experiment was conducted in randomized block design with 14 treatments and three replications. Treatments were based on initial soil test values as well as soil requirements based on sorption/fixation studies. Treatments consisted of selected combinations from four levels of N (50, 100, 150, 200 kg N/ha), P (0, 25, 50, 75 kg P_2O_5/ha) and K (0, 50, 100, 150 kg K_2O/ha). Blanket applications of 15 kg S/ha and 2 kg B/ha were also provided. Experimental treatments were compared with state fertilizer recommendations and a control. Nutrients were supplied from urea, mussoriephos (local rock phosphate), muriate of potash, elemental S, and borax. The full rates of P and micronutrients and half rates of N and K were supplied basally. The remaining N and K were applied 120 days after planting. Recommended cultural practices were adopted uniformly for all treatments (KAU, 1996).

Results

Two years of study indicated incremental rates of N applied with 50 kg P_2O_5 and 100 kg K_2O/ha increased (3.80 t/ha) fresh rhizome yield of ginger (**Table 1**). Similarly, higher yields were found with increased P application together with 150 kg N and 100 kg K_2O/ha. Lastly, varying K application rates together with 150 kg N and 50 kg P_2O_5/ha also provided steady yield gains. Treatments with neither P nor K clearly were visibly affected in terms of yield loss.

Table 1. Selected responses of NPK on fresh rhizome yield of ginger, Kerala, India.

Nutrient	Rate, kg/ha	Fixed rates[1], kg/ha	Fresh rhizome yield, t/ha 1998-99	1999-2000	Average
N	50		13.4	13.9	13.7
	100	P_2O_5 (50)	14.6	16.7	15.7
	150	K_2O (100)	15.4	16.6	16.0
	200		16.9	18.1	17.5
P_2O_5	0		13.0	16.5	14.8
	25	N (150)	15.9	17.1	16.5
	50	K_2O (100)	15.4	16.6	16.0
	75		16.5	17.8	17.2
K_2O	0		14.0	16.5	15.3
	50	N (150)	14.8	17.3	16.0
	100	P_2O_5 (50)	15.4	16.6	16.0
	150		17.4	19.3	18.4

[1]Blanket applications to all treatments: 15 kg S/ha, 2 kg B/ha

This study emphasized yields can be increased with up to 150 kg N/ha when P and K are also applied in balanced quantities (**Table 2**). In other words, P_2O_5 and K_2O applications (up to 50 and 100 kg/ha, respectively) improved yield when applied along with N. Over two years, the combined application of 150-50-150-15-2 kg N-P_2O_5-K_2O-S-B/ha produced the highest fresh

rhizome yield of 18.4 t/ha, which was 22 percent higher than the average yield (15.1 t/ha) obtained with state fertilizer recommendation.

In terms of economics, after deducting costs of all inputs and other cultural practices, a farmer adopting this production practice could get net returns of 148,000 Rupees per hectare (Rs./ha...US$3,290) compared to 110,000 Rs./ha (US$2,460) with the state fertilizer recommendation (**Table 2**). Of course, this income is over and above the income obtained from coconuts harvested from the same piece of land. This cash infusion would be extremely valuable to farmers. Extension specialists and policy makers should be aware of the economic advantage for large-scale adoption of the practice.

Table 2. Effect of selected application rates on fresh rhizome yield of ginger, Kerala, India.

Treatments	N	P_2O_5	K_2O	S	B	Average fresh rhizome yield, t/ha	Net returns, Rs./ha	Benefit: cost ratio
SR[1]	75	50	50	0	0	15.1	110,000	2.09
T2	100	50	100	15	2	15.7	111,000	2.02
T3	150	50	100	15	2	16.0	116,000	2.06
T7	150	75	100	15	2	17.2	131,000	2.20
T10	150	50	150	15	2	18.4	148,000	2.35

[1] State recommended fertilizer application rates

Conclusions

Based on this study, it can be inferred that ginger, when intercropped in coconut gardens, requires nutrients applied at 150-50-150-15-2 kg N-P_2O_5-K_2O-S-B/ha for maximum economic yield. In view of the fact that this practice is agronomically sound and economically viable, the state fertilizer NPK recommendations need upward revision. This study also emphasizes the importance of S and B in fertilizer schedules. Further studies are needed to determine whether higher yields are achievable by modifying current fertilizer recommendations under open field conditions. **BCI**

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References

KAU. 1996. Package of practices recommendations -'Crops'. Directorate of Extension, Mannuthy, Kerala Agricultural University, Kerala.

Saraswat, K.B. 1972. Effect of N, P and K on yield and oil content of ginger. Agric. Agron. Indo. J. 5: 37-38.