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RESPONSE OF CASHEW TO NUTRIENT APPLICATION IN LATERITE SOIL

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Abstract : The response of cashew grown in laterite soil to long term application of nutrients at different levels was studied in terms of yield attributing characters and yield. The quadratic response **in** yield observed with increasing levels of individual primary nutrients necessitated the estimation of optimum economic dose and were worked out to be 748 g N, 329 g P_2O_5 and 765 g K_2O per tree per year.

Key words : Cashew, nutrient requirement in cashew, economic optimum dose, yield attributes in cashew.

INTRODUCTION

Unlike seasonal crops, a long term nutritional management is imperative for improving productivity of perennial crops. Being introduced mainly for the purpose of soil conservation, cashew had not received much attention in the past. Information on its nutritional behaviour has been meagre and management technology has been arbitrary to a great extent. It remains still as a little attended crop in spite of its economic importance. The average yield is 0.5 kg per tree against a reported 8-10 kg per tree under good management. Continuous application of chemical **fertilizers** tends to develop specific nutritional environment which determines the nature and extent of productivity in perennial crops like cashew. Any management system of cashew in Kerala should take into account all the major nutrients as they are deficient in laterite soil in which the cashew cultivation is concentrated.

MATERIALS AND METHODS

The experiment was started in 1979 in the KADP farm of College of Horticulture, Vellanikkara. Seedlings of the cashew variety BLA 39-1 were planted in a 3^3+1 factorial randomised block design. The treatments were, application of the primary nutrients at different rates such as N and K at 250, 500, 1000 and P at 125, 250, 500 g per tree per year, and an absolute control with no N, P, and K application. The experimental site was laterite and the top soil was sandy clay loam with a pH of 5.8, total N 0.18 %, available P 17.8 ppm and available K 150 ppm. N, P and K were applied in the form of urea, super-phosphate and muriate of potash in single dose during the end of south-west monsoon every year. The effect of long term fertilizer application on yield attributes and yields were studied after eleven years of planting during 1990-91 and 1991-92 when the trees attained yield stabilization. Economic optimum doses of fertilizers were estimated by fitting second order regression equation.

RESULTS AND DISCUSSION

Supply vs nonsupply of nutrients

The effect of long term application of nutrients averaged over different levels of individual nutrient was highly significant (Table 1). Three to four fold increase in the panicle number coupled with an enhanced nut weight to the tune of 20-25% over unfertilized control treatments resulted in a similar increase in yield due to application of individual nutrient. Stimulation of development of new meristems and hence an increase in demand for mineral ions due to high internal concentration of minerals, especially nitrogen, in the plant system is well established.

The major role of phosphorus in the plant system is related with structure, metabolism and reproduction. A good supply of phosphorus has been observed with increased root growth which enhanced the uptake of nutrients. The increase in vegetative and yield characters may be due to P application probably through indirect effect of energy transfer or through the direct role in laying down the primordia for its reproduction

Response to potash application observed in panicle production, test weight and consequent

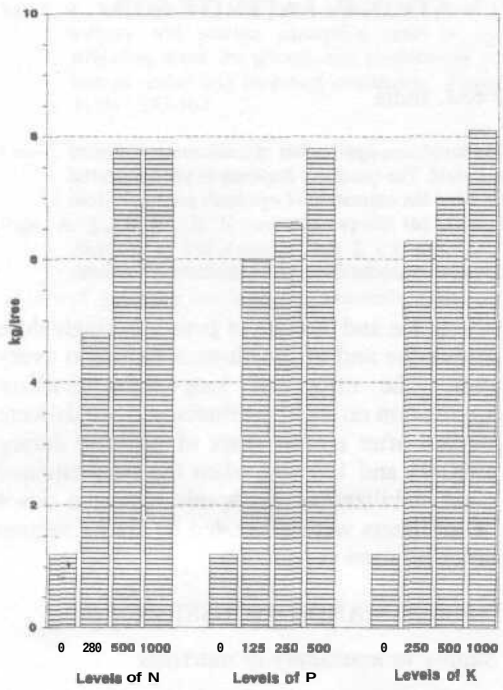

Fig. 1 Relationship between N, *P* and K(g/tree) and yield

yield may be related to its role in the translocation of elements and metabolic activities in plant. Potash is identified to play an important role in the production of cofactors and enzymes and consequently higher metabolic activities. K is reported to promote the growth of meristematic tissues.

Effect of nutrient levels

Response to the varying rate of nutrient application is shown in Table 2 and Fig 1. Increasing the N application rate from 250 to 1000 g per tree per year significantly increased the main yield contributing factors such as panicle number and nut weight in one or both years. However, response in yield was positively maintained only up to the medium level of N. With regard to differential application rate of phosphorous, the nut weight and yield were significantly increased at the highest level in one year. Similar but more pronounced effect was obtained due to the enhancement of potassium application to a level of 1000 g per tree per year.

Latha *et al.* (1994) have reported enhanced flush production, leaf chlorophyll content and leaf N, P, K content at flushing, flowering and fruiting due to mineral nutrition at higher rates. Flushes are the real progenitor of panicles. While production of new flushes is the expression of yearly growth, panicle production is the expression of productivity. Greater flush production resulted in higher panicle numbers. The increase in the nut weight can be attributed to greater sink strength due to greater availability of primary nutrients. The positive effect of this on panicle production and nut weight resulted in higher yield. However this effect can vary with agroclimatic situations where the efficiency of nutrients depend on plant uptake, loss, fixation etc. of the applied nutrients. Several workers have reported significant yield increases due to application of high rates of nutrients in cashew, particularly N (Reddy *et al.*, 1982; Kumar, 1985) even up to 1500 g N per tree per year depending on soil types and age of the trees.

Economic optimum dose

The quadratic response in yield to the applied fertilizer necessitated to estimate the optimum dose of fertilizers and was computed from a range of 250 to 1000 g for N and K and 125 to 500 g for P. The economic optimum doses are worked out to be 748 g N, 329 g P_2O_5 and 765 g K_2O per tree per year for cashew in laterite soils. Kumar (1985) estimated optimum doses of 430 g N and 130 g P_2O_5 per tree per year. He could not work out the same for K due to a linear response to K application and the plants were of three years old. In this study nutrient dose was fixed for yield stabilised 11 year old cashew tree under long term fertilizer application.

An yield level of 8-9 kg per tree was obtained at higher levels of individual nutrients or at their combinations. This yield was seven times higher than the yield in the absolute control where no fertilizer application was done since planting and sixteen times higher than the

Table 1. Effect of long term application of primary nutrients in cashew

Control vs treatment	Panicle m²		Net weight per 100 nut, g		Yield per tree, kg	
	1991	1992	1991	1992	1991	1992
No nutrient application	2.2	2.3	408	386	1.1	1.3
Effect due to N application	7.7**	7.7**	500**	486**	5.4*	5.7**
Effect due to P application	6.3**	6.5**	502**	528**	4.0*	4.9*
Effect due to K application	6.1**	6.1**	482*	510**	4.6*	4.1

* = Denotes significance at 5 per cent level ** - Denotes significance at 1 per cent level

Table 2. Yield and yield attributing characters ot cashew as influenced by different rates of nutrient application

Nutrient levels per tree per year, g	Panicle m'		Net weight per 100 nut, g		Yield per tree, kg	
	1991	1992	1991	1992	1991	1992
Nitrogen (N)						
N 250	6.5	7.1	536	548	4.3	5.3
N 500	8.5	101.1	561	564	8.3	7.2
N 1000	10.6	9.9	598	619	8.2	7.4
CD (0.05)	0.87	1.16	39.7	33.8	1.2	1.1
Phosphorus (PA)						
P 125	7.7	8.2	539	548	6.2	5.7
P 250	9.0	9.3	569	59S	6.6	6.5
P 500	8.9	9.6	586	599	8.0	7.6
CD (0.05)	NS	NS	NS	34	NS	1.0
Potassium (K_2O)						
K 250	8.6	8.1	525	533	6.4	6.1
K 500	8.6	9.0	558	600	7.1	6.8
K 1000	8.4	9.8	611	613	7.3	8.9
CD (0.05)	NS	NS	29.7	33.8	NS	0.9

average national productivity. The results of this study emphasize the importance of supplementing nitrogen with phosphorus and potassium for higher productivity in any system where specific nutritional environment in soil is generated through continuous fertilizer application.

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