NUTRITION OF HYBRID COCONUT

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Abstract: Comparatively, removal of NPK and other nutrient elements by hybrid varieties appears to be lesser than that of the tall varieties of coconut as revealed by the analysis of components. This is supported by the results of 15 year old manurial trial with WCT and three hybrids at CPCRI, Kasaragod. These results have shown that theoretically (M-B model) just to realize 50 per cent of maximum yields COD x WCT and WCT x COD require only 75:75:150 and 144:144:288 g N, P_2O_5 and K_2O respectively and to obtain 87.5 per cent of the maximum yield, the fertilizer application can be tailored to two third quantity.

Nutrient relationship to yield of coconut has shown good indications. Nitrogen content of all the leaf ranks (except 6) significantly related to yield in which leaf No.1 was showing highest correlation. The K values of all the leaves (except No.1) are significantly related to yield. The study on chemical potential in the palm and their relationship to the yield has indicated positive correlation of leaf K and Mg with coconut yield.

The D x T among the available hybrids was registered to be efficient user of nutrients in the cellular fractions of the constituents.

In coconut scattered information is available regarding reproducibility and dependability of tissue analysis with that of yield. Correlation coefficients were worked out between the nutrient contents of different ranks of leaves (1,6,11,14,16,21) and yield from samples collected from the field at CPCRI Kasaragod. Nitrogen content of all the leaves studied (except No.6) was observed to be significantly related to yield in which leaf No.1 was showing the highest correlation (0.647**). In the case of potassium, the K values of all leaves are significantly related with yield, barring leaf No.1. It was also recorded that the strength of coefficient of correlation between nutrient content and yield decreased with age of the leaf and the correlation between leaf K and yield increased with age of the leaf.

When the multiple correlations were worked out between yield and NPK content in different ranks of leaf, the predictability (R^2) was found to improve over single nutrient correlations.

Studies on diurnal variation of plant bio-elements were carried out to understand their dynamics during the day as a guide to leaf sampling for diagnostic purpose from 7.00 a.m.to 5.00 p.m. A slight increase in the mid-day and a gradual decrease thereafter for N, a decrease from 9.00 a.m. to 5.00 p.m. for K, and an uniform trend for P were observed. Calcium content of the leaf was uniform up to 11.00 a.m. and decreased thereafter while Mg content was constant throughout the day.

The pooled DRIS norms for NPK were 0.486, 0.107 and -0.594 respectively showing the order of requirement as KPN to achieve the yield of 88.8 nuts per palm/year. The optimum NP, NK and KP ratio was found to be 17.2, 1.6 and 10.8 respectively.

Chemical potential in the plant: It is now believed that cationic and anionic balances are independent of each other in the plant system. Wahid *et al.* (1974) from their studies on root CEC and its relationship with certain cations claimed

that the coconut palms always tended to maintain an equilibrium level between monovalent and divalent cations irrespective of their productivity. An attempt has been made at CPCRI Kasaragod to evaluate the total ionic balance and free energy change of all nutrients in three coconut genotypes (WCT, D x T and T x D). The estimated data for nutrients converted into ionic strength (anionic and cationic) were correlated with the yield of coconut.

Sub-cellular nutrients: Any change in yield potential as indicated by the earlier work is the reflection of efficient utilization of absorbed nutrients in the cellular and sub-cellular fractions of the plant. In this direction studies have been carried out in WCT, T x D, D x T, T x GB, LO x GB and LO x CDO genotypes. The data revealed that D x T was found to be superior in incorporating the nutrients into its various functional cellular constituents compared to other genotypes. It is also in high yield potential of the genotypes. Nutrient content in certain cell fractions gave positive correlation with yield and this can be used as an index for prediction of yield in coconut.

Soil-plant integration models: Fertilizer applications tailored to the needs of optimal production is the current strategy in crop management. In evaluating crop responses in relation to soil tests Mitscherlich-Bray equation is used for phosphorus and potassium and further extended to nitrogen by Mackay *et. al.* (1963) and Biddappa and Patnaik (1977). In view of this, a study was conducted by Khan *et al.* (1986) on coconut. A fifteen year old field experiment conducted with three coconut varieties viz., West Coast Tall (WCT), Chowghat Dwarf Orange (COD) x WCT and WCT x COD with three levels of fertilizers. The response function for yield was found to be linear for WCT and curvilinear for COD x WCT and WCT x COD in the limits of fertilizer levels tried. The attainable maximum yield (A) was determined by plotting log yields against the reciprocal of dose of nutrients and extrapolating to 1/X·····→ 0. Baule equivalents of soil and fertilizer form of nutrients were calculated by dividing the Mitscherlich efficiency constant of 0.301 by respective efficiency factors. Baule units were obtained by dividing the soil test values by Baule equivalent of soil form of nutrients. Normally for the production of 93.75 per cent of maximum yield, four Baule units of soil nutrient (NPK) are considered essential. The calculated Baule units range from 0.23 to 0.46 for soil NPK. Under the frame work of the results obtained in this experiment just to realize 50 per cent of maximum yields, COD x WCT and WCT x COD require only 75:75:150 and 144:144:288 g N, P_2O_5 and K_2O respectively per palm per year as shown in Table 1. To obtain 87.5 per cent of maximum yield, the fertilizer application can be tailored to two thirds of the M_1 dose for COD x WCT.

System approach: In the intensive cropping system and high density cropping system, the difference between nutrient enrichment and depletion is expected to give the nutrient balance which may be positive, negative or equal. In a perennial based system, the nutrient balance can be studied at equilibrium stage after 4-5 years of reproduction phase of 75 per cent crop communities concerned and at a stage when the system is fully mature. Based on the nutrient balance model suggested by Biddappa *et. al.* (1987), the nutrient profile in the system was determined in a coconut-based high density multispecies cropping system. While there was no build up of N and Mg, the levels of P and K doubled by the third year. Consequently there was a depletion in

Table 1. Fertilizer recommendation based on Mitscherlich-Bray equation

Cultivar	Nutrient	Baule units Fertilizer to be applied per palm/year			
		1 *(50%)	2 (75%)	3 (87.5%)	4 (93.75%)
WCT	N	370	851	1332	1813
	P_2O_5	370	851	1332	1813
	K_2O	741	1703	2665	3636
COD x WCT	N	75	214	352	490
	P_2O_5	75	214	352	490
	K_2O	150	427	754	980
WCT x COD	N	144	333	521	710
	P_2O_5	144	333	521	710
	K_2O	288	666	1043	1420

* Per cent of the maximum yield

the N and Mg balance. Application of higher doses of fertilizers appears to reduce the rate of N depletion. The depletion of Mg is uniform irrespective of the levels of fertilizer used. If the N depletion trend continues affecting yields and biomass production, necessary corrective measures will have to be undertaken in respect of this nutrient. On the other hand, P and K build up in the system strongly suggests the adequacy of one third dose for maximum productivity.

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