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ARTICLE

Effect of Conventional and Organic Agricultural Systems in the Major and Minor Leaf Nutrients of Coconut Palms

Sheeja Purushothaman[1], Mathew George[2*]

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Abstract

The aim of this study was to evaluate the major and minor leaf nutrients in conventional and organic agricultural system in coconut. Leaf samples were collected from plots under conventional management and organic management. Major leaf nutrients namely N,P,K, Ca, Mg, Mn, Fe, Zn were higher in organically treated plots.

Keywords: Microbial activity, organic management.

Introduction

At present tissue analysis have been widely adopted as a diagnostic tool for predicting the nutrient requirement of the palm, largely due to the pioneering work of IRHO scientists in West Africa (Anonymous, 1961). Foliar diagnosis for nutritional assay gained momentum during the late fourties of this century. The studies conducted by Manicot et.al., (1979 a & b) and the results obtained by Magat (1979 a&b) have sufficiently illustrated at the leaf analysis is an every time tool for predicting the fertilizer requirement of coconut palm.

Materials and Methods

A field study was conducted at selected places such as Shertallai, Devikulangara, Muthukulam, and Kattanam of Alappuzha District with an objective to study leaf nutrient composition in organic farm and conventional palms. The farmer's were selected from the lists provided by Krishi Vigyna Kendra, Alappuzha. The information on different aspects of crop management and their perception and constrains in adopting these farming systems were collected by asking questions. The organic plots here mentioned as Location I, II, III where root (wilt) disease is highly contiguous belongs to Sri Dayal and Sri. George Thomas of Shertallai, and Sri. Babu of Devikulangara respectively and the palms belongs to WCT variety. In location I and II , the farmers have a medium to large land holdings, (2 to 2.5 acres) are practicing organic farming

for 25 -30 years , give 7.5-10tones of cattle dung and two tones of silt per hectare per year. Besides this husk burial around the palms (20 husks per palm basin) is practiced for moisture retention. The husks are placed in layers with concave surface facing upwards and covered with soil. Mulching was done during October- November. Green manure crops were incorporated into the soil during April-May. Palm wastes like coconut leaves, crown waste, dried spathes are deposited in a small trench of convenient length at a distance of 2-2.5m. away from the base of the trunk. Intercropping with tapioca, ginger, turmeric, colocasia papaya, banana variety of palayamkodan, cocoa, pepper, clove, was done in these plots. In these plots water being fetched from the ponds and irrigate the fields regularly and systematically. Minimum tillage was done in these plots. Location III is in the low lying area ie, in the kayal area, (0.75 cents) and so the palms are planted on field bunds. The farmer adopted organic farming method for 10-15 years, use 2.20tones of farm yard waste, 2.50tones of vermicompost per hectare. Animal wastes like bone meal, fish meal, poultry manure, ground nut cake was also supplied. The above three farmer's use neem oil, cow's urine as plant protestants.

The conventional plots in location IV and V and VI where root (wilt) is also contiguous belongs to Sri. Ramanunni, of Muthukulam and Sri. John Abraham of Kattanam having 50 cents of land receives chemical fertilizers as per directions from the KrishiBhavan.. They supply small amount of cowdung, magnesium sulphate and sodium chloride as and when they got these and they remove all the bio mass from the above ground. They grow tapioca and colocasia as inter crops. Plant protection was done using Bordeaux mixture (1.0%) .

Leaf samples were collected from Organic plots, and Conventional plots according to the procedure previously standardized in the soil Chemistry laboratory, CPCRI, Kayamkulam. For this in a tree with 'n' number of leaves the $(1/2n+ 1)^{th}$ leaf was selected for sampling and leaf lets from the 14^{th} of the leaf , being most representative in respect of nutrient content was collected. The sample thus collected was dried, powdered to pass through a 80 mesh sieve and

[1]Department of Botany, M.S.M College, Kayamkulam, Kerala, India
[2]Central Plantation Crops Research Institute, Kayamkulam, Kerala, India
*Corresponding Author email: sheejalv@gmail.com

analysed for N, P, K, Ca, Mg, Fe, Mn, Zn.

Leaf samples were analysed for N, P, K, Ca, Mg, Fe, Mn, Zn. Nitrogen was estimated by Kjeldahl's method.(Jackson,1958).Determination of other nutrients were done after digestion with 2:1 HNO_3-$HClO_4$ mixture. Phosphorus in the digest was determined by the Vana domolybdate yellow colour. K by flame photometry and Ca, Mg, Fe, Mn, Zn atomic absorption spectrophotometry.

The data collected from experiments were analysed using different statistical techniques. The treatments were compared using analysis of variance techniques with two factors at different levels. (Mattur, et.al., 2008 and Pansi, et.al., 1967)

Results and Discussion

The amount of nitrogen in leaves in organically treated palms was showed higher percentage. The increase was higher only in organically treated palms mainly due to increased multiplication of microbes which mineralize the nitrogen contained in the organic manures as reported by Bharadwaj and Omanwar (1994). Whereas the nitrogen content in biofertilizer applied palms were reached up to the organically treated palms , may be because of rapid mineralization due to higher microbial activity which provided readily available nitrogen with biofertilizer + mulching with organic pest management as there was no external addition of chemical fertilizers. In conventional plots direct application of chemical fertilizers was applied and chemical fertilizers provide readily available nutrients to the plants.

In all the treatments there was no significant difference in the percentage of Phosphorus. Phosphorus content was above the critical level of 0.12% proposed by IHRO in 1980. These values indicate that the palms do not suffer due to the deficiency of this nutrient. The release of organic acids during microbial decomposition of organic matter may help in the solubility of native phosphates and increased the phosphorus pool in the soil. (Khan et.al.,1996).

The highest percentage of potassium (2.362 and 2.423) was recorded in the farmer's palms i.e, in location I and location II. In short, all the leaves of the organically treated palms the potassium level has increased it may due to the beneficial effect of organic manures in releasing K_2O due to the interaction of organic matter with clay. Due to the decomposition of products of organic debris various organic acids, might have aided in release of non exchangeable K to the water soluble forms and this increases the potassium content of leaves.(Chitra and Janaki, 1999). Anil kumar and Wahid (1989); Magat and Padrones.,(1989); Secretaria(1994); Khan(1996) reported leaf potassium content increases with chemical fertilizer application. The findings of are in corroborative to the findings of the results in conventional palm and in chemical fertilizer applied palms.

The increase in calcium content in organic palms might be due to the application of slit with organic manures. In the conventional plots the calcium content almost reached

Table 1. Percentage of nutrients on 2008

Treatments	Nitrogen	Phosphorous	Potassium	Calcium (ppm)	Magnesium (ppm)	Manganese (ppm)	Iron (ppm)	Zinc (ppm)
Control (full dose of chemical fertilizer)	1.930 (7.982)	0.190 (2.497)	1.895 (7.909)	1.820 (7.707)	0.280 (3.030)	10 (1810)	130 (6530)	40 (3620)
T1 (reduced fertilizer)	1.930 (7.982)	0.198 (2.544)	1.885 (7.887)	1.568 (7.158)	0.250 (2.865)	30 (1810)	110 (6140)	30 (2990)
T2 (reduced fertilizer + cowdung)	1.175 (6.219)	0.150 (2.219)	1.282 (6.499)	0.400 (3.613)	0.258 (2.907)	20 (3140)	120 (6200)	20 (2560)
T3 (cowdung + Bio fertilizer.)	1.388 (6.756)	0.208 (2.609)	0.645 (4.593)	0.643 (4.585)	0.255 (2.893)	20 (2370)	140 (6740)	30 (2850)
T4 (Biofertilizer)	1.442 (6.893)	0.185 (2.463)	0.682 (4.727)	0.398 (3.599)	0.193 (2.513)	20 (2370)	150 (7010)	30 (3380)
Mean	1.518 (7.073)	0.185 (2.464)	0.750 (4.951)	0.583 (4.306)	0.265 (2.947)	20 (2190)	140 (6780)	40 (3620)

Table 1. Percentage of nutrients on 2010

Treatments	Nitrogen	Phosphorous	Potassium	Calcium (ppm)	Magnesium (ppm)	Manganese (ppm)	Iron (ppm)	Zinc (ppm)
Control (full dose of chemical fertilizer)	1.960 (8.044)	0.227 (2.371)	2.362 (8.833)	2.112 (8.351)	0.225 (2.716)	10 (1810)	170 (7520)	50 (4150)
T1 (reduced fertilizer)	1.938 (7.998)	0.213 (2.641)	2.423 (8.946)	1.635 (7.334)	0.222 (2.701)	30 (1810)	140 (6840)	40 (3500)
T2 (reduced fertilizer + cowdung)	1.617 (7.304)	0.190 (2.496)	1.535 (7.114)	0.392 (3.588)	0.212 (2.639)	40 (3140)	130 (6520)	30 (3380)
T3 (cowdung + Bio fertilizer.)	1.605 (7.275)	0.195 (2.529)	1.268 (6.448)	0.795 (5.113)	0.235 (2.777)	40 (3620)	130 (6520)	10 (1810)
T4 (Biofertilizer)	1.565 (7.182)	0.193 (2.513)	1.190 (6.260)	0.677 (4.708)	0.150 (2.212)	40 (3620)	120 (6270)	20 (2190)
Mean	1.650 (7.377)	0.198 (2.546)	1.55 (6.167)	0.537 (4.199)	0.210 (2.625)	40 (3620)	130 (6470)	20 (2560)

with the critical level. This may be due to the application of nitrogenous and phosphoric fertilizers. This is in agreement with the reports of Loganathan.,(1979); Manicot.,(1979 a); and Margat.,1994).

In the organic and conventional plots, the magnesium content reached the critical level of 0.2%. Manicot, et.al., (1979 a) reported that only on coastal soils, N fertilization often depresses but P increases the leaf magnesium content. Von Uxkull (1972); Barrant(1977) and Smith (1969) reported slight improvement in foliar magnesium with K fertilization.Thus the leaf magnesium level does not follow a regular pattern in different reports.

No significant effect on the leaf percentage of manganese was obtained in the experimental plot. Application of ammonium sulphate, raw phosphate increased the leaf manganese content of coconut in North Sumatra.(Rosenquist, 1980). These findings were in conformity with the results of this investigation in control and conventional plots. The critical value of manganese proposed by IRHO1980 was 60ppm.

High percentage of iron in leaves was obtained in organic palms. The foliar iron concentration was found to be influenced by these treatments. Jagtap et.al., (2007) observed increased Zn and Fe with the application of FYM over chemical fertilizer.

The most important point in the concentration of nutrients in the leaf of coconut palms was the reduction in the percentage of zinc in conventional plots. This may be due to the higher content of P in the leaves. (Pillai, 1975). Previous studies also showed that coconut palms in Kerala are having a relatively low status of zinc in their leaves as compared to those in Sri Lanka (Giridharan et.al .,2002). A comparison in the leaf nutrients of organic system and conventional system showed higher percentage of major and minor nutrients in organic system. The organic system relied mainly on cover crops, organic debris and animal dung for fertilization.

Conclusion

A comparison in the leaf nutrients of organic system and conventional system showed higher percentage of major and minor nutrients in organic system. The organic system relied mainly on cover crops, organic debris and animal dung for fertilization.

References

1. Anil Kumar, K.S and Wahid, P.A1989.Impact of long –term inorganic fertilization on soil nutrient availability and nutrition of coconut palm. Oleagineux, 44 (6): 281-286.
2. Barrant, C.I1977. 17th Report of the Research Department. The Coconut Industry Board, Jamaica. West Indies. pp15-37.,F.M; (1934) Bronze leaf wilt of the coconut palm. Proc. Agric. Soc. Trinidad and Tobago.35:507-521.

3. Bharadwaj, V. and Omanwar, P.K., 1994, Long-term effects of continuous rotational cropping and fertilization on crop yields and soil properties II. Effects on EC, pH, organic matter and available nutrients of soil. J. Indian Soc. Soil Sci., 42: 387-392.
4. Chitra, L. and Janaki, P., 1999, Impact of various organic sources on K uptake and yield of rice in Thambirabarani river tract of Tamil Nadu. Madras Agric. J., 86: 46-48.
5. Giritharan, D., Somasiri., L.L.W., Perera, B.S.V.J (2002) Effect of the methods of applying potassium and magnesium fertilizers on their interaction in the soil and uptake by coconut (*Cocos nucifera*. L.) Cocos. 14,69-86.
6. Jagtap, P.B., Patil J.D., Nimbalkar, C.A. and Kadlag, A.D., 2007, Influence of integrated nutrient management on soil properties and release of nutrients in a saline-soil. J. Indian Soc. Soil Sci., 55(2): 147-156.
7. Khan, H. Hammed., Gopalasundaram., Yusuf andHegde, M.R(1996). Effect of long term fertilizer application and cultural practices on soil chemical properties and yield of coconut. Journal Of Plantation Crops..4(2): 101-106
8. Loganathan, P., Balakrishna murthy, T.S(1979). Effect of NPK fertilizers on the yield and leaf nutrient concentrations of adult coconut on a lateritic gravelly soil in SriLanka. Ceylon Coconut Quartely, 30: 81-90.
9. Magat, S.S., Padrones, G.D., 1994. Improvement of coconut production by combined potassium chloride and ammonium sulphate fertilization in a low yielding area of Northern Mindanano) Philippines. Phillipp. J. Cocon. Studies.14 (2): 7-15.
10. Manicot, R., Ollaginer, M., and Oche, R 1979 .a Mineral nutrition and fertilization of the coconut around the world. Part .I. Oleagineux. 34(11): 499-515.
11. Mattur, P.N., Muralidharan, K., Parthasarathy, V.A., Batugal, P., Bonnot. F., 2008. Data analysis Manual for coconut researchers. Biodiversity technical bulletin No:14.
12. Margate, K.K., Mantiquilla, J.A and Magat, S.S(1994). Response to integrated soil fertility management (ISFM) of hybrid coconut grown on an inland soil of South Cotbato, Phillippines. Phillipp. J. Cocon. Studies. 19(2): 20-25.
13. Pansi, V.G and Sukathma.1967. Statistical method for agricultural workers ICAR. New Delhi. pp381.
14. Pillai, N.G., 1975.Studies on the mineral nutrition of the coconut palms with special reference to the root (wilt) disease. Ph. D thesis, University of Kerala, Thiruvananthapuram.
15. Rosenquist, H 1980 .A coconut fertilizer trial on the podsolic soils of N. Sumatra. Oleagineux. 35(5): 241-246.
16. Secretaria, M.I., Maravilla, J.N and Margate, R.Z 1994. Response to integrated soil fertility management (ISFM) of hybrid coconuts grown on a coast upland soil of Zamboanga city, Western Mindanao, Phillippines. Philippine Journal of Coconut Studies, 19(2):15-19.
17. Smith, R.W (1969). Effect of fertilizer on the early growth and yield of Malayan Dwarf Coconuts in Jamaica. FAO. Tech. Work. Party on Coconut Production. Processing, Indonesia, Paper No. 7: 1-14.
18. VonUexkull, H.R. Von 1972. Response of coconut to potassium chloride in Philippines. Oleagineux, 27(1): 13-19.