MICROBIAL PROFILES OF ARECANUT SOILS UNDER MIXED CROPPING WITH SPECIAL REFERENCE TO ARECANUT YELLOW LEAF

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ABSTRACT

A mixed cropping experiment was started in 1975 in the yellow leaf diseased region of Palode with cowpea, NB 21 and guinea grass crop mixed with arecanut palms. The nitrogen fixing *Azotobacter* and *Beijerinckia* and phosphate solubilising microflora were enumerated in the arecanut soils during the years 1976, 1977 and 1978. The yield and disease status of the arecanut palms under mixed cropping were also recorded for the three years starting from 1976-78. The influenc of crop mixing in comparison with the control arecanut palms (palms without any crop mixing) has been discussed with emphasis on yellow leaf disease

INTRODUCTION

The arecanut palms in Kerala and part of Karnataka are affected by the destructive yellow leaf disease. Yellowing of the foliage and blackening of kernel are the main symptoms associated with the disease. It is estimated that about 36% of the palms in Kerala are affected by the malady distributed throughout the state (George, 1978). The disease is found only in pockets in Karnataka state. The etiology of the disease is not clearly known though attributed to various pathogens like a sap transmissible virus (Menon, 1963) and mycoplasma (Nayar and Seliskar, 1978). The disease is non-lethal but causes loss in yield upto 50% (Rawther, 1976). Rawther and Abraham (1972) observed that irrigation coupled with manuring maintained the yield of disease affected palms at economic level. Since the disease is not amenable to

control by any conventional plant protection measures, it becomes imperative to look into other means for reducing the loss in yield due to the disease. With this objective in view a mixed cropping trial involving regular organic recycling in a disease affected 15 year old arecanut garden was started in 1975 at the Central Plantation Crops Research Institute, Research Centre, Palode.

Materials and Methods

The trial was laid out on a 2 x 4 x 3 split plot design with the following details.

Main plots – 2 (i) With irrigation
(ii) Without irrigation

Sub plots – 4 (i) No intercrop (arecanut alone) control
(ii) Cowpea
(iii) NB 21
(iv) Guinea grass
} grown in the inter space of arecanuts.

Replication– 3

Plot size –12 arecanut palms per plot spaced at 2.7 m x 2.7 m square.

A dairy comprising of two animals was maintained in the vicinity and the cowdung and urine obtained were collected and evenly distributed in the experimental plots where the fodders were grown. The grasses NB 21 and guinea grass were cut at intervals of 40 days and fed to the animals. These grasses recorded uniform growth and out put in green matter while cowpea was shy and very poor in growth.

All the arecanut palms in the trial including those of the control plots received NPK @ 100, 40, 140 g per palm per year while the fodder crops were fertilised @ 150, 50, 100 kg per ha.

Composite soil samples were collected from the experimental as well as control plots at a depth of about 25 cm. The samples were sealed in polythene bags and stored in the

freezer immediately after collection. Serially diluted samples were poured in petriplates (in quadruplicate) and enumeration was carried out using Pikoveskoya medium, Jensen's medium and Becking medium respectively for the phosphate solubilisers' *Azotobacter* and *Beijerinckia*. The nitrogen fixing bacteria and phosphate solubilising microflora were incubated respectively for 2 and 3 weeks at a temperature of 28 $\pm$ 2°C.

The intensity of disease on the arecanut palms as evidenced by foliar yellowing was recorded every year in the month of October since the symptoms are very much pronounced during that month. Annual yield per palm was also recorded from the commencement of the trial.

Results and Discussion

The results with respect to yield and disease index of arecanut and soil microflora are given in Table 1 & 2.

Table 1. Microbial enumeration (X 103)

Year	Control		Cowpea		NB 21		Guinea grass	
	Irri-gated	Non irri-gated	Irri-gated	Non irri-gated	Irri-gated	Non irri-gated	Irri-gated	Nonir-rigated
				BEIJERINCKIA				
1976	12	21	21*	36*	20*	38*	14	26
1977	26	30	66*	26	32*	38*	38*	48*
1978	169	229	166	114	139	137	162	119
				AZOTOBACTER				
1976	49	70	46	62	47	55	114*	128*
1977	24	17	18	24*	8	56*	31	24*
1978	115	90	71	114	104	54	84	62
				PHOSPHATE SOLUBILISERS				
1976	1.82	1.88	1.69	2.16	1.74	1.62	1.53	2.04
1977	0.33	1.75	1.91	2.25	1.25	1.50	1.60	1.66
1978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* Significant at 0.05 Level

Table 2. Disease index & yield of arecanuts

Treatments	1976		1977		1978	
	Disease index	Yield kg/palm	Disease index	Yield kg/palm	Disease index	Yield kg/palm
			With Irrigation			
Control (No intercrop)	17.7	2.9	15.2	3.2	11.5	3.1
Cowpea	15.4	3.7	12.2	4.0	10.0	3.9
NB 21	16.5	1.3	16.9	3.1	13.7	1.6
Guinea grass	18.2	1.6	17.2	4.9	12.8	2.4
			Without Irrigation			
Control	18.5	4.3	17.4	4.6	11.6	3.1
Cowpea	13.8	1.9	14.6	4.6	11.6	3.2
NB 21	15.8	2.9	19.0	2.4	11.7	2.8
Guinea grass	17.1	3.1	18.4	2.9	12.2	3.4
Mean						
Control (No intercrop)	18.1	3.6	16.3	3.9	11.6	3.1
Cowpea	14.6	2.8	13.4	4.3	10.8	3.6
NB 21	16.2	2.1	18.0	2.8	12.7	2.2
Guinea grass	17.7	2.4	17.8	3.9	12.5	2.9

The analysis of data in respect of soil microflora revealed significant differences between the treatments in 1976 i.e., one year after the commencement of the trial. Highest number of soil *Beijerinckia* was recorded in plots with NB 21 under no irrigation followed by guinea grass and cowpea plots. More or less similar trend was noticed in 1977 also. However in 1978 no significant difference was noticed between the control and crop mixed plots. In the case of *Azotobacter*, the population was higher in plots with guinea grass in 1976, but in the next year all the mixed crop plots recorded significantly higher number. However in 1978 the difference in *Azotobacter* population was not significant between control and treatment plots. Crop mixing had no influence on the population of phosphate solubilising flora.

Effect of irrigation on microbial population was consistent. No significant difference between the main treatments as well as sub plot treatments was noticed with respect to the disease incidence and yield of arecanut palms. The cowdung and urine applied to the plots were utilised by the fodders and consequently the beneficial effects of the organic manures were not reflected on the yield of the arecanut palms. This is evident from the fact that the yield in the cowpea plots during the last phase of the trial (1977–78) was higher as compared to the other treatments. It is to be pointed out here that the cowpea crop was very poor and hence the beneficial effects of organics applied in those plots on the arecanut.

The earlier observation by Rawther and Abraham (1972) that NPK and micronutrients with or without irrigation had no ameliorative effect on the disease incidence is confirmed by this trial. The economics of this study will be presented in a separate communication.

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