ROOT REGION MICROFLORA OF ARECANUT

B. M. BOPAIAH

Central Plantation Crops Research Institute
Regional Station, Vittal - 574 243, Karnataka, India

ABSTRACT

The root region microflora of healthy arecanut palms were enumerated The rhizosphere samples were collected from the basin of arecanut palms of Central Plantation Crops Research Institute, Vittal The bacterial population was less, due to the acidic nature of the soil (pH 5.2-5.8). The counts of gram positive bacteria (70 80%) were more as compared to the counts of gram negative bacteria (15-30%). The bacilli group of bacteria were observed more among the gram positive bacteria. The bacteria found in the root region are *Bacillus* sp , *Arthrobacter* sp., *Micrococcus* sp , and *Pseudomonas* sp. Among the fungi, the *Trichoderma* spp. (18-35%) and *Aspergillus* spp. (21-39%) were dominating The other genera of fungi observed were *Penicillium* sp. *Curvularia, Rhizoctonia, Rhizopus, Mucor, Fusarium, Cylindrocarpon, Cladosporium,* and *Alternaria.* The actinomycetes were represented by *Streptomyces, Nocardia, Micromonospora* and *Actinomyces.* The population of asymbiotic N2 -fixers was comparatively less in the soil (13-105 x 10^2). The phosphate solubilizing bacteria were counted using pikovskaya's medium and the counts ranged from 47 5 - 108 x 10^3. Attempt to enumerate the *Endogone* mycorrhizae spores indicated that their relative occurrence was less. Number of actinomycetes colonies antagonistic to bacteria were also observed

INTRODUCTION

The major arecanut growing areas in India are located comparatively in high rainfall belts. Though the arecanut palm can grow in a variety of soils, there are certain basic requirements for proper growth and yield of this crop. Laterite loamy soils with an admixture of pebbles are ideal. In arecanut the manuring and fertilization are done at 75cm radius around the palm. In Karnataka state the major arecanut cultivation is restricted to South Canara, Shimoga and Chickmagalur districts. In South Canara the soil is laterite and pH ranges from

5.2 - 5.8. In the present investigation the author attempted to study the root region microflora of arecanut palm.

Materials and Methods

The rhizosphere samples were collected from the experimental plots of the Central Plantation Crops Research Institute, Vittal. The sampling was done at 30 and 60 cm lateral distance and 0-15 and 15-30 cm depth. The dilution plating method was followed for the enumeration of microbial population (Allon, 1953) The fungal, bacterial, actinomycetes, phosphate solubilizers and asymbiotic N_2-fixers were counted using Martin's rose bengal agar, soil extract agar, Kuster's agar, Pikovskoya's agar and Waksman's medium No. 77 respectively.

The bacterial colonies were transfered and maintained on nutrient agar slants for identification. The Gram staining was done to group the bacteria. The morphological, cultural, physiological and biochemical studies were done for the 14 bacterial isolates for identification. The fungal isolates were identified upto generic level by wet mount method. The percentage occurrence of *Trichoderma* and *Aspergillus* was calculated. The actinomycetes were identified based on the mycelium growth and sporulation. The occurrence of *Endogone* mycorrhizal spores were extracted by wet sieving and decanting technique of Gerdemann and Nicolson (1963). The percentage infection of roots by mycorrhizal fungi was done following the method of Phillips and Hayman (1970).

Results and Discussion

The quantitative root region microflora are presented in Table 1. No variation in the bacterial population was observed in 0-15 and 15-30 cm depth at 30 cm lateral distance from the base of the palm. Slight variation in bacterial count was observed between 30 and 60 cm lateral distance, but no difference in the fungal population was observed in any of the sample. The actinomycetes population ranged from $2\text{-}30 \times 10^4$.

Table 1. Root region microflora of Arecanut *

Lateral distance from the base of the palm (cm)	Depth (cm)	Bacteria (10^6)	Fungi (10^5)	Actino-mycetes (10^4)
30	15	71.50	30.67	6.33
30	30	61.83	24.17	3.33
60	15	38.83	28.52	2.00
60	30	30.30	19.67	0.50

*Average of six replications

In general the bacterial population was less in the root region of arecanut, this may be due to laterite soil which is acidic in nature. The counts of gram positive group of bacteria (70–80%) were more than the gram negative bacteria (15–30%). Among the gram positive bacteria, the bacilli type was more predominent. The dominant bacterial genera in the root region of arecanut were *Bacillus* sp., *Arthrobacter* sp., *Micrococcus* sp. and *Pseudomonas* sp.

The frequency of the occurrence of fungal flora was studied. It was observed that *Trichoderma* and *Aspergillus* were more predominant. The percentage occurrence of *Trichoderma* and *Aspergillus* was found out to be 18–35 per cent and 21–39 per cent respectively. The *Trichoderma* and *Aspergillus* inhabited more in the root region probably due to the addition of F. Y. M. and green leaf material during Sept /Oct. every year. These organisms may be actively involved in the degradation of cellulose, hemicellulose, starch etc. in the root region. Among other genara of fungi were *Penicillium, Curvularia, Rhizoctonia, Rhizopus, Mucor, Fusarium, Cylindrocarpon, Cladosporium* and *Alternaria.* Some non-sporulating fungal colonies were also observed in the plates.

The actinomycetes colonies identified were *Streptomyces, Nocardia, Micromonosporium* and *Actinomyces.* It was observed that majority of actinomycetes were antagonistic to bacteria.

The enumeration of asymbiotic N_2-fixers in the root region showed that their population in this soil was very low (13 to 105 x 10^2). The *Beijerinckia* sp. found to grow better than *Azotobacter* sp. in this type of soil. This may indicate that *Beijerinckia* survives better than *Azotobacter* in laterite acidic soils.

The population of phosphate solubilizers ranged from 47.5 to 105 x 10^5. The phosphate fixation is a problem in laterite acidic soil due to high Fe++ and Al++ions. These microorganisms make the phosphorus available by solubilizing it. Very few *Endogone* spores were observed in the root region. The low infection level of mycorrhizal fungi in arecanut shows that the association of mycorrhizae may not be of significant importance in the root region.

ACKNOWLEDGEMENTS

The author is thankful to Shri K. Shama Bhat, Scientist in charge and Dr. M. Koti Reddy, CPCRI (RS), Vittal for their suggestion and going through the manuscript.

REFERENCES

ALLON, O. N. 1953. *In experiment in soil bacteriology,* Burgess Pub. Co., Minneapolis, Minn. USA.

GERDEMANN, J. W. AND T. H. NICOLSON 1963. Spores of mycorrhizal Endogone species extracted from soil by wet sieving and decanting *Trans. Brit. Mycol. Soc.* 46 : 235-244.

PHILLIPS, J. M. AND D. S. HAYMAN 1970. Improved procedure for clearing roots and staining parasitic and vesicular arbuscular mycorrhizal fungi for rapid assessment of infection. *Trans. Brit. Mycol. Soc.* 55. 159-162.