

OCCURENCE OF SOME BENEFICIAL BACTERIA ASSOCIATING ROOTS
OF FINGER MILLET (ELEUSINE CORACANA (L.) GAERTN.)
AND THEIR EFFECTS ON NUTRIENT UPTAKE GROWTH
AND YIELD OF FINGER MILLET

By

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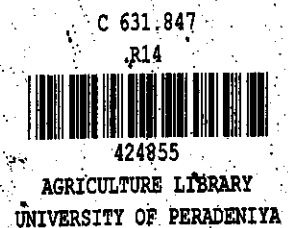
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ABSTRACT

Occurrence of total aerobic heterotrophic bacteria and some beneficial bacteria, namely Azotobacter, Azospirillum, fluorescent Pseudomonas were quantified in rhizosphere soil (RS), on finger millet roots and also in non-rhizosphere soil (NRS) in different localities of north-central region in Sri Lanka during Maha (NE monsoon) 1989/1990 (September to January 1990).

Main objective was to study the performance of beneficial bacteria in rhizosphere of finger millet. The bacteria which are suspected as Azotobacter, Azospirillum and f.pseudomonads were isolated. Evaluation of beneficial activities of bacterial isolates were done. Beneficial bacteria were grouped as far as genus and species level. Effects of artificial inoculation of selected Azotobacter, Azospirillum, Pseudomonas strains and combination of these bacterial genera were tested with four finger millet cultivars with half dose of fertilizer nitrogen under green house conditions at two environmentally different locations that is Peradeniya and Maha Illuppallama.

Populations of beneficial bacteria in the RS and roots were very high compared to beneficial bacteria population in NRS. Fluorescent pseudomonads were predominantly associated with every sample of finger millet. Population of Azotobacter, Azospirillum and f.pseudomonads (3.944×10^4 , 6.867×10^4 , 1.141×10^6) on finger millet RS was significantly higher than that of roots (3.061×10^4 , 4.568×10^4 , 9.15×10^5) respectively. Moreover population of beneficial bacteria increased remarkably over the other heterotrophic bacteria in the rhizosphere after growing finger

millet. Population of beneficial bacteria in the RS and root of finger millet varied with the soil pH. Maximum populations of Azotobacter (1.011×10^5) and Azospirillum (1.176×10^5) in RS were observed in the range of pH 7.5-7.85, and maximum population of fluorescent Pseudomonas (1.686×10^6) was observed in the range of pH 6.5-7.5. Maximum populations of Azotobacter (3.938×10^4) and Azospirillum (1.736×10^5) in roots of finger millet were observed in the range of pH 6.5-7.5 and higher population of fluorescent Pseudomonas (1.85×10^6) was observed in the range of pH 7.5-7.85. Also populations of Azotobacter and Azospirillum in RS increased with increment of soil pH. However total aerobic heterotrophic bacteria in the RS and roots of finger millet did not show a such clear variation with the soil pH. The bacterial populations in the RS and roots of finger millet did not show considerable variation with soil moisture content and it is indicated that rhizosphere environment provides sufficiently favorable conditions to bacteria for their growth and survival in the RS and root of finger millet.

Many efficient N-fixing, indole acetic acid (IAA) producing different types of bacteria mainly Azotobacter and Azospirillum were observed in RS and roots of finger millet. A. lipoferum was the dominant Azospirillum species in the finger millet rhizosphere. Many efficient N - fixing, IAA producing Azospirillum strains were denitrifiers (nir^+) whereas Azotobacter strains were non-denitrifiers (nir^-). All isolated fluorescent Pseudomonas were non N - fixers but some of them excreted siderophore and produced HCN. These strains inhibited pathogenic fungi namely Rhizoctonia solani, Pythium ultimum, Sclerotium rolfsii, and Fusarium spp. in vitro test. The major rhizosphere beneficial fluorescent Pseudomonas sp was P. fluorescence in the rhizosphere of finger millet.

In general, inoculation of finger millet with associative beneficial bacterial species improved the growth and yield parameters under intermediate N fertilizer levels over uninoculated plants at same N levels. Effect of artificial inoculation on growth, nutrient uptake and grain yield of finger millet cultivars were more prominent at Peradeniya, compared to Maha Illuppallama. It was observed that beneficial effects of associative bacteria were varies with locations. The effect on inoculation on growth, N-content in shoot, and grain yield was variable with the different finger millet cultivars used.

