With over 70 lakh hectares, India has the world’s fifth largest maize acreages globally and the third most important cereal crop. Maize is the third most important cereal crop in India after rice and wheat and is cultivated on 8.11 million (M) ha. It provides nutrients for humans and animals and serves as a basic raw material for the production of starch, oil and protein, alcoholic beverages, food sweeteners and, more recently, fuel. Due to the market application and simpler agricultural operations, farmers have begun to cultivate 2-3 crops in a year which has led to development of pests and diseases. This increasing demand is achieved through synthetic chemical pesticides and fertilizers resulting in high costs and severe environmental contamination. Hence, scientists are diverting their attention towards the biological methods of fertilization using the native microbial flora in the form of bioinoculants for sustainable agriculture.

It is through the use of plant growth promoting rhizobacteria (PGPR) which are soil bacteria that colonize the rhizosphere of plants, growing in, on or around plant tissues that stimulate plant growth by several mechanisms. They enhance plant growth either directly or indirectly by providing plants with fixed
nitrogen, phytohormones, iron that has been sequestered by bacterial siderophores, soluble phosphate and preventing phytopathogens (biocontrol). PGPR also improve root development, mineral nutrition, seed germination, and water uptake. A large number of bacterial species including *Alcaligenes, Azospirillum, Arthrobacter, Acinetobacter, Bradyrhizobium, Bacillus, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Pseudomonas* and *Rhizobium* are involved in plant growth promotion and used as plant growth promoters. Several studies have been reported on the specific microbial groups associated with maize but there are inconsistencies in the results obtained *in vitro* when compared with field trials. Thus to obtain effective inoculant it is necessary to evaluate the ideal characteristics of candidate microorganisms, which will sustain within the host plants with successful colonization in field trials.

With this background, the present study was focused on the isolation and identification of microorganisms indigenous to maize and the desirable characteristics of microorganism’s candidates to the use in PGP formulations. Soil samples, maize plants with roots were collected from different maize growing regions in and around Coimbatore and processed as per the standard protocols. A total of 222 bacterial strains were isolated and stored as glycerol stock for further studies. Gram’s staining was performed to distinguish the strains as Gram positive and negative. Starch hydrolysis test was performed to determine the ability of the strains to produce amylase and 50% of the strains were known to produce the same. The strains were assayed for the various plant
growth promoting and biocontrol traits. 78% of the strains were able to produce ammonia, 44% were able to synthesize IAA, and 26% were able to hydrolyse phosphate. Forty eight strains produced siderophores. Nearly 40% of the microbial strains synthesized the different hydrolytic enzymes like protease, cellulase, chitinase and pectinase and also produced ACC deaminase. 25% of the strains of the exhibited antagonism against the phytopathogen *F.moniliforme* exhibiting varying zones of inhibition as compared to the control plates. The potential strains were then identified using 16S rRNA phylogeny for species identification. Phylogeny studies revealed organisms of the genera *Bacillus*, *Pseudomonas*, *Klebsiella*, *Acinetobacter* which are found to be associated with the rhizosphere of maize with varied diversity at the species level. Based on the PGPR and biocontrol traits, six different microbial strains namely *Bacillus subtilis* F1 4, *Bacillus amyloliquefaciens* F1 19, *Klebsiella pneumoniae* F2 3, *Acinetobacter pitti* F2 5, *Pseudomonas putida* F2 12 and *Pseudomonas indoloeoxydans* F3 47 were selected for seed germination and pot experiments. From the above studies, three strains namely *B. amyloliquefaciens* F1 19, *P. indoloeoxydans* F1 19 and *B. subtilis* F1 4 were selected for the field trials. Five different treatments namely seed bacterization, foliar spray and carrier based (talc/lignite/coirpith) formulations were used for the study in a randomized block design. It was found that the different formulations of both *B. amyloliquefaciens* F1 19 and *P. indoloeoxydans* F3 47 significantly increased the growth of the plants as well as the yield as compared to the control. It could be concluded that the
bioformulation from these isolates are effective as a growth enhancer as well as nutrient content enhancer for the agricultural crops.

Thus the prevalence of native microbial isolates with multiple plant growth promoting traits in the rhizosphere of maize emphasizes its potential for development of effective bioinoculant to improve the growth and health of maize crop.