6. SUMMERY

The present investigation was carried out to study the effect of certain PGPR enriched vermicompost as individual and consortium level on the growth, yield and quality attributes of maize var. Co 1. The findings of the present study are summarized hereunder.

- In the present study, about ten maize growing locations of Perambalur district, Tamilnadu, India were collected and subjected to physico-chemical analysis, total heterotrophic microbial population and PGPR population.
- The physico-chemical (pH, EC) and nutritional (available nitrogen, available phosphorus, available potassium, OC and C:N ratio) properties of the rhizosphere soil sample showed greater degree of variations between the different locations and it may be attributed that are determined by different environmental and cultural practices.
- The total heterotrophic microbial population load were $10^7$, $10^5$ and $10^4$ CFU/g of soil levels for bacteria, fungi and actinobacteria respectively. The higher bacterial population of $48.00 \times 10^6$, fungal population of $9.67 \times 10^5$ and actinobacteria population of $9.33 \times 10^4$ CFU/g of soil were observed in Gangaivelli, Krishnapuram and Gangaivelli respectively.
- The soil samples were further accessed for certain important PGPR isolates namely *Azospirillum*, *Bacillus* and *Pseudomonas* population. The maximum population of $5.89 \times 10^4$ CFU/g (*Azospirillum*) from Krishnapuram; $12.67 \times 10^4$ CFU/g of soil (*Bacillus*) from Veppanthattai and
Krishnapuram and $8.00 \times 10^4$ CFU/g of soil (Pseudomonas) from Keezhaperambalur were observed in the present investigation.

- The PGPR isolates *viz.*, Azospirillum, Bacillus and Pseudomonas were isolated from all the ten locations and designated as MAZ (Azospirillum), MAB (Bacillus) and MPS (Pseudomonas) and serially numbered from 1 – 10.

- The general and biochemical characterization studies of the PGPR isolates revealed that five Azospirillum isolates *viz.*, MAZ-1, MAZ-4, MAZ-6, MAZ-8 and MAZ-9 were belongs to *A. lipoferum* and the remaining isolates such as MAZ-2, MAZ-3, MAZ-5, MAZ-7 and MAZ-10 belongs to *A. brasilense*.

- With regard to the Bacillus isolates, MBA-1, MBA-4, MBA-6, MBA-7 and MBA-10 were *B. megaterium* and the remaining isolates *viz.*, MBA-2, MBA-3, MBA-5, MBA-8 and MBA-9 were found to be *B. polymyxa*.

- Further, the isolates MPS-1, MPS-4, MPS-5, MPS-8, MPS-9 and MPS-10 were tentatively identified as *P. fluorescens* and the remaining isolates namely MPS-2, MPS-3, MPS-6 and MPS-7 were found to belong to *P. putida*.

- The PGPR isolates were subjected to screening for their efficiency in production of certain growth promoting traits such as nitrogenase activity N fixation, cell N content, phosphorus solubilization efficiency, phosphatase activity, phytohormones production and siderophore production to select the efficient isolates for further studies.

- The screening studies revealed that the PGPR isolates *viz.*, Azospirillum MAZ-6, B. megaterium MBA-6 from
Krishnapuram and *P. fluorescens* MPS-5 Veeraganur were found to be efficient isolates and used for enrichment studies.

- The survival of efficient PGPR isolates in four carrier materials *viz.*, lignite, farm yard manure, vermiculite and vermicompost in order to select the suitable carrier material for enrichment studies.

- The results of survival of efficient PGPR isolates in different carrier materials clearly indicated that vermicompost was the most suitable carrier which sustains the population of PGPR isolates for 180 days followed by FYM, vermiculite and lignite. Hence, the vermicompost was selected for further PGPR enrichment studies.

- The vermicompost sample was analysed for physico-chemical, microbiological parameters and survival of native bioinoculants. The physico-chemical properties analysis reports clearly suggested that vermicompost had desired properties of ideal organic manure.

- With regard to microbiological analysis, the vermicompost contain more heterotrophic microbial population and very less numbers of native PGPR isolates. Hence, vermicompost cannot be considered as bioinoculant as it was not fulfilling the BIS standards.

- Hence, in the present study an attempt was made to enrich the efficient PGPR isolates obtained from the maize rhizosphere soil samples of Perambalur district was carried out as individual and consortium based approaches for 60 days period.
The results of the present study clearly revealed that, vermicompost enrichment with efficient PGPR isolates *viz.*, *A. lipoferum* MAZ-6, *B. Megaterium* MBA-6 and *P. fluorescens* MPS-5 significantly increased the nutrient content such as N, P, K, OC and subsequently the C:N ratio.

Among the different treatments, T5 (vermicompost + *A. lipoferum* MAZ-6 + *B. megaterium* MBA-6 and *P. fluorescens* MPS-5) recorded more mineralization process. On the 60th day of enrichment, the treatment recorded 2.17% (nitrogen), 1.52% (phosphorus) and 2.06% (potassium) content that showed 7.96%, 20.76% and 4.04% increase over T1 (control) treatment. Hence, it was concluded that enriched vermicompost samples may be considered as a better source of plant nutrients supply than normal compost and vermicompost.

With regard to the survival of PGPR *viz.*, *Azospirillum*, *Bacillus* and *Pseudomonas* population appreciable number of populations were observed in consortium enriched vermicompost. The treatment T5 (*A. lipoferum* MAZ – 6 + *B. megaterium* MBA – 6 + *P. fluorescens* MPS – 5 enriched vermicompost) supports the growth of all PGPRs to the tune of $10^7$ – $10^8$ CFU/g of vermicompost levels. Whereas, the individual PGPR enriched vermicompost supports the growth of individual organisms without drastically affecting the growth of another organism.

A pot culture study was conducted to study the effect of efficient PGPR enriched vermicomposts (individual and
consortium) application on the growth, development and quality attributes of maize var. Co 1 along with vermicompost (without PGPR enrichment), 100% RDF and control.

- The results of the present investigation clearly revealed that all the growth parameters (plant height, dry matter production, total chlorophyll content, microbial population), nutritional status (available nitrogen, available phosphorus, total NPK and uptake), yield parameters (number of grains per cob, number of grains per row, length and girth of the cob), yield components (grains per plant, 100 seed weight, grain yield and stalk yield) and nutritive factors (protein and starch content in the grains) significantly improved in the consortium treatment T7 (vermicompost + A. lipoferum MAZ – 6, B. megaterium MBA-6 and P. fluorescens MPS-5) followed by individual PGPR enriched vermicompost, RDF and control treatment.

- From the above study, it is concluded that enrichment of efficient PGPR isolates Azospirillum MAZ-6, B. megaterium MBA-6 and P. fluorescens MPS-5 with vermicompost as individual and consortium significantly increased the growth, yield and nutritional parameters of maize var. Co 1.