Chapter 6
Summary and Conclusions
**Summary and Conclusions:**

The present research was undertaken to study the composting process by taking an example of MSW collected in Mysore city. In the degradation process, the concentrations of each of the test affect the compost quality. Accordingly, the objectives were proposed for the research objectives and the following conclusions were drawn.

The feasibility of the windrow composting method was successfully employed for the composting of municipal solid waste. The various conditions which affect the composting process, stability and maturity of the compost were analysed and found that, the compost produced from MSW was comparable with the recommended standards with respect to all the characteristics.

The study reveals that, the physico-chemical characteristics have noticeable variations in the composting process. It is observed that, the physico-chemical characteristics, such as temperature, moisture content, pH, chloride, soluble sulphate, calcium carbonate and potassium had significant variations in the degradation stages (10 to 60 days old compost samples).

The physico-chemical characteristics significantly varied during winter and rainy seasons. It has shown that a good quality of compost can be obtained during summer season, but the quality of the compost reduces to medium grade, as winter approaches. During the period 2010 to 2012 there was significant reduction in some specific characteristics (nitrate-nitrogen, water holding capacity, particle density, total organic carbon and organic matter, C/N ratio, TKN and total phosphorus) which indicates the presence of less biodegradable waste. At the same time, pH, electrical conductance, total water soluble solids, chlorides, calcium magnesium and sodium was increases.
The heavy metals, such as Copper, Cadmium, Lead, Mercury and Arsenic concentrations significantly decreased in each of the degradation stages (except in year 2010, copper and cadmium concentrations increased during summer and rainy seasons respectively). The heavy metals concentrations were found to be more in winter season compared to summer and rainy seasons.

The study on biological characteristics concluded that, mesophilic bacterial and fungal diversity were more in the initial stages of the composting process. Then, gradually decreased throughout the composting process and disappeared completely after 3 weeks, when the temperature raised more than 60°C. On the other hand, the thermophilic bacteria species increased and reached the maximum numbers during 30 and 40 days old compost sample and then gradually decreased in final maturation stage. This type of cycle was observed during degradation stages of the composting process for both bacterial diversity and isolated bacterial and fungal species. Bacterial species like, *Bacillus sp.*, *Klebsiella sp.*, *Enterobacter aerogenes* and *Pseudomonas sp.*, and fungal species like *Aspergillus sp.*, *Penicillium* and *Fusarium sp.*, which were dominant and had predominant role for all the degradation stages of composting processes.

The study of compost stability and maturity test of Windrow composting during degradation stages of MSW compost and the final stage compost sample were compared with agricultural compost sample in terms of its nutritional values employing different methods.

Physico-chemical characteristics such as pH, electrical conductance, organic carbon, TKN and C/N ratio of 60 days old compost samples were within the permissible limits of recommended standards.
In maturity tests, like plant bioassay, it was indicated that, well developed root and shoot systems of Fenugreek plants at D6-25% (25% MSW 60 days old compost sample and 75% Soil) were observed. Germination index shows that, shoot length increased from 0.32% and 0.72% for 100% (full strength) and 10times dilution at the initial (10 days old compost sample) and reached highest (0.93% and 0.97% of germination index) for final stages (60 days old compost sample). At the same time, GI index was more in final days of compost sample compared to soil samples.

Correlation study confirms that, the fenugreek seeds germination showed positive correlation with nitrate nitrogen, total phosphorus and TKN, at the same time negative correlation with EC, C/N ratio, ammonia nitrogen, sodium and potassium.

Considering the overall study, the final stage sample was found to be the best compared to all other combinations, which aids the favourable conditions for the seed germination and plant growth.

During comparative study of the nutritional status for municipal and agricultural compost samples it was confirmed that, more metal ion concentrations were observed in MSW compost sample compared to agricultural compost sample. In the germination and plant bioassay test, results revealed that MSW compost sample were found to be more favorable when compared to agricultural compost sample.

This study confirms that, MSW compost has more micronutrients compared to even agricultural compost and it can be used effectively in the agricultural field for soil enrichment.