

***BIOCOMPOSTING OF SUGARCANE TRASH AND
CORNCOB FOR SUSTAINING SOIL FERTILITY
AND CROP PRODUCTIVITY***

By

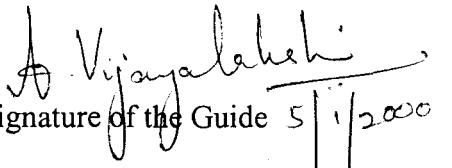
S. VIDHYA RANI

A THESIS SUBMITTED TO THE AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND
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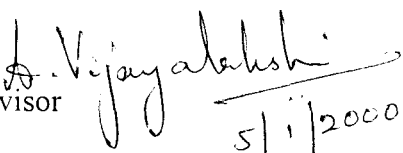
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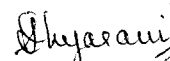
This is to certify that the thesis entitled **BIOCOMPOSTING OF SUGARCANE TRASH AND CORNCOB FOR SUSTAINING SOIL FERTILITY AND CROP PRODUCTIVITY** Submitted to the Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for the award of the degree of **Doctor of Philosophy in LIFESCIENCES**, is a record of original work done by **S.Vidhyarani** during the period of her study in the Department of Lifesciences, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, under my supervision and guidance and the thesis has not formed the basis for the award of any Degree / Diploma / Associateship / Fellowship or similar title to any candidate of any University.


Signature of the Guide 5/1/2000

DECLARATION

I hereby declare that the matter embodied in this thesis is the result of investigations carried out by me in the Department of Lifesciences, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, under the supervision of **Dr. A Vijayalakshmi, M.Sc., M.Phil., Ph.D**, Lecturer in Botany, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, and it has not been submitted for the award of any Degree / Diploma / Associateship / Fellowship etc. of any other University or Institute.

Supervisor 
5/1/2000


Candidate

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ABBREVIATIONS

| | |
|------------|------------------------------|
| C /N ratio | - Carbon, Nitrogen ratio |
| pH | - Hydrogen ion concentration |
| Ec | - Electrical conductivity |
| OC | - Organic carbon |
| N | - Nitrogen |
| P | - Phosphorus |
| K | - Potassium |
| FYM | - Farm yard manure |
| Ca | - Calcium |
| Mg | - Magnesium |
| B.D | - Bulk density |
| W.H.C | - Water holding capacity |
| S.E | - Standard error |
| C.D | - Critical Difference |

INTRODUCTION

CHAPTER 1

INTRODUCTION

The burgeoning population, industrialization and urbanization of late have created sequel of problems. The accumulation of wastes from variety of sources cause various forms of environmental and health hazards. The intensive farming practices generate abundant agricultural wastes to the tune of 320 million tonnes of organic residue per annum [Thimmiah, 1998]. These wastes burden the environment since they are not fully utilized within the confines of the production units due to the economic and social reasons. The wastes can be managed efficiently employing different technologies like incineration, sanitary landfill, pyrolysis, biomethenation etc. Amongst the different approaches for managing wastes, composting is the best solution, which in turn provides nutrients to crops.

In India, a majority of farming community is small and marginal farmers who lack capital and cannot afford the high cost of chemical fertilizers. Hence alternative source of plant nutrients play a great role for majority of the farming community. Fertilizers deteriorate the physical and biological conditions of the soil and exert a harmful effect on microbial, flora and fauna population of the soil. The soil is almost dead in areas where chemical farming is in vogue. Indiscriminate use of chemical fertilizers, pesticides and unplanned use of irrigation water have threatened the sustainability of agricultural production. These have increased the relevance of adoption of organic farming.

Organic farming is a viable alternative to the conventional agriculture. Organic farming systems rely on large-scale application of animal or farmyard manure, compost, green manure etc. Organic manures will improve the physical properties of soil like bulk density, pore space, alteration temperature, water permeability and water holding capacity. This improvement helps in the formation of “crumb” structure, a most desirable soil structure. Organic manures will increase the humus content of the soil, which in turn will increase the ionic exchange and buffering capacity of soil, thereby improving the nutrient holding capacity and stabilization of the soil reaction [Arden and Hodges, 1988].

The concept of organic matter recovery for use in agriculture is becoming more popular since the availability of chemical fertilizers to the farmers at reasonable rate is fast declining. With the introduction of high yielding crop varieties and adoption of intensive system of cropping, large quantities of crop residues such as straw, leaves, twigs, stubbles etc. are readily available in the farm. All these organic wastes cannot be applied as such into the soil due to the wide C:N ratio. They are known to reduce the availability of important mineral nutrient to growing plants through immobilization into organic forms [Ellicott, *et al.*, 1981] and also produce phytotoxic substances during their decomposition [Martin *et al.*, 1978]. To mitigate such problems, those materials could be composted in an appropriate manner with suitable microbial inoculants and used as organic manures in the crop production. Most of the organic wastes such as coir pith, paddy straw, sugarcane trash could be effectively recycled for manure purpose through bio-conversion. Compost not only supports plant nutrients but also maintains the soil health.

Sugar industry is the second largest agro based industry next to textiles and about 235 sugar mills crush 40 – 50 % of cane produced in the country. At present price, total value of sugarcane produced in the country is about Rs. 15,000 crores per year. The area under cultivation of sugarcane is 3.8 million hectare and about 270 million tonnes of canes are produced per year. The crop occupies 2.8% cultivated area and it constitutes 7.5% agricultural production of the country. Sugarcane processing yields substantial quantities of the organic matter in the form of trash, roots, stubbles, press mud, bagasse and effluents, all being rich source of organic carbon and nutrients. [PLATE - I].

Sugarcane produces huge quantity of foliage, about 40% of the total biomass. On an average, the cane trash produced amounts to 15 – 20 t/ha. The trash contains on an average 0.35% N, 0.13% P₂O₅, and 0.65% K₂O. That is for every tonne of cane trash, nutrient availability is 3.5 kg N, 1.3kg P₂O₅, and 6.5 kg K₂O. Thus from a hectare of sugarcane crop around 50 kg N, 20 kg P₂O₅, and 100 kg K₂O can be recovered from trash alone [Sundara, 1998]. Usually sugarcane farmers dispose off the trash by burning in the field itself. The farmers are also not aware of the ill effects of trash burning on the environment and the soil microflora.

The maize is cultivated in a total area of about 0.67 L.Ha and the total production is 1.07 L. metric tonnes in TamilNadu. The largest areas under cultivation in TamilNadu are Coimbatore (0.25 L.Ha) and Dindigul (0.20 L.Ha). The production in Coimbatore is about 0.28 L. metric tonnes and in Dindigul 0.40L.metric tonnes [Maruthasalam, 1999].

Cobs are usually burnt after the removal of maize grains. When the cob is burnt, the environment is polluted by smoke, CO₂ and CO. Certain nutrients are lost in the gaseous form besides, burning generate intense heat. All these undesirable effects on soil,

environment, loss of nutrients etc. could be avoided by recycling the agrowaste through composting. [PLATE - 2].

Hence, in the present study, sugarcane trash and corn cobs were composted. The composted sugarcane trash and corn cobs were substituted for chemical fertilizers for crop production with the following objectives.

1. To evaluate the role of the microbial consortia on bio composting sugarcane trash and corn cob.
2. To monitor the changes in temperature and maturity indices of composting.
3. To assess the effect of bio-compost on the growth and productivity of selected crops.
4. To quantify the effects of graded doses of the bio-compost with bio-inoculants against chemical fertilizers.
5. To evaluate the efficiency of the bio-compost in improving the physical, chemical and biological environment of the soil.

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REVIEW OF LITERATURE

CHAPTER - 2

REVIEW OF LITERATURE

The available literature pertaining to the nutrient status of organic matters, sugarcane trash and corncob composts, influence of organic amendments such as raw and composted sugarcane trash and corncob composts, farmyard manure, bio-fertilizers and inorganic fertilizers on the growth and yield of various crops and the influence of these fertilizers in increasing the fertility of soil as relevant to the present investigation are reviewed and presented in this chapter.

ORGANIC MATTER AND COMPOSTS

The scientific study of composting was conducted by Hutchinson and Richards, (1921) at Rothamsted and it was found that the best compost was prepared when crop residues and animal dung were composted together in the ratio of 3:1. Acharya,(1939) used night soil and refuse for the preparation of compost by Bangalore method of composting and it was found that more frequent turning was useful to maintain an aerobic condition for more rapid decomposition of organic matter. As ratoon sugarcane crop usually receive little or no manure, the compost prepared from their residues is likely to provide the balance needed and it appears that the sugarcane crop could easily be made self supporting for its own requirements of humus (Tambe and Yeshwant, 1935). Waksman and Starkey (1939) reported that the role of individual microorganisms as well as mixed culture as inoculants were efficient on aerobic decomposition when compared with pure culture. The decline in inoculum potential of Rhizobium bataticola by

incorporation of organic amendments might be due to competition between pathogen and saprophytes for nutrients (Blair, 1943 and Synder *et al.* , 1959) or multiplication of antagonistic organisms (Papavizas and Davey, 1960) or due to release of toxicants (Smith and Ashworth, 1965) . It is quite evident that the substances with narrow C:N ratio favour mineralisation and those with wider C:N ratio favour immobilization (Jansson, 1963). Gaur and Mathur(1966) showed a positive effect of humic acids and humus on the growth and yield of rye grass. Cooke (1967) inferred that phosphorus might have been released through the acidifying effect of CO₂ and the action of organic chelates produced by microbial decomposition. Kodama and Schnitzer, (1968) reported that the humus substances penetrate the interlamellar spaces of clay minerals and influenced the interaction of clay with other soil constituents. Among the secondary nutrients Ca and Mg are complexed mainly in the humic and fulvic fractions of organic matter and thereby influencing the soil reactions and other chemical properties of soil (Schnitzer and Skinner, 1969).

According to Tusneem and Patrick, (1971) the mineralization and immobilization due to narrow and wider C:N ratio, control the available nitrogen status in the soil. When calcium and magnesium were released from the minerals, they are likely to be absorbed by the organic matters, thereby preventing the loss of these nutrients by leaching (Allison, 1973). Bioconversion is a process in which heterotropic micro organism are sole agents for the decomposition of carbonaceous material. Their activities are directly related to the availability of energy sources and inorganic nutrients required for their growth (Alexander, 1977). Gaur (1977) has investigated the positive effect of microbial inoculants on the composting of rice straw and karanj leaves Pongamia pinnata.

According to Havelka and Hardy (1976), the favourable effects of trash incorporation were attributed to CO₂ enrichment of the soil atmosphere, which is known to help in nodulation and nitrogen fixation. Holter [1979] has reported increased macro and micro nutrient contents in vermicomposted cattledung. The organic phosphorus distributed in Indian soil varied from 2.6 to 75% of the total phosphorus present in the soil and this has to be mineralised with the involvement of microbes into organic forms before being absorbed by crops [Mukherjee *et al.*, 1979].

Composting process was accelerated between 45°C and 65°C, a range which was considered as optimum [deBertoldi and Zucconi, 1980]. Composting not only reduces the requirement of mineral fertilizers but will build up the soil fertility on permanent basis at less cost [Gaur, 1980]. The potassium moves in the formation of any organic compounds and hence the soil with high amount of organic matter content showed very low potassium content [Sobulo and Jaiyeola, 1980].

According to Misra and Hesse, [1982] the compost prepared from farm/garden wastes were superior in organic matter and major nutrients N, P and K. The average nutrient status of sugarcane trash compost was 2.73 N, 1.81 P₂O₅ and 1.31 K₂O. The manurial value of FYM was 1.23 N, 0.62 P, 0.80 K and compost was 1.29 N, 0.93 P, 0.98 K [Swaminathan *et al.*, 1982]. According to Singh *et al.*, [1983] the composting of low grade rock phosphate with agricultural wastes was known to increase the solubility of insoluble phosphate. Bisaria *et al.* , [1983] stated Pleurotus sajor-caju as one of the most efficient lignin degrading organisms for ligno cellulolytic waste material viz. coirpith. Sugarcane trash was composted with different phosphate sources and microbial cultures by heap method. The treatment combination markedly increased the decomposition rate

of sugarcane trash [Shinde and Rote, 1983]. Bollen,[1984] indicated that the high temperature reached during composting process insured inactivation of any pathogens possibly present initially in the substrates. The results of Asija *et al.*, [1984] revealed that the total nitrogen percentage was higher in manures prepared in pits than in heaps. Biddlestone and Gray, [1985] inferred that composting is the microbiological conversion of biodegradable organic wastes into a stable humus by indigenous flora, including bacteria, fungi and actinomycetes which are widely distributed in nature. Bharadwaj and Gaur, [1985] reported that inoculation with Aspergillus niger and Pencillium sp appreciably increased the total nitrogen, phosphorus and humus content of Jowar stalk (Sorghum vulgare) plus wheat straw compost. Vermicomposted maize and soya bean plant residues showed increased macro and micro nutrient contents [Mackay and Kadivko, 1985]. Nagarajan *et al.*, (1985) reported that the C:N ratio of coir waste was observed to be 112:1 and it was narrowed down to 24:1 by Pleurotus sp. With the addition of rock phosphate to the organic residues, there was an increase in the solubility of insoluble phosphates [Singh (1985), Kubat *et al.*, 1985 and Mey *et al.*, 1986].Lignin degradation of lignocellulolytic waste by the Pleurotus sp. was reported by Reddy and Ramaswamy (1985) and Ramaswamy (1986). The use of coirpith as an amendment was also successfully tried in reclaiming saline alkali soils of Madurai district [Ramaswami and Kothandaraman, 1985 and Clarson, 1986]. Subsequent studies on the usefulness of coirpith after inoculation of Pleurotus sp. with coirpith and application to groundnut crop resulted in increased pod yield (Nagarajan *et al.*, 1986). Gaur (1987), showed that during composting of paddy straw, the loss of organic carbon following fungal inoculation was found to be 33.3% at the end of week 5, where the initial carbon content was 44.2%.

Surface mulch of sugarcane crop residues may inhibit soil N uptake because of its wide C:N ratio [Ng *et al.*, 1987; Yadav *et al.*, 1987]. There is an association between nitrogen fixing organisms and saprophytes and nitrogen fixation and build up in the microbial biomass preceding maximum rates of CO₂ evolution [Hill and Patriquin, 1988]. Lovie, (1988) reported that Pleurotus sp. decomposed the lignin of Cotton straw and it was evident that higher proportion of coirwaste to paddystraw significantly reduces the yield and this might be due to the higher lignin content. According to Zadrazil and Kamra, (1989) Pleurotus eryngii degraded lignin more selectively than Stropharia rugosoannulata and Pleurotus sajor-caju.

During composting of grape pulps, the increase in temperature and pH led to the disappearance of initial microorganisms and they were replaced by bacteria that appeared to be mainly responsible for the degradation of organic matter [Faure and Deschamps, 1990]. Sustainable agriculture should involve successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the environment and conserving natural resources [FAO, 1990].

According to John Reganold, (1990) to be sustainable, a farm must produce adequate food of high quality, be environmentally safe, protect the resource base and be profitable. The use of organic manures rather than chemical fertilizers has been suggested as a method of low input agriculture to achieve sustainability in dryland agriculture [Isvarmurthi, 1990]. According to Parr *et al.*, (1990) sustainable agriculture was one that encompasses a range of strategies for addressing many of the problem that affect soil productivity, groundwater pollution etc. The production of humic substances and their retention capacities for phosphorus and calcium released during composting of wheat

straw was examined by Singh and Amberger, (1990) and reported that about 80-85% phosphorus and 90-95% calcium retained by the total humic substances produced from 1 gm straw during composting were found in the fulvic acid fractions. Singh and Mahendra Singh, (1990) reported a significant effect of compost in increasing the availability of nitrogen and phosphorus. According to Verma and Mathur, (1990) increased conversion of rice straw and biomass yield were observed when the straw was inoculated with efficient cellulolytic fungus. The manure composts had water holding capacities nearly equal to that of original peat, and the properties of the composts suggested that they could be used as substitute or supplement for the limed and fertilized peat generally used in gardening, landscaping and green house culture [Mathur et al., 1990]. The increase in available nutrient content in soil with trash have been reported by Srivastava and Prakash, (1990).

Pushpanathan and Veerabadran, (1991) observed that coirpith composted with Pleurotus sajor-caju had higher N, P and K and narrow C:N ratio. Prasad *et al.*, (1991) noted a significant increase in the available phosphorus, potassium and exchangeable calcium and sodium with the addition of leaves of Sal, Teak, Eucalyptus and Subabul. According to Gaur *et al.*, (1991) conjoint use of cellulolytic fungus and earthworms showed a decreased C:N ratio and increased total and available nitrogen than either of them alone. Tripathi and Minhas, (1991) inferred that addition of Farm Yard Manure enhanced the solubility of all the phosphate fraction. Increase in soil organic matter levels following retention of harvest residues have been reported by Wood (1991). Okamoto *et al.*, (1991) and Arora and Kahlon (1992) reported that the increase in nutrient availability in rice straw was maximum with Pleurotus ostreatus. According to Thanikachalam and

Rangarajan (1992), increased conversion of rice straw and biomass yield was maximum with straw inoculated with Aspergillus sp. (80.0%) followed by Fusarium sp. (78.0%) and Trichoderma sp. (76.0%).

The increase in phosphorus content during composting of sugarcane trash with inoculation of cellulolytic fungi has been reported by Yadav *et al.*, (1992). The annual residue production of sugarcane is 40.92 million tonnes and maize is 12.50 million tonnes (Gaur, 1992). The fertilizer consumption in India has registered a spectacular growth during the last four decades [Annon, 1993]. Yadav [1993] revealed that with the decomposition of trash in the soil, the organic acids were produced which would help in solubilizing the nutrient in the soil and increase the availability of nutrients.

According to Spain and Hodgen, [1994] the concentrations of potassium and magnesium declined rapidly with the age of sugarcane residues used as surface mulch, N and Ca increased after 75 days and C:N ratio started at 170 and finally diminished to a value of 70. The increase in infiltration rate and water holding capacity of the soil with incorporation of the trash was reported by Velayutham and Bhardwaj, [1994]. The results of Bhanavase *et al.*, [1995] showed that the size of the sugarcane trash, addition of rock phosphate and use of urea, biofertilizers and moisture play a significant role in mineralisation of compost.

According to Rajannan *et al.*, [1996] the composted pressmud was enriched with nutrients such as nitrogen, phosphorus, potassium and ferrous salts. C/N ratio was also reduced to the lower level and the process of composting was over within 90 days. The ratio of the number of fungi, ammonifying microorganisms and nitrogen fixing bacteria to the actinomycetes have been found to decrease with age of composting [Kalaiselvi and

Ramasamy,1996]. According to Sahul Hameed *et al.*, [1996] for composting one tonne of sugarcane trash, three spawn bottles of Pleurotus sajor-caju , three bottles of Trichoderma viridae and five kg of urea were needed. After one month, a stable compost with 0.70% N, 0.25% P and 0.70% K and a C:N ratio of 24:1 was obtained. Schulz and Romheld, [1997] reported that the application of organic wastes compost should be based on the amount of nutrient input. When composted maize cobs were added at 5, 10, or 20g/kg to an acidic oxisol [pH-4], the lettuce and pea growth was greater from the addition of compost. The pH was found to be lowered and the exchangeable Al, increased in corncob compost treated soils [Ren-shih chung and Sun-hoWu,1997]. According to Vijayakumar and Sagwal,[1998] sugarcane trash contain appreciable amount of nitrogen, phosphorus and potassium and other macro and micro nutrients. The incorporation of sugarcane trash along with nitrogen releases nutrients after decomposition.

ORGANIC AMENDMENTS ON CROP PRODUCTION

Addition of organic matter showed a positive effect on the growth and yield of crops such as rye-grass[Gaur and Mathur, 1966], Berseem and pea [Bharadwaj and Gaur,1968]. With the addition of organic fertilizers [FYM] and inorganics [N,P,K], a maximum grain and straw yield were reported in wheat [Nalk and Ballai,1968; Lawra and Idrani, 1972]. According to Khandelwal and Gaur [1974], the application of organic matter as humus showed an improved growth and yield of green gram. Charreau, [1975] reported a favourable effect of humic substances on the growth, yield and nutrient uptake by plants. Beneficial effect of applying organic and inorganic sources of nitrogen was

compost enriched with nitrogen fixing (*Azotobacter*), cellulolytic (*Apergillus* sp., *Trichurus spiralis*, *Paecilomyces fuisporus* and *Trichoderma viridae*) and phosphate solubilizing culture with the addition of 1% rock phosphate improved biochemical properties, grain and dry matter yield of wheat. An increase in grain yield of finger millet was more prominent by the addition of 60 kg N, 20 kg P₂O₅ and 6 tonnes farm compost ha (Rani Perumal *et al.*, 1988). Devarajan *et al.*, (1988) inferred that various bioearth composts applied soil registered significantly higher available P, K, Ca and Mg and higher cane yield than FYM alone. The highest grain and stover yield of maize was obtained with the application of FYM 25 t/ha along with ZnSO₄ at 25 t/ha (Devarajan *et al.*, 1988). 75 kg/ha in each of nitrogen, phosphorus and potassium fertilizers released more bulb yield with large sized bulbs, better viability and vigour in onion (Jayabharathi, 1989). The results of the experiment conducted by Sidhu and Beri, (1989) revealed that incorporation of wheat residue improved the soil physio chemical properties, grain and stover yield of corn significantly. The addition of sugarcane trash and nitrogen at graded levels significantly increased the grain and dry matter yields of mung over control (Rasal *et al.*, 1989). Application of 40 kg N /ha with seed and soil inoculation of *Azospirillum* resulted in higher grain yield of Sorghum than in check plot [Porwal and Puspendra Singh, 1989]. Maximum grain yield and straw yield of Sorghum with FYM and pyrite in Red non - calcareous soil was observed by Veeramani *et al.*, (1989).

Selvi, (1990) reported that mushroom spent compost registered 20.1% more of grain yield of rice over nitrogen alone. Studies of Pushpanathan and Veerabadran, (1991) recorded enhanced length and spread of roots of Sorghum plant with the application of coirwaste. The phosphate solubilising organisms appears to be promising in augmenting

the yield and yield components of rice in lateritic soils [Mohod *et al.*, 1991]. According to Gangwar and Nirunjan (1991), fodder Sorghum was improved significantly with the application of organic and inorganic sources of nitrogen. Incorporation of coirwaste into a red soil significantly increased the yield of finger millet (*Eleusine coracana*) (Veerabadran, 1992). Among the organic manures, Sesbania, green manure and FYM exerted almost similar effects on the number of productive tillers and paddy yield (Muhammad Sharif, 1992). Effect of organic amendments like green manure, rice husk, wheat straw individually and in combination produced better rice growth [Anand Swarup, 1992]. Yadav *et al.*, (1992) reported a highest number of nodules, grain and straw yield of green gram in treatment receiving combined inoculation of Azotobacter with rock phosphate. The different NPK combinations were significantly superior to the absolute control in their effect on yield and yield components of Bendi [Elizabeth *et al.*, 1992].

Mahapatra and Sharma, (1993) have given the results that dipping seedlings of rice in 2% solution of Azospirillum increased the yield. According to Mahadeva Reddy *et al.*, (1993) application of FYM alone produced an average seed yield of green gram, which was superior over phosphate application and control. Madhumita Das *et al.*, (1993) observed that there was a drastic response in the yield even due to application of manure alone under low organic matter soil (2.21%). Ramaswami *et al.*, (1993) inferred that coirpith applied at 15 t/ha enhanced the grain yield of Sorghum under rain fed conditions. Incorporation of chopped or unchopped sugarcane trash supplemented with 8 kg urea, 10 kg single superphosphate and fungal culture increased the cane yield by 11.75 Mt/ha (Shinde *et al.*, 1992). The results of Boramanikar and Patil(1993) showed that, maximum millable canes yield were obtained on incorporation of chopped sugarcane trash at 10

t/ha and culture in both pre-seasonal and ratoon crops. Incorporation of crop residue (Subabul) alone 5 t/ha gave a significantly higher grain yield than control [Bellakki and Badanur, 1994]. Makoto Kitou and Shigekata Yoshida, (1994) showed that mulching with plant residues [soyabean, mugwort, Japanese plume grass, Black wattle] resulted in the promoting of soyabean growth.

Son (1995) reported the significant increase in plant nutrients due to composting of sugarcane trash with a composite culture consisting of Pleurotus sajor-caju and Trichoderma viridae. Pod yield of vegetable soyabean in the organic plots were slightly higher than in chemical fertilizer [Hsieh-Chingfang and Hsu-Kuonan, 1995]. The high content of reducing sugar, crude protein, starch, total carbohydrate and phenol in maize grain with farmyard manure treatment were reported by Kamalakumari and Singaram, (1996). Nodulation in soyabean was increased by organic amendment compared with untreated control [Prabakaran and Ravi, 1996]. Trash mulching (3.5 t/ha) along with nitrogen increased the cane yield [Verma, 1996]. The composts obtained from a ten solid agricultural residues mixed with depotassified beat vinasse, when applied to cotton crop showed higher yield than control [Madejon *et al.*, 1996]. Lignocellulolytic fungi like Aspergillus niger and Trichoderma were used to degrade the lignocellulolytic materials in Eichornia crassipes and Ipomea carnea and the degraded material improved the overall growth of Lablab purpureus [Lakshmi and Sekar, 1996]. According to Thilagavathi and Mathan (1996), the yield of grain and straw of rice crop increased due to coirpith application. Incorporation of Azolla and Blue green algae to the preceding plant crop resulted in higher grain and straw yield of ratoon crop of Rice [Singh and Mandal, 1997]. Use of organic matter (cowdung and decomposed straw) produced higher yield in wheat

irrespective of quality of irrigation water and varieties [Aich *et al.*, 1997]. According to Alok tiwari *et al.*, [1997] incorporation of balanced fertilizers with FYM in soyabean produced more leaf area index, high crop growth rate (g/m^2) and maximum grain and straw yield. Residual effects of fertilizer phosphorus with Sesbania rostrata increased grain yield by 0.3 to 1.0 t/ha over control [Medhi and DeDatta, 1997].

Sasireka *et al.*, [1998] showed that more number of tillers and highest dry matter yield was obtained with the application of 75kg N/ha as urea with 2.5 t/ha of FYM . According to Kathiresan and Manoharan, [1999] Cane productivity with Phospho bacteria was higher [15 t/ha] than control. Wong *et al.*, [1999] reported a higher dry weight yield of Brassica chinensis and Zea mays in soil receiving manure compost amendment.

ORGANIC AMENDMENTS ON SOIL PROPERTIES

Bhairathi *et al.*, [1974] reported that organic matter addition had favourably influenced the hydraulic conductivity and total porosity of soil. Monib *et al.*, [1974] revealed that the organic matter addition significantly influenced the Azotobacter and other soil microflora. Salt affected soils are very much poor in N content and consequently large amount of applied fertilizer is lost through fertilization [Srivastava, 1975 and Laura 1976]. Blair and Boland [1978] found that incorporation of wheat residues improved the soil fertility status and yield of maize crop was higher in which crop residues had been incorporated for seven years. Gaur, [1979] reported that inoculating compost with Azotobacter and phosphate solubiliser improves the quality of compost and supplies useful and efficient micro-organisms which will further multiply in

the soil and improve soil fertility on a permanent basis. From the results of yield experiments, Ramaswami *et al.*, [1979] observed that the addition of organic matter greatly influenced *Azotobacter* population in rice soil.

The FAO soil map of the world estimates the presence of 22×10^{14} kg organic carbon in the global soil, made up from 18×10^{14} kg carbon in mineral soil and 4×10^{14} carbon in the surface matter of Peat soil [Bohn, 1982]. A long term fertilizer experiment conducted in India has revealed that continuous application of Farmyard manure in addition to NPK has brought about lowering of bulk density in medium black soil of Coimbatore, Jabalpur and Hyderabad [Muthuvel *et al.*, 1982; and Nambiar and Gosh, 1984]. Substitution of a part of urea by FYM reduced the extent of accumulation of Nitrite [Rao and Batra, 1983]. Larson and Clapp, [1984] inferred that the water retention capacity of the soil was more pronounced with high organic matter content. According to Khiami and More, [1984] organic carbon in soils after 45 years of FYM application was nearly twice [1.14%] than in non-manured plots [0.56%]. There was also a significant increase in total nitrogen, available nitrogen, phosphorus, exchangeable potassium, maximum water holding capacity and moisture retention due to FYM application.

Aravind, (1987) recorded that the soil organic matter was responsible to great extent directly or indirectly for making the physical environment of the soil suitable for growth of crops. Geigu *et al.*, (1988) found that after 5 years of addition of crop residues, the levels of Ca, Mg, and K had increased significantly in the top soil. Sidhu and Beri, (1989) showed a beneficial effect of residues on microbiological, physical and chemical properties of soils. Loganathan, (1990) reported that application of organic amendments viz., sawdust, groundnut shell powder, coirdust and farm yard manure (2.5 and 5 t/ha)

improved the soil physical characteristics like infiltration rate, total porosity and hydraulic conductivity of red soil.

Continuous recycling of crop residues for 7 years in rice and wheat markedly influenced the soil properties like organic carbon, available and total N, P, K status of the soil significantly (Bhat *et al.*, 1991). Bationa and Mokwonye, (1991) conducted an experiment with organic manure crop residues to increase chemical and physical properties of soil. Pushpanathan and Veerabadran, (1991) reported that incorporation of composted coirpith significantly increased soil moisture content and nutrient uptake over no manuring as well as application of biodigested slurry and FYM. With the application of organic amendments, it was observed that there was reduced inoculum density of pathogen through changes in microbial balance of soil indicated by Lukada, (1992). Martin *et al.*, (1992) observed that application of organic amendments increased the soil physical properties like soil aggregate stability, infiltration rates, soil respiration, moisture percentage and organic matter content and a decrease in bulk density.

Deepadevi, (1992) reported that the soil available N, P and K had been enhanced significantly due to the application of FYM and composted sugarcane trash. With the application of FYM and pressmud, the pH and EC were significantly reduced, CEC, Ca^+ , Mg^{2+} , K^+ increased significantly and Na^+ , HCO_3^- , Cl^- , SO_4^{2-} decreased at higher rates of manures compared with the control [Sivakant and Rajkumar, 1992]. Incorporation of straw that was degraded with cellulolytic or lignocellulolytic fungi and diazotrophic bacteria increased the nitrogen content in a soil containing low mineral nitrogen. Sennimalai, (1994) noted that the application of organic wastes viz, pressmud, Farmyard manure, coirpith, paddy straw and sugarcane trash had increased the CEC of soil in rice-

rice sequence. Trash mulching of the ratoon crop upgraded the level of soil organic carbon and mineral nitrogen status compared to no mulching (Yadav, 1995). Syed Ismail *et al.*, (1998) found that FYM at 30 gm /ha increased the soil pH, organic carbon, N, P, K, porosity, bulk density, infiltration rate, hydraulic conductivity in post harvest soil over control. According to Wong *et al.*, (1999) addition of manure compost increased total organic matter, micronutrients (Cu, Zn and Mn) and macronutrients (N, P, Mg, Ca, Na and K), soil porosity and hydraulic conductivity but bulk density has been decreased.

MATERIALS AND METHODS

CHAPTER-3

MATERIALS AND METHODS

The methods adopted for the decomposition of the agrowastes, incorporation of these composted wastes as treatments, seedling growth, Pot culture experiments, biometric and yield parameters recorded, analytical techniques for composts and soil samples and statistical evaluation of the data are presented in this chapter.

3.1. COLLECTION OF AGROWASTES

The agrowastes were collected in large amounts from the sugarcane and cornfields of South East Coimbatore.

3.2. COMPOSTING PROCEDURE

The sugarcane trash and corncobs were initially chopped into pieces of size ranging from 8-10cm. Pits of size 2x1½ x1 metre were used for composting.

The inoculum used for composting were Pleurotus sajor caju and Trichoderma viridae. Seven different treatments were undertaken for composting the agrowastes viz., sugarcane trash (S.T) and corncob (C.C) separately.

C₁ – S.T / C.C + Cowdung

C₂ – S.T / C.C + Urea + Pleurotus

C₃ – S.T / C.C + Urea + Trichoderma

C₄ – S.T / C.C + Urea + Pleurotus + Cowdung

C₅ – S.T / C.C + Urea + Trichoderma + Cowdung

C₆ – S.T / C.C + Urea + Pleurotus + Trichoderma

C₇ – S.T / C.C + Urea + Pleurotus + Trichoderma + Cowdung

Urea and inoculum were sandwiched between the wastes in the pits. Once in 5 days, watering was done. Once in 10 days, turning along with watering was also given. Hence for composting one tonne of sugarcane trash or corncob, four spawn bottles of Pleurotus sajor caju (1,200 gm), four packets of Trichoderma (800 gm) and five kilogram of urea were used.

3.3 ANALYSIS OF COMPOST

During the decomposition of sugarcane trash and corncob, the compost samples were drawn from the pits on the 30th and 60th days and their characteristics were analysed.

3.3.1 pH AND ELECTRICAL CONDUCTIVITY (Ec)

pH was estimated in 1:25 soil and water suspension using a glass electrode [Jackson, 1973] and Ec by electrical conductivity bridge and expressed ^{as} μdsm^{-1} .

3.3.2 ORGANIC CARBON

Organic carbon of the composts was estimated by wet chromic acid oxidation method [Appendix 1] of Walkey and Black [1934].

3.3.3 AVAILABLE NITROGEN

Available Nitrogen status of the compost sample was estimated by Alkaline permanganate method [Appendix 2] of Subbiah and Asija (1956).

3.3.4 AVAILABLE PHOSPHORUS

The available phosphorus was estimated by extracting the compost with 0.03N Ammonium fluoride in 0.025 N Hcl extract [Bray No. 1] as per Jackson (1973) [Appendix 3].

3.3.5 AVAILABLE POTASSIUM

This was estimated by extracting with Neutral normal ammonium acetate as per the procedure outlined by Stanford and English (1949). [Appendix 4].

3.3.6 CALCIUM

The available Calcium was estimated using versanate titration method using Mureoxide as indicator [Jackson, 1973] [Appendix 5].

3.3.7 MAGNESIUM

This was estimated by Versenate titration method using Erichrome Black – T as indicator [Jackson, 1973] [Appendix 5].

3.4 EFFECT OF COMPOSTED SUGARCANE TRASH AND CORNCOB ON SEEDLING GROWTH

For evaluating the efficiency of composted sugarcane trash and corncob on seedling growth, the seeds of soyabean and Green gram were germinated in germination towels. The seeds were soaked for 12 hours in beakers containing sugarcane trash and corncob compost extracts at different doses like.

T₁ - Control

T₂ - 5 t/h

T₃ - 10 t/h

T₄ - 15 t/h

T₅ - 20 t/h

T₆ - 25 t/h

T₇ - 30 t/h

T₈ - 40 t/h

and arranged in Germination towels.

After 7 days, the shoot length, root length, number of leaves, Plant fresh weight and Plant dry weight were noted and the influence of compost extracts on germination of seedlings were determined.

3.5.1 EXPERIMENTAL PLANTS AND SOIL

The test crops selected were

- (1) Glycine max L. (Soyabean)
- (2) Vigna radiata L. (Green gram)
- (3) Eleusine coracana Geartn. (Ragi).

Red loamy soil was ^{used} for the pot culture experiments.

3.5.2 DESIGN AND LAYOUT OF THE EXPERIMENT

The design followed for the experiment was randomized block design with seven treatments [Pot culture experiment – I] and nine treatments [Pot culture experiment – II] replicated three times.

3.5.3 TREATMENT APPLICATION AND CULTIVATION

The pots were filled with 7 kg of Red loamy soil in each. Nitrogen as urea, Phosphorus as Superphosphate and Potash were applied to the respected pots and mixed thoroughly. Viable seeds were selected and about 5 seeds were sown in each pot after germination, three healthy plants were maintained per pot. Plant protection measures and other cultural practices were followed as per recommendations by TNAU, Coimbatore.

3.5.4 POT CULTURE EXPERIMENT – I

The experiments carried out in first set consist of seven treatments using the Raw and composted sugarcane trash, 100% NPK and farm yard manure (FYM). The treatments were as follows.

- T₁ - Absolute control
- T₂ - NPK 100%
- T₃ - Raw sugarcane trash / corncob
- T₄ - Farm yard manure
- T₅ - Compost – 1 (Trash / cob + cowdung)

T₆ - Compost – 6 (Trash / cob + Pleurotus + Trichoderma)

T₇ - Compost – 7 (Trash / cob + Pleurotus + Trichoderma + cowdung)

The compost and farm yard manure were applied at the rate of 12.5 t/h.

The above seven treatments were repeated for corncob compost in another set of experiments on the following test crops.

- 1) Soyabean
- 2) Green gram
- 3) Ragi

3.5.5 POT CULTURE EXPERIMENT – II

In the second set of experiments,composts at two different levels (12.5 t/h and 25 t h) were incorporated alone and in combination with bio inoculants [Rhizobium or Azospirillum and Phosphobacterium]. Separate experiments were carried out for sugarcane trash and corncob composts with Soyabean, Green gram and Ragi as test species.

The treatments were as follows.

T₁ - NPK 100%

T₂ - Compost [Trash / cob 12.5 t/h]

T₃ - Compost [Trash / cob 12.5 t/h] + Rhizobium / Azospirillum

T₄ - Compost [Trash / cob 12.5 t/h] + Phosphobacterium

T₅ - Compost [Trash / cob 12.5 t/h] + Rhizobium /Azospirillum +
Phosphobacteria

T₆ - Compost [Trash / cob 25 t/h]

T₇ - Compost [Trash / cob 25 t/h] + Rhizobium / Azospirillum

T₈ - Compost [Trash / cob 25 t/h] + Phosphobacterium

T₉ - Compost [Trash / cob 25 t/h] + Rhizobium / Azospirillum +
Phosphobacterium

3.5.6 PLANT SAMPLE ANALYSIS

The plants were uprooted on 30 DAS and 60 DAS and noted for its vegetative characters like shoot length, root volume, number of leaves, Internodal length, Petiole length, Shoot dry weight, Root dry weight and dry matter production, for the green gram and soyabean. The characters noted for ragi were Shoot length, Root volume, Number of Leaves, Shoot dry weight, Root dry weight and Dry matter production. At harvest stage, the pods of soyabean and green gram were collected and the characters noted were number of pods / plant, number of seeds / plant, weight of seeds / plant, 100 seed weight and haulm weight. The yield parameters noted for ragi were number of productive tillers, weight of fingers / plant, weight of grains / plant and 100 grain weight.

3.6 PRE AND POST HARVEST SOIL SAMPLE ANALYSIS

The soil samples before and after harvesting the experimental plants were collected and soil characteristics noted were as follows:

| No | SOIL ANALYSIS | METHOD | REFERENCE |
|----|----------------|----------------------------------|--------------------------|
| 1 | pH and Ec | 1 : 25 Soil and water suspension | Jackson (1973) |
| 2 | Organic Carbon | Wet chromic acid oxidation | Walkey and Black (1934) |
| 3 | Nitrogen | Alkaline permanganate | Subbiah and Asija (1956) |
| 4 | Phosphorus | Calorimetry | Jackson (1973) |
| 5 | Potassium | Flame Photometry | Jackson (1973) |

6 Bulk density , Brass Cup Keen and Raczkowski
water holding capacity (1921)

3.7 STATISTICAL ANALYSIS

The data obtained from various biometrical observations and yield parameters were consolidated and subjected to the statistical analysis and critical differences were worked out.

RESULTS AND DISCUSSION

CHAPTER – 4

RESULTS

The experimental results pertaining to the composting of agrowastes using bioinoculum, biometrical and yield parameters of test crops during pot culture experiments and the physical and chemical analysis of pre and post harvest soil samples are presented in this chapter.

4.1 INFLUENCE OF BIOINOCULUM ON COMPOSTING AGROWASTES

The sugarcane trash and corncob were composted using Pleurotus, Trichoderma and cowdung individually and in combinations. On the 30th day and 60th day of composting, the physical and chemical parameters were analysed and recorded as follows. [PLATE - 3A-3F]

4.1.1. QUALITY PARAMETERS OF SUGARCANE TRASH COMPOST [Table 1 and 2]

4.1.1.1 PHYSICAL PARAMETERS

HYDROGEN ION CONCENTRATION [pH]

The hydrogen ion concentration of raw sugarcane trash was 6.5 and it increased with the age of composting. The hydrogen ion concentration of composts influenced by different inoculated treatments ranged between 7.0 [C₁ – sugarcane trash composted with cowdung] and 7.5 [C₅ – sugarcane trash composted with Trichoderma and cowdung] on the 30th day and 7.3 [C₁– sugarcane trash composted with cowdung] to 7.9[C₆ –

TABLE - 1
COMPOSTING TREATMENTS ON THE QUALITY PARAMETERS OF
SUGARCANE TRASH (30th DAY)

| Treatments | pH | Ec milli mhos cm ⁻¹ | OC % | N % | P % | K % | Ca mg/kg | Mg mg/kg | C:N |
|----------------|-----|---|---------|--------|--------|--------|-------------|-------------|---------|
| Raw | 6.5 | 0.3 | 42.04 | 0.23 | 0.12 | 0.11 | 67 | 52 | 182.8:1 |
| C ₁ | 7.0 | 0.4 | 37.3 | 0.28 | 0.18 | 0.28 | 72 | 55 | 133.2:1 |
| C ₂ | 7.2 | 0.4 | 36.7 | 0.29 | 0.20 | 0.30 | 74 | 55 | 126.6:1 |
| C ₃ | 7.3 | 0.6 | 38.4 | 0.27 | 0.17 | 0.27 | 75 | 55 | 142.2:1 |
| C ₄ | 7.3 | 0.5 | 37.2 | 0.28 | 0.19 | 0.29 | 73 | 56 | 132.9:1 |
| C ₅ | 7.5 | 0.7 | 35.0 | 0.29 | 0.18 | 0.29 | 74 | 57 | 120.7:1 |
| C ₆ | 7.4 | 0.7 | 35.7 | 0.30 | 0.20 | 0.32 | 78 | 59 | 119.0:1 |
| C ₇ | 7.4 | 0.8 | 33.5 | 0.32 | 0.21 | 0.36 | 80 | 59 | 104.7:1 |

TABLE - 2

COMPOSTING TREATMENTS ON THE QUALITY PARAMETERS OF
SUGARCANE TRASH (60th DAY)

| Treatments | pH | Ec milli mhos cm ⁻¹ | OC % | N % | P % | K % | Ca mg/kg | Mg mg/kg | C:N |
|----------------|-----|---|---------|--------|--------|--------|-------------|-------------|---------|
| Raw | 6.5 | 0.3 | 42.04 | 0.23 | 0.12 | 0.11 | 67 | 52 | 182.8:1 |
| C ₁ | 7.3 | 0.9 | 21.0 | 0.58 | 0.32 | 0.79 | 106 | 114 | 36.2:1 |
| C ₂ | 7.4 | 1.0 | 20.2 | 0.59 | 0.36 | 0.84 | 115 | 120 | 34.2:1 |
| C ₃ | 7.6 | 0.7 | 20.8 | 0.58 | 0.34 | 0.86 | 112 | 118 | 35.9:1 |
| C ₄ | 7.5 | 0.8 | 20.1 | 0.59 | 0.33 | 0.84 | 110 | 120 | 34.1:1 |
| C ₅ | 7.7 | 0.8 | 19.8 | 0.60 | 0.32 | 0.84 | 114 | 119 | 33.0:1 |
| C ₆ | 7.9 | 0.8 | 19.0 | 0.62 | 0.35 | 0.85 | 117 | 122 | 30.7:1 |
| C ₇ | 7.8 | 0.8 | 18.0 | 0.70 | 0.38 | 0.88 | 119 | 124 | 25.7:1 |

sugarcane trash composted with Pleurotus and Trichoderma] on the 60th day of composting.

ELECTRICAL CONDUCTIVITY [Ec]

The Ec increased during the incubation of the inoculum and it was 0.3 milli mhos cm^{-1} in raw sugarcane trash. A maximum Ec of 0.8 milli mhos cm^{-1} [C₇ – sugarcane trash composted with Pleurotus, Trichoderma and cowdung] on the 30th day and 1.0 milli mhos cm^{-1} [C₂ – sugarcane trash composted with Pleurotus] on the 60th day of sugarcane trash compost was recorded.

4.1.1.2 CHEMICAL PARAMETERS

ORGANIC CARBON

The organic carbon of inoculated sugarcane trash compost decreased with the advancement of incubation period. The combination of Pleurotus, Trichoderma and cowdung (C₇) treated compost showed a minimum organic carbon content 33.5% on 30 days and 18% on 60 days among the other treatments at both the stages of analysis.

NUTRIENT STATUS

The raw sugarcane trash consisted of 0.23% N, 0.12% P, 0.11% K, 67 mg / kg Ca and 52 mg / kg Mg. On the 30th day compost, the available nutrients increased with the progress of incubation period in all the inoculated trash compost treatments. At maturity, the range of nitrogen in the sugarcane trash compost was between 0.58% (C₁) to 0.70% (C₇), phosphorus 0.32% (C₁, C₅) to 0.38% (C₇), potassium 0.79%(C₁) to 0.88% (C₇), calcium 106 mg /kg (C₁) to 119 mg/kg (C₇) and magnesium 114 mg/kg (C₁) to 124 mg/kg (C₇).

CARBON, NITROGEN RATIO [C:N]

Maturity of the compost was determined by C/N ratio. Initially the C:N ratio was 182.8 :1 in the uncomposted sugarcane trash. On the 30th day of composting, the C/N ratio was narrowed down with all the inoculated treatments ranging from 104.7:1 (C₇) to 142.2:1 (C₃). On the 60th day C/N ratio was further decreased and ranged from 25.7:1 (C₇) to 36.2:1 (C₁). Among the inoculum added treatments the combination of Pleurotus, Trichoderma and cowdung were efficiently accelerating degradation process by narrowing down the C:N ratio to 25.7:1 at maturity.

4.1.2 QUALITY PARAMETERS OF CORNCOB COMPOST [Table 3 & 4]

4.1.2.1 PHYSICAL PARAMETERS

HYDROGEN ION CONCENTRATION [pH]

The pH of raw corncob was 6.7. It ranged from 7 (corncob composted with cowdung – C₁, with Pleurotus – C₂) to 7.3 (corncob composted with Trichoderma and cowdung – C₆, with Pleurotus + Trichoderma + cowdung – C₇) at the first stage and 7.6 (corncob composted with cowdung – C₁ and with Pleurotus and cowdung – C₄) to 7.8 (corncob composted with Trichoderma and cowdung – C₅, with Pleurotus and Trichoderma – C₆ and with Pleurotus + Trichoderma + cowdung – C₇) at second stage of analysis. There was a slight increase in pH of composted corncob over raw corncob.

ELECTRICAL CONDUCTIVITY [EC]

The electrical conductivity increased with the treatments in the composted corncob over the raw corncob. The electrical conductivity of raw corncob was 0.3 milli mhos cm⁻¹. The electrical conductivity varied between 0.4 milli mhos cm⁻¹ (C₂) and 0.7

TABLE – 3
COMPOSTING TREATMENTS ON THE QUALITY PARAMETERS OF
CORNCOB (30th DAY)

| Treat ments | pH | Ec milli mhos cm ⁻¹ | OC % | N % | P % | K % | Ca mg/ kg | Mg mg/ kg | C:N |
|----------------|-----|---|---------|--------|--------|--------|-----------------|-----------------|---------|
| Raw | 6.7 | 0.3 | 39.9 | 0.14 | 0.014 | 0.056 | 67 | 24 | 285:1 |
| C ₁ | 7.0 | 0.5 | 33.0 | 0.25 | 0.017 | 0.145 | 129 | 56 | 132:1 |
| C ₂ | 7.0 | 0.4 | 32.9 | 0.29 | 0.019 | 0.152 | 132 | 58 | 117.5:1 |
| C ₃ | 7.1 | 0.6 | 31.3 | 0.27 | 0.017 | 0.148 | 136 | 62 | 115.9:1 |
| C ₄ | 7.2 | 0.6 | 34.2 | 0.26 | 0.020 | 0.144 | 133 | 60 | 131.5:1 |
| C ₅ | 7.1 | 0.7 | 33.1 | 0.22 | 0.018 | 0.142 | 135 | 59 | 150.5:1 |
| C ₆ | 7.3 | 0.7 | 32.5 | 0.28 | 0.020 | 0.168 | 134 | 62 | 116.1:1 |
| C ₇ | 7.3 | 0.6 | 31.7 | 0.30 | 0.021 | 0.176 | 147 | 64 | 105.7:1 |

TABLE - 4

COMPOSTING TREATMENTS ON THE QUALITY PARAMETERS OF
CORNCOB (60th DAY)

| Treat ments | pH | Ec milli mhos cm ⁻¹ | OC % | N % | P % | K % | Ca mg/ kg | Mg mg/ kg | C:N |
|----------------|-----|---|---------|--------|--------|--------|-----------------|-----------------|--------|
| Raw | 6.7 | 0.3 | 39.9 | 0.14 | 0.014 | 0.056 | 67 | 24 | 285:1 |
| C ₁ | 7.6 | 0.8 | 19.9 | 0.54 | 0.032 | 0.199 | 174 | 68 | 36.9:1 |
| C ₂ | 7.7 | 0.9 | 18.3 | 0.61 | 0.041 | 0.227 | 178 | 69 | 30.0:1 |
| C ₃ | 7.7 | 1.0 | 18.6 | 0.59 | 0.039 | 0.202 | 183 | 72 | 31.5:1 |
| C ₄ | 7.6 | 1.1 | 17.8 | 0.60 | 0.033 | 0.196 | 179 | 70 | 29.7:1 |
| C ₅ | 7.8 | 0.9 | 18.7 | 0.68 | 0.040 | 0.193 | 181 | 69 | 27.5:1 |
| C ₆ | 7.8 | 0.9 | 17.1 | 0.66 | 0.042 | 0.249 | 185 | 73 | 25.9:1 |
| C ₇ | 7.8 | 0.9 | 16.6 | 0.70 | 0.042 | 0.254 | 187 | 73 | 23.7:1 |

milli mhos cm^{-1} (C_5, C_6) on the 30th day of composting and 0.8 milli mhos cm^{-1} (C_1) to 1.1 milli mhos cm^{-1} (C_4) on the 60th day.

4.1.2.2 CHEMICAL PARAMETERS

ORGANIC CARBON

The microbial inoculation decreased the organic carbon of corncob compost. The organic carbon was decreased on the 30th day upto 31.7% (C_7) and further decreased on the 60th day upto 16.6% (C_7), which shows the maturity of the compost.

NUTRIENT STATUS

The nutrient content of raw corncob was 0.14% nitrogen, 0.014% phosphorus and 0.056% potassium, 67 mg/kg calcium and 24 mg/kg magnesium. With the advancement of incubation, all the inoculated treatments favoured the nutrient content of corncob compost. On the 60th day the available nutrient was further more increased and ranged between 0.54% (C_1) to 0.70% (C_7) nitrogen, 0.03% (C_1) to 0.04% (C_7) phosphorus, 0.19% (C_5) to 0.25% (C_7) potassium, 174 mg/kg to 187 mg/kg calcium and 68 mg/kg (C_1) to 73 mg/kg (C_6, C_7) magnesium.

CARBON, NITROGEN RATIO [C:N]

The C/N ratio of the raw corncob was 285:1. It narrowed down with the aging of compost. Among the inoculated treatments, the combined inoculum of Pleurotus and Trichoderma with cowdung were efficient in narrowing down C/N upto 105.7:1 (30th day) and 23.7:1 (60th day).

4.1.3 CHANGES IN TEMPERATURE DURING SUGARCANE TRASH COMPOSTING [Table – 5]

The temperature was raised gradually from the 10th day (30° C) upto 40th day (52° C – C₅ to 60° C – C₇) and then it decreased gradually upto the 60th day (32° C – C₁ and 33° C – C₂) after which it became stabilized.

4.1.4 CHANGES IN TEMPERATURE DURING CORNCOB COMPOSTING [Table – 5]

After 10 days of inoculation, the temperature of the compost was increased from 32° C to a maximum of 49° C (C₂) - 53° C (C₆, C₇) on the 40th day and the temperature was lowered upto 60th day (30° C - C₁ to 32° C –C₅) after which it became stable.

4.2 GERMINATION EXPERIMENTS

4.2.1 SUGARCANE TRASH COMPOST EXTRACT ON THE SEEDLING GROWTH OF SOYABEAN AND GREEN GRAM [Table 6 & 7, Plate 4]

4.2.1.1 SHOOT LENGTH

The shoot length of soyabean seedling was significantly influenced by sugarcane trash compost extract at 5 t/h [T₂] , 10 t/h [T₃] , 15 t/h [T₄] and 20 t/h [T₅] . The shoot length of green gram seedling was positively influenced by all the treatments when compared with the control [T₁] and 40 t/h [T₈].

4.2.1.2 ROOT LENGTH

TABLE - 5

CHANGES IN TEMPERATURE DURING COMPOSTING OF SUGARCANE

TRASH AND CORNCOB

| SUGARCANE TRASH (°C) | | | | | | | CORN COB (°C) | | | | | |
|------------------------|------|----|----|----|----|----|-----------------|----|----|----|----|----|
| Treatment | DAYS | | | | | | DAYS | | | | | |
| | 10 | 20 | 30 | 40 | 50 | 60 | 10 | 20 | 30 | 40 | 50 | 60 |
| C ₁ | 30 | 31 | 40 | 55 | 41 | 32 | 32 | 34 | 41 | 50 | 40 | 30 |
| C ₂ | 30 | 31 | 42 | 56 | 40 | 33 | 32 | 33 | 41 | 49 | 38 | 32 |
| C ₃ | 30 | 31 | 43 | 57 | 40 | 32 | 32 | 34 | 42 | 51 | 40 | 31 |
| C ₄ | 30 | 32 | 43 | 53 | 43 | 33 | 32 | 34 | 44 | 51 | 39 | 31 |
| C ₅ | 30 | 32 | 43 | 52 | 44 | 32 | 32 | 34 | 44 | 50 | 40 | 32 |
| C ₆ | 30 | 32 | 44 | 58 | 44 | 33 | 32 | 35 | 45 | 53 | 40 | 31 |
| C ₇ | 30 | 33 | 45 | 60 | 44 | 33 | 32 | 35 | 47 | 53 | 40 | 31 |

TABLE – 6

SUGARCANE TRASH COMPOST EXTRACT ON THE SEEDLING GROWTH
OF SOYABEAN

| Treatments | Shoot Length (cm) | Root Length (cm) | No. of Lateral Roots | Fresh Weight (gm) | Dry Weight (gm) |
|----------------|-------------------|------------------|----------------------|-------------------|-----------------|
| T ₁ | 11.3 | 12.1 | 3 | 0.19 | 0.012 |
| T ₂ | 12.6 | 13.5 | 4 | 0.26 | 0.021 |
| T ₃ | 13.0 | 13.8 | 5 | 0.25 | 0.020 |
| T ₄ | 12.4 | 13.3 | 4 | 0.25 | 0.019 |
| T ₅ | 12.9 | 13.7 | 4 | 0.23 | 0.014 |
| T ₆ | 11.7 | 12.6 | 4 | 0.23 | 0.013 |
| T ₇ | 11.8 | 12.9 | 4 | 0.22 | 0.014 |
| T ₈ | 11.6 | 12.4 | 4 | 0.21 | 0.010 |
| S.Ed | 0.3990 | 0.3354 | 0.7071 | 0.0198 | 0.0017 |
| CD | 0.8458 | 0.7110 | 1.4990 | 0.0420 | 0.0035 |

TABLE – 7

**SUGARCANE TRASH COMPOST EXTRACT ON THE SEEDLING GROWTH
OF GREENGRAM**

| Treatments | Shoot Length (cm) | Root Length (cm) | No. of Lateral Roots | Fresh Weight (gm) | Dry Weight (gm) |
|----------------|-------------------|------------------|----------------------|-------------------|-----------------|
| T ₁ | 12.92 | 10.19 | 2 | 0.21 | 0.01 |
| T ₂ | 12.63 | 13.86 | 4 | 0.15 | 0.02 |
| T ₃ | 13.60 | 13.64 | 4 | 0.20 | 0.02 |
| T ₄ | 12.43 | 11.86 | 4 | 0.18 | 0.01 |
| T ₅ | 13.9 | 11.75 | 4 | 0.22 | 0.01 |
| T ₆ | 12.44 | 11.36 | 3 | 0.22 | 0.01 |
| T ₇ | 11.57 | 11.11 | 3 | 0.19 | 0.01 |
| T ₈ | 10.44 | 9.78 | 3 | 0.18 | 0.01 |
| S.Ed | 1.3164 | 1.1884 | 0.2887 | 0.0202 | - |
| CD | 2.7906 | 2.5194 | 0.6120 | 0.0428 | - |

The root length of soya bean seedling was increased significantly with 5 t/h [T₂] , 10 t/h [T₃] , 15 t/h [T₄] and 20 t/h [T₅] when compared with control and other treatments. In green gram, the root length was markedly increased with 5 t/h [T₂] , 10 t/h [T₃] , 15 t/h [T₄] and 20 t/h [T₅] and 25 t/h [T₆] over control and other treatments.

4.2.1.3 NUMBER OF LATERAL ROOTS

All the treatments influenced the number of lateral roots of soya bean seedlings when compared with control. The treatments of composted sugarcane trash 5 t/h [T₂] , 10 t/h [T₃] , 15 t/h [T₄] and 20 t/h [T₅] were very effective in improving the number of lateral roots of green gram seedlings.

4.2.1.4 FRESH WEIGHT

The fresh weight of soya bean seedling was favoured by 5 t/h [T₂] , 10 t/h [T₃] , 15 t/h [T₄] , 20 t/h [T₅] , 25 t/h [T₆] , and 30 t/h [T₇] over control [T₁] and 40 t/h [T₈]. The fresh weight of green gram seedling was influenced by all the treatments except 5 t/h [T₂] which was not very effective in increasing the fresh weight.

4.2.1.5 DRY WEIGHT

The treatments of compost extract at 5 t/h [T₂] , 10 t/h [T₃] and 15 t/h [T₄] were found to be more significant in increasing the dry weight of soya bean seedling when compared with control and other treatments. For dry weight of green gram, the treatments did not show any significant variations among them and control.

4.2.2 CORNCOB COMPOST EXTRACT ON THE SEEDLING GROWTH OF SOYA BEAN AND GREEN GRAM [Table 8 & 9, PLATE 4A]

4.2.2.1 SHOOT LENGTH

The shoot length of soya bean and green gram was enhanced with compost extract at 5 t/h [T₂], 10 t/h [T₃], 15 t/h [T₄], 20 t/h [T₅] and 25 t/h [T₆] which were on par with each other and superior to other treatments and control.

4.2.2.2 ROOT LENGTH

The treatments of corncob compost at T₂, T₃, T₄, T₅ and T₆ favourably increased the root length of soya bean and green gram seedlings when compared with the control.

4.2.2.3 NUMBER OF LATERAL ROOTS

Except the control T₁, all the treatments significantly increased this parameter in both soya bean and green gram seedlings.

4.2.2.4 FRESH WEIGHT

All the treatments including control showed similar results in the fresh weight of soya bean seedlings. The green gram seedling was found to be significant with T₂ [5 t/h], T₃ [10 t/h], T₄ [15 t/h], T₅ [20 t/h] and T₆ [25 t/h].

4.2.2.5 DRY WEIGHT

The dry weight of soya bean and green gram seedling showed no significant effect with the treatments.

TABLE – 8

**CORNCOB COMPOST EXTRACT ON THE SEEDLING GROWTH OF
SOYABEAN**

| Treatments | Shoot Length (cm) | Root Length (cm) | No. of Lateral Roots | Fresh Weight (gm) | Dry Weight (gm) |
|----------------|-------------------|------------------|----------------------|-------------------|-----------------|
| T ₁ | 11.0 | 12.0 | 3 | 0.18 | 0.014 |
| T ₂ | 12.2 | 12.8 | 5 | 0.21 | 0.020 |
| T ₃ | 12.7 | 13.1 | 4 | 0.20 | 0.021 |
| T ₄ | 12.1 | 12.6 | 4 | 0.20 | 0.019 |
| T ₅ | 12.2 | 12.9 | 4 | 0.19 | 0.018 |
| T ₆ | 12.0 | 12.6 | 4 | 0.19 | 0.016 |
| T ₇ | 11.9 | 12.3 | 4 | 0.18 | 0.016 |
| T ₈ | 11.9 | 12.5 | 4 | 0.18 | 0.014 |
| S.Ed | 0.3663 | 0.2404 | 0.7071 | 0.0261 | — |
| CD | 0.7765 | 0.5096 | 1.4990 | 0.0554 | — |

TABLE – 9

**CORNCOB COMPOST EXTRACT ON THE SEEDLING GROWTH OF
GREENGRAM**

| Treatments | Shoot Length (cm) | Root Length (cm) | No. of Lateral Roots | Fresh Weight (gm) | Dry Weight (gm) |
|----------------|-------------------|------------------|----------------------|-------------------|-----------------|
| T ₁ | 11.3 | 12.1 | 2 | 0.18 | 0.01 |
| T ₂ | 13.0 | 13.8 | 4 | 0.24 | 0.02 |
| T ₃ | 13.0 | 13.3 | 4 | 0.23 | 0.02 |
| T ₄ | 12.8 | 13.0 | 4 | 0.21 | 0.02 |
| T ₅ | 12.6 | 12.9 | 4 | 0.19 | 0.01 |
| T ₆ | 12.5 | 12.7 | 3 | 0.19 | 0.01 |
| T ₇ | 11.9 | 12.3 | 3 | 0.18 | 0.01 |
| T ₈ | 11.3 | 12.1 | 3 | 0.17 | 0.01 |
| S.Ed | 0.2587 | 0.4453 | 0.6455 | 0.0242 | - |
| CD | 0.5485 | 0.9441 | 1.3684 | 0.0512 | - |

4.3 POT CULTURE EXPERIMENTS

4.3.1 POT CULTURE EXPERIMENT - I – SUGARCANE TRASH COMPOST TREATMENTS ON THE CROP GROWTH AND PRODUCTIVITY [Table 10, 11, 12, 13, 14 & 15 Plate 5, 6, 7, 5A & 7A]

4.3.1.1 SHOOT LENGTH

SOYA BEAN [Glycine max]

The shoot length of soya bean at 30 and 60 days influenced by treatments varied from 18 cm [T₁] to 24.5 cm [T₇] on the 30th day and 43.3 cm [T₁] to 53.8 cm [T₇] on the 60th day. The composted sugarcane trash inoculated with Pleurotus, Trichoderma and cowdung [T₇] recorded significantly the highest shoot length which was equal in effects with 100% NPK [T₂], composted sugarcane trash inoculated with cowdung alone [T₅], farmyard manure [T₄] and composted sugarcane trash inoculated with both Pleurotus, Trichoderma [T₆] at both the stages i.e., 30th and 60th day.

GREEN GRAM [Vigna radiata]

The treatments influenced the shoot length of green gram which varied from 14.67cm [T₁] to 35.67 cm [T₇] on the 60th day. The sugarcane trash composted with Pleurotus + Trichoderma + cowdung [T₇] showed very significant increase viz. 35.67 cm and 54.47 cm in shoot length of green gram on 30th and 60th day respectively.

RAGI [Eleusine coracana]

On the 30th day, the composted sugarcane trash inoculated with Pleurotus, Trichoderma alone [T₆] and in combination with cowdung [T₇] favoured a significant increase in the shoot length over other treatments and control. The shoot length ranged from 37.2 cm [T₁] to 52.4 cm [T₇] at the first stage and 45 cm [T₁] to 68 cm [T₇] at the

TABLE - 10

VEGETATIVE PARAMETERS OF SOYABEAN INFLUENCED BY SUGARCANE TRASH COMPOST (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 18.0 | 1.7 | 1.7 | 4.0 | 24 | 4.8 | 0.3 | 5.1 |
| T ₂ | 23.5 | 2.4 | 1.9 | 4.3 | 29 | 7.2 | 0.9 | 8.1 |
| T ₃ | 18.5 | 1.7 | 1.7 | 4.0 | 24 | 5.1 | 0.6 | 5.7 |
| T ₄ | 23.0 | 2.4 | 1.8 | 4.4 | 27 | 6.2 | 0.7 | 6.9 |
| T ₅ | 23.5 | 2.4 | 1.9 | 4.4 | 27 | 6.9 | 0.9 | 7.8 |
| T ₆ | 24.2 | 2.5 | 2.0 | 4.4 | 27 | 7.5 | 0.9 | 8.4 |
| T ₇ | 24.5 | 2.5 | 2.0 | 4.5 | 30 | 7.8 | 1.2 | 9.0 |
| S.Ed | 1.0619 | 0.2971 | 0.1681 | 0.4375 | 1.5327 | 0.1613 | 0.1069 | 0.2093 |
| CD | 2.2778 | 0.6372 | 0.3606 | 0.9385 | 3.2877 | 0.3461 | 0.2293 | 0.4490 |

TABLE - 11

VEGETATIVE PARAMETERS OF SOYABEAN INFLUENCED BY SUGARCANE TRASH COMPOST (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 43.3 | 2.8 | 2.3 | 7.2 | 51 | 16.5 | 3.5 | 20.0 |
| T ₂ | 53.0 | 3.5 | 2.6 | 7.5 | 57 | 19.3 | 7.5 | 26.8 |
| T ₃ | 44.7 | 2.8 | 2.3 | 7.3 | 54 | 17.8 | 6.7 | 24.5 |
| T ₄ | 49.0 | 3.0 | 2.3 | 7.5 | 54 | 18.8 | 6.2 | 25.0 |
| T ₅ | 53.3 | 3.6 | 2.6 | 7.5 | 57 | 19.0 | 7.0 | 26.0 |
| T ₆ | 53.0 | 3.5 | 2.8 | 7.5 | 60 | 20.0 | 7.0 | 27.0 |
| T ₇ | 53.8 | 3.7 | 2.8 | 7.5 | 60 | 20.5 | 7.0 | 27.5 |
| S.Ed | 2.0256 | 0.3780 | 0.4179 | 0.5563 | 4.0356 | 1.0337 | 0.8643 | 1.3086 |
| CD | 4.3450 | 0.8107 | 0.8963 | 1.1934 | 8.6563 | 2.2173 | 1.8539 | 2.8069 |

second stage. At 60 days, the T₄ [Farm yard manure], T₆ and T₇ favoured the shoot length significantly over control and other treatments.

4.3.1.2 ROOT VOLUME

SOYA BEAN [Glycine max]

A positive influence on the root volume of soyabean was found with all the treatments other than control [T₁] and raw sugarcane trash treatment [T₃] at both the stages. The root volume influenced by the treatments ranged from 1.7 ml to 2.5 ml on 30 days and 2.8ml to 3.7 ml on 60 days.

GREEN GRAM [Vigna radiata]

The root volume of green gram during the first experiment was profoundly increased by composted sugarcane trash + Pleurotus + Trichoderma + cowdung [T₇ – 2.0 ml] and sugarcane trash composted with cowdung [T₅ – 1.8 ml] over control [T₁ – 0.5 ml] and other treatments at 30 days. The T₇ [3.2 ml] treatment exhibited similar trend in its effect on the 60th day which was on par with T₂ [NPK – 3.0 ml] and T₄ [FYM – 2.96 ml] when compared with the control [T₁ – 1.9 ml] and other treatments.

RAGI [Eleusine coracana]

The root volume varied from 1.0 ml [T₁] to 1.8 ml [T₇] on the 30th day and 6.3 ml [T₁] to 8.5 ml[T₇] on the 60th day. The NPK [T₂] , FYM [T₄] and composted sugarcane trash [T₅, T₆,T₇] treated crops showed an appreciable enhancement in the root volume over raw sugarcane trash treatment and control on the 30th day. On the 60th day, the NPK [T₂] and sugarcane trash compost [T₅, T₆,T₇] treatments were on par with each other in augmenting the root volume.

TABLE - 12

VEGETATIVE PARAMETERS OF GREENGRAM INFLUENCED BY SUGARCANE TRASH COMPOST (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 14.7 | 0.5 | 1.8 | 2.5 | 7.3 | 3.11 | 0.17 | 3.28 |
| T ₂ | 30.2 | 1.3 | 2.7 | 3.0 | 14.0 | 5.56 | 0.56 | 6.12 |
| T ₃ | 15.0 | 0.7 | 1.7 | 2.5 | 8.0 | 4.04 | 0.13 | 4.17 |
| T ₄ | 31.7 | 1.0 | 2.0 | 3.0 | 13.3 | 5.15 | 0.46 | 5.61 |
| T ₅ | 29.2 | 1.8 | 2.2 | 3.0 | 11.0 | 5.35 | 0.33 | 5.68 |
| T ₆ | 27.3 | 1.5 | 2.5 | 2.5 | 12.0 | 4.53 | 0.50 | 5.03 |
| T ₇ | 35.7 | 2.0 | 2.5 | 3.0 | 15.3 | 5.36 | 0.58 | 5.94 |
| S.Ed | 1.3540 | 0.2182 | 0.2817 | - | 1.3452 | 0.2830 | 0.0443 | 0.4576 |
| CD | 2.9044 | 0.4681 | 0.6043 | - | 2.8854 | 0.6071 | 0.0951 | 0.9815 |

TABLE - 13

VEGETATIVE PARAMETERS OF GREENGRAM INFLUENCED BY SUGARCANE TRASH COMPOST (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 25.7 | 1.9 | 1.5 | 4.5 | 15.7 | 7.32 | 2.3 | 9.62 |
| T ₂ | 47.1 | 3.03 | 1.9 | 6.0 | 21.0 | 15.21 | 3.3 | 18.48 |
| T ₃ | 26.0 | 2.0 | 1.5 | 4.5 | 16.3 | 9.94 | 2.4 | 12.34 |
| T ₄ | 35.1 | 2.96 | 1.8 | 5.0 | 18.7 | 12.72 | 3.1 | 15.82 |
| T ₅ | 49.6 | 2.8 | 1.8 | 5.5 | 22.7 | 12.30 | 3.4 | 15.71 |
| T ₆ | 39.9 | 3.0 | 1.7 | 5.5 | 21.3 | 15.53 | 3.4 | 18.96 |
| T ₇ | 54.5 | 3.2 | 2.0 | 5.5 | 24.3 | 16.70 | 3.5 | 20.23 |
| S.Ed | 1.9948 | 0.1008 | 0.0535 | 0.3086 | 0.7559 | 0.9805 | 0.0909 | 0.9956 |
| CD | 4.2788 | 0.2162 | 0.1147 | 0.6620 | 1.6215 | 2.1032 | 0.1949 | 2.1356 |

4.3.1.3 NUMBER OF LEAVES

SOYABEAN [Glycine max]

All the composted sugarcane trash treatments [T₅, T₆, T₇] were on par with NPK [T₂] and FYM [T₄] treatments on 30 days that varied from 24 [T₁, T₃] to 30 [T₇]. On the 60th day, all the treatments increased the number of leaves when compared with control and the range was between 51 [T₁] to 60 [T₆, T₇].

GREEN GRAM [Vigna radiata]

The number of leaves was influenced significantly by composted sugarcane trash inoculated with Pleurotus . Trichoderma and cowdung [T₇ - 15.3], FYM [T₄ - 14] and NPK [T₂ - 13.3] when compared with other treatments and control (7.3) on the 30th day. Whereas on the 60th day, T₇ (24.3) and T₅ (22.7) were on par with each other in increasing the number of leaves over control (15.7) and the other treatments [T₂, T₃, T₄, T₆] showed a marginal increase in the number of leaves over control.

RAGI [Eleusine coracana]

The number of leaves influenced by the treatments varied from 7.0 [T₁] to 12 [T₄, T₆, T₇] on the 30th day and 14 [T₁] to 18 [T₇] on the 60th day. At the first stage the NPK [T₂], FYM [T₄] and composted sugarcane trash [T₅, T₆, T₇] significantly increased the number of leaves. At the second stage T₆ and T₇ exhibited a significant effect on this parameter when compared with the control and NPK treatment.

4.3.1.4 INTERNODAL LENGTH

SOYABEAN [Glycine max]

The treatments and control were on par with each other in influencing the internodal length at both the stages.

TABLE – 14

**VEGETATIVE PARAMETERS OF RAGI INFLUENCED BY SUGARCANE
TRASH COMPOST (30 DAYS)**

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 37.2 | 1.0 | 7 | 5.0 | 1.4 | 6.4 |
| T ₂ | 47.7 | 1.7 | 10 | 7.3 | 3.4 | 10.7 |
| T ₃ | 35.3 | 1.0 | 8 | 5.3 | 1.3 | 6.6 |
| T ₄ | 48.3 | 1.7 | 12 | 6.7 | 2.7 | 9.4 |
| T ₅ | 47.2 | 1.7 | 11 | 7.3 | 3.3 | 10.6 |
| T ₆ | 50.3 | 1.7 | 12 | 6.9 | 3.0 | 9.9 |
| T ₇ | 52.4 | 1.8 | 12 | 7.3 | 3.5 | 10.8 |
| S.Ed | 2.2271 | 0.0959 | 1.5736 | 0.4711 | 0.2895 | 0.4761 |
| CD | 4.7772 | 0.2058 | 3.3754 | 1.0104 | 0.6210 | 1.0212 |

TABLE – 15

VEGETATIVE PARAMETERS OF RAGI INFLUENCED BY SUGARCANE
TRASH COMPOST (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|----------------------|-------------|---------------|--------------------------|-------------------------|-------------------------------|
| T ₁ | 45 | 6.3 | 14 | 10.5 | 5.5 | 16.0 |
| T ₂ | 60.8 | 8.0 | 17 | 16.2 | 7.8 | 24.0 |
| T ₃ | 46 | 6.5 | 14 | 15.7 | 5.3 | 21.0 |
| T ₄ | 64 | 6.7 | 15 | 16.2 | 6.8 | 23.0 |
| T ₅ | 66 | 8.1 | 16 | 16.4 | 7.4 | 23.8 |
| T ₆ | 67 | 8.5 | 16 | 16.8 | 7.7 | 24.5 |
| T ₇ | 68 | 8.5 | 18 | 16.7 | 7.9 | 24.6 |
| S.Ed | 3.4640 | 0.3478 | 0.8165 | 0.9082 | 0.5538 | 0.5831 |
| CD | 7.4303 | 0.7460 | 1.7514 | 1.9480 | 1.1879 | 1.2508 |

GREEN GRAM [Vigna radiata]

The treatments of composted sugarcane trash [T₅ – 2.2 cm, T₆ and T₇ – 2.5 cm] and NPK [T₂ – 2.7 cm] were on par with each other superior to control [T₁ – 1.8 cm] and composted sugarcane trash inoculated with Pleurotus, Trichoderma and cowdung [T₃ – 2.0 cm] were recorded.

4.3.1.5 PETIOLE LENGTH

SOYABEAN [Glycine max]

The treatments being on par with each other failed to show any significant variation among them in the petiole length at both the stages.

GREEN GRAM [Vigna radiata]

On the 30th day the treatments were on par with each other and with the control. On the 60th day the petiole length was marginally increased by the treatments [T₂ – 6.0 cm, T₄ – 5.0 cm, T₅ – 5.5 cm, T₆ – 5.5 cm , T₇ – 5.0 cm] over control [T₁ – 4.5 cm] and raw sugarcane trash [T₃ – 4.5 cm].

4.3.1.6 SHOOT DRY WEIGHT

SOYABEAN [Glycine max]

The shoot dry weight was favourably enhanced by composted sugarcane trash inoculated with Pleurotus + Trichoderma and cowdung [T₆ – 7.5 gm and T₇ – 7.8 gm] when compared with control [4.8 gm] on the 30th day. Except the control [T₁] and uncomposted sugarcane trash [T₃] all the other treatments positively influenced the shoot dry weight that ranged between 16.5 gm [T₁] to 20.5 gm [T₇] at 60 days.

GREEN GRAM [Vigna radiata]

The composted sugarcane trash [T₅, T₆ and T₇] and NPK treatments favourably increased the root dry weight at both the stages and the values varied from 0.17gm [T₁] to 0.58gm [T₇] on 30 days and 2.3gm [T₁] to 3.5gm [T₇] at 60 days.

RAGI [Eleusine coracana]

The root dry weight was favoured with NPK [T₂-3.4gm] and composted sugarcane trash treatments [T₅-3.3gm, T₆-3.0gm, T₇-3.5gm] on the 30th day and T₂ [NPK-7.8gm], T₄ [FYM – 6.8gm], T₅ [7.4gm], T₆ [7.7gm] and T₇[7.9gm] on the 60th day when compared with control [T₁-5.5gm] and raw sugarcane trash treatments [T₃].

4.3.1.8. DRY MATTER PRODUCTION

SOYABEAN [Glycine max]

The sugarcane trash composted with bioinoculants and cowdung [T₇ – 9 gm] treatment was found to be more significant in increasing the dry matter production on the 30th day. The other treatments marginally increased the dry matter production when compared with control [5.1gm] on the 30th day. At 60 days, all the composted sugarcane trash treatments [T₅, T₆ and T₇] and NPK [T₂] augmented the dry matter content which varied from 20gm [T₁] to 27.5gm [T₇].

GREEN GRAM [Vigna radiata]

The dry matter content varied from 3.28gm [T₁] to 5.94gm [T₇] at first stage and 9.6gm [T₁] to 20.2gm [T₇] at the second stage. There was a spectacular enhancement of the dry matter production of green gram at T₂ [NPK] and T₆,T₇ [composted sugarcane trash] at both the stages of green gram.

RAGI [Eleusine coracana]

The treatments such as NPK [T₂] and composted sugarcane trash [T₅, T₆, T₇] were same in their effects and increased dry matter production at both the stages which ranged from 6.4gm [T₁] to 10.8gm [T₇] at 30 days and 16.0gm [T₁] to 24.6gm [T₇] at 60 days.

YIELD PARAMETERS [Table 16, 17, 18 , Fig 123]

4.3.1.9. NUMBER OF PODS /PLANT

SOYABEAN [Glycine max]

All the treatments favourably influenced the number of pods/plant of soyabean when compared with control. The values ranged between 58 [T₁] to 76 [T₅].

GREEN GRAM [Vigna radiata]

The treatments other than control and raw sugarcane trash significantly increased the pod yield of green gram that varied from 29 [T₁] to 49 [T₇].

4.3.1.10. NUMBER OF SEEDS/PLANT

SOYABEAN [Glycine max]

The most significant seed yield per plant was obtained with sugarcane trash composted with cowdung [T₅ -222] which was on par with NPK amendment [T₂ -220]. The other treatments also favourably increased the number of seeds/plant of soyabean when compared with control.

TABLE – 16

YIELD PARAMETERS OF SOYABEAN INFLUENCED BY SUGARCANE

TRASH COMPOST

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) | Haulm Weight / Plant (gm) |
|----------------|---------------------|----------------------|------------------------------|----------------------|---------------------------|
| T ₁ | 58 | 174 | 21.8 | 11.83 | 9.6 |
| T ₂ | 76 | 220 | 27.5 | 12.54 | 12.3 |
| T ₃ | 71 | 203 | 25.4 | 12.51 | 9.9 |
| T ₄ | 73 | 211 | 26.4 | 12.54 | 11.6 |
| T ₅ | 76 | 222 | 27.8 | 12.45 | 11.8 |
| T ₆ | 72 | 213 | 26.6 | 12.52 | 12.0 |
| T ₇ | 73 | 203 | 24.7 | 12.55 | 12.3 |
| S.Ed | 3.2708 | 2.2254 | 0.6568 | 0.4635 | 0.4198 |
| CD | 7.0160 | 4.7735 | 1.4089 | 0.9942 | 0.9004 |

FIG - 1
YIELD PARAMETERS OF SOYABEAN AS INFLUENCED BY SUGARCANE
TRASH TREATMENTS

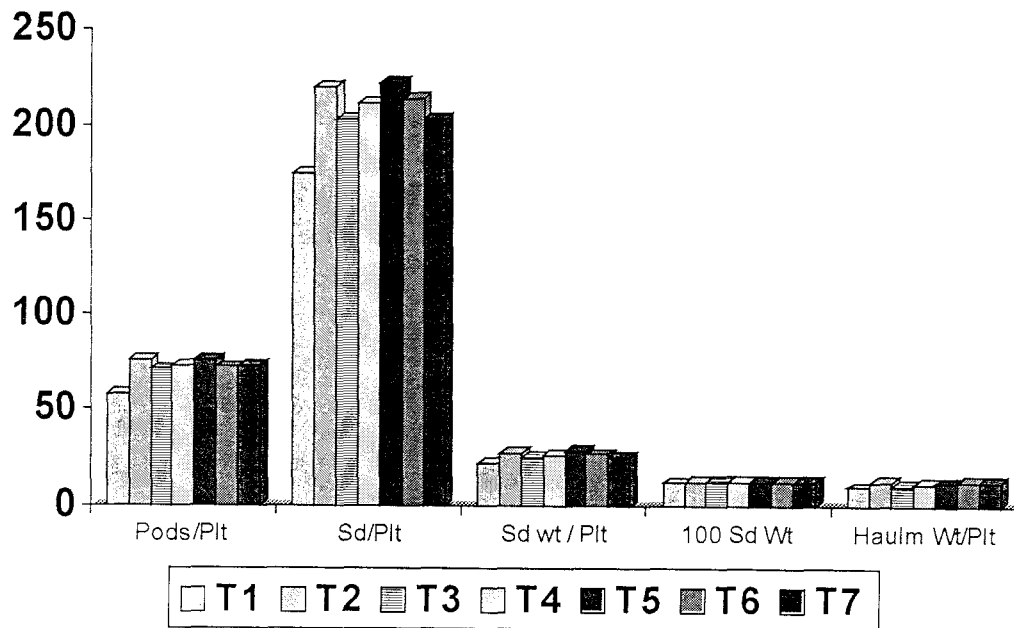


FIG - 2
SUGARCANE TRASH COMPOST LEVELS WITH BIOINOCULANTS ON

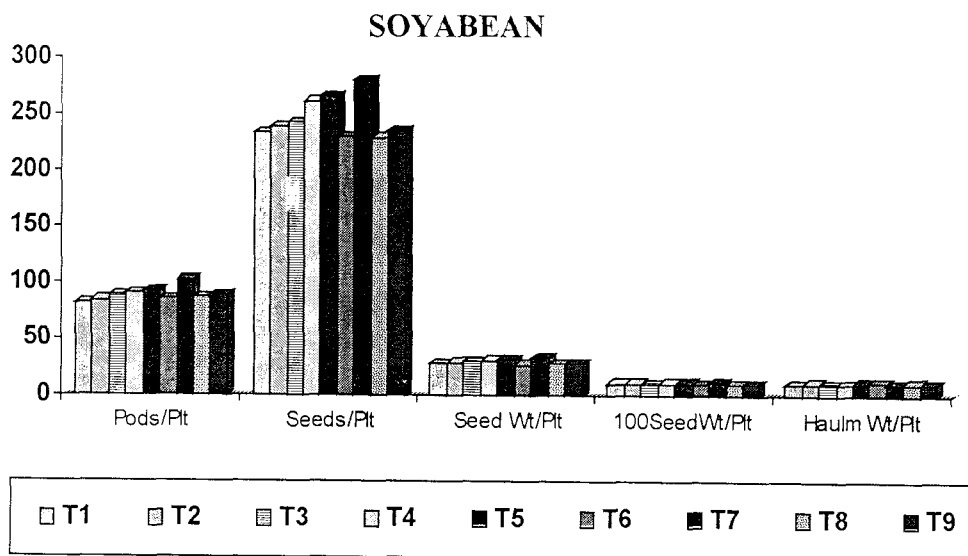


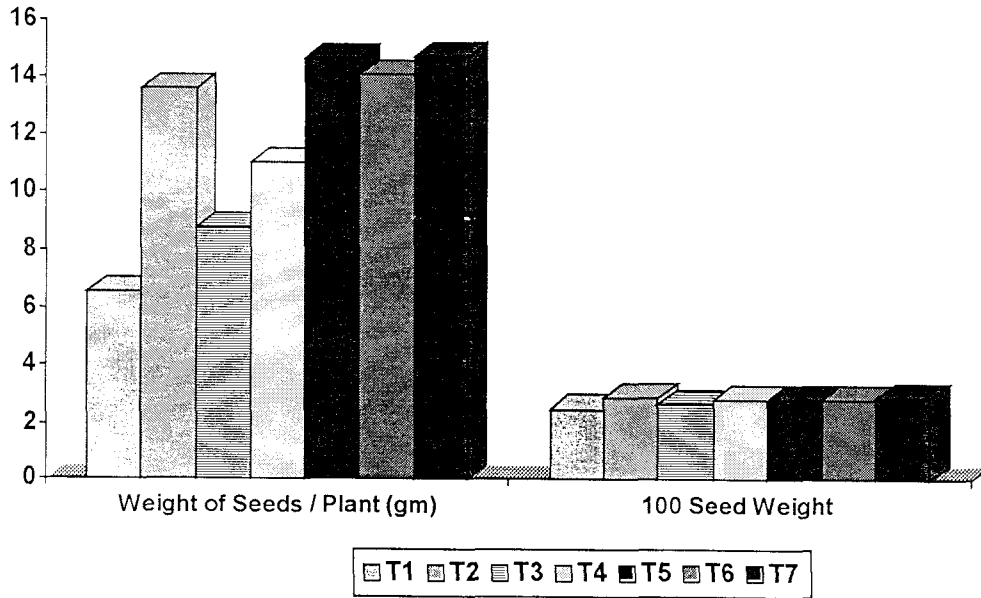
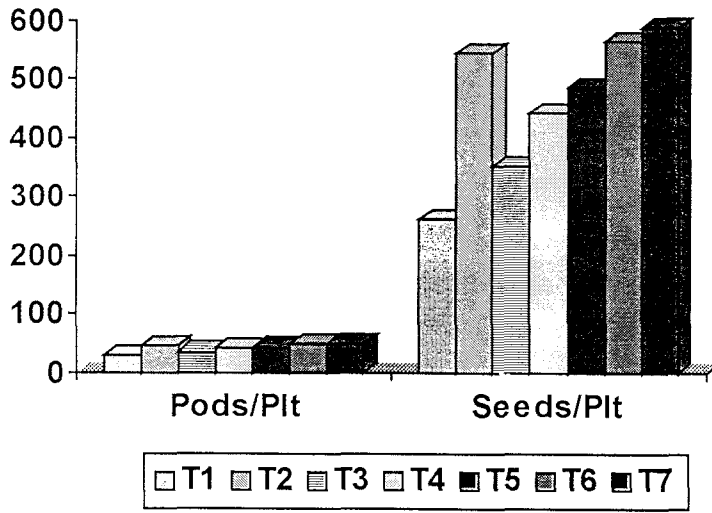
TABLE – 17

**YIELD PARAMETERS OF GREENGRAM INFLUENCED BY SUGARCANE
TRASH COMPOST**

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) |
|----------------|------------------------|----------------------------|------------------------------------|----------------------------|
| T ₁ | 29 | 261 | 6.53 | 2.5 |
| T ₂ | 46 | 543 | 13.58 | 2.9 |
| T ₃ | 35 | 350 | 8.75 | 2.7 |
| T ₄ | 40 | 440 | 11.0 | 2.8 |
| T ₅ | 43 | 486 | 14.65 | 2.8 |
| T ₆ | 48 | 563 | 14.08 | 2.8 |
| T ₇ | 49 | 588 | 14.70 | 2.9 |
| S.Ed | 4.2984 | 26.1461 | 0.6436 | 0.1155 |
| CD | 9.2201 | 56.0839 | 1.3805 | 0.2477 |

FIG-3

SUGARCANE TRASH COMPOST ON GREENGRAM YIELD



GREEN GRAM [Vigna radiata]

The NPK [T₂] and composted sugarcane trash treatments [T₆, T₇] favourably influenced the seed number/plant when compared with control and rest of the treatments, which varied from 261 [T₁] to 588 [T₇].

4.3.1.11. WEIGHT OF SEEDS / PLANT

SOYABEAN [Glycine max]

The treatments such as NPK [T₂ - 27.5 gm], FYM [T₄ - 26.4 gm] and composted sugarcane trash [T₅ - 27.8 gm and T₆ - 26.6 gm] had a greater influence in the seed weight/plant of soyabean when compared with control [21.8 gm]. The other treatments were also increased markedly over control.

GREEN GRAM [Vigna radiata]

The weight of the seed was significantly influenced with the application of NPK [T₂ - 13.6 gm] and composted sugarcane trash treatments [T₅ - 14.7 gm, T₆ - 14.1 gm and T₇ - 14.7 gm] when compared with the control [T₁ - 6.5 gm] and they were on par with each other. FYM [T₄ - 11 gm] was also found significant than control.

RAGI [Eleusine coracana] [FIG - 4] ,

The seed weight per plant ranged between 15.9 gm (T₁) to 23.4 gm (T₇). The NPK [T₂ - 12.8 gm], FYM [T₄ - 12.5 gm] and the composted sugarcane trash treatments [T₅ - 12.3 gm, T₆ 12.6 gm, T₇ - 12.0 gm] were similar in their effects and significantly improved the grain weight per plant.

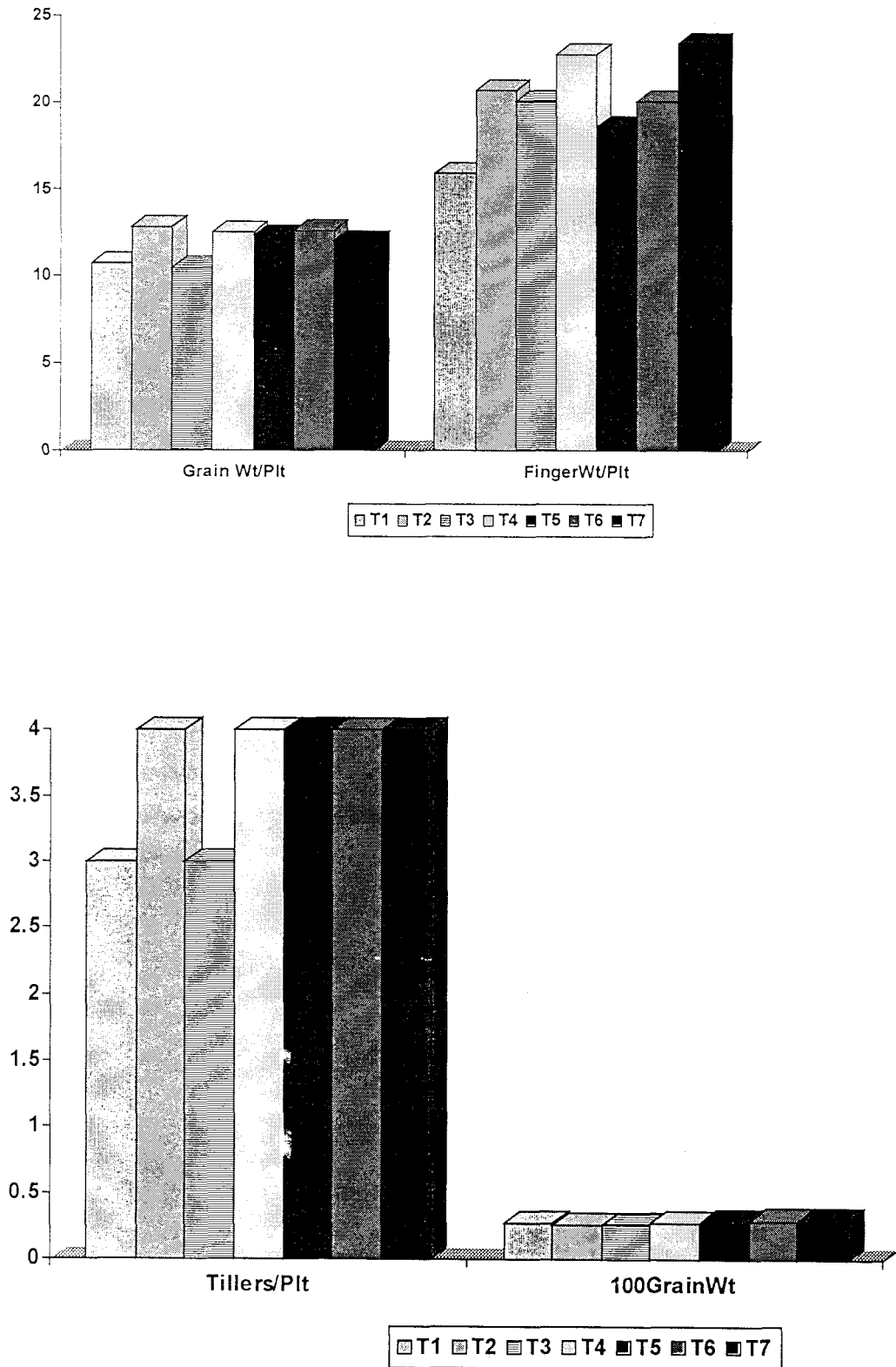
TABLE – 18

YIELD PARAMETERS OF RAGI INFLUENCED BY SUGARCANE TRASH
COMPOST

| Treatments | No. of Tillers / Plant | Wt. of Grains / Plant (gm) | Wt. of Fingers / Plant (gm) | 100 Grain Weight (gm) |
|----------------|------------------------------|----------------------------------|-----------------------------------|-----------------------------|
| T ₁ | 3 | 10.7 | 15.9 | 0.27 |
| T ₂ | 4 | 12.8 | 20.7 | 0.26 |
| T ₃ | 3 | 10.5 | 20.1 | 0.26 |
| T ₄ | 4 | 12.5 | 22.8 | 0.27 |
| T ₅ | 4 | 12.3 | 18.6 | 0.28 |
| T ₆ | 4 | 12.6 | 20.1 | 0.29 |
| T ₇ | 4 | 12.0 | 23.4 | 0.29 |
| S.Ed | - | 0.6473 | 1.1625 | 0.0146 |
| CD | - | 1.3886 | 2.4936 | 0.0313 |

FIG - 4

SUGARCANE TRASH ON RAGI YIELD



4.3.1.12 100 SEED WEIGHT

SOYABEAN [Glycine max]

The treatments failed to show significant variation among them including control in favouring 100 seed weight of soyabean.

GREEN GRAM [Vigna radiata]

In green gram, all the treatments significantly favoured the 100 seed weight over control and it ranged from 2.5gm [T₁] to 2.9gm [T₇] .

RAGI [Eleusine coracana]

The treatments including control were on par with each other in influencing the 100 grain weight.

4.3.1.13 HAULM WEIGHT/PLANT

SOYABEAN [Glycine max]

The haulm weight of soyabean was influenced favourably with NPK, FYM and composted sugarcane trash treatments over control and uncomposted sugarcane trash and the values extend between 9.6gm [T₁] to 12.3gm [T₂, T₇].

4.3.1.14 NUMBER OF PRODUCTIVE TILLERS/ PLANT

RAGI [Eleusine coracana]

The number of productive tillers/plant was not influenced significantly by the treatments over control.

4.3.1.15 WEIGHT OF FINGERS/PLANT

RAGI [Eleusine coracana]

The finger weight per plant was favourably influenced by all the treatments when compared with control [T₁ – 15.9gm]. The most significant increase was recorded with T₇ – 23.4gm and T₄ – 22.8gms.

4.3.2. POT CULTURE EXPERIMENT 11 – LEVELS OF SUGARCANE TRASH COMPOSTS WITH BIOFERTILIZERS ON THE CROP GROWTH AND PRODUCTIVITY [Table 19, 20, 21, 22, 23 & 24, PLATE 8, 8A, 9, 10, 10A] .

4.3.2.1 SHOOT LENGTH

SOYABEAN [Glycine max]

The shoot length of soyabean ranged from 28.3cm [T₁] to 32.8cm [T₉] at 30 days and 45cm [T₁] to 51.7cm [T₉] at 60 days. The treatments such as composted sugarcane trash 12.5 t/h + Rhizobium [T₃ -31.8cm], composted sugarcane trash 25 t/h + Rhizobium [T₇ – 32.3 cm], composted sugarcane trash 25 t/h + Phosphobacteria [T₈ - 32.2cm] and sugarcane trash 25 t/h + Rhizobium + Phosphobacteria [T₉-32.8cm] positively enhanced the shoot length on 30 days. The treatments T₇ [49.7cm], T₈ [50.3cm] and T₉ [51.7cm] were on par with each other and significant over control T₁ [45cm] and other treatments.

GREEN GRAM [Vigna radiata]

All the treatments were par with each other in favouring the shoot length when compared with NPK treatment [T₁ –24.6 cm] on 30 days. The most significant values were obtained with T₉ – 29 cm [composted trash 25 t/h + Rhizobium + Phosphobacteria] and T₈ –28.4 cm [composted trash 25 t/h + Phosphobacteria]. On the 60th day, a

TABLE - 19

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON SOYABEAN (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 28.3 | 3.5 | 2.0 | 6.2 | 35 | 6.2 | 1.9 | 8.1 |
| T ₂ | 29.0 | 2.5 | 2.0 | 6.0 | 36 | 6.3 | 2.1 | 8.4 |
| T ₃ | 31.8 | 3.7 | 2.2 | 6.9 | 37 | 6.5 | 2.1 | 8.6 |
| T ₄ | 29.2 | 3.5 | 2.2 | 6.6 | 39 | 6.5 | 2.2 | 8.7 |
| T ₅ | 31.0 | 3.5 | 2.3 | 6.4 | 40 | 6.4 | 2.3 | 8.7 |
| T ₆ | 29.1 | 2.5 | 2.0 | 6.3 | 38 | 6.4 | 2.2 | 8.6 |
| T ₇ | 32.3 | 3.3 | 2.2 | 6.8 | 39 | 6.6 | 2.2 | 8.8 |
| T ₈ | 32.2 | 3.8 | 2.3 | 7.0 | 40 | 6.8 | 2.2 | 9.0 |
| T ₉ | 32.8 | 4.0 | 2.3 | 7.1 | 40 | 6.7 | 2.3 | 9.0 |
| S.Ed | 0.4355 | 0.3884 | 0.2965 | 0.3909 | 4.2076 | 0.1563 | 0.1165 | 0.0861 |
| CD | 0.9149 | 0.8160 | 0.6229 | 0.8214 | 8.8399 | 0.3285 | 0.2448 | 0.1808 |

TABLE - 20

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON SOYABEAN (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 45.0 | 3.0 | 2.0 | 4.0 | 54 | 16.8 | 9.0 | 25.8 |
| T ₂ | 45.3 | 3.0 | 2.0 | 4.0 | 55 | 17.2 | 9.2 | 26.4 |
| T ₃ | 45.5 | 3.3 | 2.0 | 4.3 | 58 | 17.4 | 9.6 | 27.0 |
| T ₄ | 48.7 | 3.3 | 2.2 | 4.3 | 58 | 17.6 | 9.7 | 27.3 |
| T ₅ | 47.7 | 3.5 | 2.2 | 4.4 | 61 | 17.8 | 9.8 | 27.6 |
| T ₆ | 46.0 | 3.0 | 2.0 | 4.0 | 56 | 17.8 | 10.0 | 27.8 |
| T ₇ | 49.7 | 3.3 | 2.2 | 4.5 | 61 | 17.9 | 10.3 | 28.2 |
| T ₈ | 50.3 | 3.3 | 2.3 | 4.5 | 60 | 17.3 | 10.4 | 27.7 |
| T ₉ | 51.7 | 3.5 | 2.3 | 4.5 | 62 | 17.8 | 9.7 | 27.5 |
| S.Ed | 1.2596 | 0.2629 | 0.3239 | 0.5441 | 9.6264 | 0.2131 | 0.3784 | 0.6336 |
| CD | 2.6464 | 0.5524 | 0.6806 | 1.1431 | 20.2245 | 0.4478 | 0.7951 | 1.3312 |

favourable result was obtained with the treatments which were on par with each other when compared with NPK 100% [T₁] and composted sugarcane trash 12.5 t/h + Rhizobium treatments [T₃]. The values varied from 36.8 [T₃] to 45.8 [T₂].

RAGI [Eleusine coracana]

The treatments such as sugarcane trash compost 12.5 with Phosphobacteria alone [T₂] and with Azospirillum and Phosphobacteria [T₅] were on par with NPK application [T₁] in influencing the shoot length. The other treatments [T₂, T₅, T₇, T₈ and T₉] significantly increased the shoot length over NPK on 30th day. On the 60th day a profound increase in the shoot length was observed with T₂, T₇, T₈ and T₉.

4.3.2.2 ROOT VOLUME

SOYABEAN [Glycine max]

The root volume of soyabean failed to show significant variations with the treatments. The composted sugarcane alone [T₂, T₆] and in combinations [T₃, T₄, T₅, T₇, T₈ and T₉] were on par with each other and with NPK amendment at both the stages.

GREEN GRAM [Vigna radiata]

At the first stage (30 days), the sugarcane trash compost 12.5 t/h alone [T₂], with Rhizobium [T₃] and NPK treatments were on par with each other. The other treatments positively enhanced the root volume, which varied from 0.8 ml to 2.0 ml. But on the 60th day, the treatments failed to exhibit significant variations.

RAGI [Eleusine coracana]

A marginal increase in the root volume of Ragi was observed with the treatments over NPK [T₁], sugarcane trash compost 12.5 t/h [T₂], sugarcane trash compost 12.5 t/h +

Azospirillum [T₃]. The values ranged from 2.1 [T₁] to 2.5 [T₉] at 30 days. At 60 days the treatments including NPK [T₁] treatment were on par with each other over T₄ (sugarcane trash compost + Phosphobacteria)

4.3.2.3 NUMBER OF LEAVES

SOYABEAN [Glycine max]

The treatments including control were similar in effects on the number of leaves of soyabean at both the stages that varied between 35 [T₁] to 40 [T₅, T₈, T₉] at 30 days and 54 [T₁] to 62 [T₉] at 60 days.

GREEN GRAM [Vigna radiata]

The composted sugarcane trash treatments favourably increased the number of leaves over NPK 100% treatment [T₁] on the 30th day that ranged between 14 [T₁] to 17 [T₂, T₈, T₉]. At 60th day of green gram, a marginal increase in number of leaves was observed with all the treatments over NPK treatment [T₁] and sugarcane trash compost 25 t/h [T₆] alone and with biofertilizers treatment [T₉]. The other treatments were on par with each other ranging from 24 [T₁] to 26 [T₄, T₅, T₈].

RAGI [Eleusine coracana]

At the first stage the number of leaves were significantly higher in all the treatments than the NPK [T₁] and composted sugarcane trash 12.5 t/h + Azospirillum [T₃]. On the 60th day the treatments were similar in their effects including the NPK [T₁] that ranged between 23.7 [T₁] to 28 [T₇].

TABLE - 21

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON GREENGRAM (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 24.6 | 0.8 | 1.5 | 2.4 | 14 | 3.7 | 1.9 | 5.6 |
| T ₂ | 25.6 | 0.8 | 2.0 | 2.4 | 17 | 4.3 | 2.0 | 6.3 |
| T ₃ | 25.7 | 1.0 | 1.7 | 2.4 | 16 | 4.2 | 1.4 | 5.6 |
| T ₄ | 26.0 | 1.2 | 1.5 | 2.4 | 16 | 4.6 | 1.8 | 6.4 |
| T ₅ | 26.9 | 1.5 | 1.8 | 2.7 | 16 | 5.3 | 1.2 | 6.5 |
| T ₆ | 27.2 | 1.5 | 1.8 | 2.9 | 17 | 4.3 | 1.6 | 5.9 |
| T ₇ | 27.8 | 1.7 | 1.5 | 2.9 | 15 | 4.4 | 1.8 | 6.2 |
| T ₈ | 28.4 | 1.7 | 1.8 | 3.2 | 17 | 4.3 | 1.7 | 6.0 |
| T ₉ | 29.0 | 2.0 | 2.0 | 3.1 | 17 | 4.6 | 1.7 | 6.3 |
| S.Ed | 0.2780 | 0.1482 | 0.1571 | 0.1030 | 0.4714 | 0.4277 | 0.4853 | 0.3747 |
| CD | 0.5841 | 0.3114 | 0.3301 | 0.2165 | 0.9904 | 0.8987 | 1.0197 | 0.7872 |

TABLE – 22

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON GREENGRAM (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------------|----------------|----------------------------|---------------------------|------------------|-----------------------------|----------------------------|----------------------------------|
| T ₁ | 38.6 | 3.2 | 1.8 | 5.0 | 24 | 15.9 | 3.7 | 19.6 |
| T ₂ | 45.8 | 3.5 | 2.0 | 6.2 | 24.7 | 17.0 | 3.8 | 20.8 |
| T ₃ | 36.8 | 2.9 | 1.7 | 5.5 | 25 | 19.1 | 3.6 | 22.7 |
| T ₄ | 41.2 | 2.6 | 1.5 | 5.5 | 26 | 17.3 | 3.5 | 20.8 |
| T ₅ | 40.8 | 3.2 | 1.8 | 5.3 | 26 | 18.2 | 3.3 | 21.5 |
| T ₆ | 42.6 | 3.3 | 1.8 | 5.2 | 24 | 17.7 | 3.1 | 20.8 |
| T ₇ | 42.3 | 3.4 | 1.8 | 5.2 | 25 | 18.1 | 3.5 | 21.6 |
| T ₈ | 39.2 | 3.5 | 1.5 | 5.1 | 26 | 18.7 | 3.3 | 22.0 |
| T ₉ | 42.7 | 3.5 | 1.8 | 6.0 | 24 | 18.2 | 3.5 | 21.8 |
| S.Ed | 3.3167 | 0.4595 | 0.2043 | 0.2553 | 0.9027 | 0.5863 | 0.4690 | 1.9512 |
| CD | 6.9683 | 0.9653 | 0.4292 | 0.5364 | 1.8965 | 1.2317 | 0.9854 | 4.0994 |

4.3.2.4 INTERNODAL LENGTH

SOYABEAN [Glycine max]

All the treatments were similar in their effects on the internodal length of soyabean at both the stages and failed to exhibit any significant variation among them.

GREEN GRAM [Vigna radiata]

A slight increase in the internodal length of green gram was observed with the treatments that varied between 1.5 [T₁, T₄, T₇] and 2 cm [T₈, T₉] at the first stage. On the 60th day, except the composted sugarcane trash treatment. 12.5 t/h + Phosphobacteria [T₄] and composted sugarcane trash 25 t/h + Phosphobacteria [T₈], all the other treatments were on par with each other in increasing the internodal length of green gram.

4.3.2.5 PETIOLE LENGTH

SOYABEAN [Glycine max]

An appreciable increase in the petiole length with the addition of treatments was observed over the NPK 100% treatment [T₁] and sugarcane trash compost 12.5 t/h [T₂] at the first stage. At 60 days, all the treatments were similar in their effects which ranged between 4 cm [T₁, T₂, T₆] and 4.5 cm [T₇, T₈, T₉].

GREEN GRAM [Glycine max]

The composted sugarcane trash 25 t/h + Phosphobacteria [T₈ – 3.2 cm] and composted sugarcane trash 25 t/h + Phosphobacteria + Rhizobium [T₉ – 3.1 cm] treatments slightly increased the petiole length of green gram when compared with NPK 100% [T₁ – 2.4 cm] at the first stage. The treatments at the second stage exhibited similar trend in favouring the petiole length showing no variation among them.

4.3.2.6 SHOOT DRY WEIGHT

SOYABEAN [Glycine max]

The shoot dry weight of soyabean at 30 and 60 days varied from 6.2 gm [T₁] to 6.8 gm [T₈] and 16.8 gm [T₁] to 17.9 gm [T₇] respectively. An appreciable increase with the treatments were recorded when compared with control except T₂ (composted sugarcane trash 12.5 t/h) which was on par with control.

GREEN GRAM [Vigna radiata]

The shoot dry weight of green gram was significantly increased with sugarcane trash compost 12.5 t/h + Phosphobacteria [T₄ -4.6 gm], sugarcane trash compost 12.5 t/h + Rhizobium + Phosphobacteria [T₅ - 5.3 gm], sugarcane trash compost 25 t/h + Rhizobium [T₇ - 4.4 gm] and sugarcane trash compost 25 t/h + Rhizobium + Phosphobacteria [T₉ - 4.6 gm], when compared with control [T₁ -3.7 gm] and other treatments on the 30th day. The shoot dry weight of green gram on 60 days significantly influenced by sugarcane trash compost 12.5 t/h + Rhizobium [T₃], sugarcane trash compost 12.5 t/h + Rhizobium + Phosphobacteria [T₅] and sugarcane trash compost 25 t/h individually with Rhizobium [T₇], Phosphobacteria [T₈] and in combinations [T₉] when compared with other treatments and control that ranged between 15.9 gm [T₁] to 19.1 gm [T₃].

RAGI [Eleusine coracana]

The shoot dry weight was favoured by sugarcane trash compost 25 t/h with Azospirillum and Phosphobacteria individually and in combination [T₇ - 9.9 gm, T₈ - 9.8 gm, T₉ -9.9 gm] when compared with control [T₁ - 7.8 gm]. At the second stage, the

TABLE – 23

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON
RAGI (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|----------------------|-------------|---------------|--------------------------|-------------------------|-------------------------------|
| T ₁ | 25.6 | 2.1 | 10.3 | 7.8 | 1.8 | 9.6 |
| T ₂ | 28.1 | 2.2 | 10.7 | 7.5 | 1.9 | 9.4 |
| T ₃ | 28.2 | 2.2 | 11.7 | 8.8 | 2.5 | 11.3 |
| T ₄ | 26.6 | 2.3 | 11.3 | 8.8 | 2.6 | 11.4 |
| T ₅ | 29.5 | 2.4 | 11.3 | 9.0 | 2.8 | 11.8 |
| T ₆ | 26.3 | 2.3 | 11.0 | 8.5 | 2.3 | 10.8 |
| T ₇ | 30.2 | 2.4 | 12.0 | 9.9 | 2.6 | 12.5 |
| T ₈ | 29.4 | 2.4 | 12.0 | 9.8 | 2.2 | 12.0 |
| T ₉ | 28.3 | 2.5 | 12.0 | 9.9 | 2.1 | 12.0 |
| S.Ed | 0.9150 | 0.0981 | 0.5212 | 0.2293 | 0.1805 | 0.3573 |
| CD | 1.9224 | 0.2062 | 1.0949 | 0.4818 | 0.3793 | 0.7506 |

TABLE – 24

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON
RAGI (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|----------------------|-------------|---------------|--------------------------|-------------------------|-------------------------------|
| T ₁ | 74 | 6.5 | 23.7 | 19.2 | 8.8 | 28.0 |
| T ₂ | 85.5 | 7.0 | 27.5 | 18.3 | 8.0 | 26.3 |
| T ₃ | 78 | 6.6 | 25.0 | 19.8 | 8.8 | 28.6 |
| T ₄ | 78 | 6.0 | 25.5 | 19.0 | 8.4 | 27.4 |
| T ₅ | 79 | 7.0 | 27.7 | 20.8 | 9.4 | 30.2 |
| T ₆ | 75 | 6.7 | 25.0 | 19.1 | 8.0 | 27.1 |
| T ₇ | 86.7 | 7.7 | 28.0 | 21.7 | 10.3 | 32.0 |
| T ₈ | 85 | 6.7 | 26.0 | 20.2 | 10.3 | 30.5 |
| T ₉ | 83 | 6.6 | 27.0 | 20.3 | 10.5 | 30.8 |
| S.Ed | 3.7082 | 0.6755 | 6.1338 | 0.6104 | 0.4776 | 0.9282 |
| CD | 7.7908 | 1.4192 | 12.8868 | 1.2824 | 1.0035 | 1.9500 |

composted sugarcane trash 12.5 t/h + Azospirillum + Phosphobacteria [T₅ – 20.8 gm] and composted sugarcane trash 25 t/h + Azospirillum [T₇ – 21.7 gm] favoured the shoot dry weight significantly over control [T₁ – 19.2 gm].

4.3.2.7 ROOT DRY WEIGHT

SOYABEAN [Glycine max]

On the 30th day, the root dry weight of soyabean was significantly influenced by all the treatments when compared with NPK amendments. The treatments were on par with each other that ranged from 1.9 gm [T₁] to 2.3 gm [T₅, T₇]. At 60 days, the root weight was significantly increased with all the treatments except composted sugarcane trash 12.5 t/h [T₂] when compared to NPK 100% treatment. The range of values was between 9 gm [T₁] to 10.4 gm [T₈].

GREEN GRAM [Vigna radiata]

The root dry weight of green gram with the application of treatments was on par with each other including the NPK treatment at both the stages. The root dry weight from 1.2 gm [T₅] to 2 gm [T₂] at first stage and 3.1 gm [T₆] to 3.8 gm [T₂] at the second stage of green gram.

RAGI [Eleusine coracana]

The treatment showing more influence on the root dry weight of ragi were, sugarcane trash compost 12.5 t/h with Azospirillum and Phosphobacteria individually [T₃, T₄], in combinations [T₅] and composted sugarcane trash 25 t/h + Azospirillum [T₇] at the first stage, where the values varied between 1.8 gm [T₁] to 2.8 gm [T₅]. At the second stage, the root dry weight was more significantly increased by sugarcane trash

compost 25 t/h with Azospirillum and Phosphobacteria individually [T₇, T₈ – 10.3 gm] and in combination [T₉ – 10.5 gm].

4.3.2.8 DRY MATTER PRODUCTION

SOYABEAN [Glycine max]

The dry matter content of soyabean was enhanced with composted sugarcane trash treatments at 25 t/h [T₇ – 8.8 gm, T₈ – 9.0 gm, T₉ – 9.0 gm] when compared with control [T₁ – 8.1 gm] at 30 days. The rest of the treatments were on par with each other in favouring the dry matter production of soyabean on 30th day. On the 60th day, the dry matter was significantly increased with all the composted sugarcane trash compost over control except compost at 12.5 t/h [T₂] and it ranged from 25.8 gm [T₂] to 28.2 gm [T₈].

GREEN GRAM [Vigna radiata]

Except the NPK application [T₁] and sugarcane trash compost 12.5 t/h + Rhizobium [T₃] all the other treatments markedly increased the dry matter production of green gram at 30 days. On the 60th day the dry matter production influenced by the treatments were on par with each other including the NPK application which ranged from 19.6 gm [T₁] to 22.7 gm [T₃].

RAGI [Eleusine coracana]

The dry matter production of ragi at 30 days was highly influenced by the treatments such as sugarcane trash compost 12.5 t/h + Azospirillum + Phosphobacteria [T₅ – 11.8 gm], sugarcane trash compost 25 t/h with Azospirillum and Phosphobacteria individually [T₇ – 12.5 gm, T₈ – 12 gm] and in combinations [T₉ – 120 gm] when

compared with NPK application [T₁ – 9.6 gm]. On the 60th day, the dry matter production was influenced by T₅ [30.2 gm], T₇ [32.0 gm], T₈ [30.5 gm] and T₉ [30.8 gm] when compared with other treatments and NPK application [T₁ – 28.0 gm].

YIELD PARAMETERS [TABLE 25, 26 , 27]

4.3.2.9 NUMBER OF PODS / PLANT

SOYABEAN [Glycine max]

This parameter was most significantly increased by sugarcane trash compost 25 t/h + Rhizobium [T₇ - 103]. The other treatments were on par with each other and superior over control [T₁] and composted sugarcane trash 12.5 t/h [T₂].

GREEN GRAM [Vigna radiata]

The treatments failed to show any significant variations among them in the pod yield of green gram which varied from 47 [T₁, T₄ ,T₅] to 50 [T₂].

4.3.2.10 NUMBER OF SEEDS / PLANT

SOYABEAN [Glycine max]

The number of seeds /plant was positively influenced by treatments such as sugarcane trash compost 12.5 t/h + Phosphobacteria [T₄ – 261], sugarcane trash compost 12.5 t/h + Phosphobacteria and Rhizobium [T₅ – 266] and sugarcane trash compost 25 t/h + Rhizobium [T₇ - 280] when compared with control [T₁ – 233].

GREEN GRAM [Vigna radiata]

The treatments failed to exhibit any significant variations among them including NPK 100% [T₁]. The range of seed yield was between 563 [T₅] and 588 [T₃].

TABLE – 25

**LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON
THE YIELD OF SOYABEAN**

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) | Haulm Weight / Plant (gm) |
|----------------|------------------------|----------------------------|------------------------------------|----------------------------|---------------------------------|
| T ₁ | 83 | 233 | 29.2 | 12.3 | 11.7 |
| T ₂ | 85 | 239 | 29.9 | 12.4 | 12.4 |
| T ₃ | 89 | 242 | 30.3 | 11.5 | 11.8 |
| T ₄ | 91 | 261 | 31.7 | 12.3 | 12.0 |
| T ₅ | 93 | 266 | 33.3 | 12.4 | 12.3 |
| T ₆ | 86 | 230 | 28.3 | 11.4 | 12.8 |
| T ₇ | 103 | 280 | 34.6 | 12.5 | 11.7 |
| T ₈ | 88 | 229 | 28.7 | 11.8 | 12.3 |
| T ₉ | 89 | 235 | 29.4 | 11.9 | 11.8 |
| S.Ed | 2.1140 | 11.6343 | 1.0463 | 0.2708 | 0.4745 |
| CD | 4.4415 | 24.4432 | 2.1983 | 0.5689 | 0.9970 |

4.3.2.11 WEIGHT OF SEEDS / PLANT

SOYABEAN [Glycine max]

The weight of seeds per plant was significantly enhanced by sugarcane trash compost 25 t/h + Rhizobium [T₇ - 34.6 gm] when compared with NPK amendments [T₁ - 29.2 gm] and other treatments.

GREEN GRAM [Vigna radiata]

The seed weight per plant of green gram influenced by the treatments was on par with each other including the NPK treatment. The seed weight ranged from 14.08 gm [T₅] to 14.70 gm [T₂].

RAGI [Eleusine coracana] [Fig-5]

The grain yield of ragi was favoured by sugarcane trash compost 12.5 t/h + Azospirillum [T₃ - 13.4 gm], sugarcane trash compost 12.5 t/h + Azospirillum + Phosphobacteria [T₅ - 13.6 gm], sugarcane trash compost 25 t/h [T₆ - 12.9 gm], sugarcane trash compost 25 t/h + Phosphobacteria [T₈ - 13.7 gm] and sugarcane trash compost 25 t/h + Azospirillum + Phosphobacteria [T₉ - 13.3 gm], when compared with other treatments and NPK amendment [T₁ - 12 gm].

4.3.2.12 100 SEED WEIGHT

SOYABEAN [Glycine max]

The 100 seed weight of soyabean influenced by NPK [T₁], composted sugarcane trash 12.5 t/h individually [T₂], with Phosphobacteria [T₄], with Rhizobium and Phosphobacteria [T₅], composted sugarcane trash 25 t/h + Rhizobium [T₇] and composted

TABLE – 26

LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON
THE YIELD OF GREENGRAM

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) |
|----------------|------------------------|----------------------------|------------------------------------|----------------------------|
| T ₁ | 47 | 571 | 14.28 | 3.0 |
| T ₂ | 50 | 588 | 14.70 | 3.0 |
| T ₃ | 48 | 576 | 14.40 | 2.9 |
| T ₄ | 47 | 566 | 14.15 | 2.9 |
| T ₅ | 47 | 563 | 14.08 | 3.0 |
| T ₆ | 49 | 580 | 14.50 | 3.0 |
| T ₇ | 49 | 584 | 14.60 | 2.9 |
| T ₈ | 48 | 579 | 14.48 | 2.8 |
| T ₉ | 49 | 572 | 14.30 | 2.9 |
| S.Ed | 3.0551 | 12.6257 | 0.3463 | 0.1466 |
| CD | 6.4185 | 26.5259 | 0.7276 | 0.3079 |

TABLE - 27

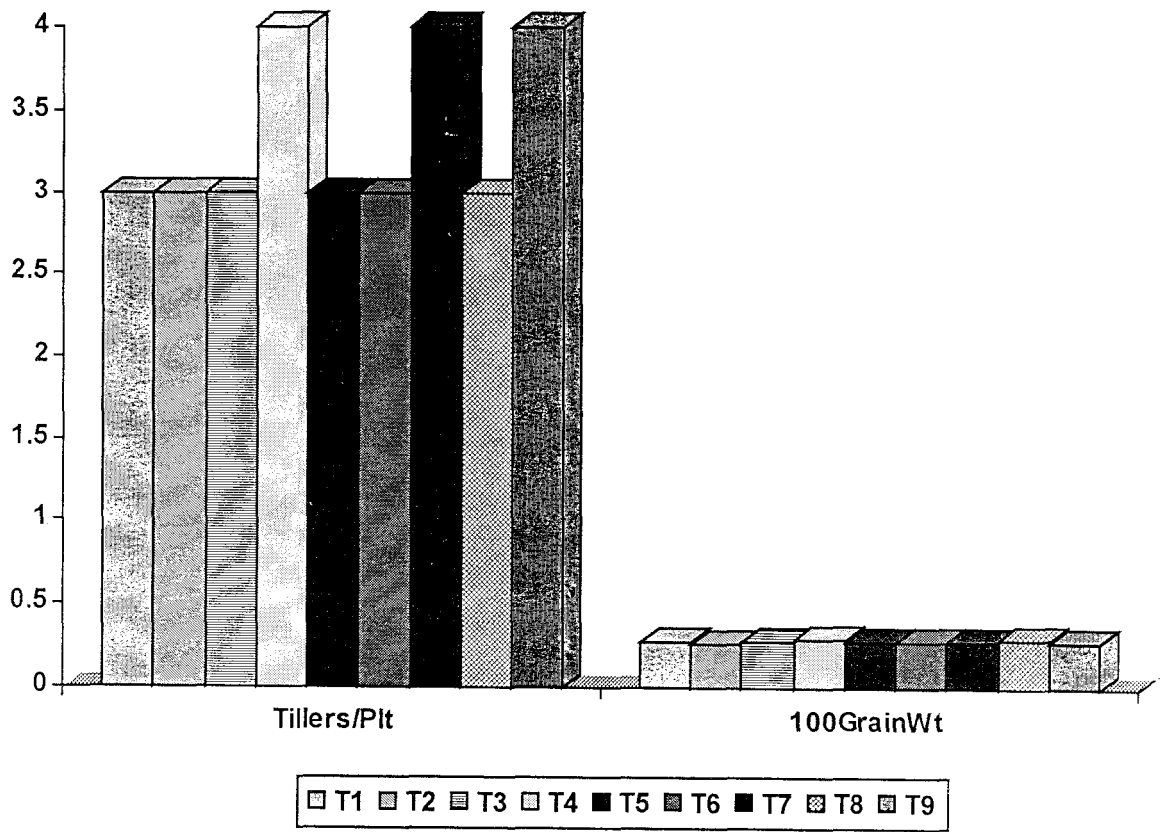
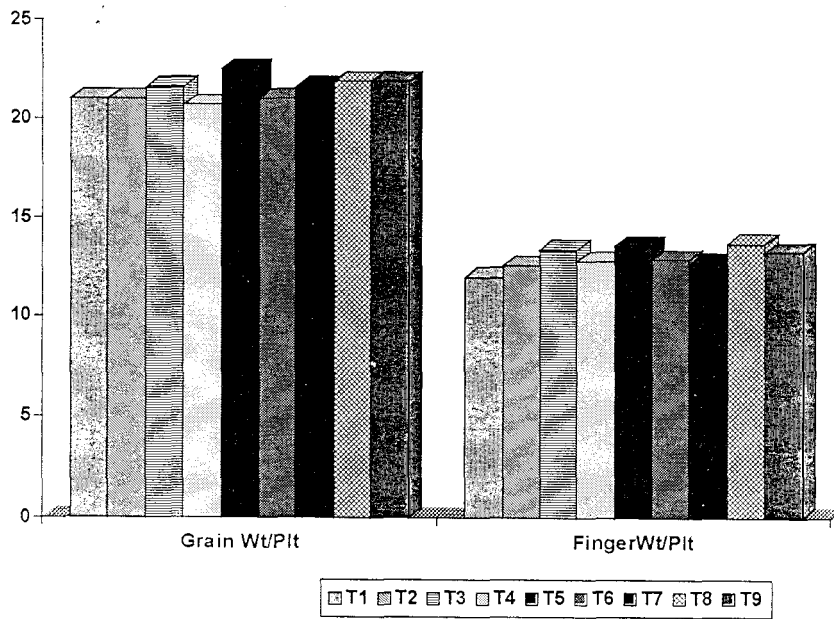
**LEVELS OF SUGARCANE TRASH COMPOST WITH BIOINOCULANTS ON
THE YIELD OF RAGI**

| Treatments | No. of Tillers / Plant | Wt. of Fingers / Plant (gm) | Weight of Grains / Plant (gm) | 100 Grain Weight (gm) |
|----------------|------------------------------|-----------------------------------|-------------------------------------|-----------------------------|
| T ₁ | 3 | 21.0 | 12.0 | 0.28 |
| T ₂ | 3 | 21.0 | 12.6 | 0.26 |
| T ₃ | 3 | 21.6 | 13.4 | 0.28 |
| T ₄ | 4 | 20.7 | 12.8 | 0.29 |
| T ₅ | 3 | 22.5 | 13.6 | 0.28 |
| T ₆ | 3 | 21.0 | 12.9 | 0.27 |
| T ₇ | 4 | 21.6 | 12.7 | 0.28 |
| T ₈ | 3 | 21.9 | 13.7 | 0.29 |
| T ₉ | 4 | 21.9 | 13.3 | 0.28 |
| S.Ed | - | 0.2981 | 0.3887 | 0.0110 |
| CD | - | 0.6264 | 0.8167 | 0.0231 |

FIG - 5

SUGARCANE TRASH COMPOST LEVELS WITH BIOINOCULANTS ON RAGI

YIELD



sugarcane trash 25 t/h + Rhizobium + Phosphobacteria [T₉] treatments were on par with each other.

GREEN GRAM [Vigna radiata]

The treatments did not exhibit any significant variation among them.

RAGI [Eleusine coracana]

The 100 grain weight were similar in their effect including NPK amendment except sugarcane trash compost [T₂]. The 100 grain weight varied from 0.26 gm [T₂] to 0.29 gm [T₄, T₈].

4.3.2.13 HAULM WEIGHT / PLANT

SOYABEAN [Glycine max]

All the treatments were on par with each other in the haulm weight / plant of soyabean excluding NPK treatment [T₁] and sugarcane trash compost 25 t/h + Rhizobium [T₇].

4.3.2.14 NUMBER OF TILLERS / PLANT

RAGI [Eleusine coracana]

The number of tillers / plant failed to exhibit significant variations among them.

4.3.2.15 WEIGHT OF FINGERS / PLANT

RAGI [Eleusine coracana]

The finger weight / plant was marginally influenced by the treatment over NPK treatment (21 gm). The enhanced increase was noted with sugarcane trash compost 12.5

t/h + Phosphobacteria [T₈ – 21.9 gm] and sugarcane trash compost 25 t/h + Phosphobacteria + Azospirillum [T₉ – 21.9 gm].

4.3.3 INITIAL SOIL ANALYSIS [Table 28]

The initial red soil with the pH of 7.3 was assessed for its physiochemical properties. The electrical conductivity of the red soil was 0.8 milli mhos cm⁻¹. The organic carbon content was 0.05%. The available Nitrogen, Phosphorous and Potassium were 3.0 ppm, 10.6 ppm, 72 ppm respectively.

The bulk density of the soil was 2.8 g /cc and maximum water holding capacity was 20.3%.

4.3.4 POST HARVEST SOIL ANALYSIS OF SOYA, GREEN GRAM AND RAGI TREATED WITH SUGARCANE TRASH COMPOST AND BIOFERTILIZERS [TABLE 28A, 29, 30, FIG 12, 13, 14].

4.3.4.1 HYDROGEN ION CONCENTRATION AND ELECTRICAL CONDUCTIVITY [pH and Ec]

The pH of post harvested soil treated with compost and biofertilizers varied from 6.9 to 7.4 in soya, 7.4 to 7.9 in green gram and 7.6 to 7.9 in ragi crops.

The electrical conductivity was ranging from 0.4 to 0.7 milli mhos cm⁻¹ in soya, 0.5 to 0.8 milli mhos cm⁻¹ in green gram and 0.4 to 0.8 milli mhos cm⁻¹ in ragi crops.

ORGANIC CARBON

When compared with control, the organic carbon of the post harvested soil, of soya, green gram and ragi was improved by the composted sugarcane trash treatments,

TABLE – 28

INITIAL SOIL SAMPLE ANALYSIS

| PHYSICAL CONSTANTS | | NUTRIENTS | |
|--|------|-----------|------|
| pH | 7.3 | OC (%) | 0.05 |
| Ec (milli mhos cm ⁻¹) | 0.3 | N (ppm) | 3.0 |
| Bulk Density (gm cc ⁻¹) | 2.8 | P (ppm) | 10.6 |
| Water Holding Capacity (%) | 20.3 | K (ppm) | 72 |

the best being the sugarcane trash compost 25 t/h along with Phosphobacteria and Rhizobium. The organic carbon content varied from 0.07% [T₁] to 0.28% [T₉] in soya, 0.09% [T₁] to 0.29% [T₉] in green gram and 0.10% [T₁] to 0.32% [T₉] in ragi.

4.3.4.2 AVAILABLE NPK STATUS

The composted sugarcane trash treatments favourably improved the macronutrient status of the post harvested soil of all the three test crops when compared to the NPK 100% treatment.

The available nitrogen content was found to be best with composted sugarcane trash 25 t/h + Rhizobium treatment [T₇] which ranged from 6.7 ppm to 8.3 ppm in soyabean, 4.4 ppm to 6.6 ppm in green gram and 7.2 ppm to 8.8 ppm in ragi.

The available phosphorus was most effective with composted sugarcane trash 25 t/h along with Phosphobacteria [T₈] ranging from 13.1 ppm to 14.8 ppm in soyabean, 11.8 ppm to 13.3 ppm in green gram and 13.8 ppm to 15.7 ppm in ragi.

The available potassium content was ranging between 82 ppm to 99 ppm in soya, 87 ppm to 99 ppm in green gram, and 112 ppm to 123 ppm in ragi. The available potassium was found favourable with composted sugarcane trash 25 t/h + Rhizobium + Phosphobacteria treatment.

4.3.4.3 BULK DENSITY AND WATER HOLDING CAPACITY

The bulk density of the post harvested soil was decreased with composted sugarcane trash treatments, while the water holding capacity of the soil was distinctly increased with the treatments.

TABLE – 28A

POST HARVEST SOIL SAMPLE ANALYSIS OF SOYA TREATED WITH
SUGARCANE TRASH COMPOST

| Treat ments | pH | Ec milli mhos/ cm | OC % | N ppm | P ppm | K ppm | B. D gm/cc | W.H. C % |
|----------------|-----|----------------------------|---------|----------|----------|----------|---------------|-------------|
| T ₁ | 7.1 | 0.7 | 0.07 | 6.7 | 13.1 | 82 | 2.41 | 29.2 |
| T ₂ | 6.9 | 0.6 | 0.19 | 7.2 | 13.3 | 86 | 1.83 | 30.2 |
| T ₃ | 6.8 | 0.6 | 0.20 | 7.8 | 13.4 | 89 | 1.61 | 38.2 |
| T ₄ | 6.6 | 0.5 | 0.21 | 6.8 | 13.7 | 87 | 1.82 | 36.4 |
| T ₅ | 7.2 | 0.6 | 0.23 | 7.9 | 13.6 | 91 | 1.69 | 38.1 |
| T ₆ | 7.1 | 0.4 | 0.23 | 7.6 | 14.0 | 94 | 1.66 | 37.2 |
| T ₇ | 7.1 | 0.4 | 0.25 | 8.3 | 14.2 | 98 | 1.54 | 35.5 |
| T ₈ | 7.2 | 0.5 | 0.26 | 7.3 | 14.8 | 96 | 1.59 | 34.3 |
| T ₉ | 7.4 | 0.4 | 0.28 | 8.2 | 14.6 | 99 | 1.44 | 36.8 |

FIG - 12

POST HARVEST ANALYSIS SOIL SAMPLE ANALYSIS OF SOYA TREATED
WITH SUGARCANE TRASH COMPOST

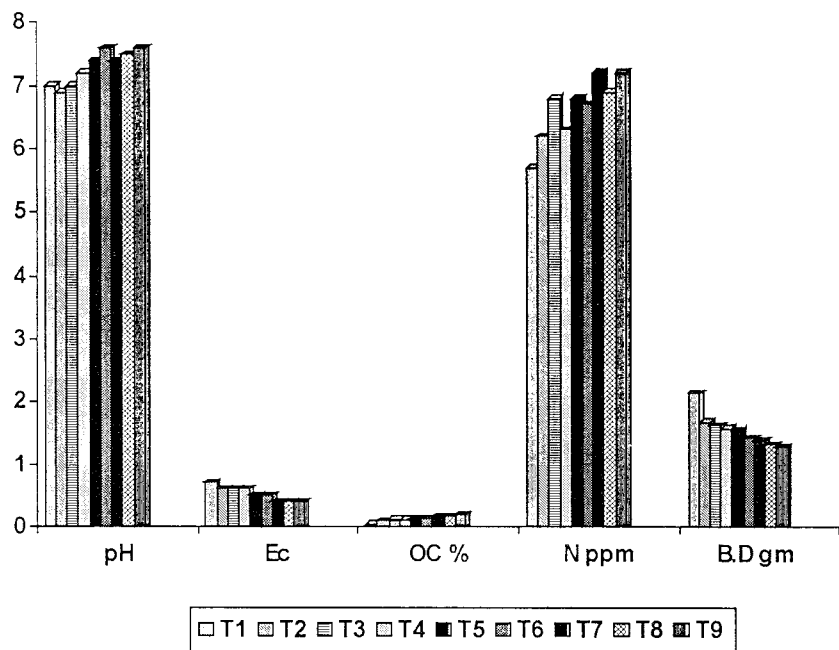
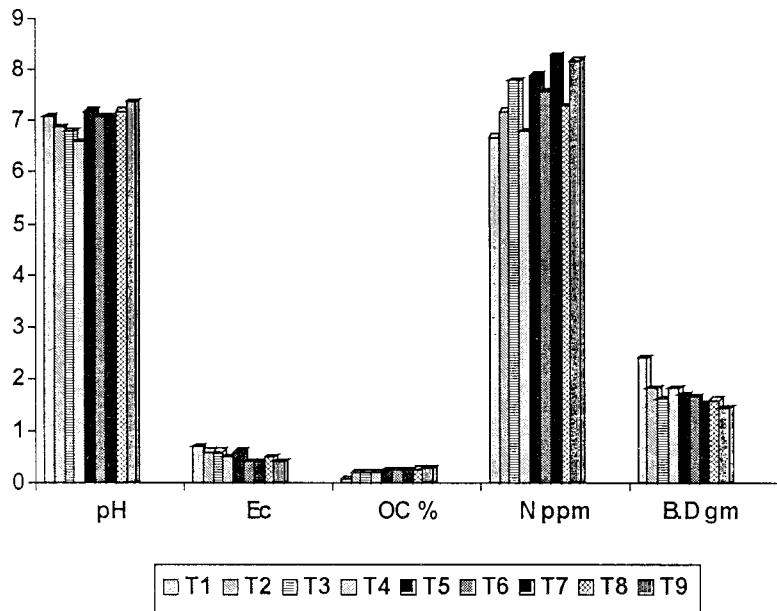


TABLE – 29

POST HARVEST SOIL SAMPLE ANALYSIS OF GREENGRAM TREATED
WITH SUGARCANE TRASH COMPOST

| Treat ments | pH | Ec milli mhos/ cm | OC % | N ppm | P ppm | K ppm | B.D gm / Cc | W.H. C % |
|----------------|-----|----------------------------|------|----------|----------|----------|-------------------|----------------|
| T ₁ | 7.6 | 0.8 | 0.09 | 4.4 | 11.8 | 87 | 2.60 | 26.3 |
| T ₂ | 7.4 | 0.7 | 0.21 | 5.6 | 12.2 | 91 | 1.83 | 29.8 |
| T ₃ | 7.7 | 0.7 | 0.24 | 5.9 | 12.3 | 93 | 1.88 | 37.0 |
| T ₄ | 7.6 | 0.6 | 0.23 | 5.7 | 12.6 | 90 | 1.98 | 30.2 |
| T ₅ | 7.8 | 0.6 | 0.25 | 6.0 | 12.6 | 96 | 2.24 | 30.1 |
| T ₆ | 7.7 | 0.6 | 0.26 | 6.1 | 12.5 | 92 | 1.90 | 28.6 |
| T ₇ | 7.8 | 0.5 | 0.27 | 6.6 | 12.8 | 95 | 1.87 | 26.7 |
| T ₈ | 7.7 | 0.6 | 0.27 | 6.4 | 13.3 | 93 | 1.78 | 28.7 |
| T ₉ | 7.9 | 0.5 | 0.29 | 6.3 | 13.0 | 99 | 1.63 | 27.6 |

FIG - 13

POST HARVEST SOIL SAMPLE ANALYSIS OF GREEN GRAM TREATED
WITH SUGARCANE TRASH COMPOST

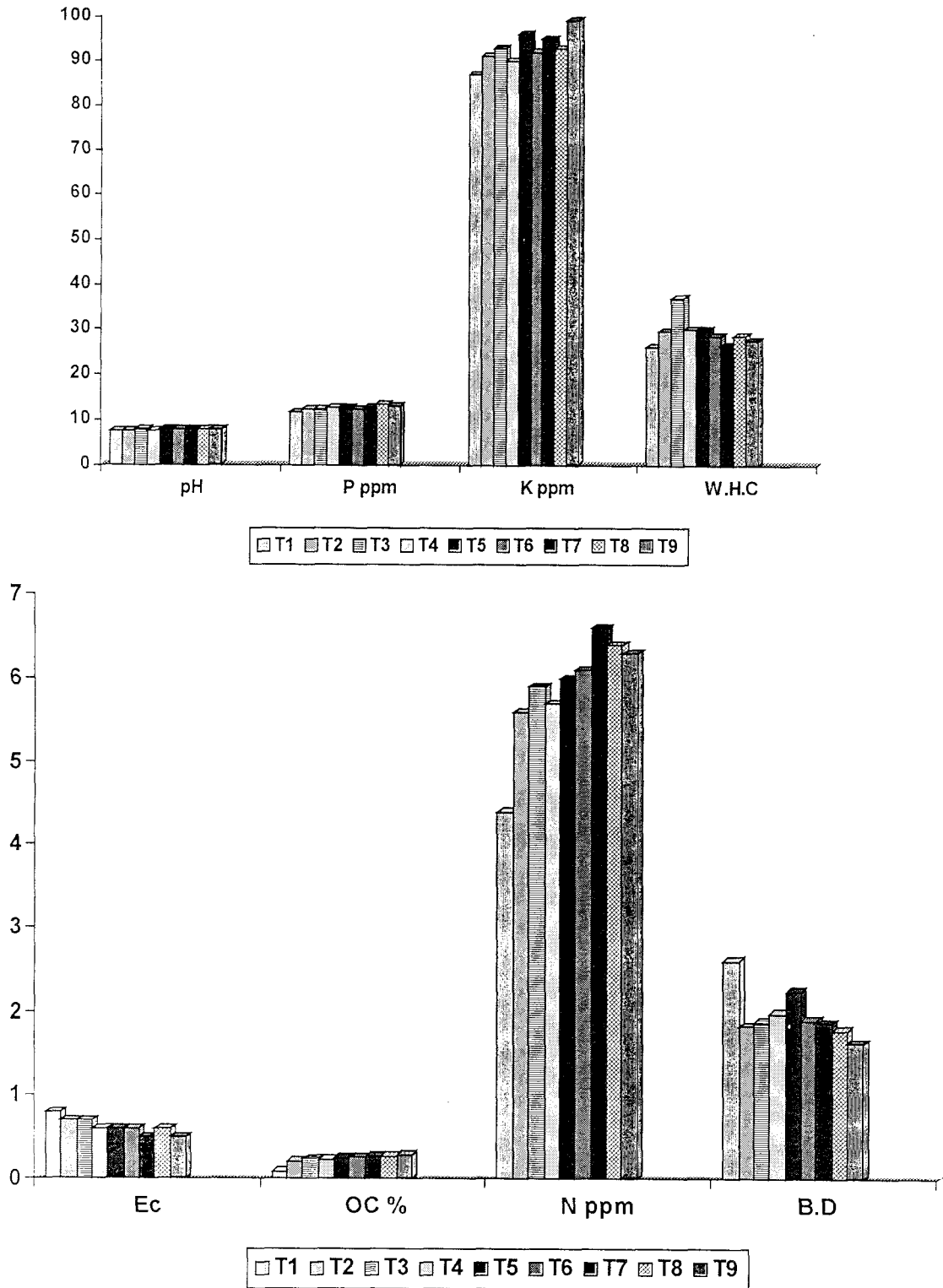


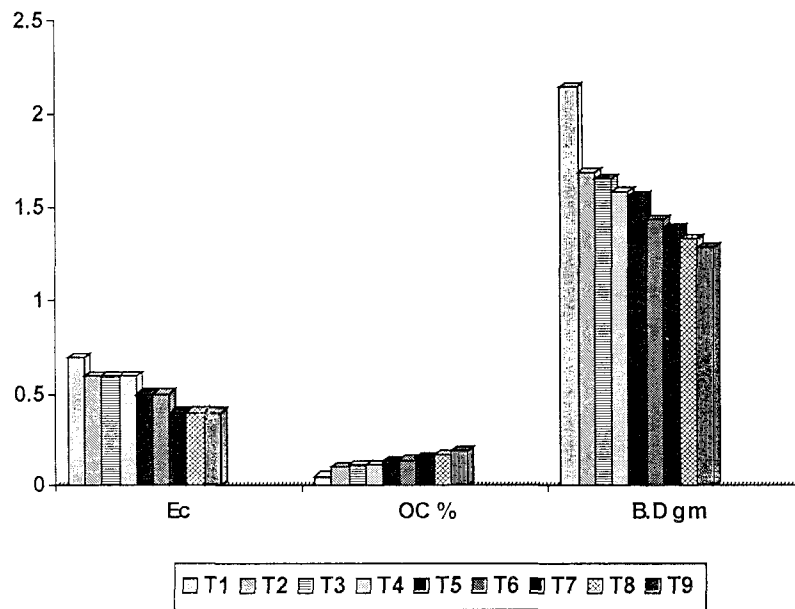
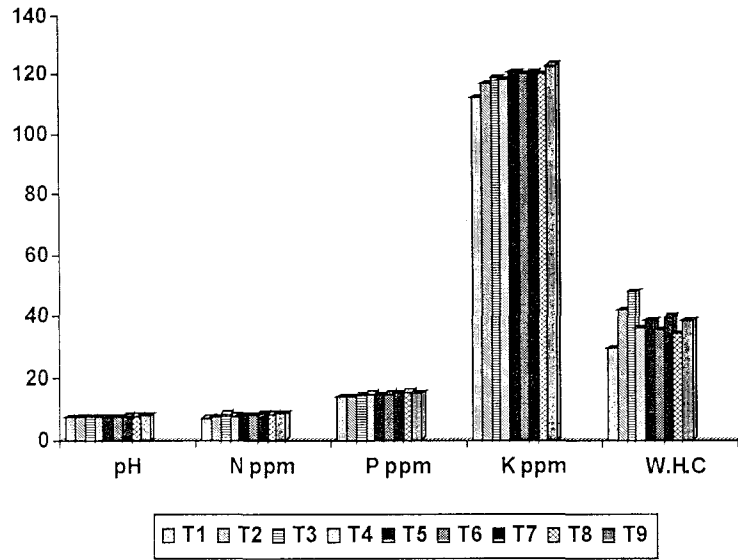
TABLE – 30

POST HARVEST SOIL SAMPLE ANALYSIS OF RAGI TREATED WITH
SUGARCANE TRASH COMPOST

| Treat ments | pH | Ec milli mhos / cm | OC % | N ppm | P ppm | K ppm | B.D gm/cc | W.H.C % |
|----------------|-----|-----------------------------|------|----------|----------|-------|--------------|------------|
| T ₁ | 7.6 | 0.8 | 0.10 | 7.2 | 13.8 | 112 | 2.75 | 29.6 |
| T ₂ | 7.7 | 0.6 | 0.27 | 7.6 | 14.1 | 117 | 2.34 | 42.1 |
| T ₃ | 7.6 | 0.6 | 0.23 | 8.4 | 14.6 | 119 | 2.03 | 48.1 |
| T ₄ | 7.7 | 0.7 | 0.26 | 7.8 | 15.0 | 118 | 2.11 | 36.3 |
| T ₅ | 7.7 | 0.6 | 0.28 | 8.3 | 14.8 | 121 | 1.99 | 39.0 |
| T ₆ | 7.7 | 0.5 | 0.28 | 8.2 | 15.0 | 120 | 2.23 | 35.4 |
| T ₇ | 7.8 | 0.5 | 0.31 | 8.8 | 15.2 | 121 | 1.98 | 39.8 |
| T ₈ | 7.8 | 0.6 | 0.30 | 8.4 | 15.7 | 120 | 1.92 | 34.2 |
| T ₉ | 7.9 | 0.4 | 0.32 | 8.6 | 15.4 | 123 | 1.85 | 38.8 |

FIG - 14

POST HARVEST SOIL SAMPLE ANALYSIS OF RAGI TREATED WITH SUGARCANE TRASH COMPOST



In soyabean the bulk density ranged from 1.44 gm cc⁻¹ [T₀] to 2.41 gm cc⁻¹ [T₁] and water holding capacity from 29.2 % [T₁] to 38.2% [T₃].

In green gram the bulk density varied between 1.63 gm cc⁻¹ [T₀] to 2.6 gm cc⁻¹ [T₁] and the water holding capacity ranged between 26.3% [T₁] to 37.0% [T₃].

In ragi, the bulk density was ranging from 1.85 gm cc⁻¹ to 2.75 gm cc⁻¹ and water holding capacity from 29.6% [T₁] to 48.1% [T₃].

4.3.5 POT CULTURE EXPERIMENT III – CORNCOB COMPOST TREATMENTS ON THE CROP GROWTH AND PRODUCTIVITY [Table 31, 32, 33, 34, 35 & 36 Plate 11, 12, 13 , 11A , 13A]

4.3.5.1 SHOOT LENGTH

SOYABEAN [Glycine max]

The treatments of corncob composts [T₅ - 23.5 cm, T₆ - 23.5 cm and T₇ - 24 cm] and NPK 100% application [T₂ - 24 cm] were on par with each other and increasing the shoot length of soyabean significantly at 30 days over control [T₁ - 18 cm] and other treatments. At 60 days, the NPK application [T₂ - 54.3 cm] and corncob composts inoculated with Pleurotus and Trichoderma [T₆ - 53.7 cm] and with cowdung combination [T₇ - 58.3 cm] were equal in their effects for the significant raise in the soyabean shoot.

GREEN GRAM [Vigna radiata]

The shoot length had a highly pronounced effect with the treatment of corncob composted with Pleurotus , Trichoderma and cowdung [T₇ - 36.3 cm] when compared with other treatments and control (16.4 cm) at 30 days. On the 60th day the composted

TABLE -- 31

VEGETATIVE PARAMETERS OF SOYABEAN INFLUENCED BY CORNCOB COMPOST (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|------------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 18.0 | 1.0 | 1.5 | 4.0 | 24 | 4.2 | 1.0 | 5.2 |
| T ₂ | 24.0 | 2.5 | 2.0 | 5.3 | 30 | 6.3 | 1.5 | 7.8 |
| T ₃ | 18.5 | 1.2 | 1.7 | 4.0 | 23.5 | 4.0 | 1.3 | 5.3 |
| T ₄ | 20.5 | 2.0 | 2.0 | 4.0 | 27 | 5.2 | 1.4 | 6.6 |
| T ₅ | 23.5 | 2.0 | 2.0 | 4.3 | 27 | 6.0 | 1.4 | 7.4 |
| T ₆ | 23.5 | 2.5 | 2.0 | 4.5 | 28.5 | 6.1 | 1.4 | 7.5 |
| T ₇ | 24.0 | 2.8 | 2.5 | 5.0 | 30.5 | 6.5 | 1.4 | 7.9 |
| S.E _d | 1.1547 | 0.2482 | 0.3563 | 0.6667 | 1.3093 | 0.5749 | 0.4157 | 0.1234 |
| CD | 2.4769 | 0.5323 | 0.7644 | 1.4300 | 2.8085 | 1.2331 | 0.8917 | 0.2648 |

TABLE -- 32

VEGETATIVE PARAMETERS OF SOYABEAN INFLUENCED BY CORNCOB COMPOST (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|-------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 42.3 | 1.3 | 1.8 | 7.0 | 51.0 | 13.0 | 6.0 | 19.0 |
| T ₂ | 54.3 | 3.0 | 2.7 | 9.2 | 51.0 | 18.8 | 8.1 | 26.9 |
| T ₃ | 43.7 | 1.5 | 2.0 | 7.5 | 54.0 | 14.7 | 7.0 | 21.7 |
| T ₄ | 52.3 | 1.8 | 2.7 | 9.2 | 56.0 | 17.6 | 6.5 | 24.1 |
| T ₅ | 53.0 | 2.0 | 2.0 | 8.3 | 55.3 | 17.5 | 7.0 | 24.5 |
| T ₆ | 53.7 | 2.5 | 2.3 | 8.5 | 55.0 | 18.4 | 6.8 | 25.2 |
| T ₇ | 58.3 | 2.8 | 3.2 | 9.2 | 59.0 | 19.0 | 8.4 | 27.4 |
| S.Ed | 2.4103 | 0.4364 | 0.5040 | 0.9344 | 8.9407 | 0.7286 | 0.5330 | 1.3945 |
| CD | 5.1701 | 0.9362 | 0.0810 | 2.0042 | 19.1780 | 1.5628 | 1.1434 | 2.9913 |

corn cob treatments [T₅, T₆, T₇], FYM [T₄] and NPK 100% amendment were equal in their effect in increasing the shoot length than control and other treatments that ranged from [T₁ – 26.2 cm to T₇ – 51.3 cm].

RAGI [Eleusine coracana]

The shoot length of ragi ranged between 47.1 cm [T₅] to 54.2 cm [T₆] at 30 days and 63 cm [T₅] to 71.3 cm [T₂] on the 60th day . At both the stages the NPK, FYM and composted corn cob treatments significantly augmented the shoot length over control and other treatments.

4.3.5.2 ROOT VOLUME

SOYABEAN [Glycine max]

The root volume of soyabean at 30 days ^{was} favourably increased by the composted corn cob treatments inoculated with Pleurotus, Trichoderma and cowdung [T₆ – 2.5 ml, T₇ – 2.8 ml] and NPK treatments [T₂ – 2.5 ml] when compared with control [T₁ – 1.0 ml]. On the 60th day the root volume was increased by all the composted corn cob treatments [T₅, T₆, T₇] and NPK [T₂] treatment which were on par and superior to other treatments.

GREEN GRAM [Vigna radiata]

The 30th day plant of green gram was significantly improved in the root volume with the application of FYM [T₄ – 1.8 ml], composted corn cob inoculated with Pleurotus and Trichoderma [T₆ – 1.7 ml] and corn cob composted with Pleurotus, Trichoderma and cowdung [T₇ – 2.0 ml] and in control it was 0.5 ml. At 60 days T₂ [3.1 ml], T₄ [2.5 ml], T₅ [2.8 ml], T₆ [3.1 ml] and T₇ [3.0 ml] treatments showed very pronounced effect on this parameter than control and other treatments.

TABLE -- 33

VEGETATIVE PARAMETERS OF GREENGRAM INFLUENCED BY CORNCOB COMPOST (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|-------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 16.4 | 0.5 | 1.3 | 4.5 | 7.0 | 4.50 | 1.3 | 5.8 |
| T ₂ | 28.1 | 1.0 | 3.0 | 5.6 | 15.0 | 8.03 | 1.6 | 9.6 |
| T ₃ | 18.9 | 1.0 | 1.5 | 4.9 | 8.7 | 4.93 | 1.2 | 6.1 |
| T ₄ | 25.4 | 1.8 | 1.6 | 6.2 | 12.7 | 6.93 | 1.5 | 8.4 |
| T ₅ | 26.7 | 1.5 | 2.5 | 5.2 | 14.0 | 7.17 | 1.5 | 8.7 |
| T ₆ | 30.8 | 1.7 | 3.0 | 5.8 | 14.7 | 6.30 | 2.5 | 8.8 |
| T ₇ | 36.3 | 2.0 | 2.7 | 6.4 | 15.3 | 6.70 | 2.2 | 8.9 |
| S.Ed | 1.0696 | 0.1297 | 0.1168 | 0.2233 | 1.1684 | 0.7868 | 0.0504 | 0.5460 |
| CD | 2.2944 | 0.2782 | 0.2506 | 0.4789 | 2.5062 | 1.6877 | 0.1081 | 1.1711 |

TABLE -- 34

VEGETATIVE PARAMETERS OF GREENGRAM INFLUENCED BY CORNCOB COMPOST (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|-------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 26.2 | 2.0 | 1.5 | 4.5 | 16.0 | 7.3 | 2.5 | 9.8 |
| T ₂ | 48.3 | 3.1 | 1.7 | 6.0 | 23.0 | 16.7 | 3.9 | 20.6 |
| T ₃ | 27.8 | 2.0 | 1.5 | 5.0 | 17.0 | 8.9 | 3.0 | 11.9 |
| T ₄ | 46.8 | 2.5 | 1.6 | 5.0 | 22.3 | 15.2 | 3.5 | 18.7 |
| T ₅ | 50.1 | 2.8 | 1.7 | 5.5 | 23.0 | 15.9 | 3.4 | 19.3 |
| T ₆ | 49.7 | 3.1 | 1.8 | 5.0 | 23.3 | 16.5 | 3.8 | 20.3 |
| T ₇ | 51.3 | 3.0 | 1.8 | 5.5 | 23.7 | 16.7 | 4.2 | 20.9 |
| S.Ed | 3.1905 | 0.3842 | 0.1852 | 0.2182 | 1.9349 | 1.7806 | 0.5127 | 1.9782 |
| CD | 6.8436 | 0.8241 | 0.3972 | 0.4681 | 4.1504 | 3.8194 | 1.0997 | 4.2433 |

RAGI [Eleusine coracana]

The root volume of ragi ranged from 0.67 ml [T₁] to 2.3 ml [T₇] on the 30th day and 5.0 ml [T₁] to 9.0 ml [T₆, T₇] on the 60th day . The root volume was significantly improved with NPK [T₂] and composted corncob treatments [T₆, T₇] which were similar in their effects and superior over control.

4.3.5.3 NUMBER OF LEAVES

SOYABEAN [Glycine max]

The NPK treatment [T₂] and composted corncob treatments [T₆ and T₇] had marked influence on the number of leaves of soyabean on 30 days, that varied between 24 [T₁] to 30.5 [T₂]. On the 60th day the treatments were on par with each other and failed to show any significant variations among themselves. The number of leaves varied from 51 [T₁] to 61 [T₂].

GREEN GRAM [Vigna radiata]

The number of leaves was positively enhanced by T₂ (NPK), T₅, T₆, T₇ [composted corncob inoculated with fungus and cowdung individually and in combinations]. The range was between 7 [T₁] to 15.3 [T₇]. On the 60th day, T₂, T₄, T₅, T₆ and T₇ were on par with each other and superior over control [T₁] and raw corncob treatment [T₃].

RAGI [Eleusine coracana]

The number of leaves were highly influenced by NPK [T₂ – 11.0], composted corncob [T₅ – 11, T₆ – 11.3, T₇ – 12.2] when compared with control [T₁ – 7.7] on 30

TABLE – 35

VEGETATIVE PARAMETERS OF RAGI INFLUENCED BY CORNCOB

COMPOST (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 35.3 | 0.67 | 7.7 | 5.0 | 0.5 | 5.5 |
| T ₂ | 49.7 | 2.0 | 11.0 | 11.1 | 0.9 | 12.0 |
| T ₃ | 44.7 | 1.0 | 8.0 | 6.9 | 1.4 | 8.3 |
| T ₄ | 48.3 | 1.7 | 10.0 | 7.8 | 1.8 | 9.6 |
| T ₅ | 47.1 | 1.7 | 11.0 | 7.4 | 1.7 | 9.1 |
| T ₆ | 54.2 | 1.8 | 11.3 | 10.4 | 1.4 | 11.8 |
| T ₇ | 54.0 | 2.3 | 12.3 | 11.3 | 1.3 | 12.6 |
| S.Ed | 3.4269 | 0.2404 | 0.7346 | 0.4653 | 0.2047 | 0.7771 |
| CD | 7.3507 | 0.5156 | 1.5758 | 0.9981 | 0.4391 | 1.6668 |

TABLE – 36

VEGETATIVE PARAMETERS OF RAGI INFLUENCED BY CORNCOB

COMPOST (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|----------------------|-------------|---------------|--------------------------|-------------------------|-------------------------------|
| T ₁ | 44.67 | 5.0 | 14.0 | 9.4 | 5.6 | 15.0 |
| T ₂ | 71.30 | 8.7 | 17.0 | 18.6 | 7.4 | 26.0 |
| T ₃ | 44.00 | 5.3 | 14.7 | 13.5 | 6.9 | 20.4 |
| T ₄ | 64.00 | 7.7 | 15.3 | 14.1 | 6.9 | 21.0 |
| T ₅ | 63.00 | 7.3 | 15.7 | 16.7 | 6.3 | 23.0 |
| T ₆ | 64.30 | 9.0 | 16.3 | 17.4 | 7.1 | 24.5 |
| T ₉ | 76.30 | 9.0 | 16.7 | 19.3 | 8.5 | 27.8 |
| S.Ed | 9.2770 | 0.4960 | 1.0541 | 1.0872 | 0.6838 | 0.4902 |
| CD | 19.8994 | 1.0640 | 2.2610 | 2.3320 | 1.4668 | 1.0515 |

days. On the 60th day, the treatments were on par with each other and higher than control. The number of leaves varied from 14.0 [T₁] to 17.0 [T₂].

4.3.5.4 INTERNODAL LENGTH

SOYABEAN [Glycine max]

The internodal length of soyabean varied from 1.5 cm [T₁] to 2.5 cm [T₇]. The treatments were on par with each other and higher than control on 30 days. On the 60th day, the corncob composted with Pleurotus , Trichoderma and cowdung [T₇ – 3.2 cm] treatment positively enhanced the internodal length when compared with the control [T₁ – 1.8 cm].

GREEN GRAM [Vigna radiata]

The NPK 100% [T₂ – 3.0 cm] and corncob compost [T₆ – 3.0 cm, T₇ – 2.7 cm] were on par and significantly influenced the internodal length on the 30th day. The 60th day plants revealed similar effects in the internodal length including control that ranged from 1.5 cm [T₁, T₃] to 1.8 cm [T₆, T₇].

4.3.5.5 PETIOLE LENGTH

SOYABEAN [Glycine max]

The treatments failed to reveal any significant variations among themselves in this parameter on the 30th and 60th days, which varied from 4.0 cm [T₁] to 5.3 cm [T₂], on the 30th day and 7.0 cm [T₁] to 9.2 cm [T₂, T₄, T₇] on the 60th day .

GREEN GRAM [Vigna radiata]

The petiole length of green gram was highly influenced with FYM [T₄ – 6.2 cm] and corncob compost [T₇ – 6.4 cm] at the first stage, when compared to control [T₁ – 4.5 cm]. At the second stage, the NPK 100% [T₂ – 6 cm] and the corncob compost [T₅ and T₇ – 5.5 cm] increased the petiole length significantly over control [T₁ – 4.5 cm].

4.3.5.6 SHOOT DRY WEIGHT

SOYABEAN [Glycine max]

The treatments other than control [T₁] and raw corncob [T₃], were on par with each other in influencing the shoot dry weight at both the stages. The shoot dry weight ranged between 4.0 gm [T₃] to 6.5 gm [T₇] at the first stage and 13.0 gm [T₁] to 19.0 gm [T₇] at the second stage.

GREEN GRAM [Vigna radiata]

The shoot dry weight of green gram also exhibited similar results as that of soyabean at both stages which varied from 4.5 gm [T₁] to 8.0 gm [T₂] at 30 days and 7.3 gm [T₁] to 16.7 gm [T₂, T₇] on 60 days.

RAGI [Eleusine coracana]

The NPK 100% [T₂ – 11.1 gm] and corncob composted with Pleurotus and Trichoderma [T₆ – 10.4 gm] and corncob composted with Pleurotus , Trichoderma and cowdung [T₇ – 11.3 gm] treatments spectacularly enhanced the shoot dry weight compared to control [T₁ – 5 gm] on 30 days. At 60 days T₇ and T₂ (18.6 gm) were similar in their effects and significant over control [T₁ – 9.4 gm] and other amendments.

4.3.5.7 ROOT DRY WEIGHT

SOYABEAN [Glycine max]

At the first stage (30 days), the treatments influencing the root dry weight were on par with each other and showed a slight increase over control . The root dry weight varied from T₁ (1 gm) to T₂ (1.5 gm). At the second stage (60 days) the corncob compost [T₇ – 8.4 gm] and NPK [T₂ – 8.1 gm] influenced the root dry weight over control [T₁ – 6 gm] and other treatments.

GREEN GRAM [Vigna radiata]

The root dry weight was influenced with NPK [T₂ – 1.6 gm] , FYM [T₄ – 1.5 gm] and corncob compost [T₅ – 1.5 gm, T₆ – 2.5 gm, T₇ – 2.2 gm] at the first stage. At the second stage, the root dry weight was influenced by same treatments [T₂ – 3.8 gm, T₄ – 3.5 gm, T₅ – 3.4 gm, T₆ – 3.8 gm, T₇ – 4.2 gm] when compared to control [T₁ – 2.5 gm].

RAGI [Eleusine coracana]

The FYM [T₄] and the corncob compost [T₅, T₆] favourably influenced the root dry weight of ragi at 30 days, that ranged between 0.5 gm [T₁] to 1.8 gm [T₄]. The most significant increase in the root dry weight was observed with NPK [T₂ – 7.4 gm] and corncob compost [T₇ – 8.5 gm] when compared with control [5.6 gm] and rest of the treatments on 60 days.

4.3.5.8 DRY MATTER PRODUCTION

SOYABEAN [Glycine max]

The NPK application [T₂ – 7.8] gm and corncob compost treatments [T₅ – 7.4 gm, T₆ – 7.5 gm and T₇ – 7.9 gm] showed a significant increase in the dry matter content of

soyabean at 30 days that varied from 5.2 gm [T₁] to 7.9 gm [T₇]. At 60 days the dry matter production ranged from 19 gm [T₁] to 27.4 gm [T₇] in which the NPK and corncob compost treatments [T₂, T₅, T₆ and T₇] highly influenced the dry matter production compared to other treatments and control.

GREEN GRAM [Vigna radiata]

The dry matter production of green gram at first stage was influenced by NPK treatments [T₂ – 9.6 gm], FYM [T₄ – 8.4 gm] and corncob compost treatments [T₅ – 8.7 gm, T₆ – 8.8 gm, T₇ – 8.9 gm] when compared with control [T₁ – 5.8 gm]. At the second stage also the dry matter was significantly influenced by same treatments [T₂ – 20.6 gm, T₄ – 18.7 gm, T₅ – 19.3 gm, T₆ – 20.3 gm and T₇ – 20.9 gm].

RAGI [Eleusine coracana]

The dry matter production was influenced highly by NPK application [T₂ – 12 gm] and corncob compost [T₆ – 11.8 gm and T₇ – 12.6 gm] when compared with control [T₁ – 5.5 gm]. All the other treatments on the 30th day were on par with each other but superior to control. On the 60th day , the corncob compost [T₇ – 27.8 gm] and NPK 100% [T₂ – 26 gm] were similar in their effects in increasing the dry matter production.

YIELD PARAMETERS [Table 37, 38 & 39 , Fig 6,7,8].

4.3.5.9 NUMBER OF PODS / PLANT

SOYABEAN [Glycine max]

The NPK treatment [T₂ – 88], FYM [T₄ – 85] and corncob compost [T₅ – 87, T₆ – 89 and T₇ – 88] had enhanced the number of pods / plant significantly over control [T₁ – 70] and raw corncob [T₃ – 68].

GREEN GRAM [Vigna radiata]

The pod yield per plant of green gram was significantly increased with NPK [T₂ – 48], FYM [T₄ – 43] and corncob composts [T₇ – 46] treatments when compared with control [T₁ – 26].

4.3.5.10 NUMBER OF SEEDS / PLANT

SOYABEAN [Glycine max]

All the treatments were on par with each other in influencing the seed yield per plant when compared with control. The seed yield ranged from 196 [T₁] to 246 [T₂].

GREEN GRAM [Vigna radiata]

The NPK [T₂] and corncob compost [T₇] were on par in favouring the seed yield per plant. The treatments influenced the number of seeds per plant, which ranged from 337 [T₃] to 545 [T₂].

4.3.5.11 WEIGHT OF SEEDS / PLANT

SOYABEAN [Glycine max]

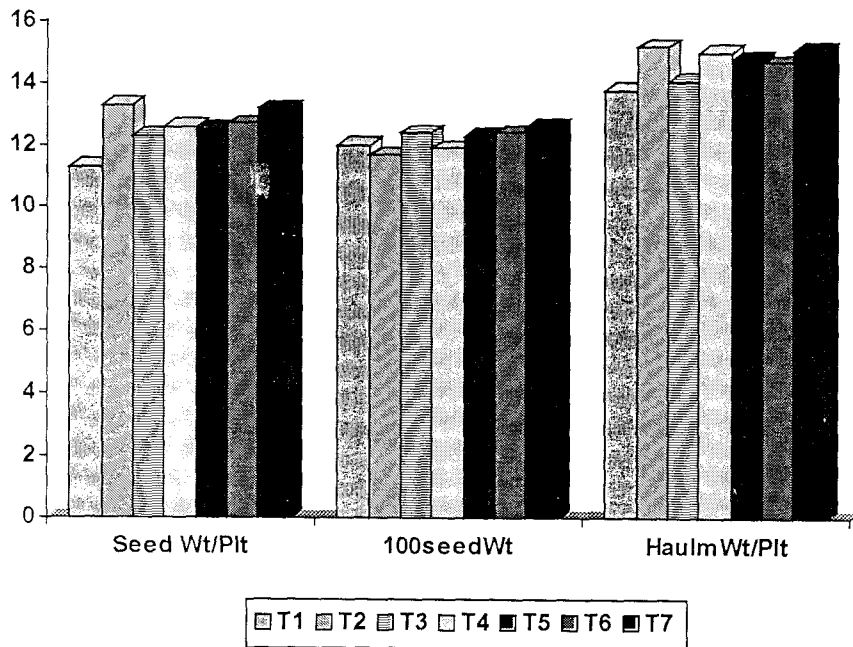
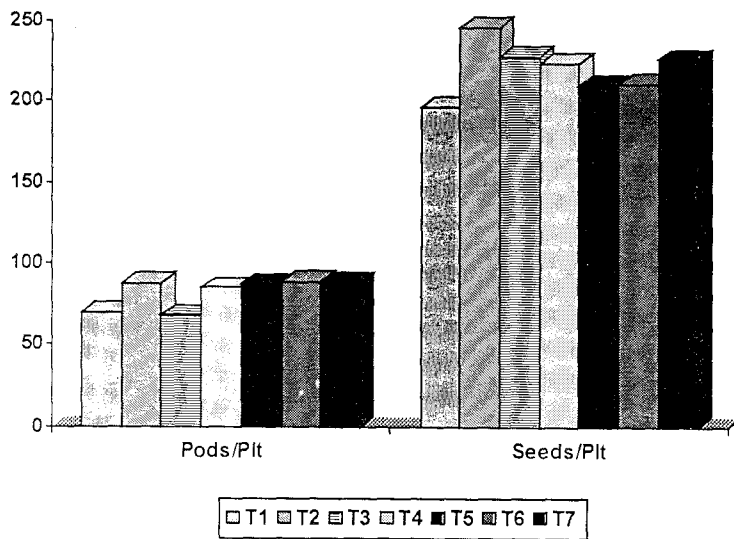
The weight of seeds per plant was significantly influenced by NPK [T₂ – 13.3 gm] and corncob compost [T₇ – 13.2 gm] which were on par with each other.

TABLE – 37

**YIELD PARAMETERS OF SOYABEAN INFLUENCED BY CORNCOB
COMPOST**

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) | Haulm Wt. /Plant (gm) |
|----------------|------------------------|----------------------------|------------------------------------|----------------------------|--------------------------|
| T ₁ | 70 | 196 | 11.3 | 12.0 | 13.8 |
| T ₂ | 88 | 246 | 13.3 | 11.7 | 15.2 |
| T ₃ | 68 | 228 | 12.3 | 12.4 | 14.1 |
| T ₄ | 85 | 223 | 12.6 | 11.9 | 15.0 |
| T ₅ | 87 | 210 | 12.5 | 12.3 | 14.8 |
| T ₆ | 89 | 211 | 12.7 | 12.4 | 14.7 |
| T ₇ | 88 | 226 | 13.2 | 12.6 | 15.1 |
| S.Ed | 2.0471 | 12.6453 | 0.2377 | 19.4306 | 0.5757 |
| CD | 4.3910 | 27.1245 | 0.5099 | 41.6790 | 1.2349 |

FIG-6
 CORNCOB COMPOST ON SOYA YIELD



GREEN GRAM [Vigna radiata]

The seed weight of green gram was also influenced significantly with NPK [T₂ – 13.6 gm] and corncob compost [T₇ – 13.4 gm] when compared with control [T₁ – 6.1 gm] and other treatments.

RAGI [Eleusine coracana]

The grain yield was increased significantly with NPK [T₂ – 12.5 gm], FYM [T₄ - 12.6 gm] and corncob composts [T₆ – 12.3 gm and T₇ – 12.8 gm] when compared with control [T₁ – 10.3 gm].

4.3.5.12 100 SEED WEIGHT

SOYABEAN [Glycine max]

The treatments favouring 100 seed weight were on par with each other including control that ranged from 11.7 gm [T₂] to 12.6 gm [T₇].

GREEN GRAM [Vigna radiata]

The treatments influencing 100 seed weight were also on par with each other, which failed to show any significant variation among them.

RAGI [Eleusine coracana]

The 100 grain weight ranged from 0.26 gm [T₁, T₃] to 0.28 gm [T₅, T₆, T₇] and showed no significant variation among treatments.

4.3.5.13 HAULM WEIGHT /PLANT

TABLE – 38

**YIELD PARAMETERS OF GREENGRAM INFLUENCED BY CORNCOB
COMPOST**

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) |
|-------------------|--------------------------------|-------------------------------------|---|-------------------------------------|
| T ₁ | 26 | 242 | 6.1 | 2.6 |
| T ₂ | 48 | 545 | 13.63 | 2.9 |
| T ₃ | 33 | 337 | 8.43 | 2.7 |
| T ₄ | 43 | 458 | 11.45 | 2.8 |
| T ₅ | 42 | 464 | 11.60 | 2.8 |
| T ₆ | 43 | 476 | 11.90 | 2.8 |
| T ₇ | 46 | 537 | 13.43 | 2.8 |
| S.Ed | 2.6726 | 20.7663 | 0.7370 | 0.1380 |
| CD | 5.7328 | 44.5441 | 1.5808 | 0.2960 |

FIG - 7

CORNCOB COMPOST ON GREENGRAM YIELD

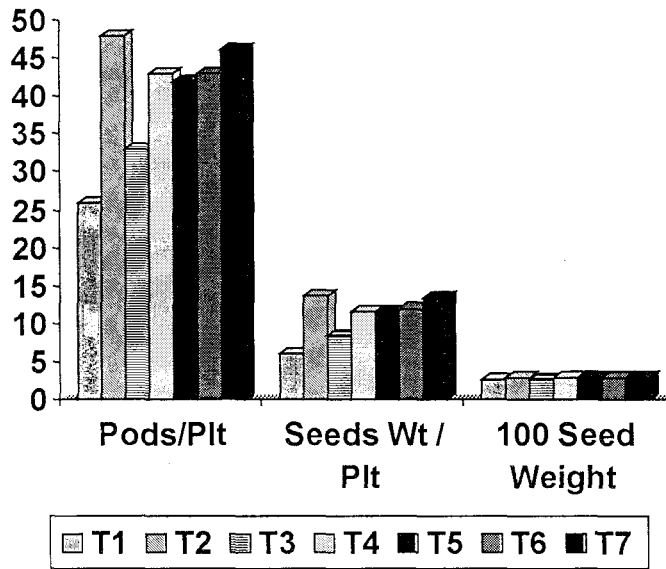


FIG - 8

CORNCOB COMPOST LEVELS WITH BIOINOCULANT ON GREEN GRAM

YIELD

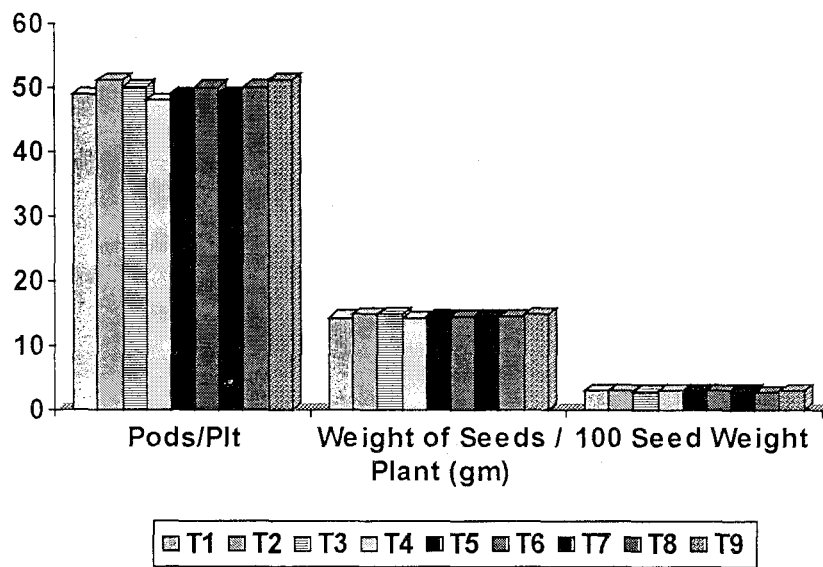


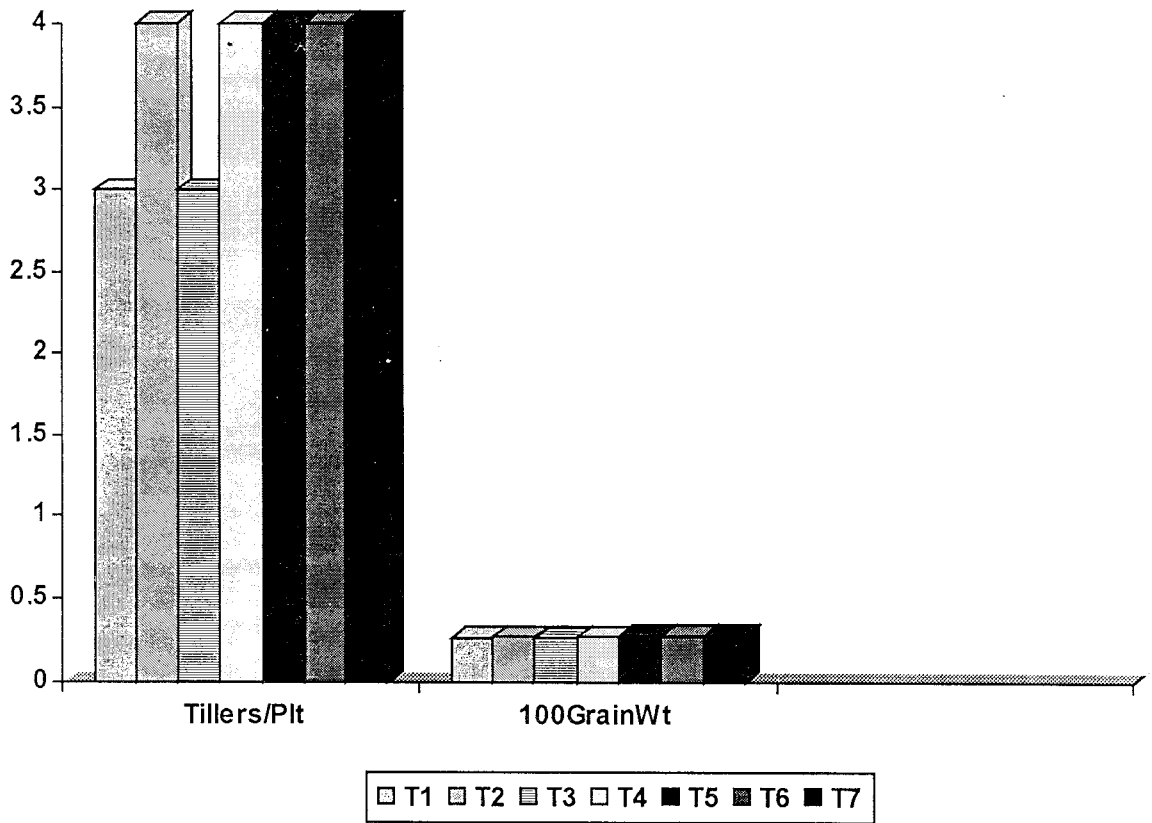
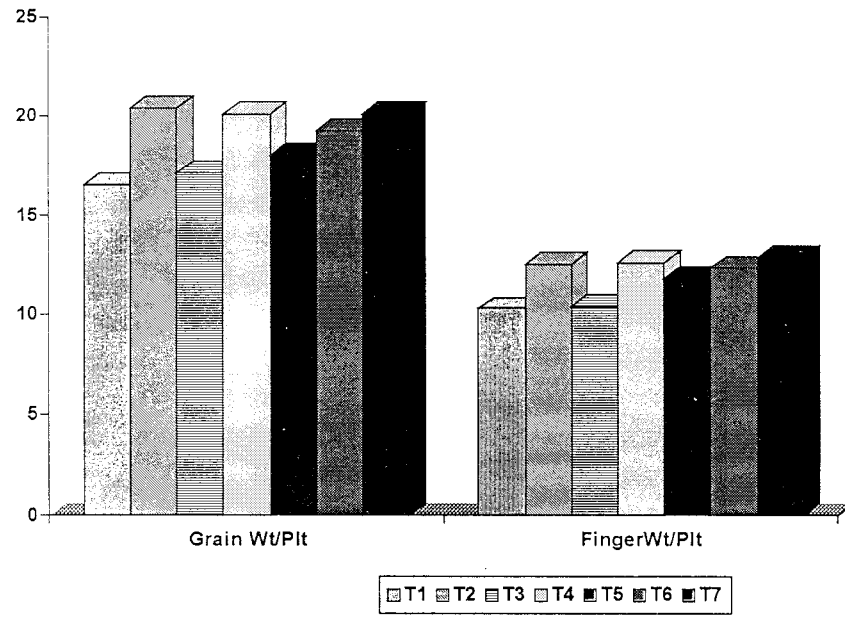
TABLE – 39

YIELD PARAMETERS OF RAGI INFLUENCED BY CORNCOB COMPOST

| Treatments | No. of Tillers / Plant | Wt. Of Fingers / Plant (gm) | Weight of Grains / Plant (gm) | 100 Grain Weight (gm) |
|----------------|------------------------------|-----------------------------------|-------------------------------------|-----------------------------|
| T ₁ | 3 | 16.5 | 10.3 | 0.26 |
| T ₂ | 4 | 20.4 | 12.5 | 0.27 |
| T ₃ | 3 | 17.1 | 10.4 | 0.26 |
| T ₄ | 4 | 20.1 | 12.6 | 0.27 |
| T ₅ | 4 | 18.0 | 11.8 | 0.28 |
| T ₆ | 4 | 19.2 | 12.3 | 0.28 |
| T ₉ | 4 | 20.1 | 12.8 | 0.28 |
| S.Ed | - | 0.2655 | 1.2250 | 0.0115 |
| CD | - | 0.5694 | 2.4078 | 0.0248 |

FIG - 9

CORNCOB COMPOST ON RAGI YIELD



SOYABEAN [Glycine max]

All the treatments applied to soyabean significantly influenced the haulm weight per plant over control. The treatments were on par with each other and ranged from 13.8 gm [T₁] to 15.2 gm [T₂].

4.3.5.14 NUMBER OF PRODUCTIVE TILLERS / PLANT

RAGI [Eleusine coracana]

There was no significant effect with the treatments on the number of productive tillers of ragi that ranged between 3 [T₁, T₃] to 4 [T₂, T₄, T₅, T₆, T₇]

4.3.5.15 WEIGHT OF FINGERS /PLANT

RAGI [Eleusine coracana]

The finger weight per plant was significantly influenced by NPK [T₂ - 20.4 gm], FYM [T₂ - 20.1 gm] and corncob compost [T₅ - 18 gm, T₆ - 19.2 gm and T₇ - 20.1 gm] when compared with control [T₁ - 16.5 gm] and raw corncob treatment [T₃ - 17.1 gm].

4.3.6 POT CULTURE EXPERIMENT IV – LEVELS OF CORNCOB COMPOST WITH BIOFERTILIZERS ON THE CROP GROWTH AND PRODUCTIVITY [Table 40, 41, 42, 43, 44 &45 Plate 14, 15, 16, 14A , 16A]

4.3.6.1 SHOOT LENGTH

SOYABEAN [Glycine max]

The shoot length ranged from 29 cm [T₁ , T₄] to 33.8 cm [T₉]. The most significant values was found with corncob compost 12.5 t/h + Rhizobium +

Phosphobacteria [T₅ – 33cm], corncob compost 25 t/h + Rhizobium [T₇ – 35 cm], corncob compost 25 t/h + Phosphobacteria [T₈ – 33 cm] and corncob compost 25 t/h + Rhizobium + Phosphobacteria [T₉ – 33.8 cm] on 30 days. The rest of the treatments were on par with NPK 100% treatments [T₁]. At 60 days, all the treatments except corncob compost 12.5t/h [T₂] alone and in combination with Rhizobium [T₃] favourably influenced the shoot length of soyabean that ranged between 43.5cm [T₃] to 52 cm [T₆ , T₉].

GREEN GRAM [Vigna radiata]

The treatments that favoured the shoot length of green gram were on par with each other including the NPK amendment, at both 30 and 60 days. The shoot length varied from 26 cm [T₃] to 28.3 cm [T₅] on 30 days and 39.3 cm [T₅] to 44.2 cm [T₂] on 60 days.

RAGI [Eleusine coracana]

The corncob compost 12.5 t/h + Azospirillum + Phosphobacteria [T₄], corncob compost 25 t/h in combination with Azospirillum [T₇], Phosphobacteria [T₈] and both [T₉] increased the shoot length significantly over control and other treatments which varied between 26.3 cm [T₁] to 30 cm [T₇] at 30 days and 70 cm [T₃] to 84 cm [T₇] at 60 days.

4.3.6.2 ROOT VOLUME

SOYABEAN [Glycine max]

The root volume was marginally increased with corncob compost 12.5 t/h + Phosphobacteria [T₄ – 3.5] and along with Rhizobium [T₅ – 3.5] corncob compost 25 t/h

TABLE - 40

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANTS ON SOYABEAN (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 29.0 | 3.0 | 2.0 | 6.3 | 39 | 6.0 | 2.0 | 8.0 |
| T ₂ | 31.5 | 2.5 | 2.0 | 6.0 | 36 | 5.9 | 2.3 | 8.2 |
| T ₃ | 30.5 | 3.0 | 2.3 | 6.7 | 42 | 6.5 | 2.4 | 8.9 |
| T ₄ | 29.0 | 3.5 | 2.1 | 6.4 | 41 | 6.1 | 2.1 | 8.2 |
| T ₅ | 33.0 | 3.5 | 2.2 | 6.5 | 39 | 6.2 | 2.2 | 8.4 |
| T ₆ | 29.3 | 3.0 | 2.5 | 6.4 | 39 | 6.4 | 2.1 | 8.5 |
| T ₇ | 35.0 | 3.0 | 2.2 | 6.5 | 48 | 6.5 | 2.2 | 8.7 |
| T ₈ | 33.0 | 3.5 | 2.3 | 7.0 | 40 | 6.6 | 2.5 | 9.1 |
| T ₉ | 33.8 | 3.8 | 2.3 | 7.1 | 38 | 6.9 | 2.1 | 9.0 |
| S.E.d | 1.0103 | 0.3127 | 0.2228 | 0.2277 | 2.1082 | 0.2283 | 0.1089 | 0.3277 |
| CD | 2.1226 | 0.6570 | 0.4680 | 0.4784 | 4.4292 | 0.4795 | 0.2287 | 0.6885 |

TABLE - 41

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANTS ON SOYABEAN (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 47 | 3.0 | 2.0 | 4.0 | 48 | 16.9 | 8.5 | 25.4 |
| T ₂ | 45 | 3.0 | 2.0 | 4.0 | 42 | 17.9 | 9.0 | 26.9 |
| T ₃ | 43.5 | 3.5 | 2.0 | 4.4 | 45 | 17.5 | 9.2 | 26.7 |
| T ₄ | 51 | 3.0 | 2.5 | 4.5 | 45 | 17.2 | 9.5 | 26.7 |
| T ₅ | 48 | 3.5 | 3.0 | 5.0 | 60 | 17.4 | 9.6 | 27.0 |
| T ₆ | 52 | 3.0 | 2.0 | 5.0 | 54 | 18.0 | 9.9 | 27.9 |
| T ₇ | 50 | 3.0 | 2.5 | 4.5 | 57 | 17.9 | 10.0 | 27.9 |
| T ₈ | 48 | 3.5 | 2.0 | 4.0 | 63 | 18.3 | 9.8 | 28.1 |
| T ₉ | 52 | 3.0 | 3.0 | 5.0 | 59 | 18.1 | 9.8 | 27.9 |

+ Phosphobacteria [T₈ –3.5] and along with Rhizobium [T₉ –3.8] on the 30th day. On the 60th day , a similar effect with the treatments of corncob compost 12.5 t/h +Rhizobium [T₃] and along with Phosphobacteria [T₅] and corncob compost 25 t/h + Phosphobacteria [T₈] was observed.

GREEN GRAM [Vigna radiata]

The influence of treatments on root volume of green gram was slightly increased with NPK application [T₁], corncob compost 12.5 t/h alone [T₂], with Phosphobacteria [T₄] , with Rhizobium and Phosphobacteria [T₅], corncob compost 25 t/h + Phosphobacteria [T₈], with Rhizobium and Phosphobacteria [T₉] than other treatments. At the second stage, the root volume was on par with each other and failed to express any significant variations among them.

RAGI [Eleusine coracana]

At the first stage, the root volume was marginally increased by all the treatments over NPK 100% [T₁] that varied from 2 [T₁] to 2.5 [T₅ , T₇ , T₈ , T₉]. At the second stage, the treatments were on par with each other except corncob compost 12.5 t/h [T₂] and they ranged between 6 [T₂] to 8 [T₅ , T₇ , T₈] .

4.3.6.3 NUMBER OF LEAVES

SOYABEAN [Glycine max]

The treatments exhibit similar effects in the number of leaves of soyabean and the most significant increase was noted at corncob compost 25 t/h + Rhizobium [T₇ – 48] at 30 days. At 60 days, the corncob compost 12.5 t/h + Rhizobium + Phosphobacteria [T₅ –

TABLE 42

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANT ON THE GREENGRAM (30 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 26.3 | 1.5 | 2.0 | 2.6 | 16 | 4.0 | 2.2 | 6.2 |
| T ₂ | 27.8 | 2.0 | 1.9 | 2.8 | 18 | 4.6 | 1.8 | 6.4 |
| T ₃ | 26.0 | 1.2 | 1.5 | 2.5 | 17 | 4.5 | 1.8 | 6.3 |
| T ₄ | 27.2 | 1.5 | 1.5 | 2.7 | 16 | 4.3 | 2.2 | 6.5 |
| T ₅ | 28.3 | 1.5 | 1.8 | 2.7 | 15 | 4.5 | 1.3 | 5.8 |
| T ₆ | 25.7 | 1.2 | 1.7 | 2.5 | 16 | 4.4 | 1.3 | 5.7 |
| T ₇ | 26.9 | 1.3 | 1.5 | 2.6 | 17 | 4.6 | 0.9 | 5.5 |
| T ₈ | 27.8 | 1.7 | 1.7 | 2.7 | 17 | 4.4 | 1.7 | 6.1 |
| T ₉ | 27.0 | 1.7 | 1.8 | 2.7 | 16 | 4.5 | 1.8 | 6.3 |
| S.Ed | 2.2148 | 0.2277 | 0.1826 | 0.2643 | 1.6630 | 0.3580 | 0.4055 | 0.3868 |
| CD | 4.6531 | 0.4784 | 0.3836 | 0.5554 | 3.4938 | 0.7521 | 0.8520 | 0.8127 |

TABLE - 43

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANT ON THE GREENGRAM (60 DAYS)

| Treatments | Shoot Length (cm) | Root Volume | Internodal Length (cm) | Petiole Length (cm) | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------|-------------|-------------------------|---------------------|---------------|-----------------------|----------------------|----------------------------|
| T ₁ | 42.0 | 3.5 | 1.8 | 5.5 | 25 | 16.6 | 3.8 | 20.4 |
| T ₂ | 44.2 | 3.7 | 2.0 | 6.0 | 26 | 17.8 | 3.9 | 21.7 |
| T ₃ | 41.0 | 3.3 | 1.5 | 5.5 | 24 | 15.1 | 3.2 | 18.3 |
| T ₄ | 39.8 | 3.5 | 1.7 | 5.5 | 25 | 16.4 | 3.3 | 19.7 |
| T ₅ | 39.3 | 3.5 | 1.8 | 5.0 | 23 | 16.8 | 3.5 | 20.3 |
| T ₆ | 41.6 | 3.4 | 1.8 | 5.5 | 23 | 17.0 | 3.6 | 20.6 |
| T ₇ | 40.3 | 3.3 | 1.7 | 5.3 | 25 | 17.9 | 3.8 | 21.7 |
| T ₈ | 41.1 | 3.5 | 1.5 | 5.2 | 24 | 16.8 | 3.3 | 20.1 |
| T ₉ | 42.0 | 3.5 | 1.7 | 5.2 | 24 | 16.9 | 3.9 | 20.8 |
| SEd | 3.1514 | 0.4076 | 0.2449 | 0.4312 | 1.3053 | 1.2423 | 0.4037 | 1.8991 |
| CD | 6.6209 | 0.8564 | 0.5146 | 0.9059 | 2.7423 | 2.6099 | 0.8481 | 3.9900 |

60]. corncob compost 25 t/h with Rhizobium [T₇ – 57] with Phosphobacteria [T₈ – 63] and with Rhizobium and Phosphobacteria [T₉ – 59].

GREEN GRAM [Vigna radiata]

The treatments failed to express any significant variations among themselves at 30 days and they ranged between 16 [T₁ , T₄ , T₆ ,T₉] to 18 [T₂]. On the 60th day , the treatments except T₅ and T₆ showed a similar effect in increasing the number of leaves.

RAGI [Eleusine coracana]

The number of leaves at the 30th day, was on par with each other and failed to exhibit significant variations among themselves. On the 60th day , the treatments such as corncob compost 12.5 t/h + Azospirillum [T₃ –26], corncob compost 25 t/h [T₆ –26], with Azospirillum [T₇-27], with Phosphobacteria [T₈ – 26], with Azospirillum and Phosphobacteria [T₉ –28].

4.3.6.4 PETIOLE LENGTH

SOYABEAN [Glycine max]

This parameter of soyabean at 30 days, was slightly increased with corncob compost 12.5 t/h with Rhizobium [T₃ – 6.7 cm], with Rhizobium and Phosphobacteria [T₅ –6.5 cm] and corncob compost 25 t/h + Rhizobium and Phosphobacteria individually [T₇ – 6.5 cm and T₈ – 7 cm] and in combinations [T₉ –7.1 cm]. At the second stage, the marginal increase in the petiole length was noted with T₃, T₄, T₅ , T₆ ,T₇ and T₉ over other treatments.

TABLE – 44

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANTS ON RAGI (30
DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|-------------------------|----------------|------------------|-----------------------------|----------------------------|----------------------------------|
| T ₁ | 26.3 | 2.0 | 10 | 8.0 | 1.9 | 9.9 |
| T ₂ | 27.8 | 2.3 | 11 | 7.7 | 2.1 | 9.8 |
| T ₃ | 26.7 | 2.3 | 12 | 8.9 | 2.5 | 11.4 |
| T ₄ | 28.0 | 2.4 | 12 | 9.2 | 2.8 | 11.0 |
| T ₅ | 29.0 | 2.5 | 12 | 9.4 | 3.1 | 11.5 |
| T ₆ | 27.0 | 2.3 | 11 | 8.6 | 2.6 | 11.2 |
| T ₇ | 30.0 | 2.5 | 12 | 9.7 | 2.7 | 11.4 |
| T ₈ | 29.7 | 2.5 | 12 | 9.8 | 2.3 | 11.1 |
| T ₉ | 28.5 | 2.5 | 13 | 10.1 | 2.5 | 12.6 |
| S.Ed | 0.9572 | 0.0943 | 1.8459 | 0.4828 | 0.3580 | 0.3953 |
| CD | 2.0111 | 0.1981 | 3.8782 | 1.0143 | 0.7521 | 0.8306 |

TABLE – 45

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANTS ON RAGI (60
DAYS)

| Treatments | Shoot Length (cm) | Root Volume | No. of Leaves | Shoot Dry Weight (gm) | Root Dry Weight (gm) | Dry Matter production (gm) |
|----------------|----------------------|-------------|---------------|--------------------------|-------------------------|-------------------------------|
| T ₁ | 75 | 7.0 | 21 | 16.0 | 8.3 | 24.3 |
| T ₂ | 80 | 6.0 | 23 | 15.3 | 8.0 | 23.3 |
| T ₃ | 70 | 6.7 | 26 | 18.3 | 8.8 | 27.1 |
| T ₄ | 81.5 | 7.0 | 22 | 16.9 | 9.0 | 25.9 |
| T ₅ | 77 | 8.0 | 23 | 17.1 | 9.2 | 26.3 |
| T ₆ | 76 | 7.0 | 26 | 18.4 | 9.4 | 27.8 |
| T ₇ | 84 | 8.0 | 27 | 20.0 | 9.8 | 29.8 |
| T ₈ | 82 | 8.0 | 26 | 18.8 | 10.1 | 28.9 |
| T ₉ | 82.5 | 7.7 | 28 | 19.7 | 10.3 | 30.0 |
| S.Ed | 2.4646 | 0.7247 | 1.7427 | 0.6650 | 0.5340 | 1.8433 |
| C.D | 5.1779 | 1.5226 | 3.6613 | 1.3971 | 1.1220 | 3.8727 |

GREEN GRAM [Vigna radiata]

The treatments were on par with each other and did not show any significant variation in the petiole length of green gram at both the stages.

4.3.6.5 INTERNODAL LENGTH

SOYABEAN [Glycine max]

The treatments were equal in their effects including NPK 100% in favouring this parameter of soyabean at 30 days. At 60 days, a slight increase was noted with the combination of Rhizobium and Phosphobacteria with composted corncob 12.5 t/h [T₅] and composted corncob 25 t/h [T₉].

GREEN GRAM [Vigna radiata]

At both the stages, the internodal length of green gram did not influence any significant change among the treatments. The treatments were on par with each other and with NPK application.

4.3.6.6 SHOOT DRY WEIGHT

SOYABEAN [Glycine max]

The shoot dry weight was positively enhanced with composted corncob 12.5 t/h + Rhizobium [T₃ – 6.5 gm] and composted corncob 25 t/h alone [T₆ – 6.4 gm], with Rhizobium [T₇ – 6.5 gm], with Phosphobacteria [T₈ – 6.6 gm] and with Rhizobium + Phosphobacteria [T₉ – 6.9 gm] at 30 days. At the 60th day, the composted corncob 12.5 t/h [T₂ – 17.9 gm] and T₆ (18 gm), T₇ (17.9 gm), T₈ (18.3 gm) and T₉ (18.1 gm) showed a

significant influence on the shoot dry weight over NPK [T₁ – 16.9 gm] and other treatments.

GREEN GRAM [Vigna radiata]

The treatments including NPK amendment were on par with each other for favouring the shoot dry weight which varied from 4.0 gm [T₁] to 4.6 gm [T₂ , T₆] at the first stage. The shoot dry weight was favourably increased with all the treatments when compared with the corncob compost 12.5 t/h [T₂] at the second stage.

RAGI [Eleusine coracana]

The shoot dry weight at 30 days was positively influenced with the corncob compost 12.5 t/h with Phosphobacteria [T₄ – 9.2 gm] and with Azospirillum and Phosphobacteria [T₅ – 9.4 gm], corncob compost 25 t/h with Azospirillum [T₇ – 9.7 gm], with Phosphobacteria [T₈ – 9.8 gm] and with Azospirillum and Phosphobacteria [T₉ – 10.1 gm] when compared with other treatments . At 60 days, the shoot dry weight was significantly influenced by T₇ (20 gm), T₈ (18.8 gm) and T₉ (19.7 gm) when compared with NPK application (16 gm) and other treatments.

4.3.6.7 ROOT DRY WEIGHT

SOYABEAN [Glycine max]

A slight increase in the root dry weight was observed at T₂ [composted corncob 12.5 t h – 2.3 gm], T₄ [composted corncob 12.5 t/h + Rhizobium – 2.4 gm] and T₈ [corn cob compost 25 t/h + Phosphobacteria – 2.5 gm] whereas in T₁ (NPK) the root dry weight was 2 gm at the first stage. At the second stage, the root dry weight was

favourably increased with the composted corncob treatments when compared with NPK amendment. The root dry weight ranged from 8.5 gm [T₁] and 10.0 gm [T₇].

GREEN GRAM [Vigna radiata]

The treatments exhibited similar effects on the root dry weight of green gram at both the stages except T₇ [corn cob compost 25 t/h + Rhizobium] at 30 days. The root dry weight varied from 0.9 gm [T₇] to 2.2 gm [T₂] on 30 days and 3.2 gm [T₃] to 3.9 gm [T₂, T₉] on 60 days.

RAGI [Eleusine coracana]

This parameter at 30 days was positively influenced by the treatments over NPK [T₁] and corn cob compost 12.5 t/h [T₂]. The value ranged from 1.9 gm [T₁] to 3.1 gm [T₅]. At 60 days, the root dry weight was enhanced with corn cob compost 12.5 t/h + Azospirillum + Phosphobacteria [T₅ – 9.2 gm], corn cob compost 25 t/h [T₆ - 9.4 gm], corn cob compost 25 t/h + Azospirillum [T₇ – 9.8 gm] with Phosphobacteria [T₈ – 10.1 gm], with Azospirillum and Phosphobacteria [T₉ – 10.3 gm] when compared with NPK and other treatments.

4.3.6.8 DRY MATTER PRODUCTION

SOYABEAN [Glycine max]

The treatments significantly increased the dry matter production over NPK [T₁], corn cob compost 12.5 t/h alone [T₂] and with Phosphobacteria [T₄]. The dry matter content ranged from 8 gm [T₁] to 9.1 gm [T₈] at the first stage and 25.4 gm [T₁] to 28.1 gm [T₈] at the second stage. The corn cob treatments alone at different levels and in

combinations with biofertilizers were on par with each other and significant over NPK amendment.

GREEN GRAM [Vigna radiata]

The treatments of corncob compost and NPK 100% were equal in their effect on the dry matter production at both the stages except corncob compost 25 t/h + Rhizobium [T₇] at 30 days. The values extend from 5.5 gm [T₇] to 6.5 gm [T₅] on 30 days and 18.3 gm [T₃] to 21.7 gm [T₂, T₇] on 60 days.

RAGI [Eleusine coracana]

At 30 days, the dry matter content was influenced positively by corncob compost 12.5 t/h with Azospirillum [T₃ – 11.4 gm], with Azospirillum + Phosphobacteria [T₅ – 11.5 gm], corncob compost 25 t/h with Azospirillum [T₇ – 11.4 gm], and with Azospirillum + Phosphobacteria [T₉ – 12.6 gm] when compared with NPK [T₁ – 9.9 gm] and other treatments. At 60 days, the treatments such as corncob compost 12.5 t/h with Azospirillum [T₃ – 27.1 gm], with Azospirillum and Phosphobacteria [T₅ – 26.3 gm], corncob compost 25 t/h [T₆ – 27.8 gm], with Azospirillum [T₇ – 29.8 gm], with Phosphobacteria [T₈ – 28.9 gm] and with Azospirillum and Phosphobacteria [T₉ – 30 gm].

YILED PARAMETERS [Table 46, 47 & 48 FIG 10, 11]

4.3.6.9 NUMBER OF PODS /PLANTS

SOYABEAN [Glycine max]

The number of pods per plant was favourably influenced by corncob compost with Phosphobacteria [T₄ – 89], with Rhizobium and Phosphobacteria [T₅ – 93], corncob

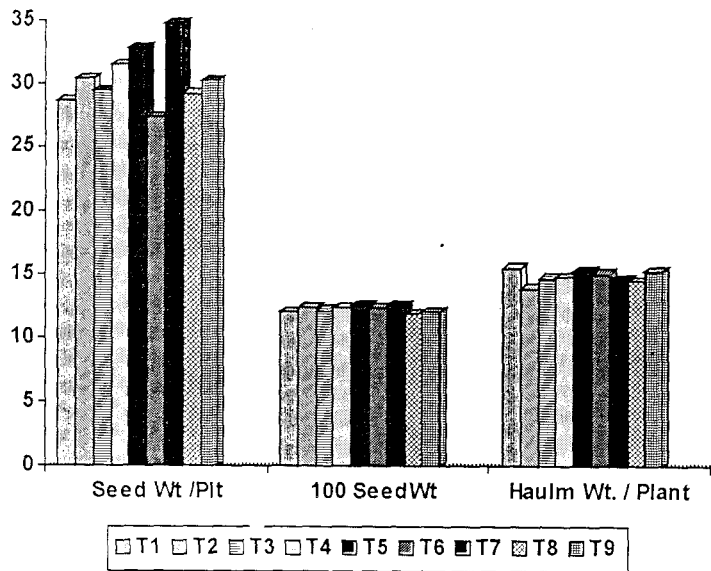
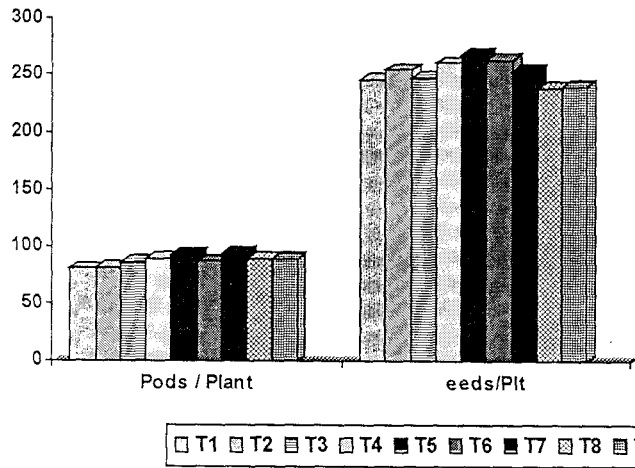
TABLE – 46

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANTS ON YIELD OF
SOYABEAN

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) | Haulm Wt. / Plant (gm) |
|----------------|------------------------|----------------------------|------------------------------------|----------------------------|---------------------------|
| T ₁ | 81 | 246 | 28.8 | 12.0 | 15.5 |
| T ₂ | 82 | 255 | 30.5 | 12.3 | 13.9 |
| T ₃ | 86 | 248 | 29.6 | 12.1 | 14.7 |
| T ₄ | 89 | 261 | 31.7 | 12.4 | 14.8 |
| T ₅ | 93 | 268 | 32.9 | 12.5 | 15.3 |
| T ₆ | 87 | 263 | 27.5 | 12.3 | 15.0 |
| T ₇ | 94 | 254 | 34.9 | 12.5 | 14.6 |
| T ₈ | 89 | 238 | 29.3 | 11.9 | 14.4 |
| T ₉ | 90 | 240 | 30.4 | 12.0 | 15.2 |
| S.Ed | 2.7933 | 3.1623 | 1.1314 | 0.1826 | 0.4064 |
| CD | 5.8686 | 6.6438 | 2.3770 | 0.3836 | 0.8539 |

FIG -10

CORNCOB COMPOST LEVELS WITH BIOINOCULANTS ON SOYA YIELD



compost 25 t/h with Rhizobium [T₇ – 94], with Phosphobacteria [T₈ – 89], with Rhizobium – Phosphobacteria [T₉ – 90] when compared with NPK [T₁ – 81] and other treatments.

GREEN GRAM [Vigna radiata]

The influence of the treatments did not show any significant variations among themselves and with NPK amendment. The pod yield ranged between 48 [T₄] to 51 [T₂, T₉].

4.3.6.10 NUMBER OF SEEDS /PLANT

SOYABEAN [Glycine max]

The number of seeds/ plant was most significant with the application of corncob compost 12.5 t/h in combination with biofertilizers [T₅ – 268] and corncob compost at 25 t/h [T₆ – 263] when compared with NPK [T₁ – 246] and other treatments.

GREEN GRAM [Vigna radiata]

The seed yield per plant exhibited similar effect with the treatments that ranged from 570 [T₄] to 591 [T₂].

4.3.6.11 WEIGHT OF SEEDS /PLANT

SOYABEAN [Glycine max]

A significant increase in the seed weight per plant was observed with T₅ [corncob compost 12.5 t/h + Rhizobium + Phosphobacteria] and T₇ [corncob compost 25 t/h + Rhizobium]. The weight of seeds ranged from 27.5 gm [T₆] to 32.9 gm [T₅].

TABLE – 47

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANT ON THE YIELD
OF GREENGRAM

| Treatments | No. of Pods / Plant | No. of Seeds / Plant | Weight of Seeds / Plant (gm) | 100 Seed Weight (gm) |
|----------------|------------------------|----------------------------|------------------------------------|----------------------------|
| T ₁ | 49 | 574 | 14.35 | 2.9 |
| T ₂ | 51 | 591 | 14.78 | 3.0 |
| T ₃ | 50 | 588 | 14.70 | 2.8 |
| T ₄ | 48 | 570 | 14.25 | 2.9 |
| T ₅ | 49 | 583 | 14.58 | 3.0 |
| T ₆ | 50 | 585 | 14.63 | 3.0 |
| T ₇ | 49 | 576 | 14.40 | 2.8 |
| T ₈ | 50 | 582 | 14.55 | 2.7 |
| T ₉ | 51 | 589 | 14.73 | 2.9 |
| S.Ed | 2.0184 | 22.3226 | 0.8370 | 0.0831 |
| CD | 4.2406 | 46.8986 | 1.7586 | 0.1747 |

GREEN GRAM [Vigna radiata]

The treatments influencing the seed weight per plant were on par with each other ranging from 14.25 gm [T₄] to 14.78 gm [T₂].

RAGI [Eleusine coracana]

A significant increase in the weight of grains / plant was observed with the application of corncob compost 12.5 t/h alone [T₂ – 13 gm], with Phosphobacteria [T₄ – 13.3 gm], with Azospirillum and Phosphobacteria [T₅ – 13.1 gm], corncob compost 25 t/h alone [T₆ – 13.3 gm], with Azospirillum [T₇ – 13.7 gm], with Azospirillum and Phosphobacteria [T₉ – 13.5 gm] over NPK [T₁ - 12.7 gm] and other treatments.

4.3.6.12 100 SEED WEIGHT

SOYABEAN [Glycine max]

The 100 seed weight of soyabean influenced by treatments were on par with each other and superior over T₁ [NPK], T₈ [corncob compost 25 t/h with Phosphobacteria] and T₉ [corn cob compost 25 t/h with Rhizobium and Phosphobacteria].

GREEN GRAM [Vigna radiata]

The treatments showed equal effects in the 100 seed weight including NPK treatment and the range was between 2.7 gm [T₈] to 3.0 gm [T₂, T₅, T₆].

RAGI [Eleusine coracana]

The 100 grain weight was significant at corncob compost 12.5 t/h [T₂ – 13 gm], with Phosphobacteria [T₄ – 13.3 gm] with Azospirillum and Phosphobacteria [T₅ – 13.1 gm] corncob compost at 25 t/h alone [T₆ – 13.3 gm], with Azospirillum [T₇ – 13.7 gm] and with Azospirillum and Phosphobacteria [T₉ – 13.5 gm].

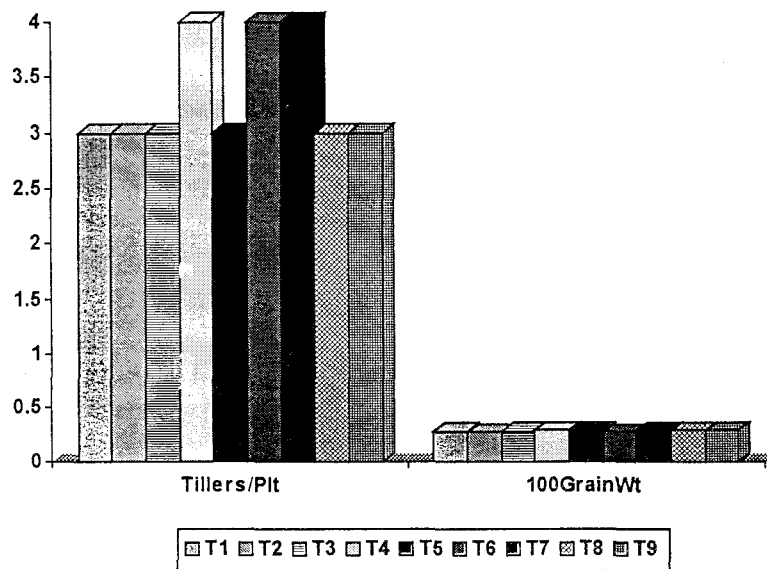
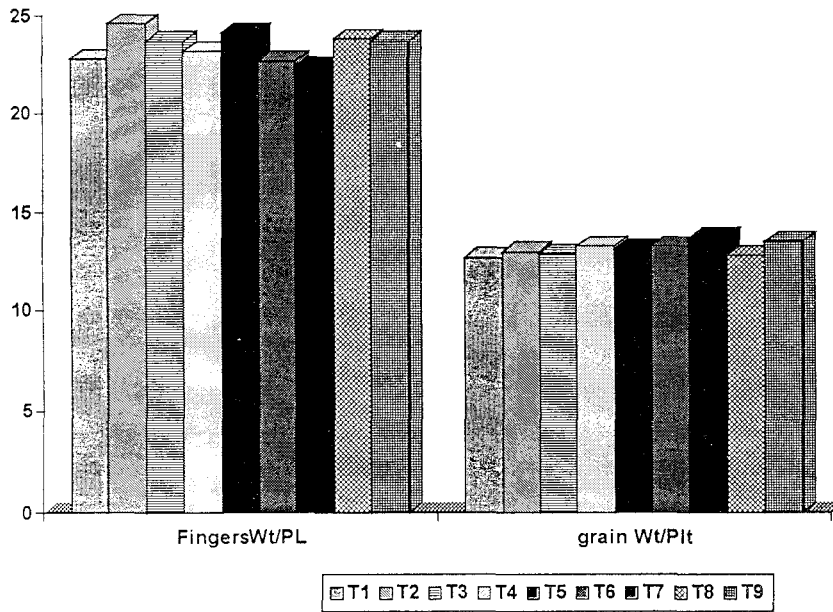
TABLE – 48

LEVELS OF CORNCOB COMPOST WITH BIOINOCULANTS ON YIELD OF
RAGI

| Treatments | No. of Tillers / Plant | Wt. of Fingers / Plant (gm) | Weight of Grains / Plant (gm) | 100 Grain Weight (gm) |
|----------------|------------------------------|-----------------------------------|-------------------------------------|-----------------------------|
| T ₁ | 3 | 22.8 | 12.7 | 0.28 |
| T ₂ | 3 | 24.6 | 13.0 | 0.27 |
| T ₃ | 3 | 23.7 | 12.9 | 0.28 |
| T ₄ | 4 | 23.2 | 13.3 | 0.29 |
| T ₅ | 3 | 24.1 | 13.1 | 0.29 |
| T ₆ | 4 | 22.7 | 13.3 | 0.27 |
| T ₇ | 4 | 22.4 | 13.7 | 0.29 |
| T ₈ | 3 | 23.8 | 12.8 | 0.29 |
| T ₉ | 3 | 23.7 | 13.5 | 0.29 |
| S.Ed | - | 0.8170 | 0.3232 | 0.0077 |
| CD | - | 1.7164 | 0.6790 | 0.0162 |

FIG - II

CORNCOB COMPOST AND BIOINOCULANTS ON RAGI YIELD



4.3.6.13 HAULM WEIGHT / PLANT

SOYABEAN [Glycine max]

The treatments were on par with each other in influencing the haulm weight / plant except T₈ [corn cob compost T₈ with Phosphobacteria]. The range of haulm weight was between 13.9 gm [T₂] to 15.5 gm [T₁].

4.3.6.14 NUMBER OF PRODUCTIVE TILLERS / PLANT

RAGI [Eleusine coracana]

The number of tillers / plant failed to express significant variations among themselves which varied between 3 [T₁] and 4 [T₇].

4.3.6.15 WEIGHT OF FINGERS / PLANT

RAGI [Eleusine coracana]

A favourable influence of the treatments such as corn cob compost 12.5 t/h alone [T₂ – 24.6 gm], with Azospirillum [T₃ – 23.7 gm], with Phosphobacteria [T₄ – 23.2 gm], with Azospirillum and Phosphobacteria [T₉ – 23.7 gm] was observed over other treatments and NPK application [T₁ – 22.8 gm].

4.3.7 POST HARVEST SOIL ANALYSIS OF SOYA, GREEN GRAM AND RAGI TREATED WITH CORNCOB COMPOST AND BIOFERTILIZERS [Table 49, 50, 51, FIG 15, 16, 17]

4.3.7.1 HYDROGEN ION CONCENTRATION AND ELECTRICAL CONDUCTIVITY

The soil reaction (pH) of the post harvested soil samples treated with corncob compost and biofertilizers ranged between 6.9 to 7.6 in soyabean, 7.0 to 7.6 in green gram and 6.7 to 7.6 in ragi.

The electrical conductivity ranged from 0.4 to 0.7 milli mhos cc^{-1} in soya, 0.6 to 0.8 milli mhos cc^{-1} in green gram and 0.4 to 0.8 milli mhos cc^{-1} in ragi.

4.3.7.2 ORGANIC CARBON

The composted corncob 25 t/h along with Rhizobium and Phosphobacteria favoured the organic carbon content in the post harvested soil most favourably than other treatments and control. The organic carbon content varied between 0.05% to 0.19% in soyabean, 0.08% to 0.25% in green gram and 0.10% to 0.31% in ragi.

4.3.7.3 AVAILABLE NPK STATUS

The composted corncob treatments positively influenced the macronutrient status of the post harvested soil of the test crops when compared with NPK 100%

The available nitrogen content was ranging between 5.7 ppm [T₁] to 7.3 ppm [T₉] in soyabean, 3.2 ppm [T₁] to 5.9 ppm [T₇] in green gram and 6.6 ppm [T₁] to 7.8 ppm [T₉] in ragi. The available phosphorus was found to be highest with composted corncob 25 t/h – Phosphobacteria treatment [T₈] which varied from 13.0 ppm to 13.5 ppm in soyabean, 11.3 ppm to 12.3 ppm in green gram and 13.4 ppm to 14.6 ppm in ragi. The available potassium content was most favourable with corncob compost 25 t/h +

TABLE - 49

POST HARVEST SOIL SAMPLE ANALYSIS OF SOYA TREATED WITH
CORNCOB COMPOST

| Treat ments | pH | Ec milli mhos/ cm | OC % | N Ppm | P ppm | K ppm | B.D gm / cc | W.H.C % |
|----------------|-----|----------------------------|------|----------|----------|----------|-------------------|------------|
| T ₁ | 7.0 | 0.7 | 0.05 | 5.7 | 13.0 | 79 | 2.14 | 24.9 |
| T ₂ | 6.9 | 0.6 | 0.10 | 6.2 | 13.1 | 84 | 1.68 | 30.6 |
| T ₃ | 7.0 | 0.6 | 0.11 | 6.8 | 13.0 | 87 | 1.64 | 29.8 |
| T ₄ | 7.2 | 0.6 | 0.11 | 6.3 | 13.3 | 83 | 1.58 | 34.7 |
| T ₅ | 7.4 | 0.5 | 0.13 | 6.8 | 13.2 | 88 | 1.55 | 30.9 |
| T ₆ | 7.6 | 0.5 | 0.14 | 6.7 | 13.6 | 86 | 1.43 | 34.6 |
| T ₇ | 7.4 | 0.4 | 0.16 | 7.2 | 13.4 | 89 | 1.39 | 29.7 |
| T ₈ | 7.5 | 0.4 | 0.17 | 6.9 | 13.7 | 86 | 1.33 | 38.9 |
| T ₉ | 7.6 | 0.4 | 0.19 | 7.2 | 13.5 | 91 | 1.28 | 37.6 |

FIG - 15

POST HARVEST SOIL SAMPLE ANALYSIS OF SOYA TREATED WITH CORNCOB COMPOST

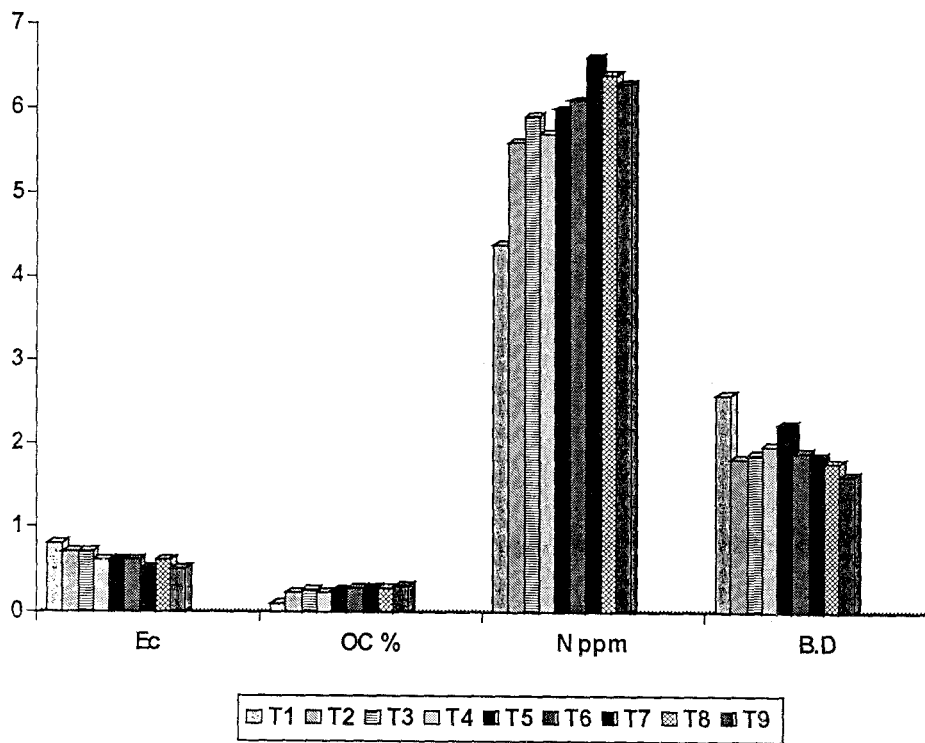
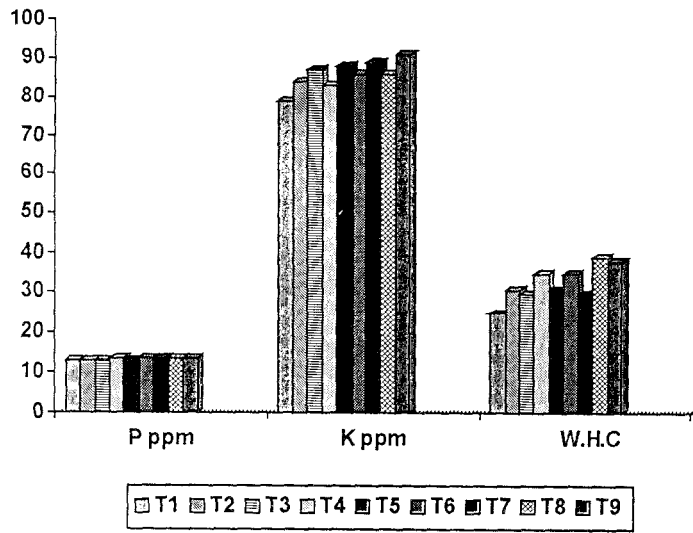


TABLE – 50

**POST HARVEST SOIL SAMPLE ANALYSIS OF GREENGRAM TREATED
WITH CORNCOB COMPOST**

| Treat ments | pH | Ec milli mhos/ cm | OC % | N ppm | P ppm | K ppm | B.D gm / cc | W.H.C % |
|----------------|-----|----------------------------|------|----------|----------|-------|-------------------|------------|
| T ₁ | 7.5 | 0.8 | 0.08 | 3.2 | 11.3 | 84 | 2.24 | 28.6 |
| T ₂ | 7.0 | 0.7 | 0.05 | 4.6 | 11.8 | 88 | 1.59 | 37.2 |
| T ₃ | 7.0 | 0.7 | 0.12 | 5.2 | 11.7 | 91 | 1.53 | 32.2 |
| T ₄ | 7.4 | 0.7 | 0.17 | 4.8 | 12.2 | 89 | 1.55 | 30.7 |
| T ₅ | 7.5 | 0.7 | 0.20 | 5.0 | 12.0 | 93 | 1.48 | 31.1 |
| T ₆ | 7.4 | 0.6 | 0.23 | 5.6 | 12.3 | 96 | 1.54 | 32.6 |
| T ₇ | 7.4 | 0.6 | 0.22 | 5.9 | 12.5 | 100 | 1.46 | 36.4 |
| T ₈ | 7.6 | 0.6 | 0.22 | 5.5 | 12.9 | 98 | 1.43 | 30.7 |
| T ₉ | 7.6 | 0.6 | 0.25 | 5.8 | 12.7 | 102 | 1.38 | 31.4 |

FIG 16

POST HARVEST SOIL SAMPLE ANALYSIS OF GREEN GRAM TREATED
WITH CORNCOB COMPOST

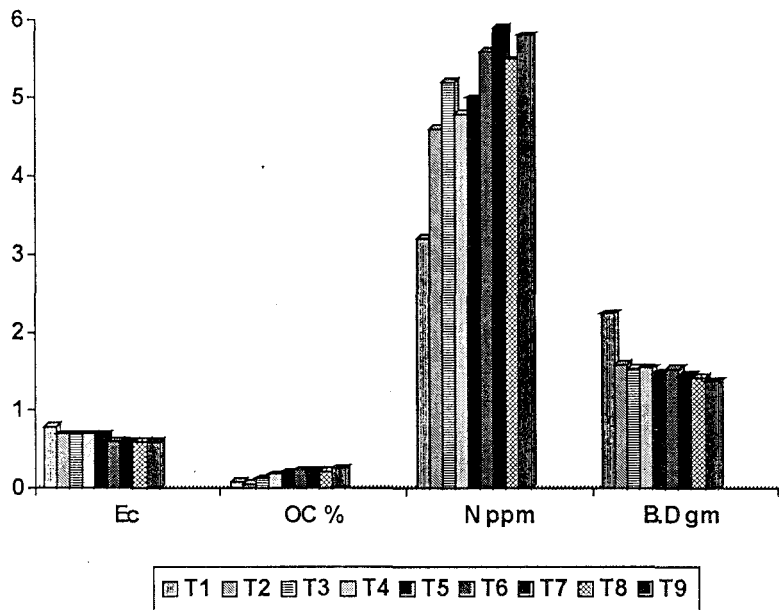
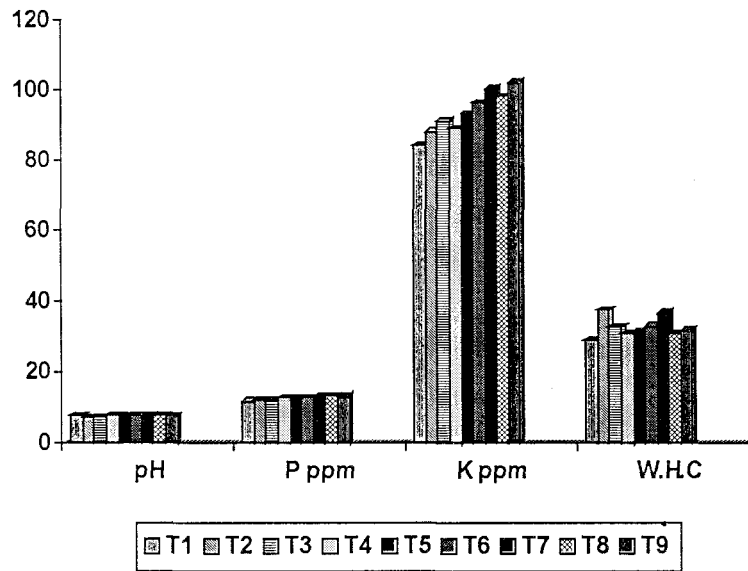


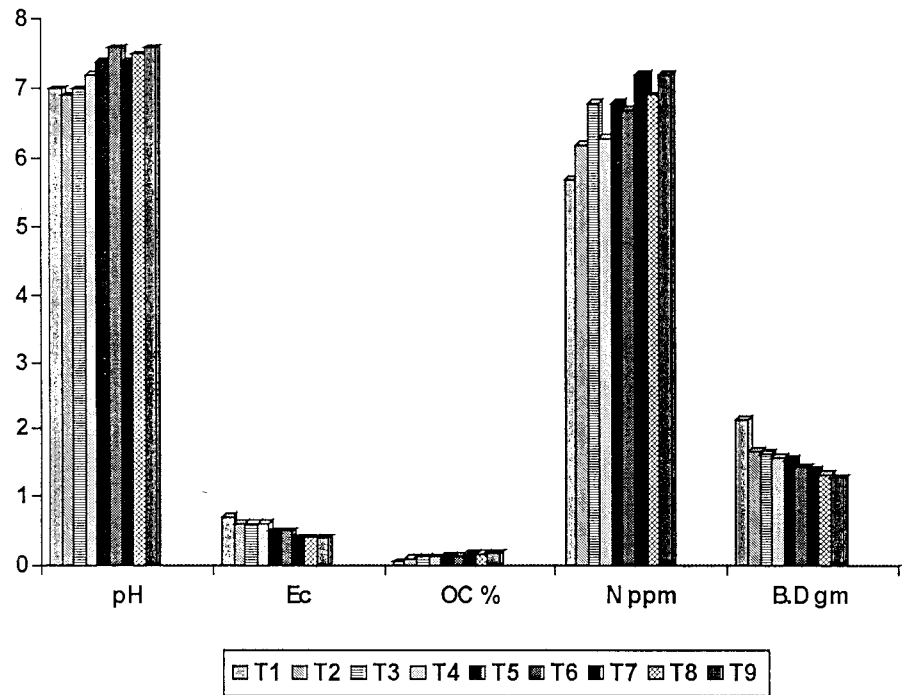
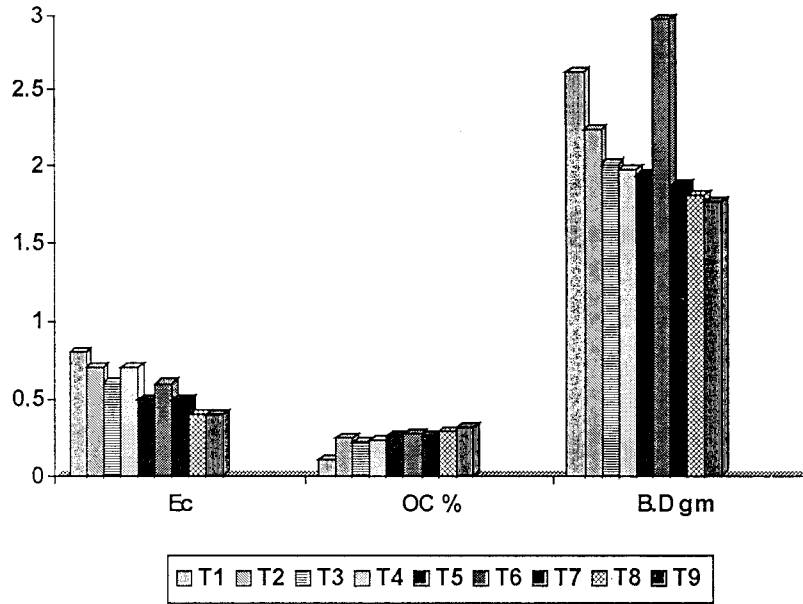
TABLE – 51

POST HARVEST SOIL SAMPLE ANALYSIS OF RAGI TREATED WITH
CORNCOB COMPOST

| Treatments | pH | Ec milli mhos/ cm | OC % | N ppm | P ppm | K ppm | B.D gm/cc | W.H.C % |
|----------------|-----|----------------------------|------|----------|----------|----------|--------------|------------|
| T ₁ | 6.9 | 0.8 | 0.10 | 6.6 | 13.4 | 108 | 2.62 | 29.6 |
| T ₂ | 6.7 | 0.7 | 0.24 | 7.0 | 13.9 | 111 | 2.24 | 37.2 |
| T ₃ | 7.2 | 0.6 | 0.21 | 7.5 | 13.9 | 113 | 2.01 | 27.8 |
| T ₄ | 7.1 | 0.7 | 0.23 | 7.2 | 14.2 | 115 | 1.98 | 32.4 |
| T ₅ | 7.4 | 0.5 | 0.26 | 7.3 | 14.3 | 120 | 1.94 | 30.7 |
| T ₆ | 7.4 | 0.6 | 0.27 | 7.4 | 14.0 | 118 | 2.97 | 31.1 |
| T ₇ | 7.4 | 0.5 | 0.26 | 7.8 | 14.3 | 118 | 1.87 | 30.8 |
| T ₈ | 7.4 | 0.4 | 0.28 | 7.5 | 14.6 | 119 | 1.81 | 28.8 |
| T ₉ | 7.6 | 0.4 | 0.31 | 7.7 | 14.4 | 121 | 1.76 | 31.3 |

FIG - 17

POST HARVEST SOIL SAMPLE ANALYSIS OF RAGI TREATED WITH
CORNCOB COMPOST



Rhizobium + Phosphobacteria [T₉] and ranged between 79 ppm to 91 ppm in soyabean, 88 ppm to 102 ppm in green gram and 108 ppm to 121 ppm in ragi.

4.3.7.4. BULK DENSITY AND WATER HOLDING CAPACITY

The bulk density of the soil was lowered with composted corncob treatments, while the water holding capacity was raised favourably with the treatments .

In soya bean, the bulk density ranged from 1.28 gm cc⁻¹ [T₉] to 2.14 gm cc⁻¹ [T₁] and the water holding capacity increased from 24.9% [T₁] to 38.9% [T₈]. In green gram, the bulk density extended from 1.38 gm cc⁻¹ [T₉] to 2.24 gm cc⁻¹ [T₁]. The water holding capacity varied from 28.6% [T₁] to 37.2% [T₂]. In ragi, the bulk density was ranging from 1.76 gm cc⁻¹ [T₉] to 2.62 gm cc⁻¹ [T₁] and the water holding capacity ranged from 27.8% [T₃] to 37.2% [T₂].

CHAPTER - 5

DISCUSSION

In the present study, an attempt has been made to study the role of inoculum in composting, influence of the composts with regard to the growth and yield parameters of test crops and to assess its applicability in improving the soil fertility status. The results of the above investigations are discussed in this chapter.

5.1. INFLUENCE OF BIOINOCULUM ON COMPOSTING AGROWASTES

5.1.1. EVALUATION OF MATURITY OF SUGARCANE TRASH AND CORNCOB COMPOSTS BASED ON PHYSICAL PROPERTIES

pH AND EC

During biodegradation, the pH of the agrowastes namely sugarcane trash and corncob was increased upto 7.9 in sugarcane trash compost and 7.8 in corncob compost.

The electrical conductivity of the raw sugarcane trash was 0.3 milli mhos cm^{-1} , and raw corncob was 0.8 milli mhos cm^{-1} . The Ec was also slightly increased upto 1 millimhos (C_7) in sugarcane trash compost and 1.1 milli mhos (C_7) in corncob compost.

This is in accordance with the findings of Polo *et al.*, (1988); Verdonck, (1988) and Baca *et al.*, (1993).

5.1.2 EVALUTION OF MATURITY OF SUGARCANE TRASH AND CORNCOB COMPOST BASED ON CHEMICAL PROPERTIES

The bioconversion is a process in which heterotrophic microorganisms are the sole agents for the decomposition of carbonaceous material [Alexander, 1977]. Similarly in the present study, the organic carbon content of sugarcane trash and corncob was lowered during composting whereas the available nitrogen had an increasing trend. The organic carbon content of raw sugarcane trash was 42%. It decreased in cowdung and microbial inoculated treatments. The minimum organic content was 18% in sugarcane trash and 17% in corncob composts observed at C₇ treatment [composted with Pleurotus + Trichoderma and cowdung].

Maximum available nitrogen was recorded [0.70%] in both sugarcane trash and corncob composts in the same treatment. All the cowdung and fungal inoculated treatments raised the nitrogen content in both the sugarcane trash and corncob composts, thereby narrowing down the C:N ratio. This is in accordance with the reports of Gaur[1987] and Asija *et al.*,[1984].

Among the treatments, the dual culture of Pleurotus and Trichoderma with cowdung(C-) was most efficient in narrowing down the C/N ratio of sugarcane trash and corncob while composting. During degradation of waste materials, the carbon is utilised for energy and growth by the microorganisms in higher amount, compared to nitrogen. This results in narrowing C/N ratio. The findings are in agreement with the results of Nagarajan *et al.*, (1985); Rajanna(1996) and Sahul Hameed *et al.*,(1996).

An increase in the available nutrient status of the composts was observed when compared with raw sugarcane trash and corncob. According to Misra and Hesse, (1982) the composts prepared from farm waste were superior in its major nutrients like nitrogen, phosphorus and potassium. Similarly, in the present investigation, an increase in the

available nutrient status of the composts was observed with all the microbial inoculated treatments. The available phosphorus, potassium, calcium and magnesium were increased during composting and a maximum nutrient status of 0.38% phosphorus, 0.88% potassium, 119 mg/kg calcium and 124 mg/kg magnesium in sugarcane trash compost and 0.042% phosphorus, 0.254% potassium, 187 mg/kg calcium and 73 mg/kg magnesium in corncob composts were recorded. These maximum nutrient values were obtained with the compost prepared with the Pleurotus, Trichoderma and cowdung combination (C₇). This result is in accordance with the results of Bharadwaj and Gaur, [1985]; Mackay and Kadivko, [1985]; Singh and Amberger [1990]; Prasad *et al.*, [1991] and Bhanavase *et al.*, [1995].

5.1.3. CHANGES IN TEMPERATURE DURING COMPOSTING OF SUGARCANE TRASH AND CORNCOB

The temperature inside the composting pits increased rapidly from 10th day to a maximum of 52°C (C₅) to 60°C (C₇) in sugarcane trash composting pits and 49°C (C₂) to 53°C (C₆, C₇) in corncob composting pits upto 40 days. After that the temperature gradually decreased upto 32°C and 31°C in cane trash and corncob compost respectively.

This is attributed to the inactivation of any pathogens present initially in the raw material. Similar results were reported by Bollen [1984], De Bertoldi [1986] and Faure and Des champs [1990].

5.2. SEEDLING GROWTH EXPERIMENT

5.2.1. SEEDLING GROWTH OF SOYABEAN AND GREEN GRAM INFLUENCED BY SUGARCANE TRASH COMPOST

A significant increase in the germination percentage of sugarcane crop with the addition of sugarcane trash compost at graded levels were reported by Rasal *et al.*, [1987]. The shoot length of soyabean seedlings was influenced significantly with sugarcane trash compost extract at the rate of 5, 10, 15 and 20 t/h. Higher doses of compost extract failed to show a significant effect on the shoot length of soyabean and green gram seedlings. The shoot length of green gram seedling was favoured positively with 5, 10, 15, 20, 25 and 30 t/h when compared with control.

The root length of soya and green gram seedlings was also influenced significantly by T₂[5t/h], T₃[10t/h], T₄[15t/h] and T₅[20t/h]. The number of lateral roots of soya was improved in all the compost extract treated seedlings over control. But in green gram, T₂, T₃, T₄ and T₅ influenced this parameter.

The fresh weight of the seedlings were influenced significantly by T₃, T₄, T₅, T₆ and T₇, but the dry weight of soyabean seedlings were improved by compost extract at 5t/h[T₂], 10t/h[T₃] and 15t/h[T₄]. The green gram seedlings influenced by the treatments were on par with each other in their dry weight.

5.2.2. SEEDLING GROWTH OF SOYABEAN AND GREEN GRAM INFLUENCED BY CORNCOB COMPOST

The composted corncob at the range of 5t/h[T₂] to 25t/h[T₆] significantly favoured the shoot and root length of soyabean and green gram seedlings. The number of

lateral roots of both the seedlings was improved with the corncob composts when compared with control.

The corncob compost treatments failed to favour any significant variations among them in the fresh weight of soyabean. But the treatments from T₂ to T₆ were found to be significant in increasing the fresh weight of green gram. The dry weight of the seedlings of soyabean and green gram had no profound effect with the treatments.

The increased seedling growth of the test crops at the optimum rate of compost is attributed to the nutrients provided by the composts and the efficiency of the microbes in degrading the lignocellulolytic waste material. This result is in accordance with Verma and Mathur, Swaminathan *et al.*, [1982] and Bisaria [1983].

5.3. POT CULTURE EXPERIMENTS

5.3.1. INFLUENCE OF SUGARCANE TRASH AND CORNCOB COMPOSTS ON THE GROWTH AND YIELD OF SOYABEAN, GREEN GRAM AND RAGI.

The growth and yield of the test crops were influenced positively by NPK 100% [T₂], FYM [T₄] and composted sugarcane trash and corncob composts at both vegetative and flowering stages.

5.3.1.1. SHOOT LENGTH INFLUENCED BY SUGARCANE TRASH COMPOST

In soyabean, the shoot length was more enhanced with composted sugarcane trash treatments. The average increase of shoot length was from 18% to 28% over control. The shoot length of green gram was also favoured positively by the NPK, FYM and

composted sugarcane trash treatments when compared to control and raw canetrash application.

The average increase of 30th and 60th day ragi crop ranged from 32% to 47% over control.

5.3.1.2. SHOOT LENGTH FAVOURED BY CORNCOB COMPOSTS

The NPK, FYM and corncob compost treatments were on par with each other in influencing the shoot length of the test crops.

The NPK amendment increased the shoot length of soyabean upto 30% over control. The average range of increase influenced by treatments was 21% to 37% over control. The composted corncob treatments, NPK and FYM positively influenced the shoot length of soyabean.

The shoot length of green gram and ragi was also increased with NPK 100% [T₂], FYM[T₄] and composted corncobs [T₅, T₆, T₇] when compared with control [T₁] and raw corncob [T₃]. The mean range of increase was 70% to 106% in green gram and 11% to 63% in ragi.

The trend of results obtained showed a positive impact of composted sugarcane trash and corncob on the growth of soyabean, green gram and ragi. The increased nutrient availability due to the application of composts in the soil would have produced such an increase in plant growth. This is in accordance with the results of Gaur and Mathur[1966] and Alok tiwari *et al.*, [1997].

5.3.1.3. ROOT VOLUME INFLUENCED BY SUGARCANE TRASH COMPOST TREATMENTS

The sugarcane trash compost treatments were on par with NPK 100% and FYM in increasing the root volume of soyabean at both the stages.

The root volume of green gram was most favourably improved by composted sugarcane trash inoculated with Pleurotus + Trichoderma + cowdung[T₇] which was 116% increase over control. The sugarcane trash compost treatments were equal in its effect when compared with NPK and FYM amendment.

A similar result was obtained for ragi in the root volume. At both the stages, the root volume was appreciably improved when compared to control and raw sugarcane trash treatments.

According to Arden,[1988] the organic manures will increase the humus content of the soil, which inturn will increase the nutrient holding capacity and stabilization of the soil reaction. Similar to this, in the present study the root volume was favourable with the compost treatments.

5.3.1.4. ROOT VOLUME INFLUENCED BY CORNCOB COMPOST

The root volume of soyabean was positively enhanced which ranged from 65% to 143% in composted corncob, FYM and NPK applied crops when compared with control. The NPK application improved the root volume of soyabean by 139% than control.

The treatments exhibited similar trend in their effects on the root volume of green gram and ragi. This is in accordance with Pushpanathan and Veerabadran,[1991] who inferred the improvement in root growth due to favourable soil physical environment

created by the addition of organic manures. Similar results were reported by Asija *et al.*, [1984] and Gaur [1974].

5.3.1.5. NUMBER OF LEAVES INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOST

The FYM, NPK 100% and composted sugarcane trash were similar in their effect in increasing the number of leaves of soyabean, green gram and ragi. The percentage increase of these treatments over control was ranged between 8% to 20% in soyabean, 39% to 72% in green gram and 29% to 43% in ragi.

The composted corncob treatments were on par with the NPK and FYM amendment in increasing the number of leaves of soyabean when compared with control and the range of increase was 2% to 9%. The number of leaves of green gram was favoured by corncob composts, which was similar in its effect with NPK 100% and FYM. The corncob composted with Pleurotus + Trichoderma + cowdung [T₇] showed a 69% increase over control. Similarly in ragi crop, the same treatment T₇, recorded the highest percentage of increase [34%] over control.

This is due to the higher nutrient availability caused by the incorporation of sugarcane trash and corncob composts to the soil which inturn had increased the number of leaves of the test crops. This is in agreement with the results of Alok tiwari *et al.*, [1997] who inferred that balanced fertilizers with FYM produced more leaf area index in soyabean. Similar results were given by Anand Swarup [1992].

5.3.1.6. PETIOLE LENGTH INFLUENCED BY SUGARCANE TRASH COMPOST AND CORNCOB COMPOST

The petiole length of soyabean and green gram failed to show any significant influence with the application of sugarcane trash and corncob composts.

5.3.1.7. INTERNODAL LENGTH INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOST

Singh and Mahendra Singh, [1990] reported that the application of compost showed a better effect in increasing the availability of phosphorus than other organic matters. The increased available nutrients thus favour the growth of the crops.

In the present study, the internodal length of soyabean was not affected with the sugarcane trash compost treatments. But in green gram a slight increase in the internodal length was influenced by the compost treatments.

With the application of corncob treatments, a significant increase was noted in the internodal length of both the crops. The most significant increase 73% in soyabean and 61% in green gram over control were observed with cob compost inoculated with Pleurotus + Trichoderma and cowdung [T₇].

5.3.1.8. DRY MATTER PRODUCTION INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOST

Verma and Mathur[1990] stated that the cellulolytic fungus inoculation increased the conversion of rice straw and the biomass yield. The available nutrients in the compost influence the plant growth and inturn their dry matter production. In the present

investigation, the dry matter content of the test crops was significantly improved with the application of composted sugarcane trash and corncob compost treatments.

This parameter of soyabean was enhanced with the treatments and an increase of 27% to 45% was observed over control. With the treatmental influence, the dry matter production of green gram varied from 66% to 102%. The NPK treatment increased to 91% over control. The composted sugarcane trash increased the dry matter content upto a maximum of 185% with the sugarcane trash composted with Pleurotus, Trichoderma and cowdung[T₇].

The composted corncob treatments increased this parameter of soyabean, which ranged from 27% to 46% over control and the NPK application increased the dry matter production to 43% than control. With the treatments, the dry matter content was positively influenced in green gram from 74% to 93% and in ragi from 49% to 97% than the control.

This could be attributed to the favourable effects caused by higher availability of nutrients under the incorporation of sugarcane trash and corncob compost which inturn could have increased the dry matter production. This is in confirmation with the results of Wong *et al.*, [1999] who reported higher dry weight yield of Brassica and Zea mays in soil receiving manure compost treatments. Similar result was reported by Sasireka *et al.*, [1998].

5.3.1.9. YIELD PARAMETERS INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOSTS

Devarajan *et al.*, [1996] inferred that various bioearth composts applied soil registered significantly higher available nutrients and higher cane yield. Similarly in the present study, the NPK, FYM and sugarcane trash compost treatments significantly improved the yield parameters of soyabean. The sugarcane trash composted with cowdung treatments [T₅] was found to be very significant in increasing the number of pods/plant to 31%, number of seeds/plant to 28% and the weight of seeds/plant to 28% than control.

The yield parameters of green gram was favourably influenced by the composted sugarcane trash treatments, FYM and NPK. The influence was maximum upto 70% in number of pods/plant, 125% in number of seeds/plant, 126% in weight of seeds/plant and 16% in 100 seed weight with the sugarcane trash composted with Pleurotus, Trichoderma and cowdung [T₇]. The treatments other than control and raw sugarcane trash significantly improved the yield characters of ragi such as the grain yield/plant and weight of fingers/plant, that ranged from 15% to 20% and 17% to 47% respectively. This is in line with the results of Bharadwaj and Gaur, [1968]; Helkiah *et al.*, [1981]; Devarajan *et al.*, [1988]; Sidhu and Beri [1989] and Elizabeth *et al.*, [1992].

The yield parameters of soyabean was positively influenced by NPK, FYM and corncob compost over control and raw corncob. The treatmental influence increased the number of pods of soyabean from 21% to 27%, number of seeds/plant from 7% to 26%, grain yield/plant from 11% to 18%, haulm weight/plant from 7% to 10% when compared with control.

A significant increase in the yield characters of green gram was observed with NPK 100% [T₂], FYM [T₄], composted corncob [T₅, T₆, T₇] when compared with control and raw corncob [T₃]. Among the treatments, T₇ was found to be very significant.

The effect of treatments on the grain yield/plant and weight of fingers/plant of ragi was found to be increased which ranged from 15% to 24% and 9% to 24% respectively, over control.

This increase yield could be attributed to the potentiality of composted sugarcane trash and corncob in increasing the crop production by providing a favourable soil environment with its nutrient content and narrowed C/N ratio. The results are in agreement with the findings of Selvi, [1990]; Gangwar and Nirunjan, [1991]; Veerabadran, [1992]; Madhumita Das *et al.*, [1993] and Bellaki and Badanur, [1994].

5.3.2. INFLUENCE OF THE LEVELS OF SUGARCANE TRASH AND CORNCOB COMPOSTS WITH BIOFERTILIZERS ON THE GROWTH AND YIELD OF TEST CROPS

5.3.2.1. SHOOT LENGTH INFLUENCED BY SUGARCANE TRASH WITH BIOFERTILIZERS

The shoot length of soyabean was enhanced with sugarcane trash compost along with Rhizobium and Phosphobacterium individually and in combination [T₃ to T₉]. A maximum increase in shoot length [15%] was noted with sugarcane trash compost 25t/h+Rhizobium+ Phosphobacterium [T₉].

All the composted sugarcane trash treatments with biofertilizers favoured the shoot length of green gram. A maximum increase was recorded with compost at

25t/h+Rhizobium+Phosphobacteria [T₉-14%] followed by sugarcane trash compost at 12.5t/h[T₂-13%] when compared with NPK 100% treatment.

The shoot length of Ragi was increased marginally by the treatments of composted sugarcane trash. Among the treatments, the composted sugarcane trash 25t/h+Azospirillum [T₇] enhanced the shoot length appreciably upto 17% over NPK amendment.

The increased nutrient availability due to the application of compost with biofertilizers would have produced such increase in the plant growth. This is in accordance with Charrveau [1975] and Harishkumar and Rai [1976].

5.3.2.2. SHOOT LENGTH INFLUENCED BY CORNCOB COMPOST WITH BIOFERTILIZERS

The corncob compost treatments at graded levels and with/without biofertilizers favourably increased the shoot length of soyabean and a maximum percentage of increase was obtained with corncob compost 25t/h with Rhizobium + Phosphobacteria[T₉-13%] followed by corncob compost 25t/h with Rhizobium [T₇-12%] when compared with NPK treatment[T₁].

The corncob compost at 12.5t/h [T₂], at 25t/h with Phosphobacteria [T₈] and with Rhizobium and Phosphobacteria [T₉] increased the shoot length of green gram by 5%, 0.9% and 1% respectively over T₁. Excluding corncob compost 12.5t/h+Azospirillum [T₃], all the other treatments favourably increased the shoot length of Ragi when compared with T₁.

This is in agreement with the results of Lakshmi and Sekar [1996] and Thilagavathi and Mathan, [1996].

5.3.2.3. ROOT VOLUME INFLUENCED BY SUGARCANE TRASH COMPOST WITH BIOFERTILIZERS

Yadav *et al.*, [1993] revealed that the organic acids produced during the decomposition of sugarcane trash would help in solubilizing the nutrient in the soil and increase the available nutrients, which in turn promote the plant growth.

In the present study the root volume of soyabean was markedly increased by the composted sugarcane trash treatments along with the biofertilizers individually and in combinations. The T₉ treatment showed a maximum increase of 13% over NPK.

A higher percentage increase [38%] in root volume of green gram was obtained with T₉ and the other treatments such as T₂, T₅, T₆, T₇ and T₈ also improved the root volume significantly over NPK treatment. All the treatments except T₄, favourably improved the root volume of Ragi when compared with NPK application.

5.3.2.4. ROOT VOLUME INFLUENCED BY CORNCOB COMPOST WITH BIOFERTILIZERS

The corncob treatments marginally increased the root volume of soyabean and the maximum been at T₈. The root volume of green gram showed a maximum of 14% increase with T₂ over NPK treatment. The root volume of Ragi was more enhanced with T₅[16%], T₇[10.5%], T₈[10.5%] and T₉[13%] over NPK application.

This is attributed to the favourable soil physical and chemical characteristics provided by the composts which in turn could have increased the root volume. Similar results were reported by Makoto Kitou and Shigekata Yoshida, [1994], and Pusphanathan and Veerabadran [1991].

5.3.2.5. NUMBER OF LEAVES INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOSTS WITH BIOFERTILIZERS

A favourable increase in this parameter was observed with T₉. The rest of the sugarcane trash compost treatments also favourably increased the number of leaves of soyabean when compared with NPK treatment.

In green gram the sugarcane trash compost treatments were almost similar in their effect when compared with NPK amendment. The T₇ increased the number of leaves of Ragi to a maximum of 18% when compared with NPK treatment. The other treatments also favourably influenced the number of leaves.

The corncob compost treatments except T₂ increased the number of leaves of soyabean and a maximum increase was with T₇ [21%]. The recommended dose of corncob compost, T₂ had the highest influence in increasing the number of leaves by 7% than NPK treatment.

The entire composted corncob with biofertilizers exhibited positive influence on this parameter of Ragi over control. The increased dose of composted corncob was very effective and it is maximum with T₉ by 24% over NPK amendment.

This is attributed to the increased nutrient content provided by the incorporation of composts and biofertilizers to the soil. Similar findings were reported by Alok tiwari *et al.* [1997] and Gangwar and Nirunjan[1991].

5.3.2.6. PETIOLE LENGTH INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOSTS WITH BIOFERTILIZERS

The petiole length of the soyabean were slightly increased with the application of composted sugarcane trash treatments at 12.5t/h [T₃,T₄,T₅] and comparatively higher increase was noted with 25t/h [T₇,T₈,T₉] treatments with the combination of biofertilizers.

In green gram the petiole length was increased more with T₆, T₇, T₈ and T₉. The corncob composts also marginally raised the petiole length of soyabean than the NPK treatment. But the petiole length of green gram had no significant effect with the application of corncob compost.

5.3.2.7. INTERNODAL LENGTH INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOSTS WITH BIOFERTILIZERS

The composted sugarcane trash treatments at both the levels with the biofertilizers alone and in combinations favourably increased the internodal length of soyabean. The composted sugarcane trash treatments favourably influenced the internodal length by T₂, T₃, T₅, T₆ and T₈ in green gram.

The composted corncob treatments marginally raised the internodal length of soyabean but this parameter of green gram had no influence with the treatments.

5.3.2.8. DRY MATTER PRODUCTION INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOSTS WITH BIOFERTILIZERS

The dry matter production of soyabean was enhanced with the sugarcane trash compost treatments ranging from 3% to 9% when compared with NPK treatment. The sugarcane trash at 25t/h showed a higher dry matter content than at 12.5t/h.

This parameter of green gram was favourably increased with all the treatments of composted sugarcane trash and had a maximum influence with T₃ [28.3gm] when compared with other treatments and control. The dry matter production of ragi was influenced highly with the composted sugarcane trash treatments at 12.5 and 25t/h with biofertilizers and a maximum increase of 18% was observed with T₇.

This is ascribed to the increased organic carbon and available NPK in the soil. Blair and Boland [1978] also found that incorporation of wheat residues improved the soil fertility and the dry matter yield of maize crop. Sidhu and Beri, [1989] who showed the beneficial effect of residues, obtained similar results on the microbiological, physical and chemical properties of soil.

The composted corncob treatments at the 2 different levels alone and with biofertilizers combination augmented the dry matter content of soyabean with a maximum of 11% with corncob compost 25t/h with phosphobacteria [T₈].

The corncob compost 12.5t/h exhibited a maximum increase of 7% over NPK application, the other treatments also increased this parameter favourably when compared with NPK.

The corncob compost treatments favourably increased the dry matter content of Ragi when compared with NPK treatment. Higher doses of compost [25t/h] treatments increased the dry matter production more than the 12.5t/h treatments.

The increased dry matter production is attributed to the soil physical, chemical and biological environment provided by the organic amendments along with biofertilizers. Similar findings were reported by Rasal *et al.*, [1989] and Wong *et al.*, [1999].

5.3.2.9. YIELD PARAMETERS INFLUENCED BY SUGARCANE TRASH AND CORNCOB COMPOSTS WITH BIOFERTILIZERS

The yield parameters were significantly increased with the application of compost prepared with fungal inoculant [Gaur, 1987]. Similarly in the present investigation, the composts and biofertilizers markedly influenced the yield parameters.

The T₇ [sugarcane trash compost 25t/h+Rhizobium] treatment very significantly favoured the number of pods/plant by 24%, number of seeds/plant by 20%, weight of seeds/plant by 18% and 100 seed weight 2% over NPK amendment. The T₆ [sugarcane trash compost 25 t/h] increased the haulm weight very significantly upto 9%.

The treatments of sugarcane trash compost favourably increased the yield characters of green gram. The sugarcane trash compost treatment 12.5t/h favourably influenced the number of pods/plant by 6%, number of seeds/plant by 3% and weight of seed/plant by 3% over chemical fertilizer treatments.

The treatments favourably augmented the yield parameters of Ragi such as grain yield plant by 3% [T₈] and weight of fingers by 7% [T₅] and 100 grain weight by 4% [T₈]

over NPK application. The other compost treatments with biofertilizers also improved the yield of Ragi.

The grain yield per plant of Ragi treated with sugarcane trash compost positively correlates with the nutrient status of the post harvested soil sample like N, P, K with the r values being 0.686*, 0.691* and 0.751* respectively.

Blair and Boland [1978] found that incorporation of wheat residues improved the soil fertility status and yield of maize crop. Similar results were reported by Singh and Mandal, [1997]; Yadav *et al.*, [1992]; Porwal and Pushpendra Singh, [1989] and Mahapatra and Sharma [1988].

The yield parameters of soyabean, green gram and ragi were significantly influenced by the corncob compost treatments. The corncob compost and Rhizobium significantly improved the number of pods/plant and seed yield/plant by 16% and 21% of soyabean respectively and T₅ improved the number of seed/plant and 100 seed weight by 9% and 4% respectively.

The yield of green gram was positively enhanced by all the treatments of composted corncob + biofertilizer application, the maximum percentage of increase in the yield parameters was obtained with corncob compost 12.5t/h [T₂].

The weight of fingers/plant, 100 grain weight and grain yield/plant was influenced by the composted corncob treatments with biofertilizer.

The increase yield is due to the increased nutrient status, which was inturn favoured by incorporation of sugarcane trash and corncob treatments. This is in agreement with the results of Shinde [1976] who reported that the application of organic

manure with biofertilizer increased the grain yield. Similar reports were given by Mathur and Gaur [1977], Devarajan *et al.*, [1988], Gaur[1987] and Yadav *et al.*, [1992].

5.3.3.1. POST HARVEST SOIL SAMPLE ANALYSIS OF THE TEST CROPS TREATED WITH SUGARCANE TRASH COMPOST [TABLE 52, 53, 54]

Aravind [1987] reported that the soil organic matter is responsible to a great extent, directly or indirectly for making the physical environment of the soil suitable for the growth of crops.

The organic carbon content of the post-harvested soil sample of the test crops was substantially increased with the composted sugarcane trash at both the levels with bio-fertilizers. The macro nutrients such as nitrogen, phosphorus and potassium were also increased significantly with the application of treatments in all the three test crops. Similar results were reported by Khiami and More [1984] who inferred that continuous application of organic amendment increased the organic carbon, and available NPK status of the soil significantly.

The physical parameters like the bulk density was lowered and the water holding capacity was raised with the application of the treatments when compared with NPK amendment. Loganathan, [1990] reported that application of organic amendments improved soil physical characteristics.

The organic carbon content of post harvested soil sample of soya treated with trash compost positively correlates macro nutrients N, P and K with the r values being 0.695*, 0.810** and 0.885** respectively. The organic carbon of post harvest soil of green gram positively correlates with N, P and K with the r values 0.971**, 0.833**, 0.814**.

TABLE - 52

SIMPLE CORRELATION MATRIX BETWEEN SEED YIELD OF SOYABEAN
AND SOIL NUTRIENTS TREATED WITH TRASH COMPOST

| | Organic Carbon | Nitrogen | Phosphorous | Potassium | Seed Yield |
|----------------|----------------|----------|-------------|-----------|------------|
| Organic Carbon | - | 0.695* | 0.810** | 0.885** | 0.191 |
| Nitrogen | | - | 0.468 | 0.795* | 0.409 |
| Phosphorous | | | - | 0.899* | 0.091 |
| Potassium | | | | - | 0.142 |
| Seed Yield | | | | | - |

TABLE - 53

SIMPLE CORRELATION MATRIX BETWEEN SEED YIELD OF GREEN
GRAM AND SOIL NUTRIENTS TREATED WITH TRASH COMPOST

| | Organic Carbon | Nitrogen | Phosphorous | Potassium | Seed Yield |
|----------------|----------------|----------|-------------|-----------|------------|
| Organic Carbon | - | 0.971** | 0.833** | 0.814** | 0.130 |
| Nitrogen | | - | 0.849** | 0.777* | 0.246 |
| Phosphorous | | | - | 0.677* | 0.024 |
| Potassium | | | | - | -0.079 |
| Seed Yield | | | | | - |

TABLE - 54

SIMPLE CORRELATION MATRIX BETWEEN SEED YIELD OF RAGI AND
SOIL NUTRIENTS TREATED WITH TRASH COMPOST

| | Organic Carbon | Nitrogen | Phosphorous | Potassium | Seed Yield |
|----------------|----------------|----------|-------------|-----------|------------|
| Organic Carbon | - | 0.783* | 0.795* | 0.919** | 0.638 |
| Nitrogen | | - | 0.800* | 0.910** | 0.686* |
| Phosphorous | | | - | 0.818** | 0.691* |
| Potassium | | | | - | 0.751* |
| Seed Yield | | | | | - |

The organic carbon content of post harvested soil sample of Ragi had a significant influence with N, P and K with the r values being 0.783*, 0.795* and 0.919**.

5.3.3.2. POST HARVEST SOIL SAMPLE ANALYSIS OF THE TEST CROPS TREATED WITH CORNCOB COMPOST [TABLE 55, 56, 57].

The effect of post-harvested soil sample of the test crops treated with corncob compost was similar to that of sugarcane trash compost.

Continuous recycling of crop residues influence the soil properties like organic carbon, nitrogen, phosphorus and potassium status of the soil significantly [Bhat *et al.*, 1991].

The organic carbon was appreciably increased in corncob compost treatments amended soil. The macro nutrients were also increased significantly with the treatments. The bulk density was reduced with the treatments at both the levels of compost and the water holding capacity was substantially increased with the treatments over chemical fertilizer application. According Wong *et al.*, [1999] addition of manure compost increased total organic matter, macro and micro nutrients but decreased the bulk density.

The organic carbon of post harvested soil of soyabean treated with corncob compost had a positive correlation with the macro nutrients N,P and K with the r values being 0.929**, 0.807**, 0.874** respectively. The organic carbon of green gram had a significant bearing with N, P and K with r values being 0.861**, 0.906** and 0.907** respectively. The organic carbon of post harvested soil of Ragi positively influence with N,P and K with the r values being 0.805**, 0.874** and 0.880**.

TABLE - 55

SIMPLE CORRELATION MATRIX BETWEEN SEED YIELD OF SOYA AND
SOIL NUTRIENTS TREATED WITH COB COMPOST

| | Organic Carbon | Nitrogen | Phosphorous | Potassium | Seed Yield |
|----------------|----------------|----------|-------------|-----------|------------|
| Organic Carbon | - | 0.929** | 0.807** | 0.874** | 0.235 |
| Nitrogen | | - | 0.588 | 0.967** | 0.363 |
| Phosphorous | | | - | 0.453 | -0.093 |
| Potassium | | | | - | 0.391 |
| Seed Yield | | | | | - |

TABLE - 56

SIMPLE CORRELATION MATRIX BETWEEN SEED YIELD OF GREEN
GRAM AND SOIL NUTRIENTS TREATED WITH COB COMPOST

| | Organic Carbon | Nitrogen | Phosphorous | Potassium | Seed Yield |
|----------------|----------------|----------|-------------|-----------|------------|
| Organic Carbon | - | 0.861** | 0.906** | 0.907** | 0.221 |
| Nitrogen | | - | 0.823** | 0.908** | 0.341 |
| Phosphorous | | | - | 0.885* | 0.082 |
| Potassium | | | | - | 0.268 |
| Seed Yield | | | | | - |

TABLE - 57

SIMPLE CORRELATION MATRIX BETWEEN SEED YIELD OF RAGI AND
SOIL NUTRIENTS TREATED WITH COB COMPOST

| | Organic Carbon | Nitrogen | Phosphorous | Potassium | Seed Yield |
|----------------|----------------|----------|-------------|-----------|------------|
| Organic Carbon | - | 0.805** | 0.874** | 0.880** | 0.265 |
| Nitrogen | | - | 0.773* | 0.802** | 0.432 |
| Phosphorous | | | - | 0.883** | 0.637 |
| Potassium | | | | - | 0.532 |
| Seed Yield | | | | | - |

The increased organic carbon content with NPK status of the soil samples could be attributed to the addition of composted sugarcane trash and corncob with increased nutrient contents. This experimental result of the present study is in accordance with the results of Syed Ismail *et al.*, [1998]; Yadav, [1995]; Martin, [1992] and Deepadevi, [1992].

SUMMARY AND CONCLUSION

CHAPTER-6

SUMMARY AND CONCLUSION

In the present study, the efficiency of micro-organisms in composting the agrowastes viz., sugarcane trash and corncob, the effect of these composts on the growth and yield of the test crops and its role on the fertility status of post harvest soil were evaluated. The conclusions were drawn from the observations and summarized in this chapter.

6.1 EVALUATION OF COMPOST MATURITY

The pH and Ec were slightly increased during the biodegradation of the agrowastes. The organic carbon content was lowered and the available nutrients like Nitrogen, Phosphorus and Potassium in both the sugarcane trash and corncob were increased with the bioinoculum treatments. As the organic carbon was decreased and available nitrogen increased, the C: N ratio was narrowed down with the age of composting. All the microbial inoculated treatments favourably composted both the agrowastes and among the bioinoculum treatmental combinations, the dual culture of Pleurotus sajor-caju and Trichoderma viridae along with cowdung was more efficient in narrowing down C:N ratio to the least in both sugarcane trash and corncob.

6.2 CHANGES IN TEMPERATURE DURING COMPOSTING

During composting of sugarcane trash and corncob, the temperature gradually raised from the 10th day and attains a maximum on the 40th day after which it gradually decreased and became stabilized on the 60th day.

6.3 SEEDLING GROWTH

The compost extracts of sugarcane trash and corncob was optimum between 5t/h and 20t/h for influencing the shoot length, root length, number of lateral roots and fresh weight of both soyabean and green gram seedlings.

6.4 POT CULTURE EXPERIMENTS

6.4.1. INFLUENCE OF COMPOSTS ON BIOMETRICAL AND YIELD PARAMETERS

The sugarcane trash and corncob compost treatments [T₅, T₆, T₇] were similar in their effects with NPK 100% [T₂] and FYM [T₄] in the biometrical parameters of soyabean, green gram and ragi.

The biometrics of soyabean, green gram and ragi such as shoot length, root volume, number of leaves, shoot dry weight, root dry weight and dry matter production were significantly influenced by the sugarcane trash/corncob composted with Trichoderma+Cowdung [T₅], with Pleurotus -Trichoderma [T₆] and with Pleurotus +Trichoderma +Cowdung [T₇] over control and were par with NPK 100% and FYM treatments.

The yield parameters such as number of pods/plant, weight of seeds/plant and grain yield plant of soyabean and green gram and weight of ^{fingers/plant and} grains/plant of ragi were significantly

improved with T₅, T₆ and T- treatments when compared with control and equal in their effects with NPK amendment.

6.4.2. INFLUENCE OF COMPOST LEVELS WITH BIOFERTILIZERS ON BIOMETRICS AND YIELD PARAMETERS.

The compost treatments at both the levels namely 12.5t/h and 25t/h, individually and in combination with biofertilizers were either similar with NPK 100% treatment or improve the vegetative and yield characters of test crops.

The vegetative characters like shoot length, root volume, number of leaves, Internodal length, shoot dry weight, root dry weight and dry matter production were improved by the treatments individually and in combination with biofertilizers. Among the treatments, sugarcane trash/corn cob compost in combination with Rhizobium / Azospirillum [T₇], with Phosphobacteria [T₈] and with Rhizobium / Azospirillum + Phosphobacteria [T₉] were very effective in improving the vegetative parameters of the test crops. The yield parameters of soyabean and green gram such as number of pods/plant, number of seeds/plant, weight of seed/plant and 100 grain weight and of ragi such as weight of fingers/plant and grain yield/plant were very effectively augmented by T₇, T₈ and T₉. The other treatments were on par with the NPK amendment.

6.4.3. POST HARVESTED SOIL SAMPLE ANALYSIS

The post harvested soil sample of soyabean, green gram and ragi treated with sugarcane trash and corn cob composts with biofertilizers were analysed for its chemical and physical characteristics.

The organic carbon content was more in soil treated with composts and biofertilizers. The macro nutrients such as Nitrogen, Phosphorus and Potassium were also found to be higher in soil treated with composted sugarcane trash and corn cob, than chemical fertilizer application.

The nutrient content was found to increase with higher doses of compost [25t/h] with biofertilizer combinations.

The physical constants of the post harvested soil like bulk density decreased with the application of sugarcane trash and corncob composts. The water holding capacity was significantly raised in soil receiving composts and biofertilizers when compared to NPK 100% amendment. Among the treatments, the sugarcane trash /corncob compost with Rhizobium : Azospirillum + Phosphobacteria [T₉] proved to be the best treatment which increased the nutrient status of the post harvested soil samples of test crops.

CONCLUSION

Concern about the increasing cost of production, energy conservation and pollution has promoted the need for improved fertilizer application technology to increase crop production as well as the efficiency of its use. Most of the cultivated soils of India are poor in organic matter due to high temperature and intense microbial activity. Hence systematic addition of organic manure is highly necessary for maintaining soil health and sustainable crop production. Technology of organic farming practice thus gives primary importance to recycling of organic matter.

From the present investigation, it has become evident that the farm wastes such as sugarcane trash and corncob composted with Pleurotus and Trichoderma proved to be very effective in improving the growth and yield of legumes[soyabean and green gram] as well as cereals [ragi]. The post harvested soil sample data analysis revealed an increased fertility status with the application of composts when compared with chemical fertilizers. Thus, the composting of farm waste and its utilization as manure leads to sustainable soil health and crop production and free the farmers from the expensive and hazardous synthetic fertilizers.

RECOMMENDATION FOR FUTURE RESEARCH

1. Studies on long term effect of organic farming on ecosystem.
2. Exploration of new microbial species for bio-composting agro wastes.
3. Environmental management and improvement through judicious use of chemicals with organics.
4. Integrated nutrient management practices involving the balance use of organics and inorganics with bio fertilizers to sustain higher levels of agricultural productivity.
5. To improve commercial value of bio-composts produced from organic wastes and its effective utilization in farms and home gardens.

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APPENDIX 1

ESTIMATION OF ORGANIC CARBON

[WALKEY AND BLACK, 1934]

PRINCIPLE

Organic carbon present in organic matter is oxidised by chromic acid in the presence of Conc. H_2SO_4 . Potassium dichromate on reaction with sulphuric acid provides nascent oxygen, which combines with carbon and forms CO_2 . The H_2SO_4 enables easy digestion of organic matter by rendering heat of dilution. Only a certain quantity of chromic acid is used for oxidation. The excess chromic acid left unused by the organic matter is determined by back titration with 0.5N ferrous sulphate or ferrous ammonium sulphate using diphenylamine indicator.

REAGENTS

1. 1N Potassium dichromate: Exactly 49.04 gm of $K_2Cr_2O_7$ was dissolved in one litre of distilled water.
2. Diphenylamine indicator: 0.5 gm of diphenylamine was dissolved in 20ml of water and 100ml of Conc. H_2SO_4 was added.
3. 0.5N Ferrous sulphate or Ferrous ammonium sulphate: 139.0gm of Ferrous sulphate or 196.1gm of Ferrous ammonium sulphate was dissolved in 800ml of distilled water. 20ml of Conc. H_2SO_4 was added and the volume was made upto one litre.
4. Conc. H_2SO_4 .
5. Phosphoric acid [ortho phosphoric acid 85%]

PROCEDURE

Exactly 0.5 gm of soil [passed through 0.2mm sieve] was weighed and transferred to a 500ml conical flask. 10ml of 1N $K_2Cr_2O_7$ was added and mixed well by swirling the flask. Added 20ml of Conc. H_2SO_4 mixed by gentle rotation for one minute to ensure complete contact of the reagent with the soil. Allowed the contents to stand for 20-30 minutes. Kept the flask on asbestos sheet to avoid burning of table due to intense heat. Added 200ml of water after 30 minutes. Then added 10ml of phosphoric acid and 1ml of diphenylamine indicator. Titrated the solution with 0.5N ferrous ammonium sulphate. As the titration proceeds the dull green colour shifted to a turbid blue and at the end point bright green colour developed. Conducted simultaneously a blank titration [without soil] and the volume of 0.5N ferrous ammonium sulphate consumed was noted.

CALCULATION

Weight of soil taken = 0.5 g

Volume of 1N $K_2Cr_2O_7$ used = 10 ml

Volume of 0.5N ferrous ammonium sulphate

used for blank titration = X ml (Sample T.V)

Volume of 0.5N ferrous ammonium sulphate

used for sample titration = Y ml (Sample T.V)

X ml of $FeSO_4$ reduces 10ml of 1N $K_2Cr_2O_7$

Therefore Y ml of $FeSO_4$ reduces $Y / X * 10$ ml

Hence actual quantity of 1N $K_2Cr_2O_7$ used for

oxidation of organic matter = $10 - (10 * Y / X)$

1 ml of 1N $K_2Cr_2O_7$ = 0.003 g of 'C'

Therefore $10 - (10 * Y/X)$ ml of $1N K_2Cr_2O_7 = 10 - (10 * Y/X) * 0.003$

This is present in 0.5 g of soil

Therefore in 100g $= 10 - (10 * Y/X) * 0.003 * 100/0.5$

Organic matter (Surface soil) $= \text{organic carbon} * 1.724$

Organic matter (Sub Surface soil) $= \text{organic carbon} * 2.5$

APPENDIX 2

ESTIMATION OF AVAILABLE NITROGEN IN SOIL

[BY ALKALINE PERMANGANATE METHOD]

[SUBBIA AND ASIJA, 1956]

PRINCIPLE

A known weight of soil is mixed with excess of alkaline permanganate and distilled organic matter present in soil is oxidised by the nascent oxygen liberated by KMnO_4 in the presence of NaOH and thus ammonia is released. This released ammonia is absorbed in a known volume of boric acid [2%] containing double indicator and converted to ammonium borate. This ammonium borate is titrated against standard H_2SO_4 .

REAGENTS

1. 0.32% KMnO_4 solution [3.2gm of KmnO_4 dissolved in one litre of distilled water].
2. 2.5% NaOH solution [25gm of NaOH dissolved in one litre of distilled water].
3. 2% boric acid [20gm of boric acid dissolved in one litre of distilled water].
4. N/50 H_2SO_4 [30ml of Conc. H_2SO_4 is diluted to 1 litre with distilled water and standardized by titration with N/10 Na_2CO_3 . This gives N/10 H_2SO_4 . From this N/50 H_2SO_4 is prepared by di ution]
5. Double indicator Bromocresol green (0.5gm) and methyl red (0.1gm) dissolved in 100ml and ethyl alcohol.

PROCEDURE

Weighed 20gm of soil and transferred into a distillation flask. Added 30ml of distilled water to moist the soil and 1ml of liquid paraffin. Added few pieces of glass

beads to avoid frothing. Added 100ml of freshly prepared 0.32% KMnO_4 and 100ml of 2.5% NaOH to the soil in the distillation flask. A 100ml beaker containing approximately 20ml of 2% boric acid with double indicator was kept below the delivery end of the condenser in the distillation set. Distilled the contents and the liberated ammonia was collected in boric acid. Distillation continued until the release of ammonia. Titrate the ammonia collected in boric acid with $\text{N}/50 \text{ H}_2\text{SO}_4$.

CALCULATION

| | |
|--|-------------------------------|
| Weight of the soil taken | = 20 g |
| Volume of $\text{N} / 50 \text{ H}_2\text{SO}_4$ | = X ml (titre Value) |
| 1 ml of $\text{N}/10 \text{ H}_2\text{SO}_4$ | = 0.0014 g N |
| Therefore 1 ml of $\text{N}/50 \text{ H}_2\text{SO}_4$ | = 0.00028 g N |
| X ml of $\text{N}/50 \text{ H}_2\text{SO}_4$ | = 0.00028 * X g N |
| This is present in 20 g of soil | |
| Therefore N present in kg/ha | = $0.00028(X/20) \times 10^6$ |

APPENDIX 3

ESTIMATION OF AVAILABLE PHOSPHOROUS

[BRAY 1 METHOD – JACKSON, 1973]

PRINCIPLE

The combination of HCl and NH_4F extracts acid soluble forms of phosphorus such as mono calcium phosphate. The fluoride ion has the special property of complexing Al^{+++} and Fe^{+++} in acid solution with consequent release of phosphorus held in the soil by these ions. The phosphorus so released into the soil solution is estimated colorimetrically as available phosphorus.

REAGENTS

1. NH_4F solution (1N) : 37g of NH_4F was dissolved in 1 litre of distilled water.
2. HCl (0.05N) : 20.2 ml conc. HCl diluted 500 ml with distilled water.
3. Bray No.1 extractant [0.03N NH_4F and 0.02 N HCl]: 15ml of 1N NH_4F and 25ml of 0.5N HCl are mixed and the volume was made upto 500ml with distilled water.
4. Ascorbic acid.

PROCEDURE

Weighed 5g of soil and transfer to a 100ml polythene shaking bottle. Added 50ml of Bray.1 extractant. Shake the contents in a reciprocatory mechanical shaker for one minute. Filtered the contents through whatman No.40 filter paper. Simultaneously conducted a blank. Pipetted out 5ml of filtrate into 25ml volumetric flask. Added 4ml of reagent B as in Olsen's method and made up the volume to 25ml. The intensity of the colour developed was measured in a photoelectric calorimeter using red filter[660nm].

CALCULATION

Weight of soil taken = 5g

Volume of NaHCO₃ = 50ml

Volume of extractant solution used for
phosphorus estimation (aliquot) = 5 ml

Calorimeter reading = T

Concentration of phosphorus read from
standard graph for the reading T = X ppm

= X mg/ml

= X/10⁶ g/ml

Therefore in 25 ml of solution = X/10⁶ * 25g

This is present in 50ml of the extractant solution and 5 g of soil

Therefore available P₂O₅ in kg/ha = X*25*50*2*10⁶
10⁶ * 5 *5

$$= x/10^6 \text{ g/ml}$$

Therefore in 25 ml solution

$$= x/10^6 * 25 \text{ g}$$

This is present in 5g of soil

Therefore available K in soil in kg/ha

$$= x / 10^6 * 25 * 2 * 10^6 / 5$$

APPENDIX - 5

ESTIMATION OF CALCIUM AND MAGNESIUM

VERSANATE METHOD

PRINCIPLE

Calcium and Magnesium get complexed by EDTA in the order calcium first followed by Magnesium. Calcium is estimated first by using murexide indicator at p^H 12 in the presence of sodium hydroxide. Then calcium and magnesium is estimated using Erichrome Black-T at p^H 10 in the presence of ammonium chloride and ammonium hydroxide buffer solution.

REAGENTS

- 1.0.02N EDTA
- 2.10% Sodium hydroxide
- 3.Ammonium chloride-ammonium hydroxide buffer solution
- 4.Murexide solution
- 5.Erichrome Black-T indicator

PROCEDURE

Calcium alone

1. Pipette out 10ml of seaqui oxide filterate into a porcelain basin.
2. Add 10% sodium hydroxide solution drop by drop to neutralise the activity (red litmus turns blue) and another 5 ml excess to maintain the p^H at 12.
3. Add a pinch (50mg) of murexide indicator and titrate with 0.02N EDTA till the colour changes from pinkish red to purple or violet.

Calcium and Magnesium

1. Pipette out 10ml of seaqui oxide filterate into a porcelain basin.

2. Add ammonium chloride - ammonium hydroxide buffer solution drop by drop to neutralise the acidity (use red litmus paper) and 5ml excess to maintain the p^H at 10.
3. Add 2-3 drops of Erichrome Black – T indicator solution and titerate with 0.02N EDTA till the colour changes from purple red to sky blue.

CALCULATION

| | |
|--|---------------------|
| Weight of the soil sample taken | =Wg |
| Volume of Hydrochloric acid extract prepared | =500ml |
| Volume of Hydrochloric acid extract pipetted out for R_2O_3 estimation | =50ml |
| Volume of R_2O_3 filtrate made upto | =250ml |
| Volume of R_2O_3 filtrate pipetted out for Calcium estimation | =10ml |
| Volume of 0.02N EDTA used for Calcium and Magnesium | =a ml |
| Volume of 0.02N EDTA used for Calcium alone | =b ml |
| Volume of 0.02N EDTA used for Magnesium alone | =(a-b) ml |
| 1 ml of 0.02N EDTA | =0.0004g Calcium |
| 1 ml of 0.02N EDTA | =0.00024g Magnesium |
| Percentage of Calcium on moisture free basis | |

$$= 0.0004 * b * \frac{250}{10} * \frac{500}{50} * \frac{100}{W} * \frac{100}{(100 - M)}$$

Percentage of Magnesium on moisture free basis

$$= 0.00024 * (a - b) * \frac{250}{10} * \frac{500}{50} * \frac{100}{W} * \frac{100}{(100 - M)}$$

M = Moisture basis

APPENDIX 6

DETERMINATION OF PHYSICAL CONSTANTS OF SOIL

[KEEN RACZKOWSKI, 1921]

PRINICIPLE

A known quantity of soil is allowed to fully saturate and equilibrate with water and from the water held in the single value constants viz. Bulk density, particle density, volume expansion on wetting, maximum water holding capacity and pore space are determined gravimetrically using keen Raczkowski box.

MATERIALS REQUIRED

Keen Raczkowski box (circular brass box having an internal diameter of 5-6cm and a height of 1.6 cm) with perforated bottom having numerous holes of 0.75mm diameter spaced at 4mm apart. Each box has split ring, which serves to hold the filter paper in position over the perforated bottom.

PROCEDURE

A thin filter paper [whatman No.1] was placed on the perforated bottom of the box and fit in position with the help of the splitring. The box with filter paper was weighed. Using a spatula, small portions of air dry soil to be estimated was transferred to the box and the soil was packed by tapping the box gently on a hard surface. The addition of soil and tapping the box systematically was continued until it was full. By running a sample knife over the rim of the box, the excess soil was removed. The weight of the box plus air dry soil was determined. The box was placed in a petridish and water was added to the dish until the water level reaches about half the height of the box and kept overnight.

Next day morning the box was removed and the water on outside of the box was wiped out and the weight recorded. Then the expanded soil was removed by running a knife over the rim of the box and the soil thus removed was placed in a weighed watch glass. Again the weight of the watch glass and expanded soil was taken. Then the soil in box and the watch glass was dried in an electrical air oven at 105⁰c for 10-12 hours. The box was cooled in a desicator and recorded the weight. From the weights obtained the single value constants were calculated.

CALCULATION

| | |
|--|-------------------------------|
| Weight of the box + filter paper | -a g |
| Weight of air dry box + box (filter paper) | -b g |
| Weight of the box + wet saturated soil | -c g |
| Weight of the box + wet residual soil | -d g |
| Weight of the box + dry residual soil | -e g |
| Weight of empty watch glass | -f g |
| Weight of watch glass + wet expanded soil | -g g |
| Weight of watch glass + dry expanded soil | -h g |
| The volume of the box | =V ml |
| 1. Bulk density | = $b-a/v$ g. cc ⁻¹ |
| 2. Absolute specific gravity | = $e-a/v-[d-e]$ |
| 3. Maximum water holding capacity | = $[e-a]-[b-a]/[b-a]*100$ |
| 4. Percent pore space | = $[d-a]-[e-a]/V*100$ |
| 5. Volume expansion | = $[g-h]+[h-f]/sp. g/V*100.$ |