Efficient Utilization of Composted Sago Waste, Composted Coirpith and Farmyard Manure on Growth and Yield of Winged Bean (*Psophocarpus tetragonolobus* (L.)DC) And Soya Bean (*Glycine max* (L.) Merr.)

By

Seema George G.

Reg. No. 96 PLS 10

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SEEMA GEORGE. G

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Certified as Bonafide Research Work

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Dedicated To
My Beloved Parents

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WINGED BEAN

No Politicking hog wash
No Vote Seeking hokus pokus
Real nitrogen enfixing
Genus **Psophocarpus**
tetragonolobus

Soup and french cut
Formally Served
Not only did not bloat us
But also pleased our palates
Long podded **Psophocarpus**
tetragonolobus

Purple, Yellow, brown and green
Sometimes Spotted
Sometime clean
Grotesquely knotted
Roots unseen
Why do they call you
Winged bean?

Nodulated tuber
Pole bean tall
Flowers, seed, pods
Edible all

FRONTISPIECE

FRONTISPIECE

Who's the fairest
Bean of all
Soy or **Psophocarpus**
tetragonolobus ?

Richard Buckminister Fuller
January 1978

Introduction

CHAPTER - I

INTRODUCTION

Pollution - the culprit behind creating a threat to the present day environment. The environmental pollution is also being caused by the agricultural wastes, thereby consuming a vast area of land. There is always a growing concern that unsatisfactory ways of waste disposal could pose a serious threat to the environment and lead to the degeneration of the quality of our environment. In our country India where about 80 per cent of the land is used for agricultural purposes, there occurs a vast potential of agricultural wastes and through utilization of which not only helps to conserve energy but also helps to minimise the palaver creating issue-the pollution. Thus it is easy to generate wastes, but difficult to dispose the refuse. Hence agro industrial wastes like sago wastes, coir pith waste and manures from domestic animals (farm yard manure) were taken in the present investigation.

The high yield of modern agriculture are mainly dependent on the chemical fertilizers. Deterioration and degradation of the soil are the causes of repeated applications of fertilizers. Due to the energy crisis as well as the escalating prices of fertilizers, the fertilizer consumption has shown decreasing trend. Resorting to the applications of bio-fertilisers and plant products could

minimize these problems as they posses many advantages which the chemical fertilizers lack.

SAGO:

Sago is a by-product of Tapioca (Manihot esculenta Crantz) tubers, a crop of economic importance. Sago industries are agro-based and India is the third largest producer of cassava in Asia, produces 5.9 million tonnes annually. Sago wastes are considered to be highly toxic and space consuming when dumped into the environment and creates an unpleasant odour.

Besides polluting the environment with their high organic content, they are toxic to most of the organisms because they release cyanide. Cassava roots contain poison in the form of cyanoglucoside which results in chronic cyanide poisoning and even paralysis when consumed before the processing of the roots has reached completion. Inspite of this they have a great potential for utilisation.

Sago is one of the well known food stuff made of starch. The major raw material for sago industries is Tapioca. Most of the sago factories are concentrated in Tamil Nadu. Out of the 800 factories producing sago and starch from Tapioca in Salem district, 200 are in Attur Taluk which process 50 tonnes of tubers every day. Sago, an edible starch is a staple food of many communities in South east Asia, India, Srilanka, Central and South America, Melanesian

Islands. In other areas where it is not the main staple sago is a reserve food resource when other crops fail.

On an average, the yield of sago is 200 kg per ton of raw tapioca processed. About 40,000 litres of water is required to obtain one ton of sago from 5 tonnes of tapioca (Raghupathy, 1991). Two types of waste constitute for the pollution in Tapioca starch unit.

Thippi: The fibrous residue left after the starch is removed.
Effluent : Water coming out from settling tanks.

This sago waste after composting yields a good manure.

COIRPITH:

The coconut palm is known as **"Kalpavriksha"** (tree of heaven) as it constitutes each of its parts which is highly beneficial in economic aspects. India is one of the major coconut (Cocos nucifera L) cultivating countries in Asian continent covering over 1428.7 thousand hectares of land and producing approximately 9283 million nuts per annum (Anitha Das Ravindranath, 1991). Coir fibre is obtained from the fruit of the coconut palm and consists of a mass of fibrous tissue which lies between the tough exocarp of the fruit, or the outer covering and the nut, that is the hard kernel or endocarp containing white flesh. Coir pith is the binding material of coir fibre. Extraction of one kilogram of coir fibre generates two kilogram of coir pith which is considered a waste.

Coir pith has no immediate use. On the contrary coir pith "Hillocks" collected over a period of time turns out to be a nuisance both in terms of its non-usability and in occupying land space. The industrial and commercial applications of coir pith have so far been very limited. At the same time, the high quantum of its production in defibring units and the difficulties experienced in its disposal have tend to create a major problem of pollution of large area of land in an around these units. Coimbatore district has a large number of coconut palms and pollachi has a lot of units converting coconut husk into coir.

Coir pith disposal creates a major problem of pollution and when burnt it does not burn completely thus emitting smoke for several days.

Therefore it is appropriate to find out means and solution in utilising the coir pith which will yield commercial value.

FARM YARD MANURE:

Historically, manures from domestic animals were carefully husbanded for the use of fertilizers. Now with the tightening supply of fertilizers and increasing cost of energy, we are once again looking at animal manure as a valuable source. Farm yard manure consists of livestock excreta plus litter. It is frequently stored for sometime before application to reduce its bulk and to improve

availability of its nutrients (Raniperumal et al., 1991). The main value of manure is related to major fertilizer nutrients and trace elements it contains. Also there is benefit as soil conditioner as the organic matter in manure will improve soil tilth (Riffaldi et al., 1988). Hence farm yard manure is a traditional organic source for maintaining and improving the chemical physical and biological properties of soil.

In countries like India, leguminous seeds provide majority of proteins that is required for human nutrition to supplement the carbohydrates of the cereals. Hence winged beans and soya beans are chosen for present study and the effect of different treatments of composted sago, composted coir pith and farm yard manure are undertaken with the following objectives.

1. This project is undertaken to turn the garbage into a fertilizer.
2. To bio-degrade the agro-industrial waste like sago wastes and coir pith by Pleurotus sajor caju.
3. To evaluate the impact of composted sago, composted coir pith and farmyard manure on biometrical parameters of winged bean (Psophocarpus tetragonolobus (L.) DC) and soya beans (Glycine max (L.) Merr).
4. To evaluate the impact of composted sago, composted coir pith and farmyard manure on yield parameters of winged beans (Psophocarpus tetragonolobus (L.) DC and soya bean (Glycine max (L) Merr).

Review of Literature

CHAPTER II

REVIEW OF LITERATURE

The literature pertaining to the influence of composted sago waste, composted coir pith and farmyard manure on the biometrics and yield parameters of winged beans (Psophocarpus tetragonolobus (L.) DC) and Soyabeans (Glycine max L. Merr) as relevant to the present investigation is reviewed and presented in this chapter.

SAGO

Ralph. W. Kerr (1950) stressed the need for processing tapioca, the main constituent of which is starch. One pound of starch provides 1800 calories which would amount to 50% of daily energy requirements of a hard working labourer.

Raja et al., (1979) discussed the major uses of cassava starch including its use as food stuff in the form of sago, adhesive in textiles and paper industries for production of glucose, dextrin and alcohol.

Vasanthi (1985) reported that the evolved median tolerance limit (Lc 50) for sago effluent at 72 hours in Sarotherodon mosambicus was 7.9% . As the concentration of the effluent is increased the oxygen consumption is decreased.

Balasubramaniam et al., (1987) reported that 1/5th of the world production of Cassava is fed to animals and 8% of world production goes into starch for other industrial purposes. Noparatnaraporn (1988) cultured Rhodocyclus gelatinosus on cassava solid waste medium alone or mixed with Rhodobacter sphaeroides. The nutritional quality of the waste was upgraded with both types of culture. Protein content was increased from 2.9 to 20.8% and 21.7% respectively.

Ternes (1989) reported that in Brazil starch production in cassava is in order of 1,80,000 - 2,00,000 tonnes per annum of which 10% is fermented starch.

Besides polluting the environment with their high organic content, cassava residues are toxic to most of the organisms because they release cyanide. Inspite of this they have a great potential for utilization (Clair Hershey, 1989).

Karuna et al., (1990) reported that moist centrifuged starch was used for preparation of sago. The study revealed that starch and sago of excellent quality could be prepared from dry cassava chips.

Ragupathy (1991) reported that starch content in cassava ranges from 78.1 to 90.1 %. Mathew George et al., (1991) reported that during industrial manufacture of starch

and sago about 20% of cassava tubers/chips that are processed forms the waste fibrous residue. It forms 40-60% of starch on dry weight basis.

Hong - Qing Li et al., (1996) reported that cassava (Manihot esculenta (Crantz) is the fourth most important caloric source in the tropical and sub- tropical areas. Its tuberous roots contain starch upto 85% of their dry weight and provide food for over 500 million people.

Pugalendhi et al., (1998) analysed the physico-chemical characteristics of sago industrial effluent for evaluation as a potential feed stock for bio-fuel generation. The maximum gas production was obtained in cow dung fed digesters where as maximum methane content was obtained in digesters fed with mixture of cow dung and sago effluent (1:1 ratio).

Palaniswamy et al., (1998) reported that Tapioca which is recognised as an excellent raw material for the production of starch and sago contain cyanoglucoside mainly in the rind. Alagesaboopathi et al., (1998) has recommended an urgent need to start a "Tapioca Board" for conducting tests prescribed by Indian Standard Institutions which would minimise the environmental pollution caused by sago factories.

According to Rajasekaran et al., (1998) Tapioca waste (Tippi), a by-product of sago factories is also reported to be rich is starch content. Fermentation of tippi hydrolysate by yeast (Saccharomyces cerevisiae) resulted in high alcohol yield of 78% (W/V) when the hydrolysate was sterilised. The study indicated that tapioca waste can be a cheap but effective alternate source of starch for producing alcohol, the future bio fuel.

COIR PITH:

Hume as early as 1949, reported that application of coir pith to soil will increase seed germination and rooting. A judicious combination of organic manures with fertilizer resulted in marked increase in rice grain yield.

Diener (1950) and Stadler (1952) evidenced that the application of one effective strain of Rhizobium and five doses of phosphate increases the nodular growth of winged bean. Loganathan et al., (1979) studied that the application of coir dust at the rate of 5.07 t/ha gave markedly higher yield recording 19.1% increase over control in groundnut. Pal and Malik (1981) reported an increase in the yield of sorghum when coir pith is added. According to Ramaswamy and Sree Ramulu (1983) coirpith can be efficiently utilised for conserving rain water in the soil and also increase the yield of crop due to higher moisture availability.

Dry land agriculture occupies the major area in Tamil Nadu. The success of crop production in dry land depends upon the efficient use of rainfall during the crop period. According to Giri Dhara Krishnan and Sree Ramulu(1983) coirpith can be utilised to absorb rain water since it can retain 5.3 times of its weight of water.

Nagarajan et al., (1985) reported an increase in the yield of maize due to the application of raw or composted coirpith. Addition of coir pith and biofertilizers increased the yield of maize (Krishnan, 1986). Improvement in yield due to coirpith was indicated in ragi (Lavanya, 1986). Clarson (1986) recorded increase in the yield of cowpea with the application of coir pith at the rate of 10/ha. In 1987, Nagarajan et al., reported a significant increase in the yield of groundnut and rice. The coirpith improved the drainage besides keeping the solid moist and preventing capillary rise of salts.

The studies of Pusphanathan (1987) indicated an improvement in the yield of sorghum with the addition of composted coirpith in black soils. Application of organic manure alone or in combination with fertilizers helps both in proper nutrition of the crop plants and in maintaining the fertility of the soil (Gupta et al., 1988). Kandiannan (1988) reported that, the application of composted coirpith at the rate of 12.5 t/ha improved the grain yield in sorghum plants.

Improvement in the yield due to coirpith was recorded in Sorghum by Anbayan (1988).

Jaganathan et al., (1990) inferred that the residual effect of coir pith application significantly increased the available nitrogen, phosphorus and potassium in soil and also organic carbon content. Sharma and Mithra (1990) showed the usefulness of decomposed coir pith as manure in increasing crop yield.

Pryce (1991) evidenced that coirpith has been identified as an alternative to peat for micropropagation and as a growth medium.

Devaraj (1991) found that raw coirpith mulching to sugarcane increase not only the yield but also the quality of sugarcane. The effects were probably due to greater moisture conservation in these plots.

Anitha Das Ravindranath (1992) by conducting experiments concluded that coirpith is having potentials for use as soil additive. Mendel and chatterjee (1992) alsc indicated that the application of coirpith reduced the formation of insoluble iron phosphate and there is a possibility of increasing the availability of phosphorus in these soils. Pavithran (1992) inferred that coconut pith having an open cell foam structure offers an unique opportunity to use it as an inexpensive and environmental

friendly matrix for diffusion controlled release systems and this may provide better returns to the producers.

Selvakumari et al., (1992) evidenced that in turmeric, application of composted coir pith recorded an increase of 17.2% in plant height and higher yield, fresh rhizome.

Sundar Singh et al., (1992) indicated that the application of coirpith at 15 t/ha was found to be optimum to achieve cane yield. Singaram and Pothiraj (1992) by conducting experiments with (Co.1) and finger millet (Co.13) reported that the application of 10 t/ha of raw coirpith significantly increased the yield..

Martin and Poultney (1992) evidenced that the coir mulch reduced the weed growth, increased the soil water and reduced the maximum day time soil temperature over mulched clone seedlings.Logamadevi (1993 a) confirmed an increased yield of blackgram by 53% over control when composted coirpith when applied. Logamadevi (1993 b) reported that raw coir pith when applied along with neem cake (4t/ha) increased the growth and yield of black gram plants than control.

Annon (1993) reported that the coir pith has got the unique property of absorbing and retaining moisture upto 500-600 per cent. It improves the infiltration rate and hydraulic conductivity of the soil. Macrow (1994) confirmed

that raw coir pith enhanced the growth index and root dry weight of Dentas and Ixora plants. Singaram (1994) had conclusively proved that decomposed coir pith can be used as soil amendment at the rate of 10 t/ha for increasing the productivity of maize and finger millet in tannery effluent polluted soils.

According to Mahalakshmi Priya (1994), incorporation of composted coir pith gave significant increase in plant height, root length, dry matter production and yield of soya bean.

Composted coir pith not only ensures continuous supply of nutrients to the coconut but also improves the physical characteristics of the soil and increased microbial population (Venkitaswamy et al., 1995). Sabanayagam and Savithri (1995) found that the treatment with coir pith recorded more number of leaves and more number of bright flowers to the tune of 34 per cent, 20 per cent and 40 per cent respectively and in general the stand of the crop was healthy and vigorous.

Radhika et al., (1995) reported that the yield of rice is increased by addition of coir pith compost (12.5 t/ha by 26.64 per cent over control). Rita Joseph et al., (1995) reported that composted coir pith increased the plant height of cluster beans by 12 per cent, the number of pods by 27 per

cent, plant dry weight by 200 per cent and plant fresh weight by 557 per cent over control.

Thilagavathy and Mathur (1996) concluded that when compared to control, the available soil nitrogen status was significantly greater in raw coir pith and composted coir pith treatments. Thilagavathy and Manickam (1996) evidenced that the composted coir pith application favorably increased the yield of paddy.

Dickinson et al., (1996) reported that raw coir pith improves yield in general by 16 (+ 15) per cent but considerable difference can be seen between crop yields. Mallika (1997) reported that composted coir pith extract at the level of 1:4 concentration increased the tuber length of winged bean (Psophocarpus tetragonolobus (L.) DC) than the control.

Farmyard manure:

Farmyard manure and coir pith applied by incorporation recorded highest grain yield of 1000 kg/ha while 925 kg/ha was obtained for farmyard manure incorporation alone. Ramaswamy and Sree Ramulu (1983) stated that increase in moisture content of the soil is due to the highest moisture holding capacity of coir pith.

Riffaldi et al., (1988) stated that main value of farmyard manure is related to major fertilizer nutrients and the trace elements it contain. There is a benefit as soil

conditioner as the organic matter in manure will improve soil tilth. The availability of animal manure is more potent limiting factor on crop production in this semi-arid area (Kenya) than soil moisture (Vernon Gibberd, 1990). Observations of Pobert et al., (1990) reports that manure is managed so badly traditionally that its value as fertilizer is severely reduced.

Farmyard manure is frequently stored for sometime before application to reduce its bulk and improve the availability of its nutrients. (Raniperumal et al., 1991)

According to Mahalakshmi Priya (1994) the trend of results obtained for grain yield and biometrical parameters of soya beans showed positive effect for application of coirpith, pressmud and farmyard manure.

Lukade and Rane (1994) reported that in a field experiment conducted is safflower, application of 40 cartloads of farmyard manure gave the lowest incidence of root rot caused by Rhizoctonia bataticola and the highest seed yield and in control there was high incidence of root rot and low seed yield.

Sudhakara et al., (1995) conducted an experiment using farmyard manure in Ceiba pertandra. The analysis of main and interaction effect showed that presence of farmyard manure was dominant factor influencing seedling performance.

Abid-Askari et al.,(1995) reported in Causauria the best results were obtained with 48% of farmyard manure as compared to 35 and 38%. The C.N. ratio in 40% composition was favourable as it represented balanced plant and organic matter.

Rajput et al.,(1995) reported that in late sown wheat (Triticum aestivum) the plots which received farmyard manure 10 t/ha as basal + full N as foliar in 3 splits showed maximum plant height than other treatment. Application of farmyard manure increased Sorghum yield from 2.16 t/ha without farmyard manure to 2.61 tonnes with farmyard manure (Kushwaha et al., 1995).

Manuring the crop with farmyard manure resulted in significantly higher pod and haulm yields of groundnut upto 12.58 and 14.14% respectively and resulted in higher net return (Asha Mehta et al., 1996).

Kalaimani et al., (1996) reported that farmyard manure applied at 25 t/ha a week in plots before planting sugarcane CV. Co. 6304, reduced incidence of Ceratocyst paradoxa and improved the yields.

Materials and Methods

CHAPTER III

MATERIALS AND METHODS

The details regarding the present investigations using composted sago wastes, composted coir pith and farm yard manure as treatments, the biometric and yield parameters recorded, the analytical techniques followed for the analysis of soil, biochemical analysis of plant samples and the statistical evaluation of the data are described in this chapter.

COLLECTION OF SOIL SAMPLES

Black cotton soil samples from Coimbatore was collected for pot culture experiment. The field trial experiments were also conducted with black cotton soil.

SOIL SAMPLE ANALYSIS:

The soil samples were air dried, gently ground with wooden mallet, sieved through a 2 mm sieve and used for the analysis.

Soil reaction (pH) and Electrical Conductivity (Ec)

Soil reaction in a soil water suspension ratio of 1:2:5 was estimated using a glass electrode (Jackson, 1973). The electrical conductivity was measured using a conductivity bridge and expressed as ds.m-1.

Physical Constants:

Apparent density, absolute specific gravity. maximum water holding capacity and volume expansion on wetting, were determined by the method of Keen Raczkowski (1921) using brass cup.

Chemical properties:

The available potassium was estimated by extracting with neutral normal ammonium acetate as per the procedure outlined by Stanford and English (1949). Soil organic carbon was estimated by wet chromic acid oxidation method of Walkey and Black (1934).

PROCEDURE FOR COMPOSTING

SAGO WASTE

An area of 3 meter length and 2 meter width is selected. One hundred kilogram of sago waste is spread uniformly on the marked area. One bottle (300 grams) of spawn (Pleurotus sajor caju) is spread on the sago waste. This layer is covered with another one hundred kilograms of sago waste, over which one kilogram of urea is applied. This process of sandwiching the pleurotus and urea, alternating with sago waste is repeated so that the heap reaches a height of one meter. To compost one tonne of sago waste, 5 spawn bottles (1500 gm of Pleurotus) and 5 kilogram of urea is required. Water is sprinkled on the heap to maintain the moisture content. The heap is kept for 30 days for

decomposition. At the end of 30 days sago waste turns into a black mass of compost.

COIR PITH:

An area of 8 meter length and 3 meter width is selected. One hundred kg of coir pith (approximately 2cm height) is spread uniformly on the marked area. One bottle (300 gms) of spawn (Pleurotus sajor caju) is spread on the coir waste. This layer is covered with another hundred kilogram of coir waste, over which one kg of urea is applied. This process of sandwiching the pleurotus and urea, alternatively with one hundred kilogram of coir waste is repeated, so that the heap reaches a height of one meter. To compost one tonne of coir waste, five spawn bottles (1500 gm pleurotus) and five kilogram of urea is required. Water is sprinkled on the heap to maintain the moisture content of coir waste to about 200 per cent. The heap is kept for 30 days for decomposition. At the end of 30 days coir waste turns into a black mass of compost with reduced C:N ratio and increased nutrient content.

EXPERIMENTAL DETAILS

The present investigation consists of 6 treatments each replicated 3 times.

TREATMENTS

Composted sago waste, coir pith and farmyard manure were incorporated in the treatments as follows. Simultaneously a control also was maintained.

C - Control

T1 - 20 gm composted sago waste.

T2 - 40 gm composted sago waste.

T3 - 20 gm composted sago waste + 20 gm farm yard manure.

T4 - 20 gm composted sago waste + 20 gm composted coir pith.

T5 - 10 gm composted sago + 10 gm composted coir pith + 10 gm farmyard manure.

POT CULTURE EXPERIMENTS

Pot culture experiments were conducted with Winged bean (Psophocarpus tetragonolobus (L.) DC) and soya beans (Glycine max L. Merr) as test crops in black cotton soil with 6 treatments each replicated 3 times. On the 45 days after sowing (vegetative stage) and 60 days after sowing for winged beans and on 35 days and 45 days after sowing for soya beans, various biometric observations and yield characters were evaluated and recorded.

COLLECTION OF PLANT SAMPLES

Winged bean (Psophocarpus tetragonolobus (L.) DC)

Plants were pulled out carefully at 45 days and 60 days after sowing for recording various biometric and yield parameters.

Soya beans (Glycine max L. Merr)

Plants were pulled out carefully at 35 days and 45 days after sowing for recording various biometric and yield parameters.

CULTIVATION AND TREATMENT APPLICATION

Stones and pebbles were removed from the soil and all the pots were filled with 7 kilogram of black cotton soil in each. The treatments were applied to all the pots and mixed thoroughly. Three seeds were sown in each pots.

BIOMETRICAL OBSERVATION OF PLANT SAMPLES

STAGE ANALYSIS

Winged bean (Psophocarpus tetragonolobus (L.) DC)

The plant samples were collected at 45 DAS (Days After Sowing) and 60 DAS and were air dried and then oven dried at 60°C and the weights were recorded for dry matter production (DMP).

STAGE I 45 DAS

Root length (cm), shoot length (cm) number of leaves, number of nodules, plant fresh weight (g) and plant dry weight (g) were recorded.

STAGE II 60 DAS

Root length (cm), shoot length (cm), number of leaves, number of nodules, plant fresh weight (g), plant dry weight (g) were recorded.

Soya bean (Glycine max(L.) Merr)

STAGE ANALYSIS

The plant samples were collected at 35 DAS and 45 DAS, were air dried and then oven dried at 60°C and the weights were recorded for dry matter production (DMP).

STAGE I 35 DAS

Root length (cm) shoot length (cm), number of leaves, number of nodules, plant fresh weight (g) and plant dry weight (g) were recorded.

STAGE II 60 DAS

Root length (cm), shoot length (cm), number of leaves, number of nodules, plant fresh weight (g) and plant dry weight (g) were recorded.

FIELD TRIAL EXPERIMENT

As in pot culture, apart from control five different treatments were given for the field trial experiment. Treatments were given for the respective plots, Winged bean (Psophocarpus tetragonolobus (L.) DC) seeds and Soya bean (Glycine max L. Merr) seeds were sown in each plot in two different fields and all the cultural practices were followed. At the time of harvest the pods from both the crops were taken for biometrical analysis such as pod length (cm), pod circumference (cm) and pod fresh weight (g).

In winged beans (Psophocarpus tetragonolobus (L.) DC), the plants were pulled out at the time of harvest and the root tubers were collected for analysing the fresh weight (g) of the tubers.

STATISTICAL ANALYSIS

The data obtained from various biometrical observations and yield parameters were subjected to the statistical analysis and based on the results, inferences were drawn. Whenever the treatment differences were significant, critical differences were worked out.

Results and Discussion

CHAPTER IV

RESULTS AND DISCUSSION

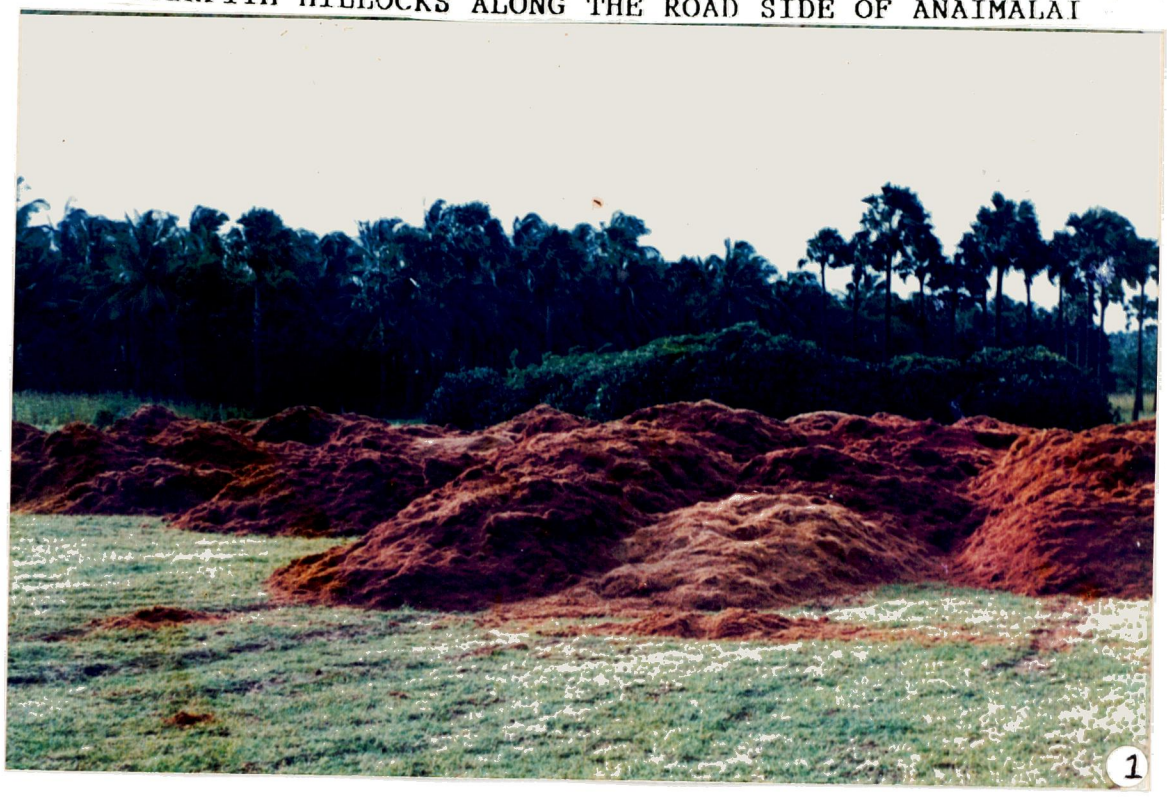
Solid wastes as an environmental problem dates back to the days when people began to live in smaller urban communities. The problem of waste disposal could be traced to the very early days of human civilization. As communities attempt to reduce the dependency of land fills by recycling, there is greater use of composting the municipal and agricultural solid wastes, which then serves as a satisfactory soil amendment. Composting is a process involving biochemical conversion of organic matter into lignoproteins (humus) by mesophilic and thermophilic organisms under optimum conditions. Composting these wastes converts them to a humus-containing organic material advantages for crop production and also increases the biological activities of the soil and greatly decreases the C/N ratio. Compost - produced crops experience less plant diseases. Composting produces sufficient heat to kill weed seeds, pathogenic organisms causing disease in plants and animals as well as human beings. Hence in the present study agricultural wastes like sago wastes and coirpith were composted by using pleurotus sajor-caju. (Plate I & II). The plants selected for the present study are winged beans (Psophocarpus tetragonolobus (L.) DC) and Soya beans (Glycine max (L.) Merr).

PLATE I

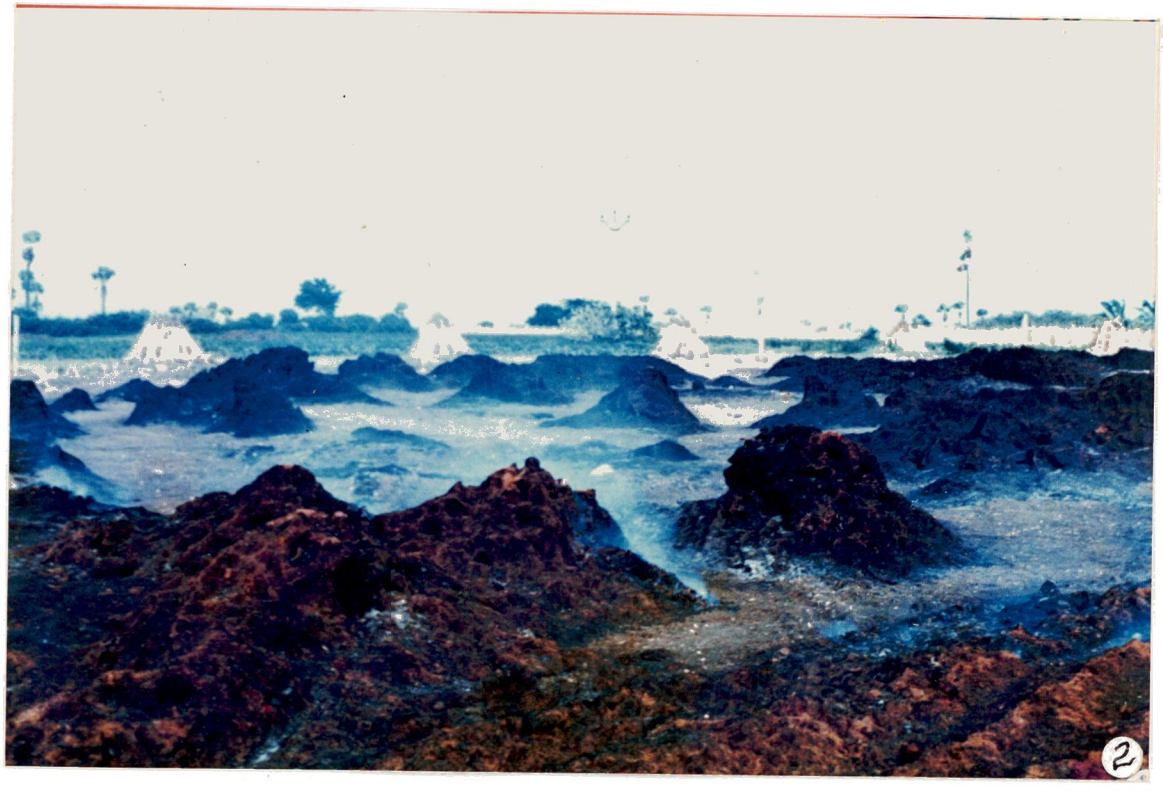
PROCESS OF RAW SAGO WASTE COMPOSTING

PLATE II

COIRPITH HILLOCKS ALONG THE ROAD SIDE OF ANAIMALAI



COIRPITH HILLOCKS ALONG THE ROAD SIDE OF ALIYAR



WINGED BEANS: (Psophocarpus tetragonolobus (L.) DC)

Winged beans which is referred to as green gold, is a vine which grows to 3-4 meter height when staked. It is a herbaceous perennial which grows as an annual. The pods are four sided with fringed wings, with winged beans everything goes into the pot. The sprouts, shoots and leaves have the highest vitamin A ever recorded in a tropical plant. Young pods make a succulent green vegetable and contains high amount of protein. The seeds are rich in calcium, phosphorus, vitamin A, B, B_{12}, proteins, minerals and oils. The tubers have 4 times the proteins content of potato. Due to its varied uses it is also known as **"A high protein crop for the tropics," and "Poor man's soya bean".**

SOYA BEANS (Glycine max (L.) Merr)

Soya bean plant is a herb, twining or prostrate, rarely it is suberect. The pods are linear and the seeds are slightly compressed. Soya flour is considered to contain more protein than red gram, black gram, bengal gram and green gram. While the dhals contain 18-20% protein soya flour contains 50% protein.

Soya is associated with health advantages like heart diseases, gout, rheumatism etc. The recent spurt in soya's popularity is due to commercial value of its various by products like lecithin (Phosphatidyl choline) which is commercially obtained from soyabean whose crude oil contains

between 2.50% to 3.25 % lecithin. Lecithin is used in a wide variety of food as an emulsifier. (Oguntunde et al., 1992).

Results pertaining to the analysis of the experimental soil and all the biometrical and yield parameters related to the pot culture experiment, field trials and the discussion on the results of investigations carried out are described in this chapter.

SOIL ANALYSIS (Table-I)

The experimental black cotton soil sample were assessed for their physico-chemical characteristics.

The soil reaction (pH) assessed was 7.9 and the water holding capacity of the soil was 3.9. Total pore space of the soil was about 36. The volume expansion on wetting of the soil was recorded as 105. The absolute specific gravity was about 0.02 and the apparent bulk density was noted as 1.2. The electrical conductivity of the soil observed was about 0.32 millimoles/cm.

The organic carbon value of the soil was about 1.75%, the calcium level was 31.1, magnesium level was 3.6. potassium was 2.44 meq/lit and sodium was about 1.20 meq/lit. The cation exchange conductivity observed in the soil was about 10.5. The percentage of moisture was about 16.66 %. The composition of Raw composted sago and coirpith is given in Table II & III.

TABLE I

PHYSICO CHEMICAL ANALYSIS OF THE EXPERIMENTAL BLACK COTTON SOIL

PROPERTIES	ANALYTICAL DATA
A. Physical Properties:	
Physical constants	
1. Apparent bulk density	1.2
2. Absolute specific gravity	0.02
3. Maximum water holding capacity	3.9
4. Total pore space	36.0
5. Volume expansion on wetting	105.0
6. Moisture content (%)	16.6
B. Chemical Properties:	
1. Soil reaction (pH)	7.9
2. Electrical conductivity (dsm^{-1})	0.32
3. Organic carbon	1.75%
4. Calcium	31.0
5. Magnesium	3.6
6. Potassium	2.44 meq/lit
7. Sodium	1.20 meq/lit
8. Cation exchange conductivity	10.5

TABLE II

CHEMICAL COMPOSITION OF RAW AND COMPOSTED SAGO

Chemical composition	Raw sago	Composted sago
Organic carbon (%)	34.54	1.3
Cellulose (%)	8	2.6
Lignin (%)	5.78	4.8
Nitrogen (%)	1.43	1.87
Magnesium (%)	1.94	2.2
Manganese (ppm)	Trace	22
Copper (ppm)	Trace	6
Iron (ppm)	1.68	2

TABLE III

CHEMICAL COMPOSITION OF RAW AND COMPOSTED COIR PITH (ON OVEN DRY BASIS)

Chemical composition	Raw coir pith	Composted coir pith
Lignin (%)	30.00	4.80
Cellulose (%)	26.50	10.10
Organic carbon (%)	29.00	24.90
Nitrogen	0.26	1.06
Phosphorus (%)	0.01	1.20
Potassium (%)	0.78	1.20
Calcium (%)	0.40	0.50
Magnesium (%)	0.36	0.48
Iron (ppm)	0.07	0.09
Manganese (ppm)	12.50	25.00
Zinc (ppm)	7.50	15.80
Copper (ppm)	3.10	6.20
C:N ratio	112:1	24:1
Volume (mm)	1	0.58

POT CULTURE EXPERIMENT

The various biometrical and yield parameters were recorded at all the stages during the growth of winged bean and soyabean as influenced by the various treatments, with composted sago waste, composted coirpith and farmyard manure. The results were statistically analysed and the details are given below.

WINGED BEANS (Psophocarpus tetragonolobus (L.) DC)

STAGE -I 45 DAS TABLE -IV (PLATE III & IV; Fig. 1,2 & 3)

On 45 DAS, plants were pulled out from the pots without any damage to the roots for observing the following parameters; root length, shoot length, plant height, number of leaves and number of nodules.

Root length as influenced by the treatments

There had been an appreciable influence of these treatments on the root length of winged beans which varied from 37.33 in control to 52.33 cm in (T2) - Composted sago. Combination of composted sago and composted coirpith (T4) had an increase from 37.33 in control to 50.33cm in length, but a decrease when compared to (T2). The other treatments had a slight increase in the root length, the control being 37.33, the (T1), (T3) and (T5) being 38.66 cm, 39.33 cm and 43 cm respectively.

Krishnan, 1986 revealed the addition of coirpith and biofertilizers increased the yield of maize.

TABLE IV

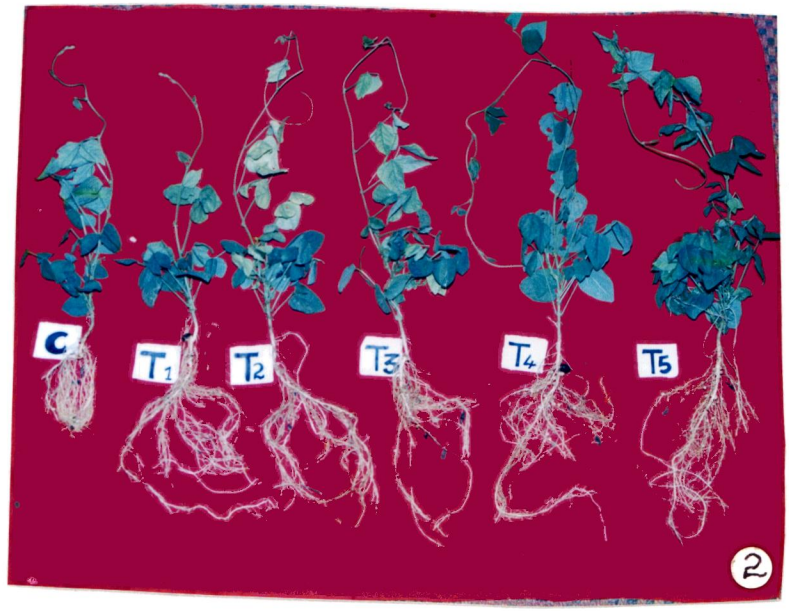
GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 45 DAS

Treatments	Root length (cm)	Shoot length (cm)	Number of leaves	Number of nodules	Fresh weight (gm)	Dry weight (gm)
Control	37.33	38.66	14.33	12.33	11.59	0.82
T_1	38.66	44.33	12.66	11.00	13.74	1.87
T_2	52.33	81.33	19.33	19.00	21.30	2.08
T_3	39.33	58.33	16.00	11.00	18.35	1.61
T_4	50.33	68.66	18.00	17.00	19.43	2.04
T_5	43.00	55.00	17.66	14.33	16.73	1.88
Mean	43.500	57.722	16.33	14.111	16.8600	1.7089
SED	2.2526	1.4782	0.8389	0.9230	0.9652	0.1190
CD 0.05	4.9080	3.2208	1.8278	2.0110	2.1029	0.2593
CD 0.01	6.8809	4.5156	2.5625	2.8193	2.9482	0.3635

PLATE III

WINGED BEAN - OVERALL POT CULTURE EXPERIMENT

WINGED BEAN PLANTS - 45 DAS



Shoot length as influenced by the treatments

The treatment composted sago (T2) and (T4) a combination of composted sago waste and coirpith increased the shoot length. Composted sago along with farmyard manure has also increased the shoot length significantly in the following order 81.33 cm (T_2), 68.66cm (T_4) and 58.33 cm (T_3) against control (38.66 cm). Composted sago, composted coirpith and farmyard manure (T_5) had a positive influence in increasing the shoot length of winged bean to 55.Ø cm.

This finding is in agreement with the findings of Loganathan et al., (1979) which reveals that the biometric observation in ground nut was significantly higher due to the application of amendment like coir dust at the rate of 5.Ø t/ha.

The slight increase in the shoot length by the incorporation of farmyard manure is in agreement with the findings of Kushwaha et al., (1995) which reveals that the application of farmyard manure increased sorghum yield from 2.16 t/ha without farmyard manure to 2.61 t/ha with farmyard manure.

Bintoro - Djoefrie et al., (1995) reported that when supplemented with fertilizer or soil, composted sagopith can be used as growing medium.

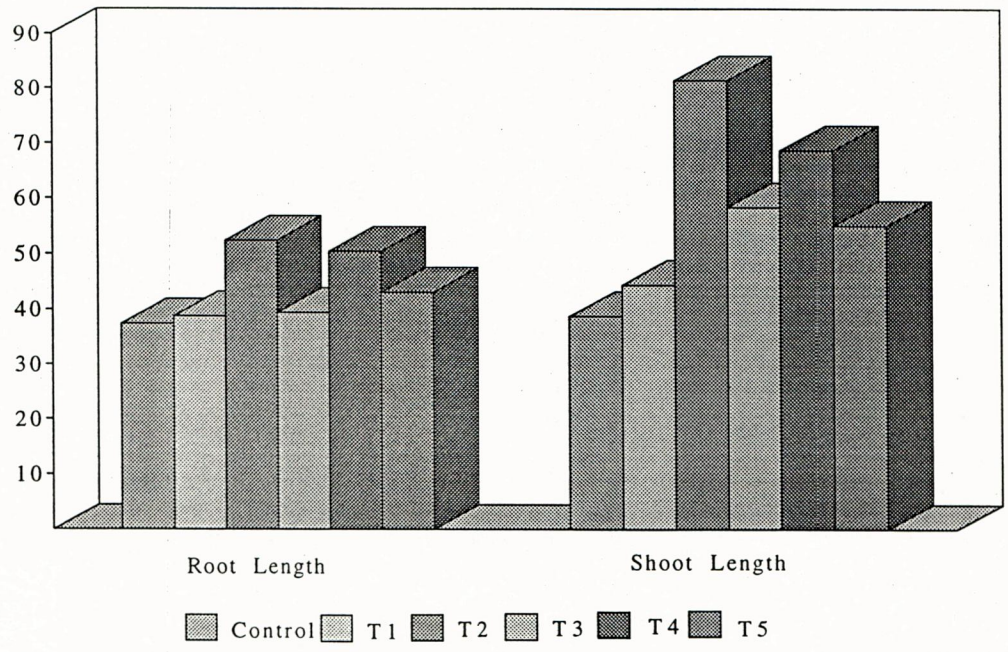
PLATE IV

WINGED BEAN - SHOOT SYSTEM 45 DAS

WINGED BEAN - ROOT SYSTEM 45 DAS

FIGURE 1

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 45 DAS



Number of leaves as influenced by the treatments

The number of leaves were increased in the treatments with (T_2) recording the highest of 19.33. (T_4) composted sago and composted coirpith had the number of leaves as 18.Ø, T_3 and T_5 being 16.Ø and 17.66 respectively over control (14.33).

Number of nodules as influenced by the treatments

Treatment (T_2) composted sago (19.Ø) and (T_4) composted sago and composted coirpith (17.Ø) increased significantly the number of nodules when compared with the control (12.33). Kaul et al., (1978) reported that a gradual dose of composted coirpith upto 1ØØ kilogram per hectare increased the number of nodules in groundnut which coincides with our results.

Plant fresh weight as influenced by the treatments

Plants of all the treatments showed an increase in the fresh weight against control (11.59 g). The maximum weight was recorded in composted sago, T_2 (21.3 g). Composted sago and coirpith (T_4) and composted sago, coirpith and farmyard manure (T_5) record ar increase in fresh weight of the plant as (19.4 g) and (16.7 g) respectively.

This findings goes hand in hand with the findings of Mahalakshmi Priya (1994) which reveals a significant increase in plant height, root length and dry matter

FIGURE 2

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 45 DAS

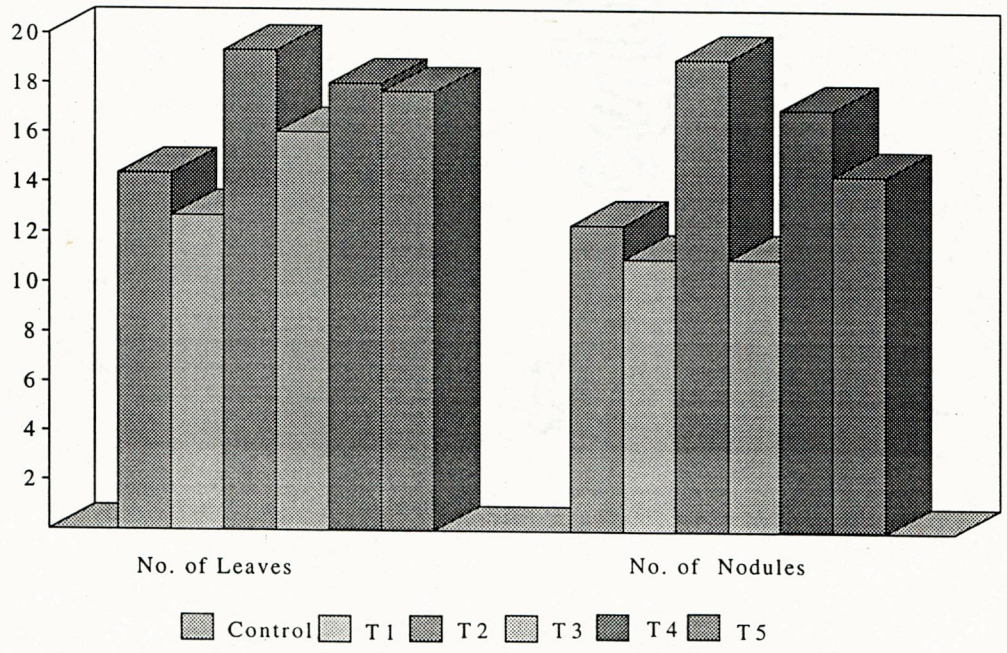
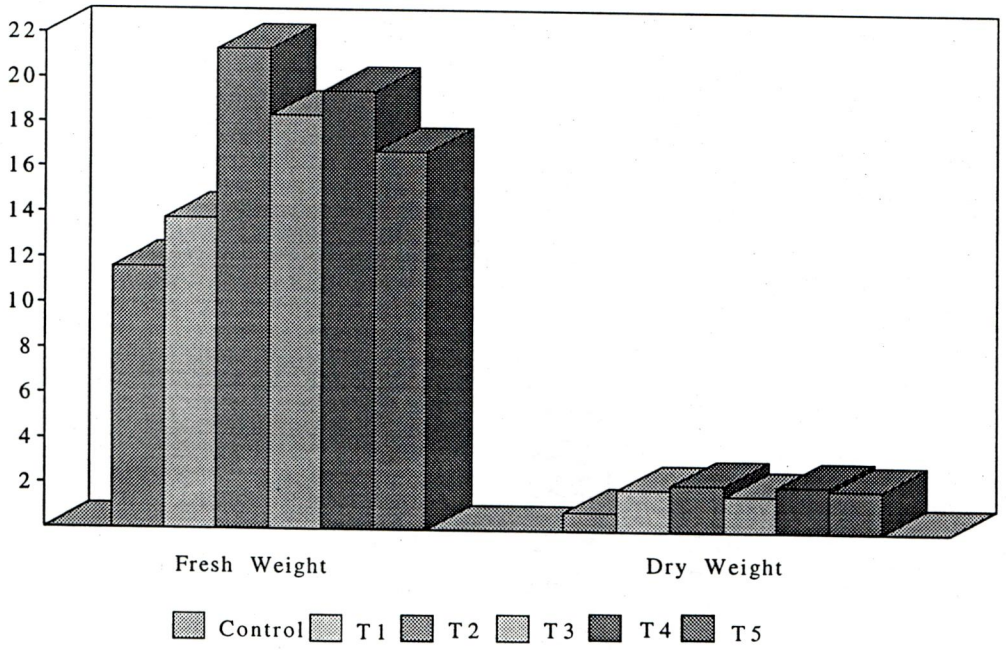


FIGURE 3

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 45 DAS



production and yield of soya bean, when incorporated with composted coirpith.

Plant dry weight as influenced by the treatments

The highest dry weight was recorded in composted sago (T_2) 2.Ø7 g with the control being Ø.816 g.

6Ø DAS STAGE - II TABLE V (Plate V ; FIG. 4,5 & 6)

On the 6Ø DAS of winged bean, the same parameters as observed in 45 Das like, root length, shoot length, number of leaves, number of nodules, plant fresh weight and dry weight were recorded .

Root length as influenced by the treatments

The treatments composted sago (T_2) (68.Ø cm), composted sago and composted coirpith (T_4) (58.33 cm) and (T_3) (55.33 cm) composted sago + composted coirpith + farmyard manure showed significant increase in root length over control (4Ø.ØØ cm).

Shoot length as influenced by the treatments

Composted sago (T_2), composted sago and coirpith (T_4), composted sago and farmyard manure (T_3) had effective results over control in increasing the shoot length in the ordered of (87.33 cm), (87.33 cm) and (71.Ø cm).

Sinha et al., (1978) revealed that height has been influenced by pyrite treatment in combination with composted coir waste in ground nut.

TABLE V

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 60 DAS

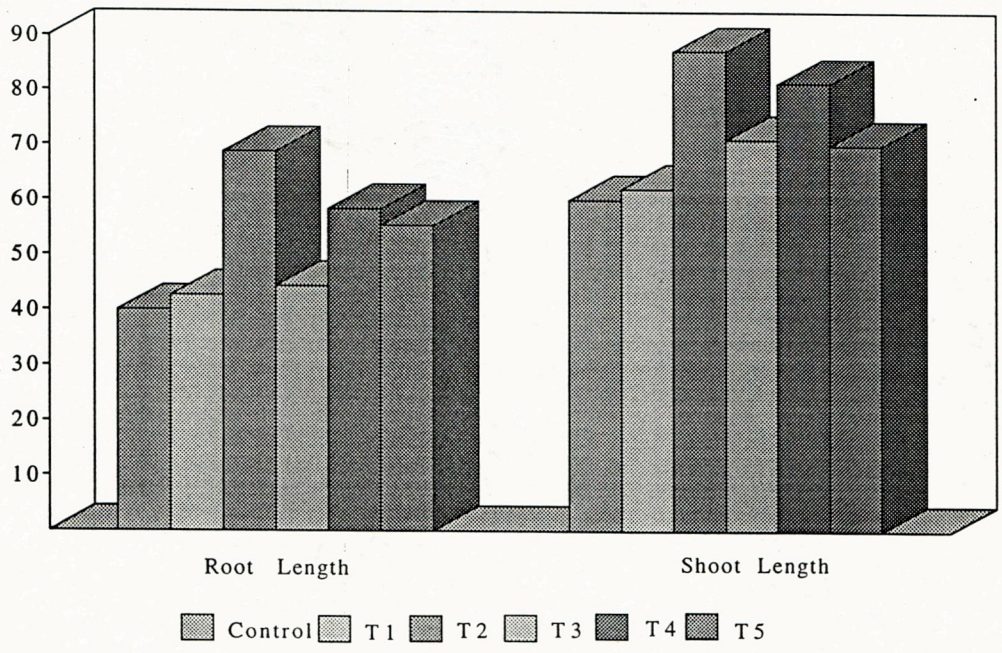
Treatments	Root length (cm)	Shoot length (cm)	Number of leaves	Number of nodules	Fresh weight (gm)	Dry weight DWT (gm)
Control	40.00	60.00	16.66	15.00	8.60	1.91
T_1	42.66	62.00	23.33	28.66	13.08	2.67
T_2	68.00	87.33	35.66	43.00	27.85	4.70
T_3	44.33	71.00	26.00	29.33	16.31	3.49
T_4	58.33	81.33	31.33	33.00	18.82	3.97
T_5	55.33	70.00	24.33	23.00	10.83	2.35
Mean	51.4444	71.9444	26.2222	28.6667	15.9156	3.1844
SED	1.4657	4.0915	3.5382	3.2773	2.5264	0.0812
CD 0.05	3.1934	8.9148	7.7090	7.1407	5.5045	0.1769
CD 0.01	4.4771	12.4948	10.8079	10.0111	7.7173	0.2480

PLATE V

WINGED BEAN PLANTS - 60 DAS

FIGURE 4

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 60 DAS



Number of leaves as influenced by the treatments

The maximum number of leaves were recorded in composted sago (T_2), (35.66). The treatments composted sago and farmyard manure (T_3), composted sago, farmyard manure and coirpith compost had a slight increase in the number of leaves in the following order. (26.Ø), (24.3) and (23.3) respectively.

Number of nodules as influenced by the treatments

The treatment composted sago (T_2) had a great influence in increasing the number of nodules to 43.Ø. The next treatment which recorded the highest number of nodules is the combination of composted sago and composted coirpith (T_4) being (33.Ø). Composted sago and farmyard manure (T_3) increased the number of nodules (29.33) over control (15.ØØ).

This finding is in agreement with the findings of Asha Mehta (1996) which reveals that the application of farmyard manure significantly increased the number of nodules per plant.

Plant fresh weight as influenced by the treatments

The fresh weight was increased in composted sago (T_2), (27.85 g), the other treatments had a significant effect in increasing the fresh weight of the plants in the following order; composted sago and composted coirpith (T_4), (18.82 g) composted sago and farmyard manure (T_3) (16.31g).

FIGURE 5

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 60 DAS

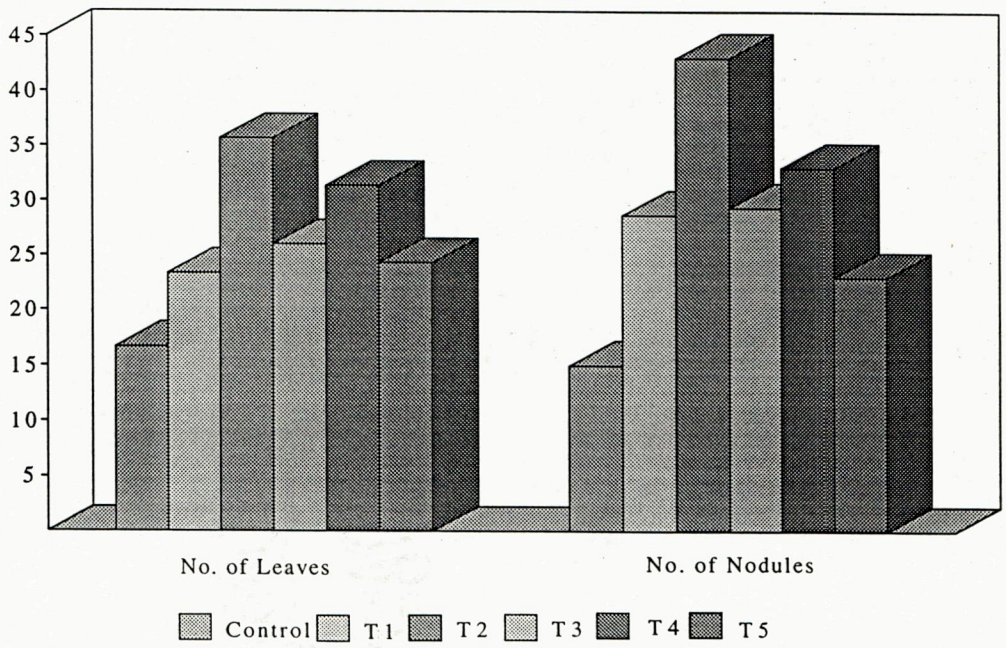
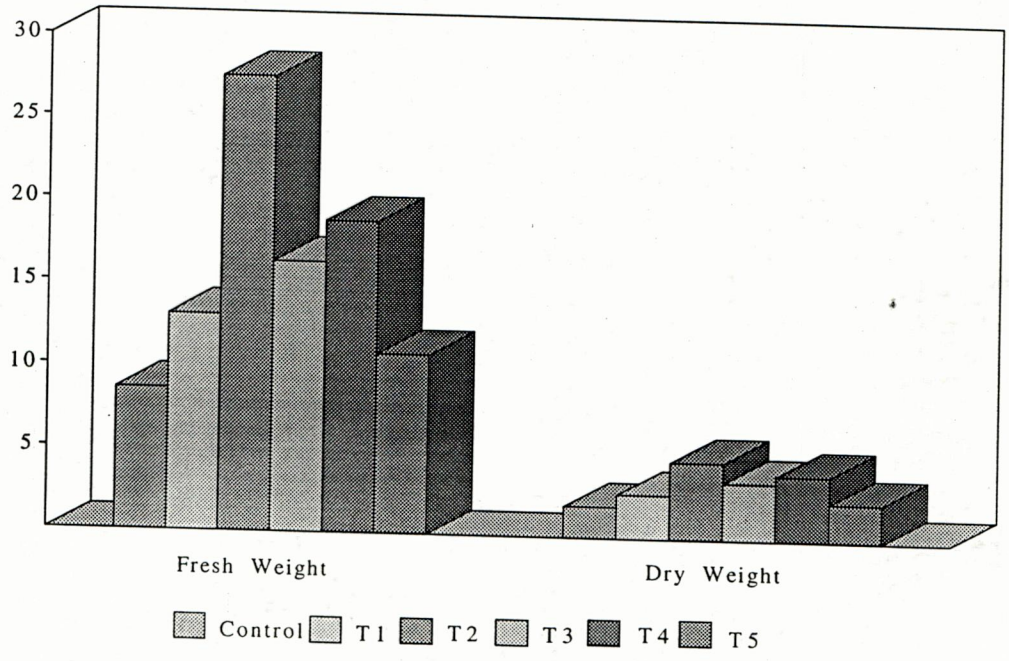


FIGURE 6

GROWTH PARAMETERS OF WINGED BEAN AS INFLUENCED BY THE TREATMENTS AT 60 DAS



Rita Joseph et al., (1995) reported that composted coirpith increased the plant height of cluster beans by 12 %, the number of pods by 27%, plant dry weight by 200% and plant fresh weight by 557% over control.

Plant dry weight as influenced by the treatments

The highest dry weight was recorded in the treatment composted sago (T_2) (4.7 g) and composted sago with composted coirpith (T_4) (3.97 g) over control (1.91g).

According to Jayakumar and Shaji (1993) the application of coir pith compost enhanced the shoot length, root growth, plant dry weight, number of seeds and seed weight of corn.

SOYA BEANS (Glycine max (L.) Merr):

The various biometrical parameters were recorded at all stages during the growth of soya bean plant as influenced by various treatments, with composted sagowaste, composted coirpith and farmyard manure. The results were statistically analysed and the details are given below:

STAGE I 35 DAS TABLE VI (PLATE VI; FIG. 7,8 & 9)

On the 35 DAS plants were carefully pulled out from the pots without any damage to the roots for observing the following parameters; Root length, Shoot length, number of leaves, number of nodules, plant fresh weight and dry weight.

TABLE VI

GROWTH PARAMETERS OF SOYA BEAN AS INFLUENCED BY THE TREATMENTS AT 35 DAS

Treatments	Root length (cm)	Shoot length (cm)	Number of leaves	Number of nodules	Fresh weight (gm)	Dry weight DWT (gm)
Control	22.31	27.33	5.00	0.66	7.14	1.763
T_1	23.00	35.33	6.33	1.00	7.28	1.816
T_2	28.00	53.33	7.00	1.66	9.19	2.133
T_3	17.00	40.33	5.66	0.66	7.30	1.820
T_4	25.71	43.33	6.66	1.00	8.18	2.056
T_5	23.00	36.70	4.66	0.66	7.97	1.880
Mean	23.1667	39.3889	5.8889	0.9444	7.8467	1.9128
SED	1.1386	3.3665	0.9027	0.2269	0.4861	0.0774
CD 0.05	2.4807	7.3350	1.9668	0.4944	1.0591	0.1687
CD 0.01	3.4779	10.2386	2.7574	0.6931	1.4849	0.2365

Root Length

There had been as appreciable increase in the root length in the composted sago treatment (T_2) (28.0 cm) over control (22.31 cm). The root length was decreased in , the treatment composted sago with farmyard manure (T_3) (17.0 cm).

Shoot Length

The shoot length had a significant increase in all the treatment with composted sago (T_2) recording a height of 53.31 cm. Composted sago with composted coirpith recorded a height of 43.31 cm. Composted sago and farmyard manure (T_3) recorded an increase in height (40.31 cm) against control(27.31 cm).

Sudhakara et. al., (1995) showed that the presence of farmyard manure was dominant factor influencing seedling performance.

Number of leaves

The number of leaves was significantly increased in the treatment composted sago (T_2) (7.0) over control (5.0). The other treatments had significantly increased the number of leaves, while (T_5) composted sago, composted coirpith and farmyard manure showed a decrease in the number of leaves than control.

PLATE VI

SOYA BEAN - OVERALL POT CULTURE EXPERIMENT

SOYA BEAN PLANTS - 35 DAS

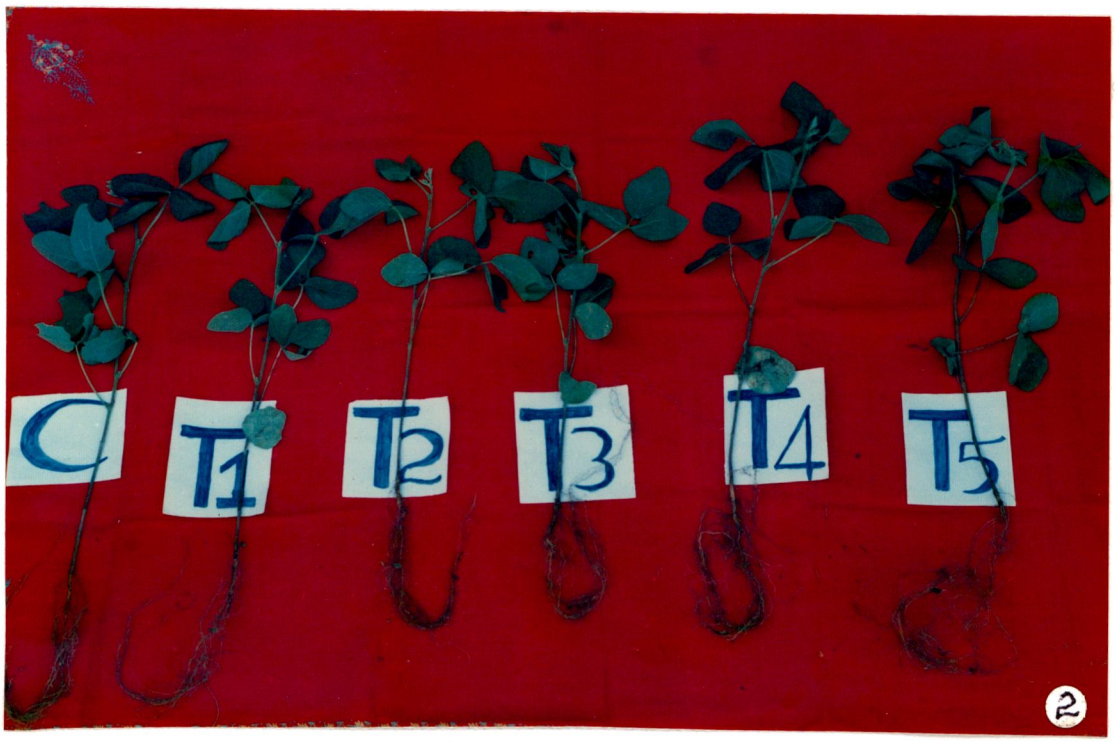


PLATE VII

SOYA BEAN PLANTS - 45 DAS

SOYA BEAN - SHOOT SYSTEM - 45 DAS

PLATE VIII

SOYA BEAN - ROOT SYSTEM - 45 DAS

SOYA BEAN ROOT WITH NODULES

FIGURE 7

GROWTH PARAMETERS OF SOYABEANS AS INFLUENCED BY THE TREATMENTS AT 35 DAS

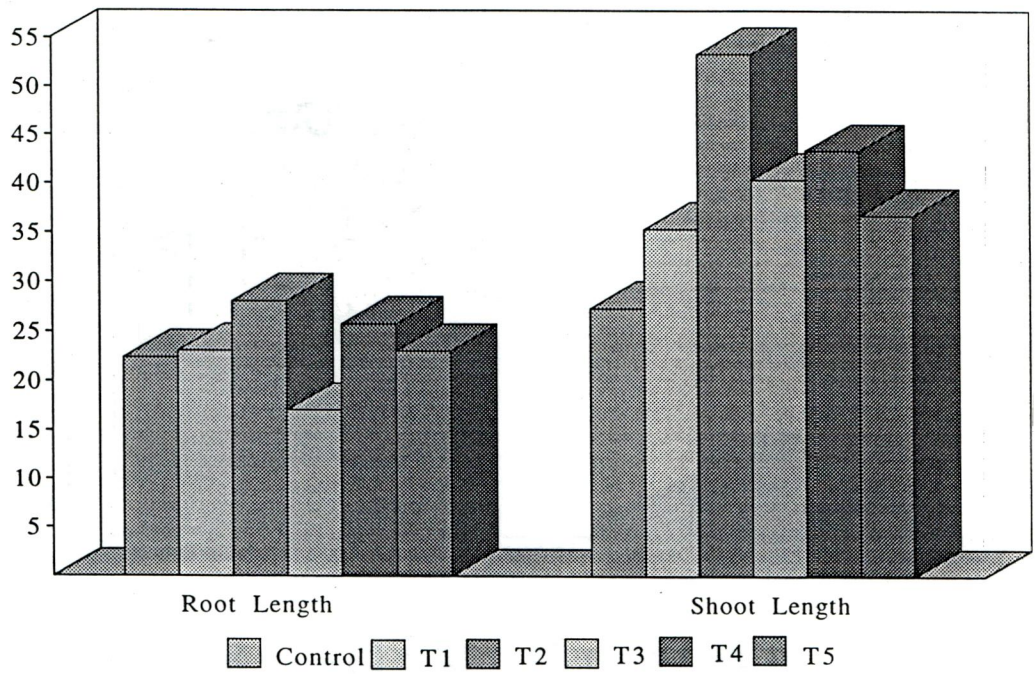
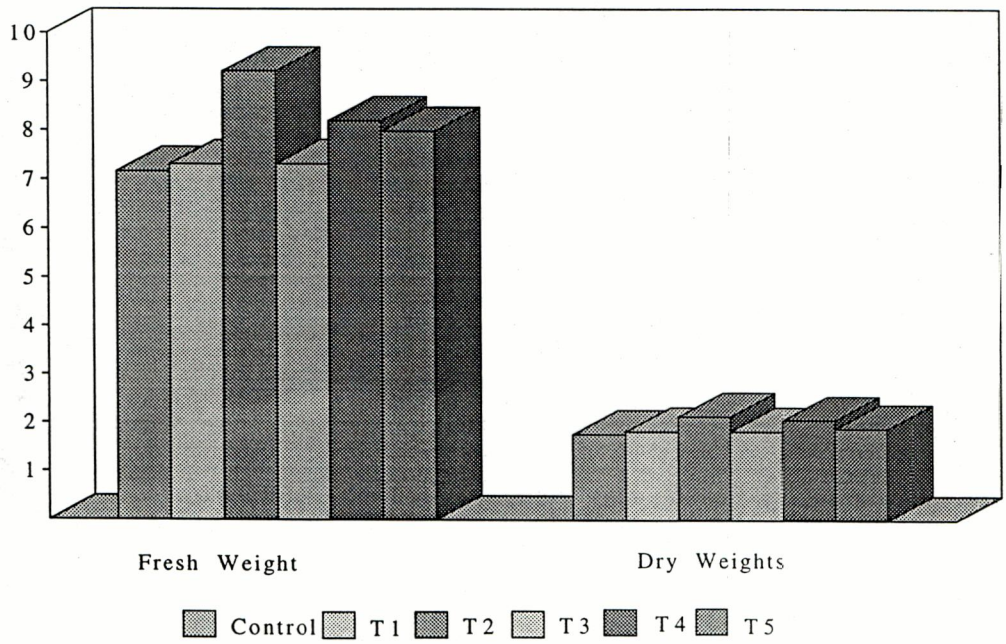


FIGURE 9

GROWTH PARAMETERS OF SOYABEANS AS INFLUENCED BY THE TREATMENTS AT 35 DAS



Number of Nodules

Composted sago (T_2) (1.66) influenced the number of nodules significantly. Composted sago (T_1), composted sago with composted coirpith (T_4) were in par with each other (1.Ø), composted sago+farmyard manure (T_3) and composted sago + composted coirpith + farmyard manure (T_5) were in par with control (Ø.66), failed to increase the number of nodules.

Plant fresh weight

Composted sago (T_2) showed an increase in the fresh weight (9.19g). Composted sago and composted coirpith (T_4) showed had an increase in weight by 8.18 g over control (7.14 g).

Ramaswami and Kothandaraman (1985) reported an increase in farm out put in rice, grapes and sorghum due to the application of coirpith.

Plant dry weight

These was a significant increase in the plant dry weight in the composted sago treatment (T_2) (2.13 g). All other treatment showed a steady increase in weight over control (1.76g).

45 DAS STAGE-II TABLE VII (Plate VII & VIII; FIG.1Ø,11 & 12)

On the 45 DAS, the same parameters like root length, shoot length, number of leaves, number of nodules, plant fresh weight and dry weight were recorded.

TABLE VII

GROWTH PARAMETERS OF SOYA BEAN AS INFLUENCED BY THE TREATMENTS AT 45 DAS

Treatments	Root length (cm)	Shoot length (cm)	Number of leaves	Number of nodules	Fresh weight (gm)	Dry weight (gm)
Control	28.33	34.66	8.00	6.66	5.06	1.18
T_1	31.00	41.00	8.66	7.00	10.46	1.94
T_2	43.33	58.00	13.33	9.00	15.32	4.85
T_3	35.00	47.33	10.33	7.66	7.09	1.63
T_4	39.66	51.00	12.00	7.33	10.53	2.56
T_5	32.00	44.00	9.33	6.00	9.13	1.79
Mean	34.8889	46.000	10.2778	7.2778	9.6017	2.3278
SED	1.2472	1.4402	0.7698	0.8165	1.4235	0.3426
CD 0.05	2.7175	3.1379	1.6773	1.7790	3.1015	0.7565
CD 0.01	3.8099	4.3993	2.3515	2.4941	4.3482	1.0465

Root length

Composted sago (T_2), composted sago + composted coirpith (T_4) and composted sago + farmyard manure (T_3) had a significant result over control in increasing the root length in the order of (43.3 cm), (39.6 cm) and (35.Ø cm) respectively.

Shoot length

There was a steady increase in the shoot length in composted sago treatment (T_2) (58.Ø cm) over control (34.6 cm). All the other treatments had a significant increase in the shoot length over control.

Number of leaves

Composted sago (T_2) (13.33) had a significant effect in increasing the number of leaves over control (8.Ø).

Number of nodules

Composted sago (T_2) (9.Ø) showed a considerable increase in the number of nodules. Composted sago+ farm yard manure (T_3) (7.66) has a positive influence in increasing the number of nodules over control (6.66). Composted sago+ composted coirpith + farmyard manure (T_5) (6.ØØ) showed a decreasing effect on the number of nodules.

Lukade and Rane (1994) reported that in safflower, application of 4Ø cartloads of farmyard manure gave the lowest incidence or root rot caused by Rhizoctonia bataticola and highest seed yield.

FIGURE 10

GROWTH PARAMETERS OF SOYABEANS AS INFLUENCED BY THE TREATMENTS AT 45 DAS

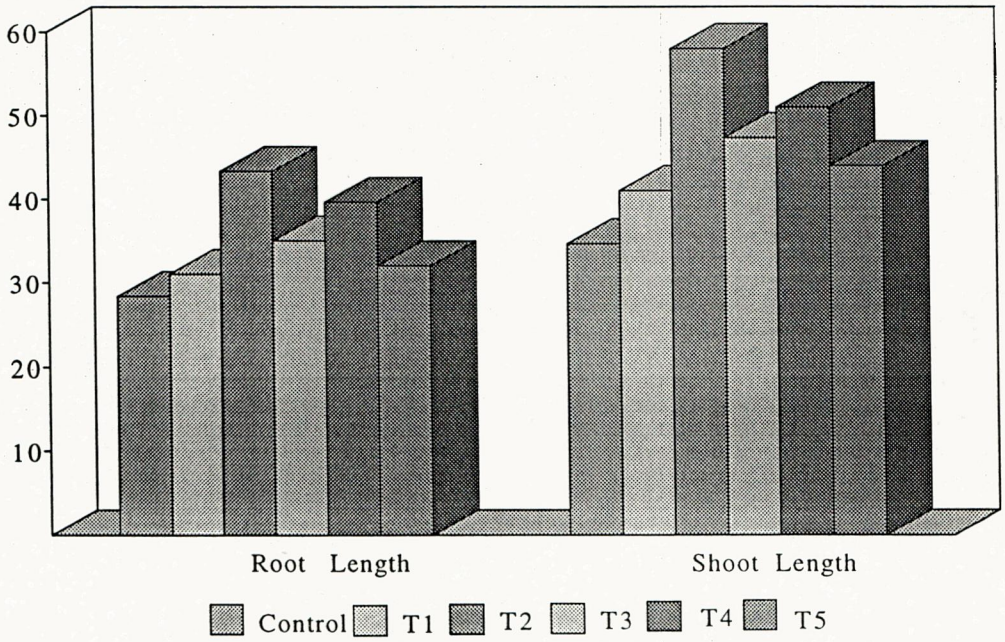


FIGURE 11

GROWTH PARAMETERS OF SOYABEANS AS INFLUENCED BY THE TREATMENTS AT 45 DAS

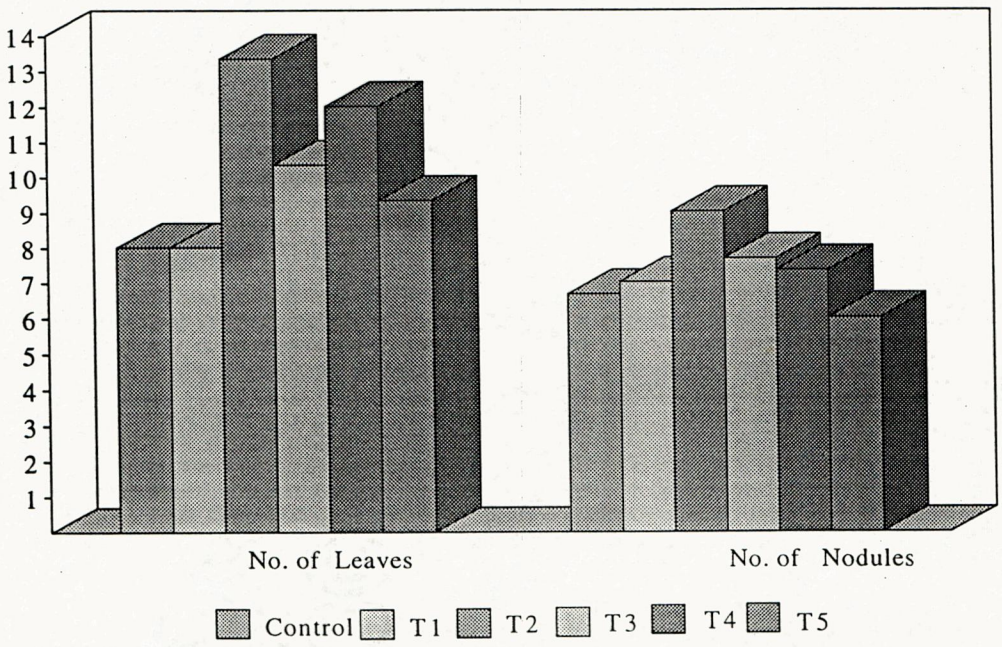
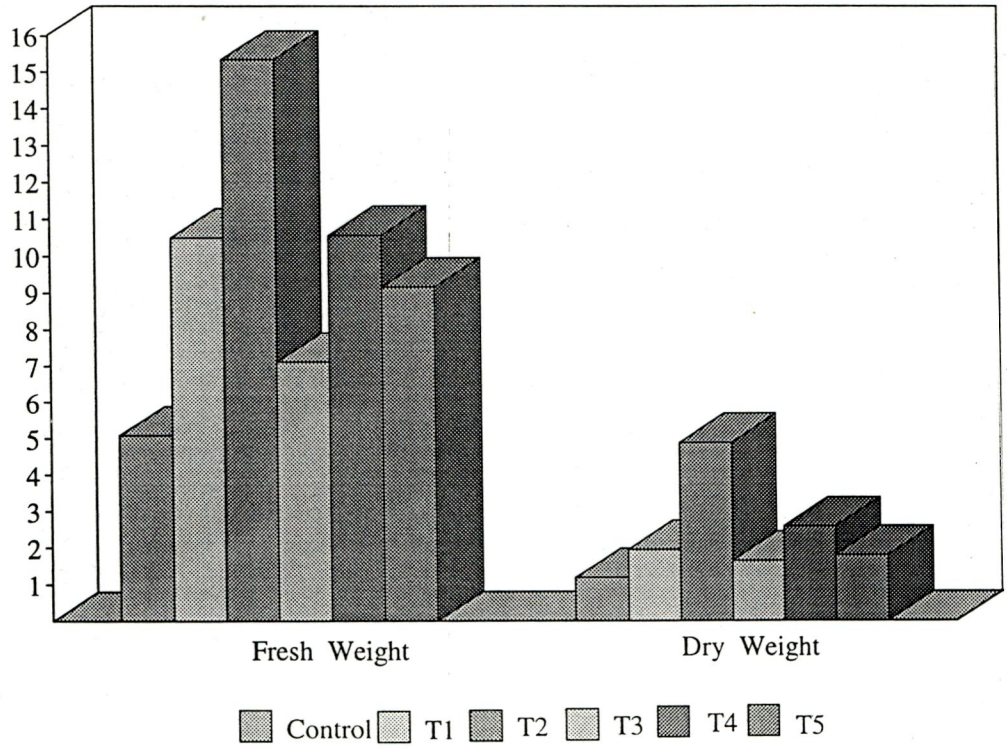


FIGURE 12

GROWTH PARAMETERS OF SOYABEANS AS INFLUENCED BY THE TREATMENTS AT 45 DAS



Fresh weight

The plant fresh weight was influenced by the application of composted sago (T_2) (15.32 g). Composted sago + composted coirpith (T_4) (10.53 g) also showed a significant increase in the weight.

Dry weight

Composted sago (T_2) and composted sago + composted coirpith showed an increase in the plant dry weight over control (1.18g) in the order of (T_2) (4.85 g) and (T_4) (2.56g).

Field trial experiment

Field trial experiments were conducted in winged beans (Psophocarpus tetragonolabus (L.) DC) and Soya beans (Glycine max (L.) Merr). 2 black cotton soil fields were selected with 6 plots each. The treatments were given to all the plots and 4 seeds were sown in each plot.

Treatments

Composted sago waste, composted coirpith and farmyard manure were incorporated in the treatments along with the control, is as follows.

C - Control

T_1 - 62.9 g composted sago

T_2 - 125.8 g composted sago

T_3 - 62.9 g composted sago + 62.9 g farmyard manure.

T_4 - 62.9 g composted sago + 62.9 composted coirpith

T_5 - 31.4 g composted sago + 31.4 g farmyard manure + 31.4 g composted coirpith.

WINGED BEANS (Psophocarpus tetragonolobus (L.) DC TABLE VIII. (Plate IX; Fig. 13 & 14)

The pod length, pod circumference and pod fresh weight were analysed for 20 pods under each treatment.

Pod length as influenced by the treatments

Composted sago (T_2) (29.03 cm) significantly influenced the pod length. Composted sago and composted coir pith (T_4) (25.93cm) had a significant increase in length over control (16.60 cm). Composted sago along with farmyard manure (T_3) (23.65) had a significant increase on the pod length.

Application of composted coirpith increased the yield of grain and straw in sorghum (Natarajan et al., 1992).

Application of farmyard manure at 5.6 t/ha significantly increased the grain yield of rice. This was reported by Shinde and Gosh (1971).

Pod circumference as influenced by the treatments

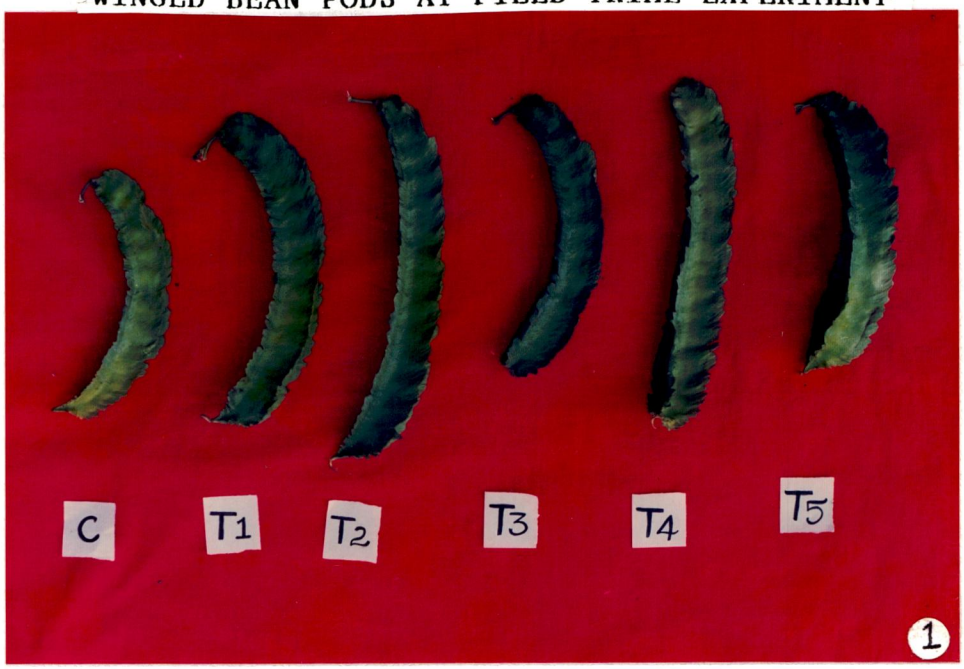
As with the length of the pod, the circumference of the pod was greater in the composted sago treatment (T_2) (11.0 cm). Composted sago combined with composted coirpith (T_4) (9.02 cm) showed an increase against control (6.55 cm).

Pod fresh weight as influenced by treatments

All the treatments had a significant effect over control in increasing the pod fresh weight. Composted sago (T_2) (32.28g), composted sago and composted coirpith (T_4)

PLATE IX

WINGED BEAN PODS AT FIELD TRIAL EXPERIMENT



WINGED BEAN TUBERS AT FIELD TRIAL EXPERIMENT

TABLE VIII

YIELD PARAMETERS OF WINGED BEAN PODS AS INFLUENCED BY THE TREATMENTS AT FIELD TRIAL EXPERIMENT

Treatments	Pod length (cm)	Pod circumference (cm)	Pod fresh weight (gm)
Control	16.605	6.555	19.925
T_1	19.460	7.805	22.870
T_2	29.030	11.000	32.288
T_3	23.655	8.690	26.491
T_4	25.930	9.020	29.490
T_5	21.605	7.805	24.520
Mean	22.714	8.4792	25.9306
SED	0.4282	0.1837	0.4577
CD 0.05	0.8501	0.3647	0.9087
CD 0.01	1.1255	0.4828	1.2032

FIGURE 13

YIELD PARAMETERS OF WINGED BEAN PODS AS INFLUENCED AT HARVEST

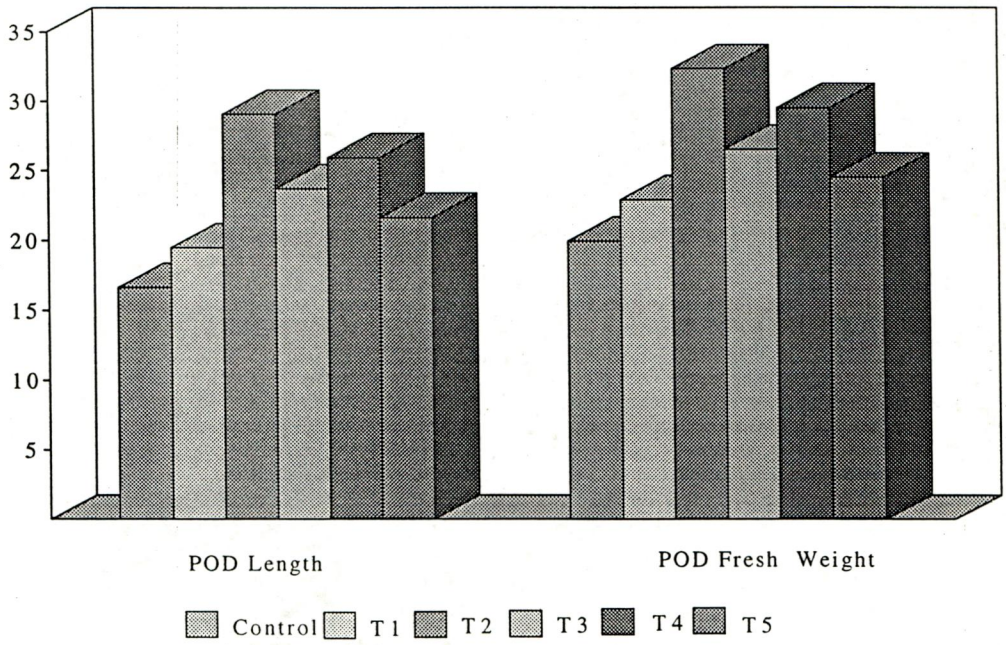
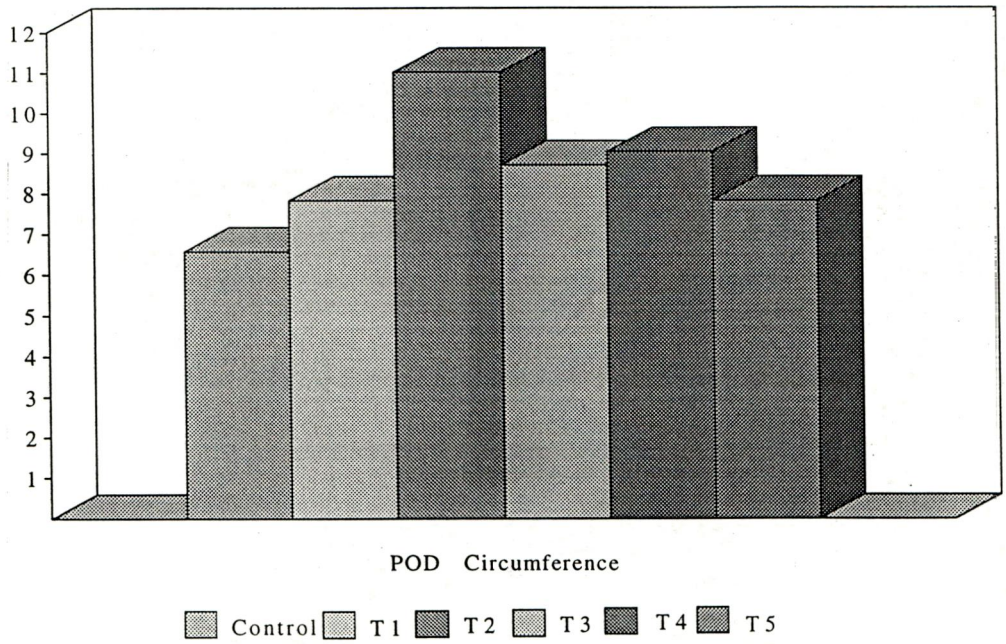


FIGURE 14

YIELD PARAMETERS OF WINGED BEAN PODS AS INFLUENCED AT HARVEST



(29.49 g) had an appreciable effect in increasing the pod fresh weight over control (19.92 g).

According to Liyange et al., (1993) coconut husk and coir dust induced a significant increased in nut yield in lateritic soil in palms gave 15-20% high yield than control.

Tuber yield as influenced by treatments

The composted sago (T_2) (68.4 g) had spectacularly increased the tuber length than control. All the other treatments also had a significant effect on this parameter.

The tuber weight of winged beans was strongly influenced by the application of composted sago (T_2) and all the other treatments showed an increase in this parameter than the control. This is in accordance with Selvakumari et al., (1992) who evidenced that in turmeric, application of composted coirpith recorded an increase of 17.2% in plant height and higher yield, fresh rhizome. The results also coincides with the results of Mallika (1997) who showed that composted coirpith extract at the level of 1:4 concentraticn has increased the tuber length than control.

SOYA BEAN (Glycine max (L.) Merr) Table IX (Plate X; Fig.15 & 16).

The pod length, pod circumference and pod fresh weight were analysed for 20 pods under each treatment.

TABLE IX

YIELD PARAMETERS OF SOYA BEAN PODS AS INFLUENCED BY THE TREATMENTS AT FIELD TRIAL EXPERIMENT

Treatments	Pod length (cm)	Pod circumference (cm)	Pod fresh weight (gm)
Control	3.700	2.555	0.193
T_1	3.795	2.230	0.192
T_2	4.490	2.975	0.196
T_3	3.835	2.870	0.234
T_4	4.020	2.920	0.198
T_5	3.765	2.670	0.211
Mean	3.934	2.703	0.203
SED	0.1347	0.1161	0.0087
CD 0.05	0.2675	0.2304	0.0174
CD 0.01	0.3541	0.3051	0.0230

Pod length

The pod length showed significant result in the treatment of composted sago (T_2) (4.49cm) and composted sago along with composted coir pith (T_4) (4.Ø2 cm). The other treatments showed slight increase in length over control (3.7Ø cm).

Kandiannan, (1988) reported that coirpith applications increased the yield in sorghum.

Pod circumference

Composted sago (T_2) (2.97 cm) has recorded the highest pod circumference which was on par with the treatments composted sago + farmyard manure (T_3) (2.87 cm) and composted sago + composted coirpith (T_4) (2.92 cm) against control (2.55 cm).

Pod fresh weight

The pod fresh weight has been significantly increased in the composted sago + composted coirpith + farmyard manure treatment (T_3) (Ø.23 g) over control (Ø.19g).

Manuring the crop with farmyard manure resulted in significantly higher pod and haulm yields of groundnut. (Asha Mehta, 1996).

PLATE X

SOYA BEAN PODS AT FIELD TRIAL EXPERIMENT

FIGURE 15

YIELD PARAMETERS OF SOYA BEAN PODS AS INFLUENCED AT HARVEST

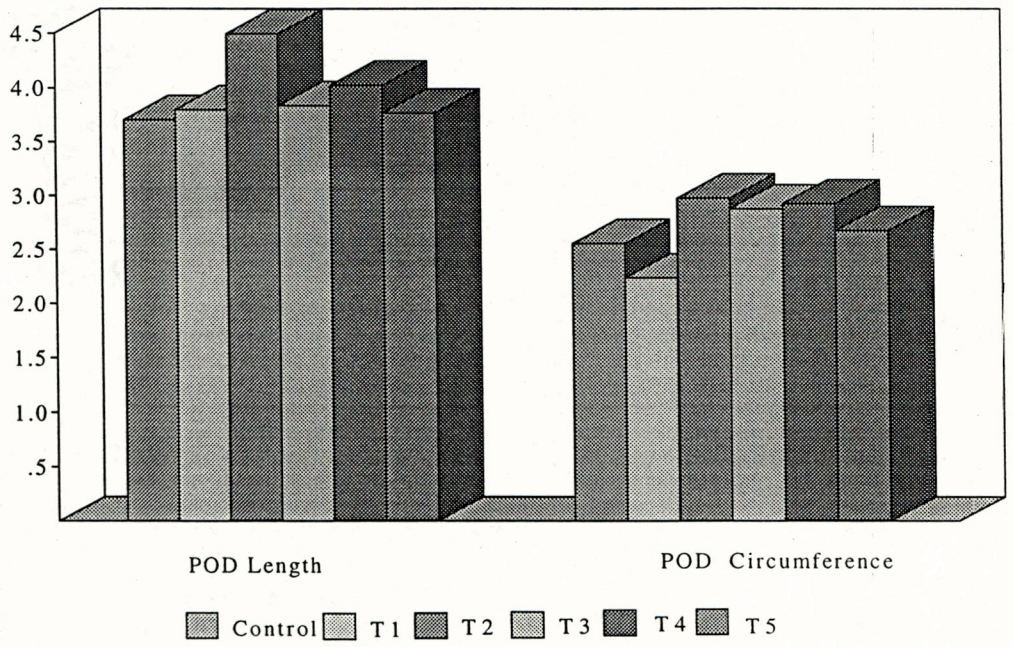
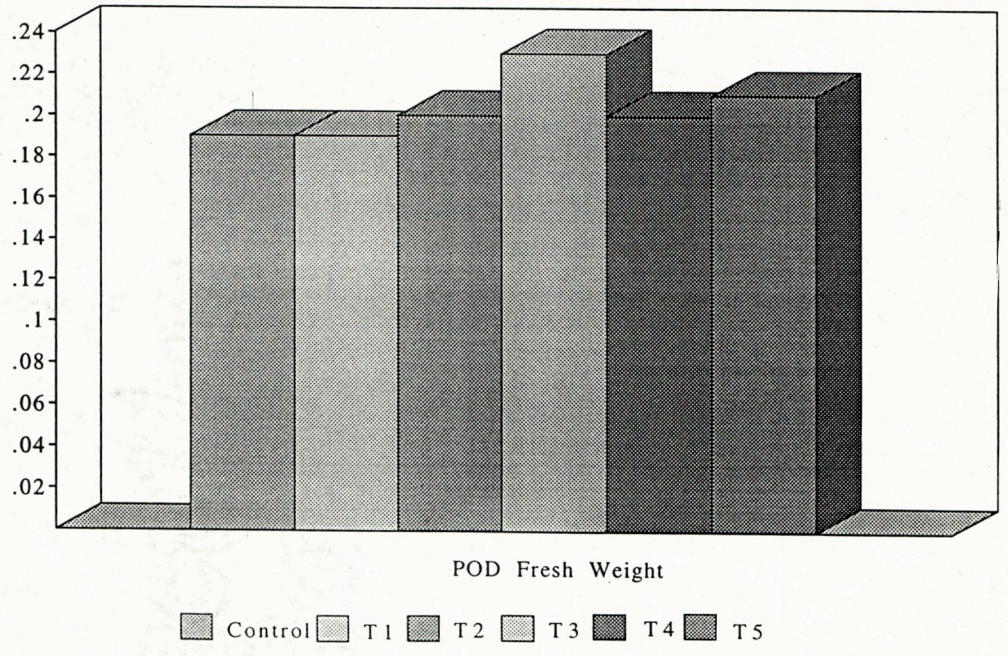


FIGURE 16

YIELD PARAMETERS OF SOYA BEAN PODS AS INFLUENCED AT HARVEST



Summary and Conclusion

CHAPTER V

SUMMARY AND CONCLUSION

Many wastes are produced from agricultural faculties that are not suitable for direct land application. There exists a continuous struggle to find a place for disposal of these solid wastes which again causes environmental pollution. Composting these wastes converts them into a humus-containing organic material advantageous for crop production. Moreover, organic manures have been successfully used in enhancing the productivity and fertility of the soils. It increases the yield of the crops.

This research is to brighten the possibilities of using sago waste, coir pith and farmyard manure in increasing the productivity of agricultural crops. The present investigation was undertaken to utilise composted sago waste, composted coir pith and farmyard manure as organic manure for legumes, specially for winged beans (Psophocarpus tetragonolobus (L.) DC) and soya bean (Glycine max (L.) Merr).

To achieve the above objectives, pot culture experiments and field trial experiments were conducted in black cotton soil with winged bean and soya bean as test crops.

The treatment T_2 (composted sago), T_4 (composted sago and composted coir pith) and T_3 (composted sago and farmyard manure) influenced the root length and shoot length of winged bean at both 45 DAS and 60 DAS. There was an increase in the number of leaves and nodules in the (T_1) composted sago treatment and T_3 (composted sago and farmyard manure) than the control at 60 DAS and in T_2 (composted sago) at 45 and 60 DAS. The number of leaves were increased in T_3 (composted sago + farmyard manure) at 45 DAS. The plant fresh and dry weight showed a significant increase in the composted sago treatment (T_2) at 45 DAS and 60 DAS.

The pod length, circumference and weight was significantly increased in winged bean in composted sago treatment (T_2) than control. The tuber weight showed a significant increase in composted sago (T_2) (65.4g), (T_4) composted sago and composted coir pith (60.6 g) and (T_3) composted sago + farmyard manure (57.7 g) over control 43.0g. The treatments T_5 (composted sago + composted coir pith and farmyard manure) 49.78 and T_1 (composted sago) (47.0 g) also showed a significant increase in tuber weight.

In soya bean at 35 DAS and 45 DAS the root length, shoot length and number of nodules were significantly increased in the composted sago treatment (T_2). The number of leaves were increased in all the treatments at 35 and 45 DAS

except (T_5) - composted sago, coir pith and farmyard manure which was on par with control.

The fresh and dry weight of the soya bean plant was significantly increased in the composted sago treatment (T_2), T_3 - (composted sago and farmyard manure) when compared with the control at 35 and 45 DAS.

Composted sago (T_2) and (T_4) - composted sago and coir pith influenced the pod length and circumference significantly. There was an increase in pod fresh weight in T_3 (composted sago and farmyard manure).

CONCLUSION:

The results of this investigation indicated the influence of application of composted sago, composted coir pith and farmyard manure in promoting the yield and biometrical parameters of winged bean and soya bean plant.

The trend of results obtained from the yield and biometrical parameters showed positive effect for the application of composted sago, composted coir pith and farmyard manure.

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