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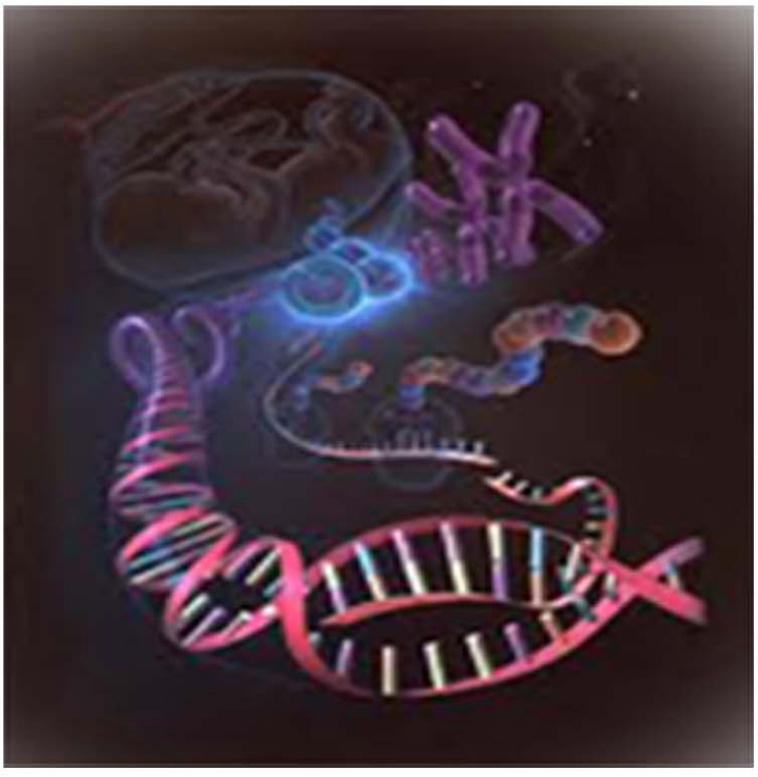

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Research Paper

INTEGRATED TECHNOLOGY FOR SUSTAINABLE AGRICULTURE

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Nature of Soil, quality and quantity of irrigating water and environmental conditions are the important factors for sustainable agriculture. The factors which affect these properties could be improved from different kinds of disposable waste from agriculture yields. Disposal and dumping of agricultural waste is a major thread for environment. Converting there as waste as wealth is a great challenge for Environmental and Social Scientist. Coir pith the final product of coconut cause pollution to nature on disposal such a waste could be used as an alternate for soil medium when it is mixed with vermin compost an organic fertilizer produced from agriculture waste in a specific proportion ground water (or) surface water with poor quality could also be used for irrigation on adopting the technology on "Solar distillation" from a solar still, and the quantity of usage can also be controlled by this technology. The required Environmental conditions could be attained by adopting the technology of solar photosynthesis principle in a closed green chamber environment. A model has been established with an integrated approach for sustainable agriculture. The study evaluates the growth performance of Jasmine plant in the developed model and its performance was compared with normal condition. This technology may be promoted for waste land development projects.

Keywords: Waste for Alternate usage, Sustainable Agriculture, Promoting waste land for cultivation

INTRODUCTION

Environmental degradation and threads caused by poor quality of water, different types of agriculture wastes and waste lands are all made use for employability through sustainable agriculture by adopting an integrated approach on different technologies put together.

Sustainable agriculture makes optimal use of locally available natural and human resources to produce high-quality and sufficiently safe food products which are economically feasible, ecologically sound, culturally adopted and socially justified. This sustainable agriculture includes conserving and protecting the quality of the resources that determine the performance of

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agriculture. The current study integrates three major technologies for sustainable agriculture as mentioned below,

- The technology on treatment of ground water for irrigational usage by having a low cost solar still.
- The technology of coir pith compost as an alternate for soil medium for the growth of plants.
- The technology on application of photo synthetic principle on a solar green chamber.

AIMS AND OBJECTIVES

In this work the natural resources, Renewable Energy Sources and Agro waste were combined together to develop a new model for sustainable Agricultural in the coastal region of Ramanathapuram District. These integrated approach leads,

- To assess the suitability of ground water for irrigational usage in Ramnathapuram District.
- To treat the saline water for irrigation purpose using solar still.
- To develop an irrigation model by integrating the solar still with green chamber.
- To analysis the performance of Integrated Solar still with green chamber.
- To study the growth rate of Jasmine plant in the soil less coir pith medium.

IRRIGATIONAL WATER QUALITY PARAMETERS

As the work is related with irrigation technology, it is necessary to assess the water quality parameters which determine the suitability of water for irrigational usage. Electrical conductivity, total dissolved solids and Sodium absorption ratio are the three important water quality parameters, which determines the suitability for irrigational water. The permissible limit prescribed by various organizations for the suitability of irrigational water were represented in the Table 1.

Table 1: Standard Limitations on Quality Parameters of Irrigational Water

Parameters Units (mg/l)	WHO 1984	ISI (1983)		Desirable Limits as per IS: 10500, 1991 & 1993
		Highest Desirable	Maximum Permissible	
Physical				
Turbidity(NTU)	5	–	–	5
EC (micro mhos/cm)	1400			
TDS	1000	500	1500	500
Chemical				
pH	6.5–8.5	7.0–8.5	6.5–9.2	6.5 – 8.5
Alkalinity	–	–	–	200
Hardness	500	–	300	300
Calcium	75	75	200	75
Magnesium	50	30	100	30
Sodium	200	–	–	–
Potassium	55	–	–	–
Chloride	250	250	1000	250
Sulphate	400	150	400	200
Bicarbonate	–	300	600	–
Carbonate	–	–	–	–
Nitrate	50	–	45	45

In general, the qualities of ground water available in the coastal region are not suited for irrigational usage. It was absorbed from the previous chapter that the quality parameters of electrical conductivity, total dissolved solid and total hardness were found higher than that of the prescribed level by the standard organizations. To make use of this water for irrigational usage, it should be treated by adopting suitable technology.

Though numerous technologies are playing important role on water purification, here the option on renewable energy sources has been identified for water treatment. Earlier studies proved that the solar energy is the only low cost energy alternate for water purification; the device used for this technology is the solar still, which have discussed in detailed in previous chapters. The extension works on its application for sustainable agriculture are all discussed in this chapter.

Solar Still for Sustainable Agriculture

The direct application of solar still for sustainable agriculture are discussed in this chapter. A domestic solar still model with an estimated cost of Rs.3,000 has been utilized for this study. A glass surface of $1m^2$ area has been used to collect the solar radiation. On examination, the quality and standards of the distillated output from the solar still was found fit for irrigation theoretically. The observed values of electrical conductivity, total dissolved solids and the calculated values of Sodium absorption ratio were all found with in the standard values. For practical analysis a case study has been carried out in this work. The technology on drip irrigation method has been followed in this work to irrigate the medium.

Soil Status for Sustainable Agriculture

Soil condition is another important parameter which determines the rate of growth of the plant in a medium and it may differ from location to location and for season to seasons. As for as in Ramanathapuram district, mostly 60% of the total land was found not suitable for cultivation. Because of its saline and alluvial nature the sustainable agriculture is not possible. To overcome this issue it is necessary to improve the physical and chemical conditions of the soil medium or certain changes could be made to improve the status of the soil condition. Research works are under progress to convert such a waste land zones to fertile land without making any change in the soil condition.

Need for Alternate Technology

No agriculture without soil. Soil is the primary need for cultivation. Due to the frequent usage of chemicals and fertilizers the quality of soil becomes very poor condition and it is not possible to cultivate continuously. It is impossible to get better yield from such soil. Because of this reason the Economic status of the district is under developed condition. To improve the economic status of Ramanathapuram district the primary changes should elevated from the nature of soil. Instead of improving the nature of soil, an alternate solution has been suggested for sustainable agriculture. Usage of coir pith compost as soil medium will provide better yield in agriculture sector. Previous studies are proving this technology.

Coir Pith as Rooting Medium

The coir extraction leaves a dusty, non fibrous spongy material called coir pith or coco peat which accounts for about 50-60 percentage of the husk mass having the soil application. The use of coir pith as moisture conserves is widely known to the farmers of coconut palm. The

specialized structure of the coir pith helps to retain water and oxygen and prevents loss of vital nutrients from the farm. Hence the coir pith is being preferred as a rooting medium and considered as a better alternate for soil medium. It absorbs water up to eight time of its weight. The special features and the benefits of the coir pith were discussed in detailed as below,

- Contains macronutrients – Nitrogen, Phosphorus and potassium
- Contains micronutrients – Calcium, copper and magnesium
- Contains natural enzymes
- Excellent water holding capacity
- Improves aeration
- Enhances strong heap root system
- Stimulates production of python hormones
- Ideal pH level – 5.6 to 6.4
- Eco-Friendly

Benefits of Coir Pith Compost

Coir pith compost having the following benefits,

- It improves the soil texture and structure.
- It improves the soil aggregation.
- It improves the water holding capacity (more than 5 times its dry weight) contributing towards increased soil moisture.
- The bulk density of both the sub surface (15-30 cm) soil is reduced to considerable extent with the application composted coir pith.
- Composted coir pith contains all plant nutrient elements and it can provide a supplemental effect along with inorganic fertilizers.
- There is improvement in caution exchange capacity of soils, where composted coir pith is applied.
- Coir pith compost application increased the soil native micro flora because of addition of humid materials.
- Ammonification, nitrification and nitrogen fixation are increased due to improved microbiological activity.

REVIEW OF LITERATURE

The idea of integrating a solar still in a green house frame was discussed in 1971 by Oztoker and Selcuk. After those different theoretical models have been developed to stimulate the behavior of a solar still integrated in a green house, which analyzed the system productivity depending on climatic parameters and still design.

Anonymous in 1981, studied that the Coir pith blended with NPK was effectively used in the establishment of coconut seedlings in sandy soils. The effect of blended coir pith was far superior then that of NPK alone and comparable with other treatments such as coconut shredding, forest leaves and farm yard manure in influencing the yield.

In 1983, Mayalagu a scholar from School of energy and environmental studied that the physical nature of soil in which the coir pith was applied. The application of coir pith in clayey soil modified the pasty consistency of the soil. It also improved the drainage characteristics.

In 1983, Nambar, Ramaswamy and Sreeramulu observed that continuous application of coir dust for 8 years influenced a reduction in bulk density and improved the water holding capacity and organic carbon status of the soil. Coir pith promoted very high level of water holding capacity due to the pore space available.

In 1985, Bhowmic and Debnath explained the process of coir extraction, dusts along with coir fragments of varied lengths are rejected. These fibre dusts are referred to as Coir pith or coco peat. This coir pith accounts for about 50-60% of the total weight of the husk.

In 1988, Anabayan explained that the soil application of coir pith as an exclusive source of potassium did not alter the usual production of sorghum in potassium rich soils.

In 1993, Damodarn experimental results have shown that coir pith impregnated with chemicals gave the best performance of soil less medium.

In 1993, Uthiah et al., studied that the coir pith when applied as much at a radius of one meter and a thickness of 10 cm around a coconut tree enhanced the yield by 25 percent.

In 1997, Jeya seeli studied that the vermin wash from coir pith compost gave better yield in brinjal and the amount of biomass produced was also higher.

In 1998, Singh of Madurai Kamarajar University, School of Energy and Environmental studied that Coir pith is being preferred as a rooting medium and considered as a better substitute to peat.

In 2000, K. Vinoth Kumar of Madurai Kamarajar University, School of Energy and Environmental studied that the growth performance of crops in unsieved Coir pith was studied and found that it was maximum in eastern side.

In 2001, Chauhan of Madurai Kamarajar University, School of Energy and Environmental studied that the Coir pith had to be used as an effective pot culture medium should be washed with water repeatedly to relieve certain ions like chloride, Sodium and potassium. To suppress the caution exchange behavior it was found desirable to treat the washed pith with calcium nitrate and subsequently rewashed.

In 2002, Ramalakshmi of Madurai Kamarajar University, School of Energy and Environmental studied that the raw coir pith medium, irrigation of high concentration of nutrient helped to maximize the biomass production.

In 2002, another scholar namely Ross of Madurai Kamarajar university, School of Energy and Environmental studied that the growth parameters of the plants grown in coir pith impregnated with calcium nitrate plus magnesium nitrate(7.0g/l) were almost equal when both the media were incorporated with neem cake and bone meal mixture.

In 2006, K. Vaigai of Madurai Kamarajar University, School of Energy and Environmental studied that the growth performance of crops was studied and found that the biomass, total dry and wet weight was higher in plants that were grown in western side than that of other three sides, and the efficiency of 11.8% was also calculated. The chemical composition of coir pith which is 1.8 percent fact and resins, 25.5 percent lignin, 7.45 percent pentoson and 35 percent cellulose. The coir pith also held 11.9 percent moisture on oven dry basis. The water holding capacity of the soil increased by 40 percent due to Coir pith addition to the soil.

Experimental Study on Coir Pith

The experimental study on coir pith includes the following,

- Identification of potential zone and its collection
- Chemical analysis of coir pith content
- Analysis of moisture content on the coir pith
- Components content in vermin composting

material.

- Analysis of nutritive value on coir pith compost

The observations made on the above were discussed below,

Identification of Potential Zone

In Ramanathapuram District the coconut cultivation is extremely high in comparison with other crops. Hence, the allied activities on coconut by products have been identified as one of the economic development activities of farmers in rural sector. Through these activities huge level of coir pith was assessed for removal in this district. Huge dumping of Coir pith in Road sector leads towards many environmental issues particularly in rural sector. It occupies bulk area for its storage. Storage can be made in waste lands of rural sector. Such a waste land which occupies enormous amount of coir pith can be made use of cultivating land by adopting the technology of soil alternating medium using coir pith.

RESULTS AND DISCUSSION

Chemical Analysis of Coir Pith Content

The Coir pith waste found in various location of Ramanathapuram district were collected and their chemical composition were analyzed in the testing laboratory at the coastal saline research station, Ramanathapuram an extension unit of Tamilnadu Agriculture university, Coimbatore. The analyzing report shows that the following chemical composition was present in the raw coir pith materials

- Nitrogen (0.21- 0.30%),
- Phosphorus (0.09-0.10%),
- Potassium (0.78-1.02%),
- Calcium (0.35-0.42%),
- Magnesium (0.36-0.70%),
- Carbon (20-26%)
- Cellulose (20-27%),
- Lignin (25-30%)
- Sulphur (0.04-0.20%),
- Ash (2-7%),
- Pentose (9.5%),
- Resin (1.28%) and
- Iron (1000ppm).
- The carbon nitrogen ratio in the coir pith is 112:1.

Moisture Content in Coir Pith

Coir pith transported from various location of Ramanathapuram District was mixed well and homogenized. A known weight of the coir pith sample was taken in a crucible and kept in hot air oven at 103°C till it attained constant dry weight. From this, the percentage of moisture content and the dry weight were calculated using the following relation:

Percentage of moisture

$$\text{content} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

where, W_1 = Weight of crucible

W_2 = Weight of Wet coir pith with crucible

W_3 = Weight of dried coir pith with crucible

Dry coir pith obtained from mechanical process was found to be effective in retaining the moisture. Use of coir pith as a soil less growth medium has a great advantage, since the coir pith has a low weight and high water holding capacity. Coir pith resists degradation and it is not easily composted because of the presence of linins and cellulose. Coir pith is having high ion exchanged property. It has a low calorific value

between 4000 and 4500 cal/g. It does not burn in its natural state. Coir pith compost contains macronutrients. It can absorb water up to eight times its weight, Coir pith, when added to sandy soil at 2 per cent increases the water holding capacity was experimentally as 40%.

Chemical Contents in Vermin Compost

To improve the fertile quality of coir pith it is necessary to mix the vermin composting material with the coir pith in the ratio of 10:1. Before mixing the organic composting material into coir pith it is necessary to analyze the chemical components present in the vermin composting material. Vermin compost is the product of decomposition of animal waste with a mix of agro waste, cow dung; excreta of the cattle, crop residues, gar bag, kitchen waste, etc. Selected type of vermin is allowed to live in the mixing unit for a particular period of 45 days. After, decomposition and permutation de composting materials as vermin could be available. These available vermin compost contains rich nutrient value suitable as fertilizers. Such a model was developed at Mohamed Sathak Polytechnic College Campus under the scheme of Community Polytechnic. The samples collected from the unit were analyzed thoroughly in the testing laboratory at coastal saline research station, Ramanathapuram. The chemical components present in the vermin compost were reported in the Table 2 after testing.

Nutritive Value of Composted Coir Pith

The coir pith obtained from the mechanical process has high nutrients. Coir pith compost is used as a source of plant nutrition, when compared to other major nutrients. The nutrient content of coir pith mix with vermin compost was examined at the testing laboratory in coastal saline research centre and its values were reported in the Table 3 after testing.

Table 2: Chemical Components in Vermin Compost

Parameters	Values
pH	6.80
EC (mhos /cm)	11.70
Total nitrogen (%)	1.94
Nitrate nitrogen (ppm)	902.20
Phosphorous (%)	0.47
Potassium (%)	0.70
Calcium (%)	4.40
Sodium (%)	0.02
Magnesium (%)	0.46
Iron(ppm)	7563.00
Zinc(ppm)	278.00
Manganese(ppm)	475.00
Copper (ppm)	27.00
Boron (ppm)	34.00
Aluminum (ppm)	7012.00

Table 3: Nutrient Content of Coir Compost

S. No.	Parameters	Values (%)
01	Lignin	4.80
02	Cellulose	10.10
03	Carbon	24.00
04	Nitrogen	1.24
05	Phosphorous	0.06
06	Potassium	1.20
07	Calcium	0.50
08	Magnesium	0.48
09	Iron(ppm)	0.09
10	Manganese(ppm)	25.00
11	Zinc(ppm	15.80
12	Copper (ppm)	6.20
13	C:N ratio	24:1

The potassium is in relatively higher quantity in the coir pith. Coir pith has gained importance owing to its properties for use as growth medium in Horticulture. Because, of wider carbon and nitrogen ratio and lower biodegradability due to high lignin content. Coir pith is still not considered as a good carbon source for use in agriculture. Coir pith is composted to reduce the wider C:N ratio, reduce the lignin and cellulose content and also to increase the manorial value of pith. Composting of coir pith reduces its bulkiness and converts plant nutrients to the available form.

INTEGRATED SOLAR STILL WITH GREEN CHAMBER

To study the effect of photo synthetic principle in the closed green environment a special experimental arrangement was made, the experimental arrangement consist of three individual units and are integrated together for performance evaluation. The three individual units are (1) solar still with water inlet tank, (2) Coir pith container with vermin mix and (3) Green chamber grow thing unit.

The primary unit consists of a solar still assembly with water supply tank. The untreated water may be taken into the tank for treatment. As the solar still is a domestic model the inlet tank has a capacity of 5 liters. The water from the inlet tank is permitted to enter into the solar collecting area through a narrow pipe. Then it is treated and the distillated output is allowed to pass over the coir pith container enclosed in a green chamber. The irrigation process is repeated for every week. The entire experiment arrangement is as shown in Figure 1.

Figure 1: Integrated Solar Still With Green Chamber

The experimental study has been conducted during the hot weather season at Mohamed Sathak Polytechnic College campus, Kilakarai for a period of 42 days. The growth rate has been observed and recorded during the period. During the study the following observations were made periodically to evaluate the performance of the experimental arrangement.

- Temperature variation above and inside the green chamber.
- Moisture content of the coir pith container.
- Growthing rate of the plant in different directions.

Selection of Plant

Four numbers of jasmine plants having the same initial life period from Horticulture centre of Sundaramudayan Government farm has been selected to perform the growth rate in the coir pith container. The performance of the growth rate of the same plant in natural soil at Sundaramudaiyan farm has been recorded to compare the growthing performance in the alternate coir medium. Four numbers of Jasmine plants has been planted in four different directions at the coir pith unit and it is allowed to growth for a period of 42 days in a coir pith medium. Distillated output water from the fabricated solar still is permitted to irrigate the coir medium. To assess the uniformity of moisture content it is necessary to evaluate the moisture content present on four different directions in the coir pith container.

Selection of Green Chamber

The green chamber is an experimental system or it is a growth chamber, which offers the possibilities of excellent climatic conditions for the growth of plant in the coir pith medium. The objective of the solar green unit structure is to allow maximum visible radiation to strike the plant. So that the plants can receives their fare and share of sunlight. This structure with transparent green shaded cover uses to allow solar energy to provide environmentally controlled plant growth facility. This is a cost effective design which creates a pleasant improvement for temperature control.

The growthing chamber which is identical to that of green house unit was developed for this study. The green shaded cover with Polythene material was tightly enclosed on the metallic frame of dimensions of length, breadth and height of 1 meter each. A coir pith mix with vermin in the ratio of 10:1 was enclosed in a separate container of size 0.75 meter in length and breadth with a height of 0.25 meter. The total weight which measures 15 kg was spread uniformly within the container. The entire containers were divided into four sectors to growth one plant in each direction. Four samples of jasmine plant having the same life period from the horticulture farm was selected for testing. The growth rate of the plant was studied under the enclosed green chamber for the period of six weeks time (6 x 7 = 42 days). The continuous performance of the growth rate was examined during this study and its progress was reported in this chapter.

Theory on Photo Synthetic Effect in Green Chamber

Photo synthetic effect is the most important chemical reaction on the earth, and it is a reaction of sunlight in green plants. In photosynthesis is the radiant energy of sun is absorbed by the green pigment chlorophyll in the plant and is stored within the plant in the form of chemical bond energy. In this reaction, water and CO_2 molecules broken down and a Carbohydrate is formed with the release of pure oxygen.

This process can be expressed as,

$CO_2 + H_2O + light + Chlorophyll \rightarrow (H_2CO)_6 + {}_O2 + Chlorophyll$

(Or)

$6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6$ (Sugar) $+ 6H_2O + 6O_2$

Hence, the Photosynthesis in a plant is a biological conversion of solar energy into sugars and starches which are energy rich compounds. The absorbed light is in the ultra violet and infrared ranges. Visible light having a wavelength below 700°A is absorbed by the green Chlorophyll which becomes activated and passes its energy on to the water molecules.

A hydrogen atom is then released and reacts with the carbon dioxide molecule to produce H_2CO and oxygen. H_2CO is the basic molecule forming carbohydrate, stable at low temperature; it breaks at high temperature, releasing an amount of heat equal to 112000 cal/mole. The absorbed energy of protons should be possible to produce large amount of carbohydrate by growing algae under optimum condition in green house frame.

Process of Photosynthesis

The process of photosynthesis has two main steps splitting of water molecules into Hydrogen and Oxygen under the influences of chlorophyl l and sunlight. This phase of reaction is called the light reaction. In this phase, light is absorbed by chlorophyll causes photolysis of water. Oxygen escapes and Hydrogen is transformed into some unknown compound this solar energy is converted into potential chemical energy. In the second phase, hydrogen is transferred from this unknown compound to CO_2 to form starch (or) sugar. Formations of starch or sugar are dark reaction not requiring sunlight. The important conditions necessary for photosynthesis are concentration of CO_2 and temperature.

CO_2 is the primary raw material for photosynthesis. Increase in CO_2 artificially results a linear increment in the yield. Hence one of the methods of increasing the biomass is by supplying additional CO_2 to the plant. The main sources to increase the amount of CO_2 to the plant are animal respiration and the decay of organic matter by bacteria.

Temperature

Photosynthesis is restricted to the temperature range which can be tolerated by protein. The tolerable temperature inside the unit is 0 - 60°C. The biochemical part controlled by enzymes is highly sensitive to temperature.

Bio Conversion and Biomass

Biomass means organic matter. In photosynthesis the solar energy is stored in the form of chemical energy. In this process, the energy is not transformed as heat but it is utilized in atomic and molecular systems by undergoing the chemical changes and biomass is produced. This biomass is used directly produce more convenient liquid by harnessing of solar energy. Thus the conversion involves,

Solar Energy $\rightarrow$ Photo synthesis $\rightarrow$ Biomass $\rightarrow$ Energy generation

Experimental Observations

Temperature variation and the moisture content in coir pith are two important physical parameters, which determine the growth rate of a plant in the coir medium within the closed green environmental conditions. Experimental observations were made for a period of 42 days. The hourly variation of ambient temperature,

temperature of air in the green chamber and the temperature of the coir pith medium were record during the study. The average variations of the above temperature during the study were reported in the Figure 2.

From the Figure 2, it may be observed that, the variation in air temperature inside the green chamber and the temperature of the coir pith compost depends on the ambient temperature. It is observed that the maximum ambient temperature during the study was 33°C and its corresponding variation in the air temperature inside the green chamber and the coir compost were found 22°C and 19°C respectively. The temperature of the coir pith container was found much suitable for better growth rate of the selected plant.

Study on Moisture Content in the Coir Pith Container

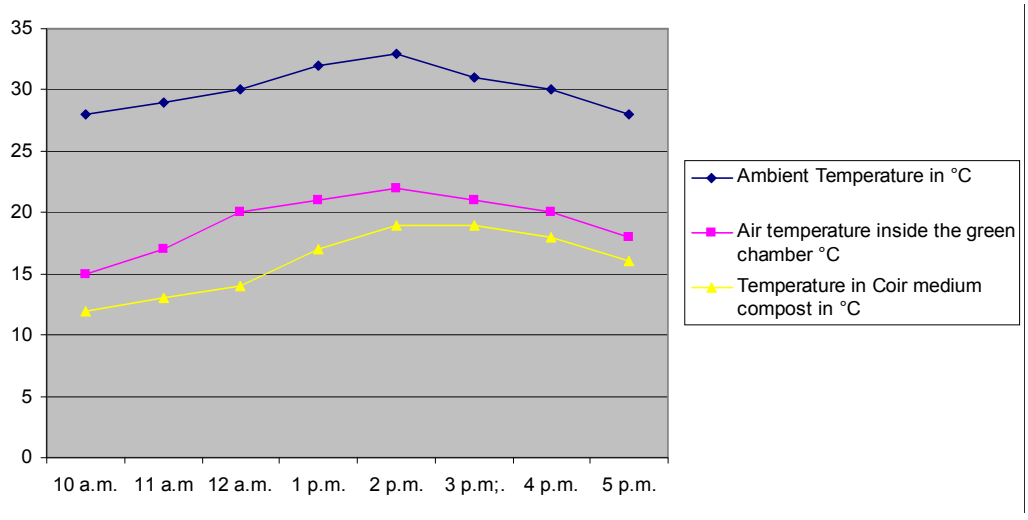
The growth rate of the jasmine plant in the coir pith medium has been analyzed by measuring the moisture content of the coir pith compost medium. The coir pith medium requires minimum water for its growth. The water holding capacity is more than eight times than that of the soil medium. To ensure uniformity in irrigation it is necessary to measure the moisture content in four different directions. Hence, samples were collected along four different directions from the coir pith container periodically to measure its moisture content. The moisture content was measured weakly once and the average values were calculated. The variations of moisture content during the study were given in Figure 3.

From the above bar chart it is observed that the presence of moisture content within the coir pith compost container during the studying period was clearly explained that the moisture content is almost uniform in all the directions except south. The variation is due to the water absorbing capacity is less in south direction. This is because the outlet of the solar still has been integrated with the growthing chamber along the north direction.

Study on Growthing Parameters

Root length, Shoot length, Root weight, Shoot weight and the total weight of the biomass are the important growthing parameters to assess

Figure 2: Performance of Temperature Variation



the growthing rate performance of the jasmine plant within the covered green chamber. After a growthing period of 42 days the measured values of the above parameters were recorded in Table 4.

Figure 3: Variations of Moisture Content Within the Coir Pith Container

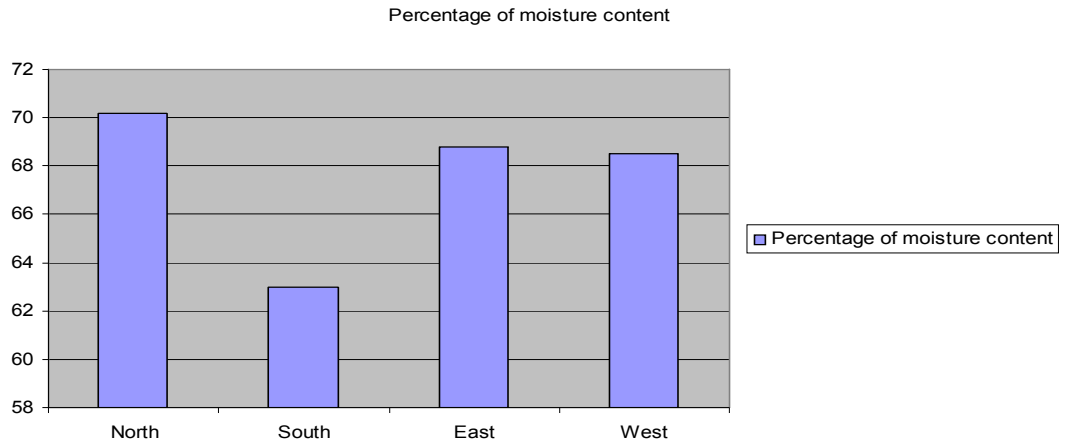


Table 4: Measurements and Calculations of Grow Thing Parameters

Plants Direction	Shoot length (cm)	Root length (cm)	Total length (cm)	Shoot weight (g)	Root weight (g)	Total Biomass
North	32.97	18.24	44.5	17.487	3.213	20.696
South	25.45	14.72	40.15	15.891	2.777	18.812
West	22.7	12.37	35.07	15.235	2.986	18.235
East	32.95	16.54	49.53	17.610	3.718	21.339
Growth rate in Soil	18.4	11.25	29.65	14.300	2.700	17.000

The growthing rate performance of shoot length, root length, shoot weight and root weight were observed in four different directions. The performances of the same parameters were also observed for the same plant on the ordinary soil medium. The growthing rate within the green chamber on the coir pith container after a period of 42 days were compared with the same performance of the plant on the soil medium in Figures 4.

From the above Figure 4a and b, maximum shoot length and the root length were observed in the north direction. In this direction the water flow rate from the still is high whereas, in the west direction the shoot length and the root length were found minimum. This direction receives maximum amount of heat radiation. This is the reason for its variation.

From the above Figure 4c and d it is observed that the shoot weight and root weight were found higher than that of the results obtained with the same plant in the ordinary soil medium. It shows that the performance rate is better in coir pith medium than that of the normal soil medium.

The average shoot weight of the plant above the coir pith medium was found 16 grams whereas

Figure 4a: Analysis of Shoot Length

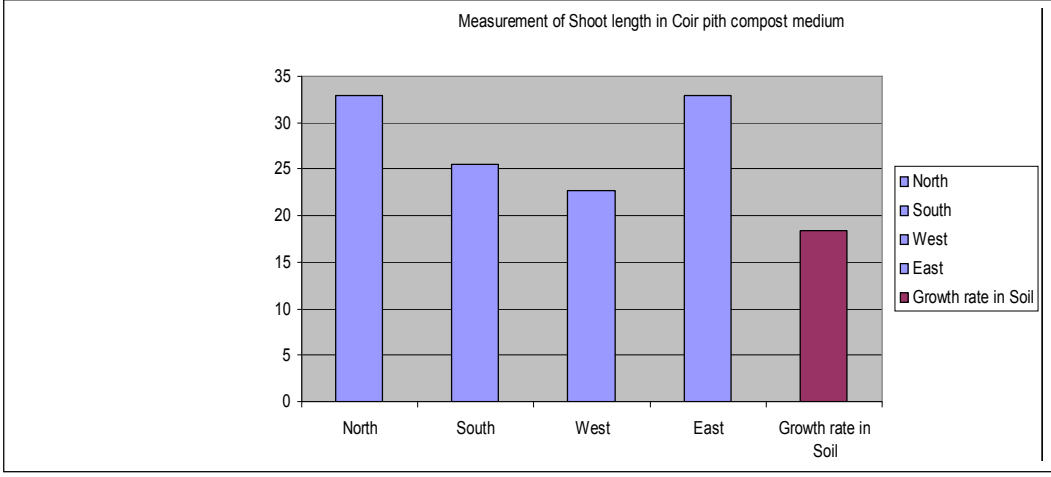


Figure 4b: Analysis of Root Length

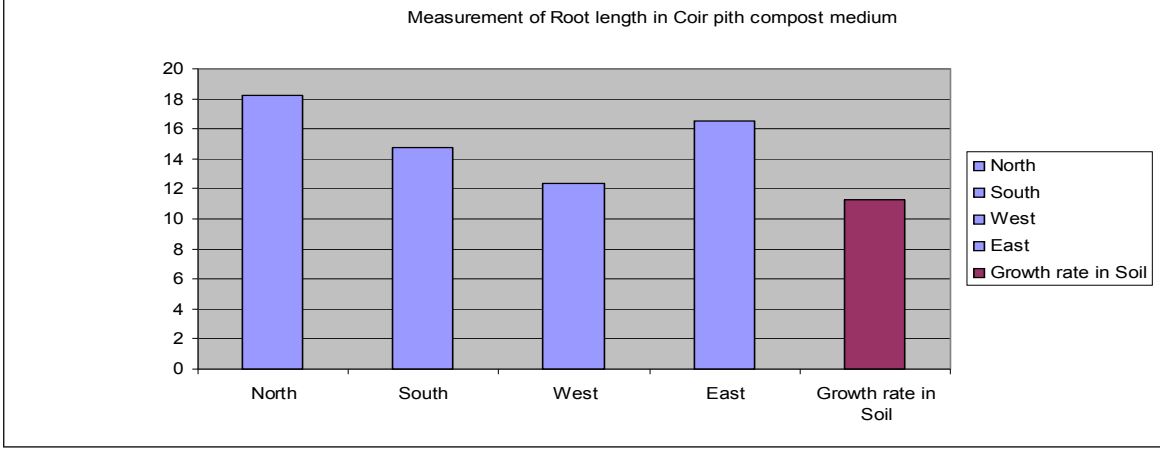


Figure 4c: The Variations of Shoot Weight

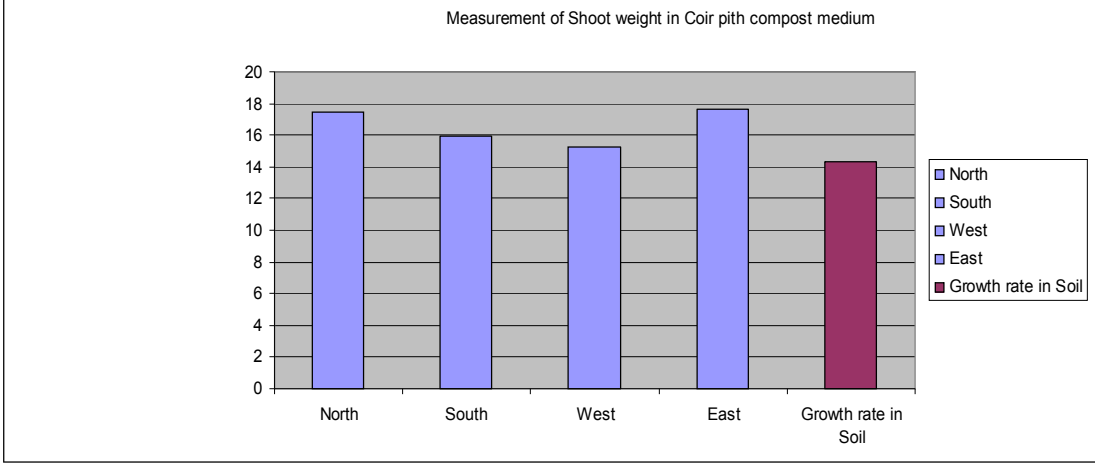
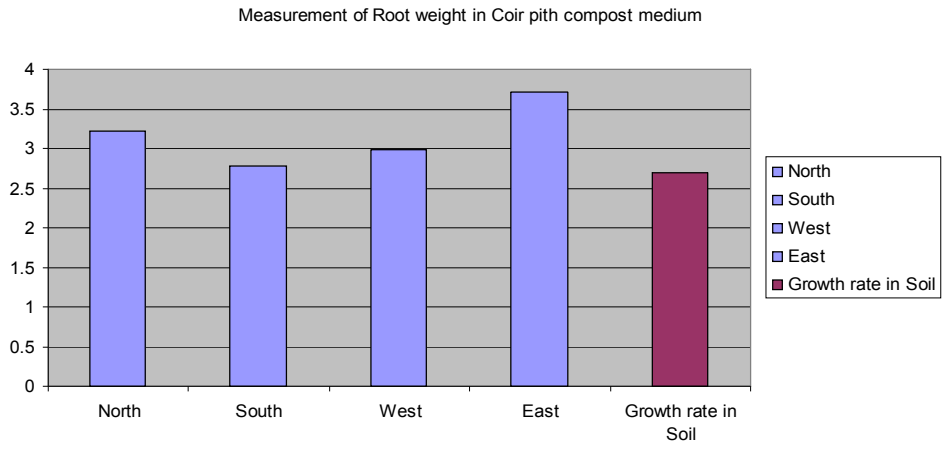


Figure 4d: The Variations of Root Weight



the shoot weight of the same plant in the soil medium is around 14 grams for the period of 42 days. Hence, the healthy growthing appears on the coir pith medium than that of the soil medium. The variation is due to the care taken on the growth of the plant inside the green chamber.

The average Root weight of the plant below the coir pith medium was found 3 grams whereas the Root weight of the same plant in the soil medium is around 2.7 grams for the period of 42 days. Here also the healthy growthing appears on the coir pith medium than that of the soil medium. Hence the coir pith has considered as one of the best rooting medium for the growth of plants.

From the observation It is obvious that the Northern side had the highest amount of moisture contest. But, the moisture contents at eastern and western sides were more or less equal. It was observed that in this short duration the plant beard buds and flowers. This showed that coir pith was able to sustain a crop similar to that of soiled medium. From the bio mass estimation, it was found that maximum growth was in plants grown in eastern side of still. This could have happened because of sufficient sunlight and hence enhanced irrigate in that side. These would in turn could increase the photosynthetic activity of plant and thereby the growth rate. Such a technology should be extended in waste land area for sustainable agriculture. Thus sustainable agriculture could possible in the closed green environmental than the normal soil medium.

CONCLUSION

For a wealthy growth of any plant it needs healthy soil, quality water and controlled green environment conditions. In coastal district like Ramanathapuram, these ideal conditions are not possible to carry out the sustainable agriculture. In this situation, the integrated technology introduced in this study will lead for sustainable agriculture. The case study on Jasmine plant proves the possibilities of this success technology for implementation. This integrated technology leads towards harmful work on agriculture without pain.

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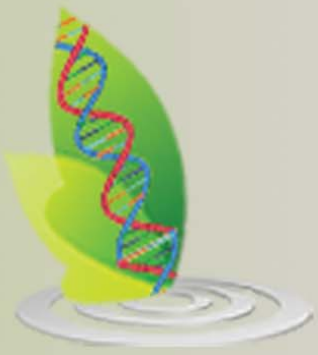

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