DESIGNING AND DEVELOPING NOVEL FERTILIZED JUTE PLANTERS

By

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DECLARATION

I declare that the dissertation entitled "DESIGNING AND DEVELOPING NOVEL FERTILIZED JUTE PLANTERS"submitted by me for the degree of Master of science (M.Sc.,) is the record of work carried out by me during the period from 2022 to 2023 under the guidance of Dr. S. AMSAMANI, M.Sc., M.Phil., Ph.D., Professor, Department of Textiles and Clothing, Avinashilingam Institute for Home Science Higher Education for Women, Coimbatore -642043 and has not formed the basis for the award of any Degree, Diploma, Associate ship, Fellowship, Titles in this University or any other similar institution of higher learning.

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I certify that dissertation entitled "DESIGNING AND DEVELOPING NOVEL FERTILIZED JUTE PLANTERS", submitted for the degree of Master of science (M.Sc.,) Bio textiles by Sobanappriya GM is the record of project work carried out by her during the academic year 2022 to 2023 under my guidance and supervision and this work has not formed the basis for the award of any Degree, Diploma, Associate ship, Fellowship, Titles in this University or any other similar institution of higher learning.

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Introduction

Introduction

The usage of plastic bags and plastic products in every industry is increasing day by day. In agriculture, floriculture technology the usage of plastics is increased by 28% of the total production of the plastics, *[Sengupta,2022]*. However, the plastic products greatly help the productivity, such as covering soil to reduce weed, nets to protect and boost the plant growth, to protect seedlings and saplings from animals and birds etc.; the effects of the plastic usage greatly impact the environment and also cause the severe pollution to the soil and environment.

According to year 2020 survey, 12.5 million tons of plastic products are used in the total plant and animal culture and 37.5 million tons in food packaging. The agriculture plastic industry forecasts that the global demand for greenhouse, mulching sheets and other agro based plastic products will increase by 9.5% in year 2030. The crop production and the livestock sectors are the large users, accounting 10 million tons of plastics are used, followed by fisheries and aquaculture by 2.1 million tons and forestry with 0.2 million,*[Dilruba,2019]*.

The major impact in environment is because of the usage of plastics. The three fourth of the entrepreneurship ideas has plastics as the part of them. Plastic has become one among the foremost pressing environmental problems that we have tend to face these days. Bharat is generating regarding 3.5million tonnes of plastic waste annually and also the plastic waste generation has nearly doubled over the last 5 years. “Plastic pollution adversely affects our ecosystems and is additionally joined to pollution,” *[Obebe,2020]*. **More than 1 million plastic bags end up in the trash every minute**. The world uses over 500 billion plastic bags a year – that's 150 for each person on Earth. World's beaches are polluted by 8.3 billion plastic straws, but only 1% of straws end up as waste in the ocean, *[Matthew, 2021]*.

The new widely opened market in nurseries are grow bags. The old traditional grow pots are now replaced by the thick rigid and flexible plastic bags. The development of those plastic grow bags is drastic and widely used because they are more economical to replace the old rigid pots which occupies more storage space, saving the growers storage cost. Many of them have the vent holes in grow bags that prevents the root rotting the punched holes take care of proper drainage. And those number of vents and their location will supply enough oxygen to the plant to breath, *[Abhishek,2022]*.

Some common drawbacks of growbags are frequent watering and shorter life span. Since jute fibre is a biodegradable the durability factor remains a drawback. The basic concept of this experiment is to prepare and analyse or study the properties of an eco-friendly biodegradable fabric fertilizer which is totally safe for the environment made out of jute fabric which is treated with fertilizer finish. This experiment's main motive is to save the environment from the harmful effect of plastic and to save the soil from the harmful effect of chemical fertilizers, *[Robin,2023]*.

Natural nutrients found in soil are essential for plant growth and include nitrogen, phosphorous, and potassium. These nutrients are manufactured synthetically from inorganic material and applied to soil in the form of chemical fertilizers to supplement what's available in your soil. Although chemical fertilizers improve the growth of plants and increase the yield of fruits and vegetables in a relatively short period of time, there are certain disadvantages of using chemical fertilizers, *[David,2021]*.

Using chemical fertilizers regularly causes the pollution of groundwater sources, also called leaching, *[Randeep.,2019]*. Chemical fertilizers that are absorbed by the ground more rapidly than they are absorbed by the intended plants. Plants can absorb only a given level of nutrition at a time, leaving the rest of the fertilizer to leach. Leaching is not only hazardous to groundwater sources but also to the health of the subsoil where these chemicals react with clay to create hard layers of soil known as hardpan. As results of chemical fertilizers use, the health of the soil and water is jeopardized, not to mention the waste of money and nutrients-deficient plants, *[Bhatt, 2020]*.

Soil fertility means the potential of the soil in a region to maintain the plant growth. Fertile soil result in high yield and better quality plants. An ideal fertile soil is rich in fundamental elements and minerals, has a good aeration, water holding capacity and good texture. The soil fertility is affected by the some of the factors, mineral composition, helps to predict the ability of soil to retain the plant's nutrients. Application of proper fertilizer and manure helps in enhancing the soil quality. The next important factor is soil pH, it helps in maintaining the nutrient availability of the soil. A pH ranging between 5.5-7 is optimum for a fertile soil, *[Marco, 2019]*

Fertilizers play a vital role in plants growth. The fertilizer can be organic or inorganic in nature, it helps in increasing and improving the soil fertility. Simply, fertilizers are any organic or inorganic material of natural or synthetic origin that is added to the soil to supply one or more plant nutrients that are essential to the growth of the plants. The usage of chemical

fertilizers is drastically increasing day by day. However, the excessive usage of chemical fertilizers leads to several issues such as serious soil degradation, nitrogen leaching, soil compaction, reduction in soil organic matter and loss of soil carbon. *[Zhirong, 2020]*.

To avoid the side effects of these chemical fertilizer which gives infertility to the soil and to avoid the unwanted plastics used in nurseries this experiment is undertaken. Based on the up given facts the experiments have been conducted as "DESIGNING AND DEVELOPING NOVEL FERTILIZED JUTE PLANTERS". With the following objectives:

- To study the effect of Epsom salt (Mgso4), coffee ground on jute fabric.
- To analyse the properties of treated jute fabric.
- To prepare a grow bag out of treated jute fabric.
- To analyse the efficiency of the grow bag through plant growth test and soil tests

Review of Literature

The review of the research entitled as “Designing and Developing Novel Fertilized Jute Planters” is discussed below,

2.1 Jute

Jute is the natural textile fibre obtained from jute plant. It is the strongest and cheapest fibre of all natural fibre which is commonly called as Golden fibre which is the second largest in

production of textile fibres, *[Shahinur,2022]*. The current annual production of jute fibre is about 3.2 billion tons and used for various application. Jute plant grows up to 10 feet height, and the fibres derived from these plants are harvested as a single long string. Therefore, the jute fibres are among the longest natural textile fibre. *[Sharma.,2020]*

2.1.1 Origin and its Composition

Jute fibre is produced from plants of genus *Corchorus*, family *Malvaceous*. Jute is a lignocellulosic fibre that is partially a textile fibre and partially wood. It falls into the bast fibre category (fibre collected from bast or skin of the plant). The chemical composition of jute fibre includes cellulose (64.4%), hemicellulose (12%), pectin (0.2%), lignin (11.8%), water soluble (1.1%), wax (0.5%), and water (10%). Jute fibre consists of several cells, *[Harpreet ,2018]*. These cells are formed out of crystalline microfibrils based on cellulose, which are connected to a complete layer by amorphous lignin and hemicellulose. Multiples of such cellulose and lignin/hemicellulose layers in one primary and the secondary cell walls stick together to form a multiple layer composite. These cell walls differ in their composition (ratio between cellulose and lignin/hemicellulose) and in the orientation of the cellulose microfibril, *[Shahinur,2015]*.

2.1.2 Jute Cultivation

Jute is a rainy season crop, sown from March to May according to the rainfall and land type, and harvested from June to September depending upon the weather. Jute requires a warm and humid climate with temperature between 27· C to 37· C. Jute is harvested any time between 120 days to 150 days, the jute fibre is extracted by the process called retting. Retting is a kind of fermentation process in which the tissues of the bark of the plant are decomposed to separate the fibre from non-fibrous woody stem. The harvested plants are left in field for three days for the leaves to shed then the stems are made into bundles for steeping in water. Steeping is carried out immediately after harvesting, *[Chapke,2013]*.

Major Jute Production States in India: they are Bihar, Assam, west Bengal, Orrisa and Meghalaya. produced in different countries also given below, *[Singh, 2019]*.

INDIA	55.1%
BAGALADESH	41.9%
CHINA	1.3%
UZBEKISTAN	0.57%
NEPAL	0.41%

Parameter For Jute Cultivation Are Mentioned Below:

- **Climate required:** Jute crop grows well in rainfed, moderate, warm humid atmosphere and sunshine condition. Jute cultivation requires 160cm to 200 cm rainfall. Humid weather will result in good yield.
- **Soil requirement:** River basins, or alluvial or loamy soils are best for jute cultivation. Jute cultivation in red soil may require high amount of manure and pH ranging between 4.8 to 5.8 is best for jute cultivation.
- **Land preparation:** Plain land or gentle slope or low land is ideal for jute cultivation. Since the jute seeds are small in size, land should be prepared to fine tilth. Couple of ploughing will make the soil to fine tilth.
- **Best season:** June to September.
- **Jute crop duration**: 4 months to 5 months, *[Naik, 2016]*.
- **Seed sowing:** There are two ways of sowing methods in jute cultivation. 1) line sowing method 2) broadcasting method. The jute crop is sown from march to May according to the rainfall and the land type.
- **Irrigation:** Jute cultivation requires good water resource (500 to 600mm of water) and plenty of sunshine. As soon as the irrigation is completed, carry out the first irrigation. Live irrigation should be given on 5^{th} day of sowing. Subsequent irrigation should be given with two weeks interval.
- **Harvesting of jute:** Depending upon the local cropping system, jute crop can reach the harvesting stage at120 to 150 days after sowing, but it can be also extended to even 160 days after sowing. After harvesting leave the jute plants in the field for four days for leaf shedding. Sort out thick and thin plants to make bundles.
- **Yield of jute**: With good farm management practices, green plant yield will be extended up to 40 to 50 tonnes, and fibre yield up to 2.0 to 2.75 tons, *[Anisur, 2022]*.

2.1.3 Process of Fibre Extraction

The jute plant's fibre lies beneath the bark and surrounded by the woody part of the stem, to extract the fibre from the stem. The process is carried out by the following stages:

Harvesting

↓

Bundling

↓

Steeping

↓

Washing

↓

Squeezing Excess

↓

Sun dry

↓

Bailing

↓

Packing

↓

Storage /Transport.

After harvesting the jute plants, jute fibres are extracted by retting. Retting is the use of micro-organisms and moisture on plants to dissolve cellular tissues surrounding fibre bundles so the fibre can be separated from the stem. The retting process consists of bundling jute stems together and immersing them in water. Water retting is a century old but the most popular process in extracting fine fibres. After the retting process, stripping of the fibre begins. The non-fibres are scraped off, then the fibres are grabbed from within the jute stem, *[Manzato,2018]*. When stripping of the jute fibre is complete, extracted jute stalks are dried in the open air, washed with water and again dried on bamboo poles.

2.1.4 Stages of Processing

The production and processing of jute fibre consist of eight important stages, which involves,

- Cultivation
- Harvesting
- Retting
- Stripping
- Washing
- Drying
- Bailing & Packing
- Storage

- **Cultivation:** The jute is sown in March or April and continuous till early June. Potash, Nitrogen and Phosphorus acts as a good fertilizer for the crop.

- **Harvesting:** Now that the jute is cultivated it is then harvested in any time between 120 to 150 days, when the flowers have been shed. It is noted that early harvesting gives good fibres. The harvested plants are kept in the field for three days so that the leaves are shed.
- **Retting:** Retting is a biological process where in the pectin (which binds the fibre) is removed. In this process the jute fibres loosened due to the decomposition of hard cell walls by the action of bacteria. During this process the bundles of fibres are steeped in water at least 60 cm to 90 cm depth, *[Rostom, 2015]*.
- **Stripping (fibre extraction):** Stripping is the process of removing the fibre from the stalk after stripping they retted. The removal of fibre is carried out by two methods, either by taking the single plants and their fibres are taken off or the handful of stalks are broken by giving it a too and for motion in water.
- **Washing:** Once the fibre is extracted the fibres are washed in clean water. The dark color of fibres can be removed by dipping them in a remained water for 15 to 20 min and again washed in a clean water.
- **Drying:** The fibres are hung on bamboo railings for them to sun dry for about 2 to 3 days. After drying, the fibres are ready to be sold in the market.
- **Bailing, packing, and storage:** After the jute fibres are dried the bailing of jute fibres is done according to the grading system such as top, middle and bottom. Packing into bales of about 250 pounds for use in mills or jute market and the bales are stored. *[Shakil, 2013]*.

2.1.5 Decomposition of Jute Fibre

As the awareness about the environment increases day by day, biodegradable natural fibres like jute are increasingly being preferred in geo textile / agro textile products. Biodegradation is a natural and non-specific process. Favourable conditions like heat, light, temperature, moisture, pH, have impact on degradation. Generally, when the jute fabric is placed in intimate contact with moist earth or soil, it starts degrading rapidly and degrades completely within 2-3 months, *[Basu, 2019]*.

The decomposition of jute and cellulose by aerobic bacteria from soil has been investigated, *[Wang ,2008]*. Bacterial decomposition of jute is rapid under aerobic conditions only when the fibre is actually wet. The mean optimum temperature for the growth of these bacteria is near 37°C and the optimum pH is near the neutral region. Jute leached in hot water is

more resistant to bacterial attack owing to the removal of micro-nutrients. Lignin is not only the most resistant constituent of jute, but it also offers some protection to the cellulosic fraction of the fibre, *[Marta,2015]*.

Jute is a ligno-cellulosic bast fibre. The basic constituent of jute is cellulose – the elements of which form the empirical formula $(C_6H_{10}O_5)_n$. Both bacteria and fungi can decompose cellulose but are dependent on moisture content. Resistance of natural fibre like jute to microbial damage may be dependent upon the physical properties (such as, crystalline, chain length, orientation of ultimate cells etc.) and the chemical constituents (such as lignin, hemicelluloses, gummy materials etc.) Quick biodegradation of jute products is advantageous in case of its disposal after use especially in land filling/land reclamation etc, *[Zhao, 2009]*. More so since the degraded jute products have got definite fertilizing effect through increasing soil nutrient and biomass. The methods protecting jute fabric against micro-biological attack depend on the introduction of a substance into or on the surface of jute fibre/product so that it acts as deterrent or provide toxicity to the micro-organisms and prevents its reproduction and growth. Past investigations have indicated that 0.5 - 2% copper content gives maximum protection against rotting of jute products. It has been found that the average life of sand-bags can be increased sixfold when treated with copper salts. This increased time/life of serviceability justifies economic pre-treatment of sand-bags/other jute products before use, *[*Sweety,*2022]*.

2.1.6 Application of Jute

Jute is the second most important vegetable fibre next to cotton. Jute is used chiefly to make cloth for wrapping bales of raw cotton, and to make sacks and coarse cloth. The fibres are also woven into curtains, chair coverings, carpets, area rugs, hessian cloth, and backing for linoleum. While jute is being replaced by synthetic materials in many of these uses, some uses take advantage of jute's biodegradable nature, where synthetics would be unsuitable, *[Shwetha, 2020]*. Some important uses of jute fibres are listed below:

- The primary application of jute fibres is in the production of matting and twine. This fibre is also widely used in the making of rope.
- Jute may be used along with sugar as a part of aeroplanes.
- In order to prevent the erosion of soils due to floods, jute matting is a viable option to secure the soil. In fact, such methods are often employed after the establishment of natural vegetation.

- Another key advantage of jute fibre for the matting and securing of soil is that the fibre is completely biodegradable and natural, *[Mahfuza, 2022]*.
- Jute is also used in the production of cloth and sacks. However, it is important to note that the cloth produced from jute fibres are usually very coarse and, therefore, unsuitable for human clothing. However, they are widely used in the production of sacks for the storage of many products.
- Jute fibres are also known to be employed in the production of certain types of curtains.
- Some carpets and area rugs are also known to be derived from jute fibres. It is not uncommon for this fibre to be used in chair coverings as well. Jute fibres are also used in the production of hessian cloth. Furthermore, these fibres are also used in backing for linoleum (a type of floor covering).
- Young trees are often planted in containers that are made up of jute fibres. These trees can be planted directly with the container intact. The jute container will not disturb the roots of the tree and will also work to prevent the erosion of the soil around the tree. The fibre is also biodegradable and will eventually be broken down.
- Jute fibres are also known to be used in the manufacture of canvas and carpet backing cloth (often abbreviated to CBC). It is not uncommon for the fibre to also be employed in the manufacture of scrim and Hessian cloth, *[Utpalendu, 2009]*.

2.1.7 Properties of Jute

The physical, chemical and mechanical properties of jute are discussed below.

2.1.7.1 Physical Properties of Jute

- **Microscopic appearance:** Jute is a multicellular fibre. The individual fibre shows nodes and cross markings in longitudinal view and polygonal shapes in cross-section. Lumen is wider than the cell wall and shows remarkable constrictions (irregular thickness) in the cell wall. Lumen broadens at the end of the fibre making cell wall very thin. Externally fibre is smooth and lustrous.

- **Length and diameter:** A single jute fibre has average length of 0.1 inch and a mean diameter of 12µ (microns). The mean length/breadth ratio is around 90.

- **Density:** The density of fibre is 1.48-1.50 gm/cm^3

- **Moisture regain:** Jute is highly hygroscopic in nature. Its moisture regain is 12-14% at standard condition.

- **Strength:** The tenacity of jute varies from 3.5-7 gm/denier.

- **Color:** Varies from yellow to brown to grey depending upon condition of growth and retting etc.

- **Elongation:** Jute do not stretch to appreciable extent under tension. Its breaking elongation is 1-1.2% under normal atmospheric condition.

- **Composition:** Jute fibre contains cellulose (55-63%), hemicellulose (20-24%) and lignin (12-14%).

- **Conductivity:** It is very good insulator of heat and electricity.

- **Elasticity:** Jute has lower elasticity due to its stiffness and rigidity. This has advantages of jute to be used as bagging material as they retain their shape on loading. *[Subhankar, 2015]*.

2.1.7.2 Chemical Properties of Jute

In chemical composition jute is different from linen and cotton as it is composed of a modified form of cellulose called lignocellulose, a compound of lignin and cellulose.

- **Action of alkalis:** Strong alkalis degrade its strength. Jute loses its weight when it is boiled with dilute caustic soda. The loss is mainly due to the removal of hemicellulose.

- **Action of oxidizing agents:** Ordinary oxidizing agents have no action on jute.

- **Action of acids:** Organic acids like oxalic acid, formic acid, mineral acids like sulphuric acid and hydrochloric acid in dilute condition has no reaction at ordinary or cold conditions. With strong acids at boiling condition hydrocellulose is formed.

- **Action of microorganisms:** Jute is more resistant to microbiological attack than grey cotton or flax. If it is slightly scoured it has excellent resistant owing to protective effect of lignin. Sometimes jute fabrics are treated with cuprammonium solution and then dried so that a film of green color is produced on the material which makes it more or less rot proof.

- **Action of sunlight:** When jute is exposed to sunlight it gradually assumes a yellowish tinge. This is due to color changes within the fibre connected with lignin molecules.

- **Action of heat:** Jute like other textile fibres may not be degraded by heat. However, prolonged heating operation degrade the fibre, *[Wang, 2010]*.

2.1.7.3 Mechanical Properties of Jute

Jute fibres are considered to be one of the most important fibres for the production of bio-composites and bio-plastics. Much research can be found studying the different mechanical properties of jute fibre, which have acceptable mechanical properties like tensile properties, specific strength, and modulus, hence increasing its potential use in different applications. Jute fibres are mostly used in geo-textiles for its mechanical properties. The jute fibre and also the fabric has the mechanical strength to withstand the external pressure and has the ability to withstand the chemical and physical factor applied on it, *[Wang, 2009]*.

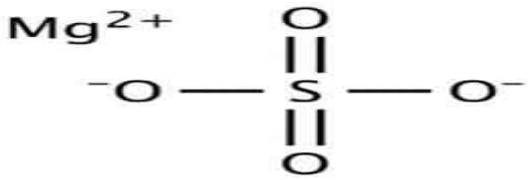
2.2 Epsom Salt (Magnesium Sulfate)

Epsom salt is also known as magnesium sulfate. Its chemical compound made up of magnesium, sulfate, and oxygen. Its molecular formula is $Mgso^4$. Though its name has salt, Epsom salt is completely different from table salt, it is named for its chemical composition. It has an appearance similar to table salt and it is often dissolved in baths, it is also known as “bath salt”. While it looks similar to table salt, its taste is distinctly different like quite better and unpalatable. Due to its taste, we probably don’t use it in cooking. Magnesium sulfate is a

magnesium salt having sulfate as the counterion. It has a role as an anticonvulsant, a cardiovascular drug, a calcium channel blocker, an anesthetic, a tocolytic agent, an anti-arrhythmia drug, an analgesic and a fertilizer. It is a magnesium salt, a metal sulfate and an organic magnesium salt. *[Rudolf ,1917]*

2.2.1 Composition and Molecular Structure

Magnesium sulfate, $MgSO_4$, is a colorless crystalline substance formed by the reaction of magnesium hydroxide with sulfur dioxide and air. A hydrate form of magnesium sulfate called kieserite, $MgSO_4 \cdot H_2O$, occurs as a mineral deposit. Synthetically prepared magnesium sulfate is sold as Epsom salt, $MgSO_4 \cdot 7H_2$ *[Walaa, 2018]*.



The above given is the molecular structure of Epsom salt. As in the formula it consists of two magnesium molecule, one sulfur group, four oxygen group. An ionic bond act as a strong electrostatic attractive force between the magnesium ion and sulphate ion. The central sulfur atom is attached to four oxygen atoms through a two single, two double bonds. $MgSO_4$ adopts an orthorhombic crystalline structure.

2.2.2 Properties of Magnesium Sulfate

The physical and chemical properties of magnesium sulfate are discussed below.

2.2.2.1 Physical Properties of Magnesium Sulfate

In its hydrate state, Epsom salt has a monoclinic crystal structure. The hydrate state is typically the state used for solution preparation, especially in medical preparation for example, Epsom salt appears similar to standard table salt, though it is typically available in much larger salt crystals than standard culinary salt, especially when intended for use in bathwater or for introduction into a saltwater aquarium.

There are three different forms, a heptahydrate, anhydrous and monohydrate form. This chemical compound contains sulphur, magnesium and oxygen. Magnesium sulfate is actually the primary substance behind the absorption of sound in ocean water. Epsom salt is commonly found in geological environments including salt deposits and burning coal dumps, *[Jennifer, 2017]*.

2.2.2.2 Chemical Properties of Magnesium Sulfate

- It appears in white crystalline solid.
- Magnesium sulfate is more soluble in water.
- It is odourless but bitter in taste.
- It as density of 2.66 g/cm^3.
- It as molar mass of 120.366 g/mol.
- Temperature of water increases with its increase in solubility.
- Its melting point is 1124˚C.
- It is most water-soluble in the anhydrous form, with a solubility of 26.9 g/100 ml.
- It is totally non-flammable in nature.
- It has no reactive hazards, *[Jagtej 2020]*.

2.2.3 Decomposition of Magnesium Sulfate

The anhydrous salt decomposes at elevated temperatures to Magnesium Oxide, oxygen, sulphur dioxide, and sulphur trioxide. The decomposition commences around 900 °C and is complete at about 1100 °C. This temperature is so much higher than what is needed for the oxidation of SO2, which is reversable explains why dissociation occurs. For the manufacture of Sulfuric acid SO2 is oxidised to SO3 by a catalyst at between 400 and 600 °C, *[Madeleine, 2011]*.

2.2.4 Application of Magnesium Sulfate

- **Promotes Sleep and Stress Reduction:** Adequate magnesium levels are essential for sleep and stress management, likely because magnesium helps your brain produce neurotransmitters that induce sleep and reduce stress. Magnesium may also help your body produce melatonin, a hormone that promotes sleep. Low magnesium levels may negatively affect sleep quality and stress. Some people claim that taking Epsom salt baths can reverse these issues by allowing your body to absorb magnesium through the skin.

- **Aids with Constipation:** Magnesium is often used to treat constipation. Most often, magnesium is taken by mouth for constipation relief in the form of magnesium citrate or magnesium hydroxide. It can be taken by mouth with water according to the directions on the package. Adults are usually advised to take 2–6 teaspoons (10–30 grams) of Epsom salt at a time, dissolved at least 8 ounces (237 ml) of water and consumed immediately. A laxative effect can be seen within 30 minutes to 6 hours. Apart from that consuming Epsom salt may produce also unpleasant side effects, such as bloating and liquid stool. It should only be used occasionally as a laxative, not for long-term relief, *[Deshmukh, 2019]*.

- **Exercise Performance and Recovery:** Some people claim that taking Epsom salt baths can reduce muscle soreness and relieve cramps. It is well known that adequate magnesium levels are helpful for exercise because magnesium helps your body use glucose and lactic acid. While relaxing in a hot bath may help soothe aching muscles, there is no evidence that people absorb bathwater magnesium through their skin. On the other hand, oral supplements can effectively stave off magnesium insufficiency or deficiency. Athletes are prone to low magnesium levels, so health professionals often recommend that they take magnesium supplements to ensure optimal levels. While magnesium is clearly important for exercise, the use of bath salt to enhance fitness is not well researched.

- **Reduce Pain and Swelling:** Another common claim is that Epsom salt helps reduce pain and swelling. Many people report that taking Epsom salt baths improves symptoms of fibromyalgia and arthritis. Again, the magnesium is deemed responsible for these effects, since many people with fibromyalgia and arthritis are deficient in

this mineral. One study in 15 women with fibromyalgia concluded that applying magnesium chloride to the skin may be beneficial for reducing symptoms, *[Jaiswal,2021]*.

- **General uses of Magnesium Sulfate** A 2017 review of studies indicates that larger and more methodical studies on topical application of Epsom salt need to be done. One 2018 study found that magnesium salts can be effective for dry skin and for reducing inflammation. However, the study doesn't include the number of study participants analyzed. As a folk remedy, Epsom salt is used on a widespread basis to provide relief for a variety of conditions. These include:

- itching caused by poison ivy
- skin irritation and inflammation
- sore feet
- sore muscles
- sprains
- stiff joints
- stress
- sunburn

Doctors also administer it intravenously. It's been showed to be effective for these uses:

- control rapid heartbeat
- relieve migraine headaches
- postpone premature birth
- prevent seizures caused by preeclampsia and eclampsia
- reduce swelling in the brain
- treat barium poisoning
- treat muscle spasms and seizures caused by magnesium deficiency, *[Lavanya, 2019]*.

Side Effects of Magnesium Sulfate

Magnesium sulfate may cause some allergic reaction to some people at sometimes. Get emergency medical help if you have any of these signs of an allergic reaction: hives; difficult breathing; swelling of your face, lips, tongue, or throat. Common side effects may include diarrhea or upset stomach. Magnesium sulfate taken orally can make it harder for your body to absorb other medications you take by mouth, especially antibiotics. Avoid taking other medicines within two hours before or after you take magnesium sulfate as a laxative. Over dose may include nausea, vomiting, flushing (warmth, redness, or tingly feeling), feeling very hot, slow heart rate, extreme drowsiness, or fainting, *[Cynthia, 2020]*.

2.2.5 Magnesium Sulfate in Gardening

Using Epsom salt in gardening is not a new tradition, it has been a favorite fertilizer/pesticide and a best friend for some plants. Because of its major role in the growth of plants, it plays the best part in concepts of 'green living' and organic gardening. Epsom salt is growing popular among the gardeners because Epsom salt is the unique answer for variety of organic gardening needs. It is very cost effective, affordable to all types of gardeners, plants easily accept it and has very fewer side effects on plants. Using Epsom salt is safe and it is a natural product that is available at home for many health and beauty uses, *[Linda, 2018]*.

Magnesium Sulfate on Plant Growth

- **Role of magnesium sulfate in seed germination:** Addition of Epsom salt for plants with soil while sowing seeds for your garden or pots. Epsom salt help your plants as a dominant boost right from the germination. Magnesium content in Epsom salt helps with the seed germination and can work in producing stronger seedlings. For the best results, before sowing seeds in the garden, add Epsom salt to the soil. Addition of one to two tablespoons of salt in each hole before sowing the seeds. In case of potted plants, mix the soil and Epsom salt in equal proportion, while sowing the seed, or use only Epsom salt as potting soil for seed germination.

- **Epsom salt to enhance the absorption rate in plant:** magnesium is a very important element when added to fertilizer it helps the plant roots to absorb essential nutrients (phosphorus, nitrogen, and sulfur). Epsom salt is also called to the soil, it helps the plant to improve their absorption rate naturally, *[Nancy, 2021]*.

- **Epsom salt as a pesticide:** Epsom salt may not dehydrate snails and slugs, but it can help to keep off pests. Crystals of hydrated magnesium sulfate in Epsom salts are sharp, which can irritate or scratch the feet and bodies of unwanted critters. But the important to note that Epsom salt is easily soluble in water and will be washed away by any amount of rainfall or water.

- **Epsom salt for high yield:** Bell pepper plants produce higher yields and the average fruits to plant size ratio. So, the plants should be fed with magnesium regularly to enhance plants and produce optimal and healthier fruits. Sprinkling few tablespoons of Epsom salt helps in production, *[Debdatta, 2023]*.

- **Epsom salt in greening up foliage:** sometimes leaves of green plants turn yellow, the yellowing of leaves is mostly caused due to the deficiency of magnesium in the soil. Magnesium is a crucial element that increase the chlorophyll production in the leaves. Which is highly necessary for greening up foliage, it also helps palms with "frizzle top" along with helping roses bloom with different colors. Adding Epsom salt to your plants will make them healthier and with amazing green foliage. [*Bokek, 2021*]

2.2.6 Disadvantages of Epsom Salt on Plants

Usage of Epsom salt has become an increasingly common gardening practice, mainly in the case of a rose and tomato plant growers. But Epsom salt are not suited for all types of soil and are not used unless you garden soil or potting soil is tested, that says whether the soil is deficient in magnesium. In case of magnesium deficiency, there are better sources of magnesium than your bath salts.

Since the Epsom salt has magnesium and salt content and many plants will suffer from excess deposits of salt in the soil. One form of Epsom salts is used as a supplement in the case of magnesium is a deficiency in garden. The Magnesium deficiency is a common problem for tomatoes, it occurs in intensive agriculture practices, it would be highly unusual for a normal gardener to have this deficiency, *[Marinkovic , 2006]*.

2.3 Fertilizers in Nursery and Agro Industry

Fertilizers, artificial or natural, are the components that increase plant productivity and development. Fertilizers help the soil increase its fertility thereby promoting growth. The use of manures as compost is presumably as old as agriculture itself. With the help of fertilizers, plants become resilient against harmful plant pathogens, pests, and weeds. Elimination of diseases in plants increases the value in the harvest. Present-day synthetic fertilizers incorporate at least one of the three components that are most significant in plant sustenance: nitrogen, phosphorus, and potassium. The secondary significance elements are Sulphur, magnesium, and calcium, *[Gordon, 2001]*.

The soil requires the regular maintenance of its fertility. Naturally, soil comprises of very fine rocks, different types of minerals, and organic matter due to the decomposition of the biological species. The proper tilth is supported by sand, minerals, and organic matter but these do not help in supporting and maintaining adequate amounts of food for the plant required for its nourishment and growth. At the time of plant growth, essential nutrients are required by the plant for its unimpeded growth. Incorporating fertilizers into the soil guarantees that the plant is getting proper nutrition during its development. *[Wang, 2005]*

Advantages of fertilizer

- Using fertilizer can increase your crop yields
- Plant growth can be enhanced
- Plants will be better able to protect against pests
- Important to use farming space efficiently
- Crucial to ensure the livelihood of farmers
- Can help to overcome poverty
- More stable and predictable yields
- Proven concept over many hundreds of years
- Fertilizer is quite cheap
- Can help to optimize the pH-value of the soil
- Supply of plants with everything they need
- Multiple crops yield a year
- Fertilizer is easy to transport and to store
- Less soil erosion, *[Dannefer, 2003]*.

Disadvantages of fertilizer

- Soil pollution
- Groundwater pollution
- Soil will become less fertile
- Short-term gains vs. long-term losses
- Chemical fertilizers are especially harmful
- Using fertilizers cannot be considered to be natural
- Harmful elements in our food
- Plants may grow too fast
- Alteration of ecosystems
- Agricultural workers may suffer as well
- Incorrect use can do more harm than good
- Overfertilization is a problem
- Fertilizers can harm microorganisms in the soil, *[Chandini, 2019]*.

2.3.1 Chemical Fertilizers and Risks

Fertilizers are mainly known to be beneficial for the production of crops and for making way to a bountiful harvest. But more people need to pay attention about their potential harmful effects on human health. A chemical fertilizer is a natural or synthetic substance that is applied to soil for the purpose of supplying nutrients essential to plant growth. Chemical fertilizers can be categorized into two types, namely organic and chemical. Here's how they differ: an organic fertilizer come from organic sources including plants and animal manure. These fertilizers are more eco-friendly but they are not ideal for commercial purposes since they tend to be expensive and have lower productivity, *[Serpil, 2012]*.

A chemical fertilizer, on the other hand, come from inorganic sources which undergo chemical processes, and they tend to be cheaper. They also provide much greater crop yield us compared to the organic type. However, these chemical fertilizers have a wide impact on human health. This potentially harmful chemical is called a pesticide. A pesticide, much like a chemical fertilizer, has also been making the rounds for its alleged short- and long-term harmful effects to humans.

Risks and Dangers

Chemical pesticide has been known for their ability to cause a wide array of negative health effects to humans. Pesticide exposure, for instance, can cause adverse health effects on humans, especially un safe pesticide levels. Excessive pesticide level is just as dangerous for human as the use of excessive quantities of fertilizer. These chemicals have also been linked to a number of detrimental impacts not only the eco system, but also to the human health, *[Kathryn,2010]*.

Effects on Human Health

Fertilizers are a combination of potentially harmful chemicals which can be absorbed by plants and possibly enter the food chain through cereals, vegetables and can even make its way through our drinking water. Aside from those, the direct and indirect effects of chemical fertilizers on human health range from minor adverse health effects to some major health risks. Food crops that are grown using inorganic fertilizer are known to be less nutrients, since it mainly targets the fast growth of plants rather than its nutritional value. Chemical fertilizers can cause problems with the heavy metals that can be found in it. These include lead, mercury, cadmium, and uranium, which can have a negative impact on the kidneys, liver and lungs. These heavy risks caused by chemical fertilizers can possibly happen through the plant macronutrients that it contains, including nitrogen, potassium, and phosphorous. The problem with chemical fertilizer is that it can infiltrate the soil, and can make its way to the groundwater and even surface water like rivers and lakes through runoffs, which can result in contamination, *[Nikita, 2020]*.

Effects on Environment

One of the harmful effects of fertilizers on the environment can be caused by eutrophication, a process by which a body of water gets an excess amount of the nutrient like nitrogen and phosphorous, which mainly happens because of the usage of chemical fertilizers both the water bodies and the land and agricultural soil are getting contamination [*Tilahun,2022]*.

2.4 Agro Textiles

Agriculture, forestry, horticulture, floriculture, fishing segments, landscape gardening, animal husbandry, aquaculture and agro-engineering all these sectors combined together are popularly called as Agro-tech sector. Agro textiles are the application of textile materials in those sectors. It is a very much important segment of **technical textile.** The word “agro textiles” is now used to classify the woven, non-woven and knitted fabrics, applied for Agro tech industries including livestock protection, shading, weed and insect control and extension of the growing season. With the continuous increase in population worldwide,

stress on agricultural crops has increased. So, it is necessary to increase the yield and quality of agro-products. But it is not possible to meet fully with the traditionally adopted ways of using pesticides and herbicides. Today, agriculture and horticulture has realized the need of tomorrow and opting for various technologies to get higher overall yield, quality and tasty agro-products, *[Priyanka, 2016]*.

2.4.1 Application of Agro Textiles

The selection of Agro-textile product is depends on crop needs. Selection of the agro textiles is also greatly influenced by the geographical location. Some of the applications of agro textiles are as follows:

- Sunscreen nets
- Bird protection nets
- Plant nets
- Ground cover nets
- Wind shield nets
- Root ball nets
- Insect protection nets
- Mulch nets
- Monofil nets
- Anti-hailstone nets
- Harvesting nets, *[Anup,2021]*.

Today agro textile plays a significant role to control environment for crop production, eliminate variations in climate, weather change and generate optimum condition for plant growth. Adopting the hi-tech farming technique, where textile structures are used, could enhance quality and overall yield of agro-products. Textile structures in various forms are used in shade house/ poly house, green house and also in open fields to control environmental factors like temperature, water and humidity. The need of textile goods in the field of agriculture has been stressed and their role in the reduced usage of harmful pesticides and herbicides to render a healthy farming culture underlined. Unique manufacturing techniques and properties of this blend of agro-textile sector products whose cost is lesser than that of pesticides and chemical herbicides have been emphasized. ‘Agro textiles’ gives multidimensional views and solutions to the problems being faced by agro industry. Textiles prove to be flexible in their suitability for specific geographical locations. [*Neha, 2022]*

2.4.2 Grow Bags

The new widely opened market in nurseries are grow bags. The old traditional grow pots are now replaced by the thick rigid and flexible plastic bags. The development of those plastic grow bags are drastic and widely used because they are more economical to replace the old rigid pots and they can be fold flat so that they don't take much space in warehouse, saving the growers storage cost. Many of them have the vent holes in grow bags that prevents the root rotting the punched holes take care of proper drainage. And those number of vents and their location will supply enough oxygen to the plant to breath, *[Abhishek, 2022]*.

Grow bags aren't without disadvantages. Watering the plant more frequently than the grow the pots is essential. Since they have more perforation more water can't stay. They are not so durable than grow pots they will long last only for 2-3 growing seasons. And another important disadvantage is they aren't biodegradable, they might harm the soil.

The jute grow bags are the nice innovation for alternatives for those plastic bags and mud pots to grow various kinds of plants. The important feature of the jute grow bags are they are biodegradable and eco-friendly. **The jute grow bags are called jute planters** which are created with the biggest aim to create a better version on environment, with rising concerns of pollution environmentalists are strongly advising to switch towards the usage of alternatives for the synthetic non biodegradables plastic grow bags. *[Mahmoud, 2020]*.

Methodology

The experimental procedure for the research, “Designing and Developing Novel Fertilized Jute Planters”, has been carried out in different phases as given below:

3.1 Selection of Fabric

3.2 Desizing of Jute Fabric

3.3 Selection of Source

3.3.1 Epsom Salt (Magnesium Sulfate)

3.3.2 Coffee Ground

3.4 Finishing of Fabric by Dip and Dry Method

3.5 Preparation of Grow Bags

3.5.1 Making Pattern for Grow Bag

3.5.2 Cutting the Fabric

3.5.3 Sewing the Grow Bag

3.6 Preparation for Plant Culture Study

3.6.1 Preparation of Soil

3.6.2 Selection of Plant

3.6.3 Sowing

3.7 Evaluation of the Treated Fabric

3.7.1 Thickness of the Fabric

3.7.2 Weight of the Fabric

3.7.3 Stiffness of The Fabric

3.7.4 Absorbency of The Fabric

3.7.4.1 Sinking Test

3.7.4.2 Wicking Test

3.8 Evaluation of the Soil

3.9 Evaluation of the Plant Growth

3.1 Selection of Fabric

Jute grow bags allows the roots to breath and the air circulation makes the healthy plant and avoids most soil diseases. Jute bags are perfect for organic gardening of vegetables and flowering plants. No chemicals or plastic so safe for nature. Since jute is a natural fiber and biodegradable in nature, by using jute instead of plastics we could save the environment by plastic pollution. Jute has large number of benefits to be selected like strength and durability. They decompose easily and give back the useful nutrients to the soil, unlike other synthetic fiber. As jute fiber are an exclusive plant product, they are accustomed to bear harsh environments. They require very low maintenance and long lasts for 12-14 months as compared to others. Considering the above given benefits of jute, it was selected for making grow bags in this research work, the selected jute fabric is shown in Appendix I, *[Sinha, 2008]*.

3.2 Desizing of Jute Fabric

Desizing is a process by which sizing materials are removed from woven fabrics. It is a part of the pretreatment process in textile wet processing. This is the first wet processing in the textile finishing process used to remove sized materials from the warp yarn of woven fabric. This must be done before any subsequent wet processing of the fabric. Because of this, warp yarns are coated with sizing elements to reduce their frictional properties, to reduce broken yarns on looms, etc. After desizing, the absorption of the fabric increases. As a result, the fabric can easily absorb chemicals, dye molecules, *[Sachin,2022]*. Desizing can be carried out in different methods namely Enzymatic desizing, Oxidative desizing, Acid steeping, Rot steeping (use of bacteria), Desizing with hot caustic soda treatment, Hot washing with detergents, *[Poulomi,2018]*. Among these various methods this is the most basic method of desizing the fabric. Hence the jute fabric was soaked over night in water and later dried. The desized fabric is shown in Appendix II.

3.3 Selection of Source

The jute fabric can be finished with suitable selected source to enhance the growth of the plant. considering this the investigator decided to finish the selected jute fabric.

3.3.1 Epsom Salt (Magnesium Sulfate)

Epsom salt is completely different from table salt, it is named from its chemical composition. Magnesium sulfate is a magnesium salt having sulfate as the counterion. It has a role as an anticonvulsant, a cardiovascular drug, a calcium channel blocker, an anesthetic, a tocolytic agent, an anti-arrhythmia drug, an analgesic and a fertilizer. It is a magnesium salt, a metal sulfate and an organic magnesium salt. *[Zhilei, 2021]*.

Using Epsom salt in gardening is not a new tradition, it has been a favorite fertilizer/pesticide and a best friend for some plants. Because of its major role in the growth of plants, it plays the best part in concepts of 'green living' and organic gardening. Epsom salt is growing popular among the gardeners because Epsom salt is the unique answer for variety of organic gardening needs. It is very cost effective, affordable to all types of gardeners, plants easily accept it and has very fewer side effects on plants. Using Epsom salt is safe and it is a natural product that is available at home for many health and beauty uses, *[Mondy,,2022]*. Magnesium sulfate gives more goodness for the plant growth such as in seed germination, enhances the absorption rate of the plant, it also acts as a pesticide, it also gives high yield, *[Mareike,2023]*. Considering these factors Epsom salt is chosen as source for this study.

3.3.2 Coffee Ground

Coffee grounds contain several key minerals for plant growth — nitrogen, potassium, phosphorus. Coffee grounds are **about 2% nitrogen by volume.** Coffee grounds are close to pH neutral (between 6.5 to 6.8 pH). Coffee grounds improve soil tilth or structure, *[Yongjun,2017]*.

Coffee has undeniable benefits when it comes to waking up the human body. However, its power is not limited to the kitchen. Instead, this caffeinated staple is equally as impactful in the garden, where experts are using coffee grounds to benefit their plants. "Used coffee grounds – left over from using a coffee maker – contain a substantial amount of nitrogen, as well as potassium and phosphorus," says coffee expert Lewis Spencer of Coffee Direct. These properties make them perfect for garden activities, such as composting. It's an innovative way to make use of something that would otherwise have ended up in landfill. The high nitrogen content makes used coffee grounds a good growing companion for roses, as it helps take the pH from neutral to acidic, which is useful for the growth of the rose plant. *[Jakyeom, 2015]*.

Lewis Spencer says that sprinkling coffee grounds in the soil next to the plant, but others warn that you should be careful not to put too much on as the high nitrogen content but sprinkling too much can be harmful for the plants. Considering the above given facts, the used coffee ground is selected for the study.

3.4 Finishing of Fabric by Dip and Dry Method

Finishing can be done in various methods such as microencapsulation, padding mangle, spray coating, electroplating, electropolishing, powder coating and more, *[Rusznák, 1973]*. Among those dip and dry method are one of the simplest methods employed to treat the fabric with something we need to finish the fabric with. This dip and dry method are generally known as Dip Coating. Dip coating refers to the immersing of a substrate into a tank containing coating material, removing the piece from the tank, and allowing it to drain. The coated piece can then be dried by force-drying or baking, *[Gokhan , 2012]*.

In order to see the effect of the amount of selected sources, namely Epsom salt and coffee ground two ratios such as the amount of water which was required for the complete immersion of the jute fabric and the same amount of source is taken (1:1). Another ratio 1:2 where in twice the amount of source taken to treat the jute fabric. In this manner four jute fabrics namely 1:1, 1:2 Epsom salt treated and coffee ground treated were prepared. The prepared samples are shown in Appendix III, IV, V, and VI respectively.

Stages of dip coating

The dip coating process can be categorized into three main stages,

- **Immersion/dipping stages**: this is the stage where the fabric is treated by immersing or dipping the fabric into the solution which is to be treated on the fabric for six to eight hours as per need. The desized fabric immersed into the solution containing Epsom salt (magnesium sulfate) and coffee ground in four different ratios as per the need of my study in five different tubs. **Dwell time**: the substrate remains fully immersed and motionless to allow for the coating material to apply itself to the substrate.

- **Withdrawal stage:** the substrate is withdrawn, again at a constant speed to avoid any judders. The faster the substrate is withdrawn from the tank the thicker the coating material that will be applied to the board.

- **Drying stage:** the treated jute fabric is thoroughly in shadow until the wetness goes fully. The dip coating process represented below as picture, *[Lorenzo, 2018]*.

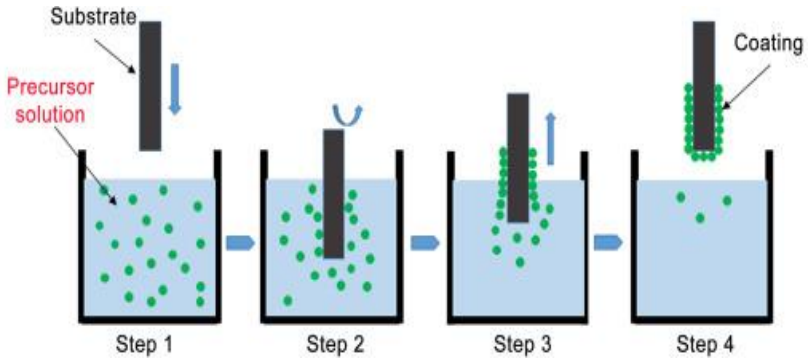


Figure 1

3.5 Preparation of Grow Bags

The process of preparing grow bags for the study has been carried out in different stages are discussed below.

3.5.1 Pattern Making

For the construction of the grow bag the preliminary process is pattern making. In the garment industry, the form that is made by drawing a replica of each part of a garment on a flat cardboard is called a pattern. Separate patterns are made for each part of the garment. These patterns are used to paint each part of the garment on the cloth or on marker paper before cutting the cloth. *[Kamrun,2018]*. The steps in construction for the pattern making is given below,

- Firstly, the fabric is spread in the cutting table and all the wrinkles, folds, creases are ironed evenly for the neat construction of patterns for grow bags.

- An average size of grow bag for tomato and rose plant is 30cm wide and 37cm deep, *[Sanjay, 2017]*. According to the average size the pattern has been made.

- A straight line is drawn A to B for 37 cm which is the length of the bag. And A to D 30 cm which is the width of the bag. AB is parallel to DC and AD is parallel to BC. The pattern making has been shown in the Plate (1) given below.

3.5.2 Cutting

- The second stage of the preparation of grow bags is cutting down the fabric along the pattern made before. The pattern can be traced to the fabric by the help of tracing wheel and tracing paper, *[Naresh,2022]*.

- The pattern has been traced in the fabric and cut along the tracing line with the help of a sharp iron scissor for a neat and sharp edges. The cutting of the fabric is shown in the Plate (2) given below.

3.5.3 Sewing

- The growbag designed for the study is consist of two pieces of fabric. Firstly, the hem line of the grow bag is finished with rolled hem stitch and the raw edges of the seam line is finished with plain stitch. The sewing was constructed in Juki sewing machine (LH 4500C), *[Henna, 2012]*.

- Then it is turned inside out and the corners of the growbags are set fit with the help of a measuring scale. The sewing of the fabric is given below in Plate (3).

- In this manner six grow bags where constructed such as two with the original jute fabric, two with Epsom salt with ratio 1:1, 1:2 and two with coffee ground with ratio 1:1, 1:2.

Plate 1

Plate 2

Plate 3

3.6 Preparation for Plant Culture Study

Plant culture study is the ultimate aim of this research, pot culture refers to the growth of desired plant in pots under artificial conditions like green house. Pot culture study is an experimental analysis with serves the growth analysis for examining the changes of the plant growth such as growth rate, root length, shoot length, number of leaves and more, *[Kishore ,2018]*.

3.6.1 Preparation of Soil

Healthy soil is the basis of healthy plants and a healthy environment. When garden soil is in good shape there is less need for fertilizers or pesticides. Organic soil is rich in humus, the end result of decaying materials such as leaves, grass clippings and compost. It holds moisture, but drains well. Good organic garden soil is loose and fluffy filled with air that plant roots need and it has plenty of minerals essential for vigorous plant growth. It is alive with living organisms from earthworms to fungi and bacteria that help maintain the quality of the soil. Proper pH is also an essential characteristic of healthy soil, *[María,2023]*.

The garden soil is mixed with some ingredients such as sand, cocopeat, vermicompost etc; because very plant has different needs, some require more nutrition, others may want fast draining soil or some require good water retention quality, etc. cocopeat is the lifeline for gardening at home, it is basically the coconut dust that comes out of the coconut husk & is available in the market in the form of a brick. Coco peat is essential for container gardening. Because it can retain moisture for a long period of time and also allow roots to grow freely which the normal garden soil fails to do, *[Blum,2005]*. Considering the above given facts, the preparation of the soil included mixing of cocopeat – 20%, sand – 10%, to the 70% of farming soil. The soil was thoroughly mixed and used for filling the jute grow bags.

3.6.2 Selection of Plant

The plant culture study can be done in the selected plant which is suitable for the study. Considering this the investigator decided to select the required plant.

3.6.2.1 Rose Plant

Rose**,** (genus *Rosa*), genus of some 100 species of perennial shrubs in the rose family (Rosaceae). Roses are native primarily to the temperate regions of the Northern Hemisphere.

Many roses are cultivated for their beautiful flowers, which range in color from white through various tones of yellow and pink to dark crimson and maroon, and most have a delightful fragrance, which varies according to the variety and to climatic conditions. Roses are very fond of water and require one to two inches of it every week, *[Feng,2018]*. During the hot, dry season, even more, may be needed depending on the size of the bushes. Usually rose plant takes 45 to 50 days to come to flowering after sowing. Magnesium is an essential element that helps roses maintain beautiful green foliage while preventing discoloration and premature leaf fall. The most significant sign of a Magnesium shortage in the soil will be the brown blotches that appear on the leaves, while a yellowing on the inside of the leaves between the veins will also be evident. The oldest leaves will be worst affected, *[Yasmeen,2019]*.

3.6.2.2 Tomato Plant

Tomato plant is a dicot and herbaceous plant. The plant forms a pile root that grows to a depth of up to 2 meters (6,6 ft.). It develops vines that grow as branching stems. At the top, there is a terminal bud. When this bud stops developing further, the plant takes the sign to start growing peripheral buds and consequently new vines. Tomato leaves are usually compound; however, some varieties have simple leaves 10-25 cm (4 -10 inches) long, pinnate with 5-7 leaflets, *[Muriel,2019]*. Both the vines and the leaves are covered with tiny hairs. Tomato seeds typically germinate in 5 to 10 days if given optimal conditions. we know seeds have germinated as soon as you see green plant emerging from the growing medium. After sowing the first fruit will appear within 65 to 70 days of sowing. Magnesium is an essential nutrient for the tomato plant growth, magnesium helps with seed germination, chlorophyll production, fruit development, strengthening cell walls, and improving uptake of nitrogen, phosphorus, and sulfur. The main sign of a magnesium deficiency in tomato plants is yellow leaves with distinct green veins, a phenomenon known as 'interveinal chlorosis'. Magnesium is an important nutrient that powers chlorophyll production, so what you're seeing is chlorophyll-less leaves, *[Salem,2013]*. Considering the above given facts based upon the information reviewed rose and tomato plants were selected for the study.

3.6.3 Sowing

Sowing is a process of planting seeds into the soil, it plays an important role in farming, *[Podolska,2001]*. Once, after the soil is loosened and ploughed, the good, disease-free and pure quality of seeds are selected and sown into the soil. After selecting seeds of good quality, they are sown on the prepared land. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. Sowing density determines the amount of light available for plants, affects the efficiency of photosynthesis, and has an impact on the plant nutrition area. Sowing at the correct time is crucial to growing a successful crop, but there are different constraints on sowing time in different parts of the world. *[Angelique,2020]*.

- For sowing the prepared grow bags are set in the appropriate place where the plants are going to be grown. Care was taken to check if the plants will be able to get enough sunlight and air. The bag is opened well to fill up the soil mixture to the bag, using some gardening tools the soil was filled with in the bag gradually. Three fourth of the grow bag is filled with soil and set for sowing.

- Generally, most of the vegetable plants are grown by sowing seeds which are available with farmers, nurseries and in agricultural centers. These seeds are dried and preserved, hence the time for the germination is said to be longer than the fresh tomato seeds with this view the investigator selected very ripped tomatoes and carefully cut them into small pieces and placed them on a neat tray to be taken for sowing. Care was taken to see that each slice of tomato has minimum of four to five seeds.

- For sowing three pieces were placed in three bags namely original, 1:1, and 1:2 grow bags treated with Epsom salt and coffee ground respectively were covered completely with the prepared soil mixture. For growing rose plant three methods are normally followed. The most traditional and the oldest technique is collecting pollination seed from rose plant and sowing this requires minimum of 90 days for the first shoot to appear. The second method is a mode of vegetative reproduction is plants where the stems are cut and placed tightly in soil, this method is also time-consuming process. The third method is the most commonly followed method where in sapling are purchased from nurseries and replanted.

- Considering the time limitation of the study the investigator selected the third method of sowing rose plants. Very small saplings three were purchased from commercial outlets. Since the study involved the effects of the treated substance on the growth of the plant, the purchased sapling where carefully opened and the roots and stem were gently tapped off. All the three saplings were placed on a neat tray and roots and shoots where trimmed and the leaves were removed gently removed. In the soil filled grow bags namely original, 1:1, 1:2 treated with Epsom salt and coffee ground a small hole was made in the center of the soil and the one plant was placed in each of the grow bags firmly and covered with the prepared soil care was taken to plant the stem steadily without any air bubbles in between.

- In the soil filled grow bag dig a hole for planting the rose plant's root into the soil. After placing the root inside the soil, close the root by covering it by soil. In the case of tomato, the live seed is sowed for germination in the equal interval of space.

- After sowing, watering is the most essential part of growing plant. Water helps in the germination of seeds, and it helps in the process of photosynthesis by which plants prepare their food and also Water helps in the transport of nutrients and minerals from the soil to the plants. the plant is watered two times a day as per the requirement.

3.7 Evaluation of the Treated Fabric

Testing is a critical part of textile production and helps companies develop textiles to the quality and standard they wish. Textile testing can be defined as "Examining and determining the physical, mechanical and chemical properties of a textile." Textile testing is the application of engineering knowledge and science to the measurement of the properties and the characteristics of the textile materials. It involves the use of techniques, tools, instruments and machines in laboratory for the evaluation of the properties of textiles. These tests are carried out as per standards. The organizations/ standard involved in textile testing are American society of testing chemist and colorist (ASTCC), American association of textile chemist and colorist, American apparel manufacturers association (AAMA), American society for testing and material (ASTM), Bureau of Indian standards (BIS), and British standard institute (BS). The textile testing is influenced by the factors such as the equipment,

the person taking test, and the atmospheric conditions. Hence to overcome the problem of the atmospheric conditions, preconditioning is done using the humidity chamber as per standards ASTMD1776 to obtain uniform and occurate results.

3.7.1 Thickness of the Fabric

The thickness of the fabric is seen by a equipment thickness tester. standard test method used – IS7702 & ASTMD1777, Unit expression– mm, Sample size – 34.2mm. loading weight is placed on the weight pan specified pressure foot is fitted on mounting rod lifting lever is pressed and pressure foot top is lifted the specimen is placed on the anvil and lifted lever is released gently. The downward pressure is applied on pressure foot on specimen. Reading of the dial gauge is noted to get specimen thickness in mm. the same procedure is repeated for six different treated fabric. the thickness tester is a table top model with rugged mild steel body. It has two pressure foots and four pressure weights as per standards. The pressure foot sizes are 28.7mm and 25.0mm pressure weight is 4.14Kpa, 5Kpa, 1Kpa, and 10Kpa.

3.7.2 Weight of the Fabric

The weight of the fabric is tested by GSM cutter and weighed in a weighing machine. standard test method used – ASTMD2646, unit expression- grams per square meter (gsm). Sample size- 112.82+ 0.3 mm. The pad is placed on smooth surface table fabric is fabric. The lock is removed by pulling and rotating in clockwise direction. The fabric is gripped between outer base and rubber pad for accurate cutting of fabric the cut fabric is weighed using electronic balance. This value is multiplied by 160 to get gsm of fabric (obtained in grams). The gsm cutter used for assessing fabric weight is GSM cutter. This is used to cut the fabric. It has sample cutter with safety catch lock. It has 4 replaceable blades. Special grade cutting pads are used for cutting fabrics. Electronic weighing balance with four decimals is used for weighing the sample.

3.7.3 Stiffness of the Fabric

With the use of stiffness tester, the stiffness of the fabric is evaluated. standard test method used- ASTMD1388, unit expression- bending length= cms. Sample size- 800×25mm. The instrument is placed on a table so that horizontal platform and inclined references is held in horizontal plane and pushed along with the fabric specimen slowly and steadily. The fabric leading edges project beyond platform. The part of specimen will be our hang and start a

way. That the 2 inclined line of the tester coincide. The pushing of specimen is stopped when its tip reaches the level of inclined plane. If the specimen has the tendency to twist, the reference point at the center of leading is recorded for warp and weft separately. Four readings for each specimen are taken from each side up, first at one end and then at the other four specimens in warp way and weft way are taken. the stiffness tester is made of mild steel and top plate of stiffness steel to minimize friction between it and test specimen. The sides are made up of two acrylic plates. The inclined plate on the plane is filled with black ink for permanent makings. It has a scale with backup weight to give required lead on specimen. It has a rubber lining at the lower surface to grip the specimen.

3.7.4 Absorbency of the Fabric

The absorbency of the fabric can be evaluated by two different methods namely sinking test and wicking test of the fabric.

3.7.4.1 Sinking Test

For evaluating the sinkability a beaker with distilled water and stop watch is needed. the specimen of size 25×25 mm piece is cut and dropped onto the surface of distilled water taken by the specimen to sink in water is recorded in seconds. If the sample does not sink within one minute, it is considered as floated.

3.7.4.2 Wicking Test

To perform this test, distilled water, beaker, glass rod, dye solution, incredible ink, stop watch are required. standard method used- AA TCC TM-197, sample size -150×25mm, the test specimen is suspended such that 20mm is immersed in the dye solution, after marking 20mm with incredible inks. This suspended fabric, depending on its absorbency properly, exhibits the rise of the liquid in one minute. In one minute, the level of rise is noted in mm or cm. all the treated fabrics are tested in the same procedure and the reading are recorded for calculations.

Plate 4

Plate 5

Plate 6

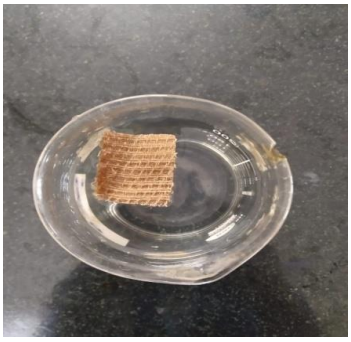


Plate 7

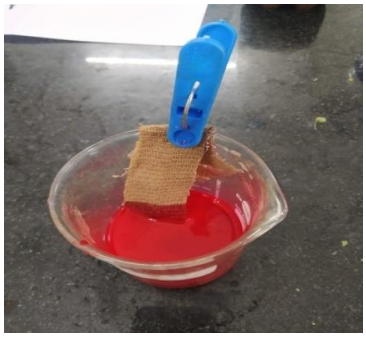


Plate 8

3.8 Evaluation of the Soil

The diagnosis of the nutrient status of the soil by using different techniques or methods is known as soil fertility evaluation. Soil analysis is a very valuable tool in nutrient management. Most importantly, it enables us to predict and determine the proper amount of nutrients that should be added to a given soil based upon its fertility needs. Soil fertility is the ability of soil to sustain plant growth and optimize crop yield. This can be enhanced through organic and inorganic fertilizers to the soil, *[Marinina,2018]*. Nuclear techniques provide data that enhances soil fertility and crop production while minimizing the environmental impact. A soil test can determine fertility, or the expected growth potential of the soil which indicates nutrient deficiencies, potential toxicities from excessive fertility and inhibitions from the presence of non-essential trace minerals. The test is used to mimic the function of roots to assimilate minerals. The basic primary nutrient of the soil is nitrogen. And the secondary important nutrient is magnesium. Evaluating these two nutrients in the soil is essential for a healthier plant, *[Shakil,2020]*. Therefore, the investigator collected the soils

from the original, 1:1, 1:2 treated grow bags of Epsom salt and coffee ground respectively. These soil where neatly packed and given for soil testing to evaluate the nutrients absorbed by the soil from the treated fabric the test was carried out in Tamil Nadu Agricultural University, TNAU - RI Block, Tamil Nadu Agricultural University, Lawley Rd, P N Pudur, Tamil Nadu 641003.

3.9 Evaluation of Plant Growth

The plant growth and development involve the study of the growth under the controlled condition, the evaluation of the plant includes the changes in root length, shoot length number of leaves flowers and buds in response to the environmental condition such as climatic changes. Environmental factors that affect plant growth include light, temperature, water, humidity and nutrition, *[David,2021]*. It's important to understand how these factors affect plant growth and development. Growth refers to the irreversible change in the size of the cell, organ or whole plant. Plant growth analysis is required to explain the differences in plant growth in terms of differences between species growing under same environmental condition or differences within a species growing in different environments, *[Constantin,2023]*. Due to time limit the study period was restricted to 45 days. The investigator measured the number of leaves, branches and height of the root and shoot on the 45^{th} day.

3.10 Statistical Analysis

All the collected data with reference to evaluation of the treated fabrics where statistically analyzed. The mean can be used to represent the typical value and therefore serves as a yardstick for all observations. The mean represents the average value in a dataset. The mean is important because it gives us an idea of where the center value is located in a dataset. The mean is also important because it carries a piece of information from every observation in a dataset. Mean is an essential concept in mathematics and statistics, *[Manikandan,2011]*. The mean is the average or the most common value in a collection of numbers. In statistics, it is a measure of central tendency of a probability distribution along median and mode. It is also referred to as an expected value.

Results and Discussion

4. Results and Discussion

The result and discussion of the study entitled “Designing and Developing Novel Fertilized Jute Planters”, is given under the following headings.

4.1 Thickness of the Jute Fabric

4.2 Weight of the Jute Fabric

4.3 Stiffness of the Jute Fabric

4.4 Absorbency of the Jute Fabric

4.4.1 Sinking of the Jute Fabric

4.4.2 Wicking of the Jute Fabric

4.5 Pot Culture Analysis of Fertilized Jute Planter

4.6 Evaluation of Soil Nutrient

4.1 Thickness of the Jute Fabric

The thickness of the original and finished jute fabric has been manifested in Table I and the Anova values in Table I (a) and in Figure I

Table I

Thickness of the Jute Fabric

S NO	Name of the sample	Thickness of the sample (mm)	Gain or loss over the original (mm)	% of loss or gain over the original
1	O	1.27		
2	A	1.60	-0.33	26
3	A1	1.63	-0.36	28
4	B	1.51	-0.24	19
5	B1	1.53	-0.26	20

O – Original sample

A – 1:1 $Mgso_4$ (Epsom salt) Treated

A1 – 1:2 $Mgso_4$ (Epsom salt) Treated

B – 1:1 coffee ground Treated

B1 – 1:2 coffee ground Treated

Table I (a)

Anova between original and treated samples

Variable		Mean	SD	SE	F – value	P – value
Thickness	A	25.98	0.01	0.01	434588.138	.000**
	A1	28.34	0.02	0.01		

	B	18.89	0.02	0.01		
	B1	20.47	0.02	0.01		

****=Significant at 1% level**

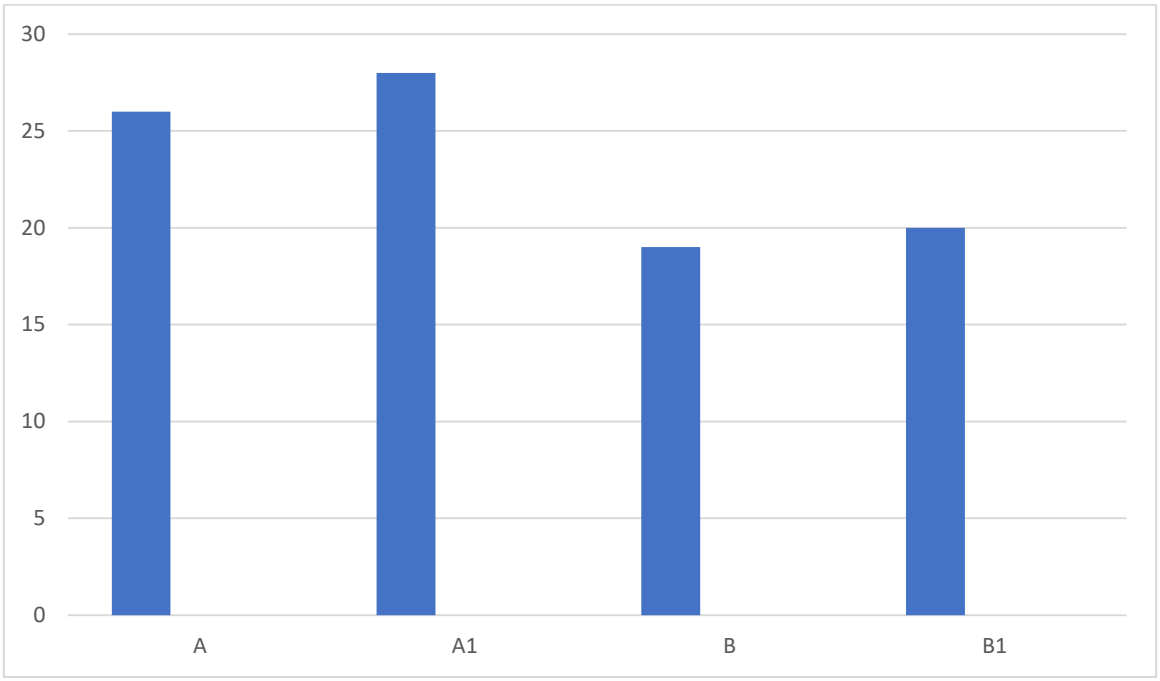


Figure 1

Thickness of the Jute Fabric

From the Table I, Table I(a) and Figure 1 it is clear that when comparing the thickness of the finished samples to the original, the increase is minimum in sample B as 19%, and the maximum increase is in sample A1 as 28% respectively. When comparing the increase of thickness between the concentration it is clear that the thickness has increased in every sample respectively. Similar increase in thickness of the jute after treatment with natural sources is expressed by Kamala Ranganathan and S. Amsamani "Jute-Cotton Blend Offers Adequate Scope for Making Tshirts" Textile Magazine, February 2005, 47-49.

As far as the sources are compared $Mgso_4$ shows the higher increase in thickness of the jute fabric. The two-way anova statistical analysis portraits that the significant difference between the thickness of the original and the treated sample at 1% level. Hence it could be concluded that there is an effect of the fabric absorbing the finishing source.

4.2 Weight of the Jute Fabric

The weight of the original and the finished jute fabric is portrayed in the Table II, Table II(a) and Figure 2.

Table II

Weight of the Jute Fabric

S.no	Name of the sample	Weight of the sample (g)	Gain or loss over original (g)	%of gain or loss over original
1	O	3.28		
2	A	3.95	-0.67	20
3	A1	3.98	-0.7	21
4	B	3.78	-0.5	15
5	B1	3.80	-0.52	15

O – Original sample

A – 1:1 $Mgso_4$ (Epsom salt) Treated

A1 – 1:2 $Mgso_4$ (Epsom salt) Treated

B – 1:1 coffee ground Treated

B1 – 1:2 coffee ground Treated

Table II (a)

Anova between original and treated sample

Variable		Mean	SD	SE	F – value	P - value
Weight	A	20.42	0.02	0.01	193809.833	.000**
	A1	21.34	0.02	0.01		
	B	15.24	0.02	0.01		
	B1	15.85	0.02	0.01		

****=Significant at 1% level**

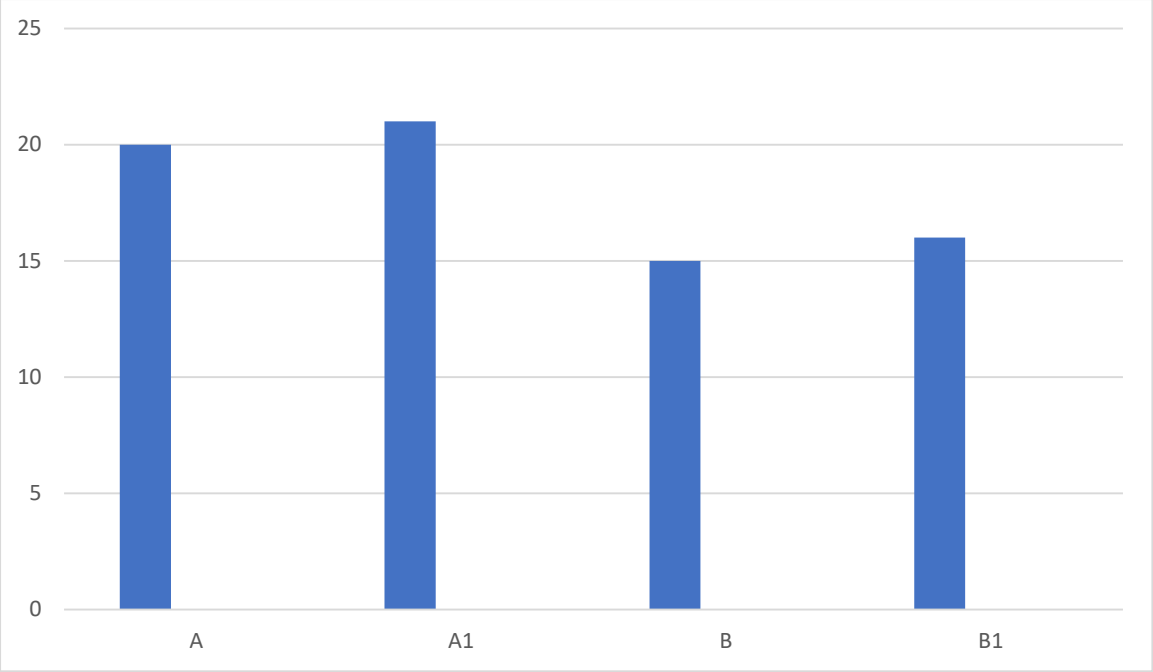


Figure 2

Weight of the Jute Fabric

The Table II, Table II(a) and Figure 2 show that the weight of the original and the treated jute fabric has increased maximum in the sample A1 by 21% and the minimum increase is happened in sample B by 15% respectively.

The weight increase in the treated jute fabrics is increased irrespective of the concentration and type of source used. This result is in par with the study, “S. Amsamani and PerarVeena “Jute Cotton Union Fabric for Apparel” Textile Trends, December 2005, Vol.XLVIII, No.9, 49-50”.

The anova results in the table II(a) between the original and the treated fabric proves that there is a significant difference between the weight of the original and the treated sample at 1% level. Hence, it could be concluded that the weight of the jute fabric has increased after the treatment irrespective of the type of finishing source.

4.3 Stiffness of the Jute fabric

Table III, Table III(a) and Figure 3 discusses the stiffness of the original and the finished jute fabrics.

Table III

Stiffness of the Jute Fabric

S NO	Name of the sample	Stiffness of the fabric(cm)over original		Gain or loss over the original(cm)		% of loss or gain over original	
		Warp	weft	Warp	weft	Warp	weft
1	O	1.6	2.06				
2	A	1.7	2.1	-0.1	-0.04	6	2
3	A1	1.8	2.1	-0.2	-0.04	12	2
4	B	1.8	2.03	-0.2	-0.03	12	1
5	B1	1.9	2.2	-0.3	-0.14	19	7

O – Original sample

A – 1:1 $Mgso_4$ (Epsom salt) Treated

A1 – 1:2 $Mgso_4$ (Epsom salt) Treated

B – 1:1 coffee ground Treated

B1 – 1:2 coffee ground Treated

Table III(a)

Anova between original and treated sample

Variable		Mean	SD	SE	F – value	P – value
Stiffness – Warp	A	6.25	0.02	0.01	10313.531	.000**
	A1	12.50	0.16	0.07		
	B	12.50	0.16	0.07		
	B1	18.75	0.02	0.01		
Stiffness – Weft	A	1.94	0.02	0.01	126734.667	.000**
	A1	1.94	0.02	0.01		
	B	1.45	0.02	0.01		
	B1	6.79	0.02	0.01		

****=Significant at 1% level**

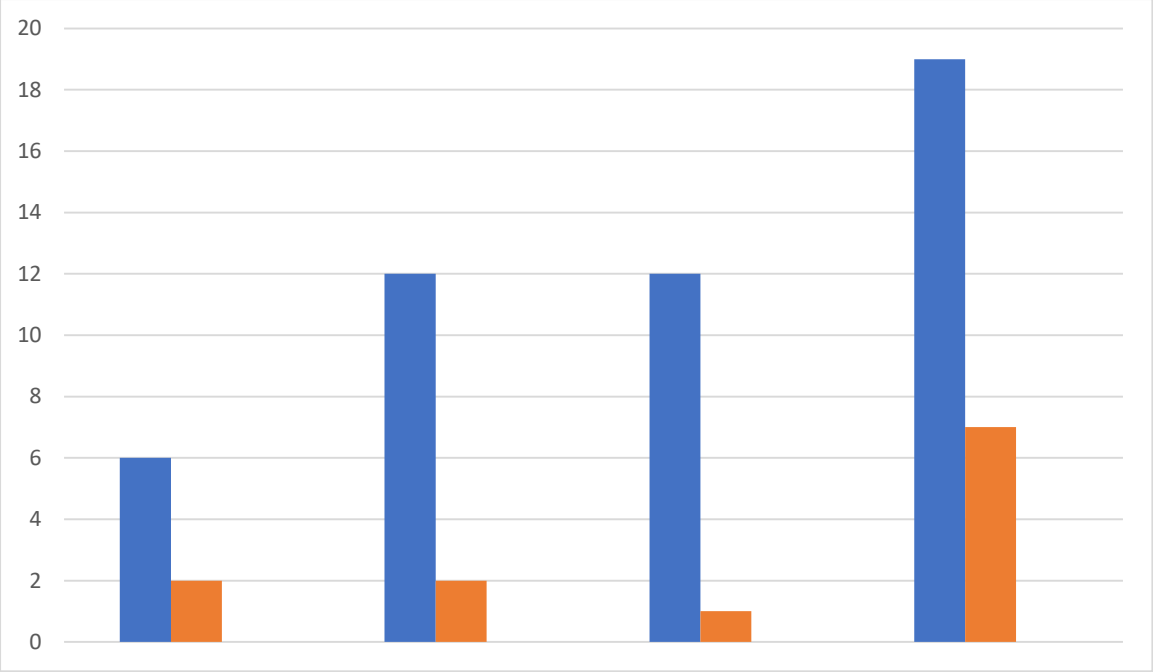


Figure 3
Stiffness of the Jute Fabric

From the Table III, Table III(a), and Figure 3 it is clear that the warp and weft stiffness has increased after the finishing with both the sources. In the case of the warp direction the stiffness is more than the weft direction. The maximum increase in stiffness is observed in sample B1 irrespective of the direction as 19% and 17% respectively. The study proves that higher concentration higher stiffness. This also acceptable as per the paper published by "Chatopadhyay et., al(2010), Finishing of Jute Fabrics for Value Added Products".

On comparing the stiffness in the warp direction between the $Mgso_4$ treated samples the stiffness has increased twice the amount of the salt used. Where as in the case of coffee ground the stiffness has increased 1/3 % only. In case of the weft direction the stiffness is same in $Mgso_4$ irrespective of the concentration.

4.4 Absorbency of the Jute Fabric

The absorbency of the jute fabric is carried out in as sinking and wicking of the fabric. The absorbency of the jute fabric is figured out in Table IV. The anova values of the original and treated samples are discussed in Table IV(a).

4.4.1 Sinking of the Jute Fabric

Table IV

Sinking of the Jute Fabric

SNO	Name of the sample	Sinking of the sample (sec)	Gain or loss over the original	% of gain or loss over the original
1	O	2.23		
2	A	4.16	-1.93	86
3	A1	4.19	-1.96	88
4	B	30	-27.77	12
5	B1	4.13	-1.9	67

O – Original sample

A – 1:1 $Mgso_4$ (Epsom salt) Treated

A1 – 1:2 $Mgso_4$ (Epsom salt) Treated

B – 1:1 coffee ground Treated

B1 – 1:2 coffee ground Treated

Table IV(a)

Anova between original and treated sample

Variable		Mean	SD	SE	F – value	P – value
Sinking	A	86.00	1.58	0.71	9161.291	.000**
	A1	87.78	0.13	0.06		
	B	12.41	0.41	0.18		
	B1	67.30	0.16	0.07		

****=Significant at 1% level**

The Table IV and Table IV(a) clearly reveals that the absorbency of the jute fabrics which has increased by 88% as maximum increase in sample A1 in sinkability and the minimum increase in sinkability is 12% in the sample B respectively.

The anova results Table IV(a) on comparison between the original and the treated samples shows that the significant difference between the stiffness of the original and treated samples at1% level. Hence, it could be concluded that the increase in absorbency due to the deposition of the finishing source on the jute fabric.

4.4.2 Wickability of the Jute Fabric

Table V

Wicking of the Fabric

S NO	Name of the sample	Wicking of the sample (cm)	Gain or loss over the original	% of gain or loss over the original
1	O	1.5		
2	A	20	-18.5	12
3	A1	22	-20.5	13
4	B	11	-12.5	15
5	B1	22	-20.5	13

O – Original sample

A – 1:1 $Mgso_4$ (Epsom salt) Treated

A1 – 1:2 $Mgso_4$ (Epsom salt) Treated

B – 1:1 coffee ground Treated

B1 – 1:2 coffee ground Treated

Table V(a)

Anova between the original and the treated fabric

Variable		Mean	SD	SE	F – value	P – value
Wicking	A	12.33	0.02	0.01	9.329	.001**
	A1	13.60	0.16	0.07		
	B	15.00	1.58	0.71		
	B1	13.60	0.16	0.07		

****=Significant at 1% level**

The Table V concludes that when compared to the original, the increase is minimum in sample A of 12.33% and the increase is maximum in sample B of 15% respectively. When comparing the increase in wickability between the concentrations it is clear that the wickability has increased in every sample respectively. The two-way anova statistical analysis portraits that the significant difference between the wickability of the original and treated samples at 1% level. This fact is also expressed by Nayab-ul Hossain et al (2023) where in natural colour treated fabric can replace the low water vapour transmission. Considering the above given increase in wickability, it could be concluded that the

absorbency is increased because of the treatment with the finishing source.

4.5 Pot Culture Analysis of Fertilized Jute Planter

The results of the pot culture analysis are expressed in the Table VI, Table VII The pot culture study has undertaken for rose plant for 45 days. Rose plant is chosen for its easy availability and faster growth so that it can reduce the time constrain factor of the study. The growth of the rose plant is under analysis for next 45days after planting the sapling. The obtained results of the pot culture study are compared and discussed below.

Table VI

Analysis of Rose Plant

Parameters	**Original Grow Bags (O)**		**1:1 Treated Grow Bag (A)**		**1:2 Treated Grow Bag (A1)**	
	Day 1	Day 45	Day 1	Day 45	Day 1	Day 45
Root length (Inches)	3	3.5	2.8	4.1	2.9	4
Shoot length (Inches)	8	11	8	15	8	16
Number of leaves	17	20	19	42	18	40
Number of flowers	Nil	Nil	Nil	1	Nil	Nil
Number of buds	Nil	Nil	Nil	Nil	Nil	1
Number of branches	3	5	3	7	3	7

From the above table it is clear that the root, shoot length, number of leaves, number of branches, number of flowers are increased when comparing to the original. It is so obvious that the root length of the original, A and A1 has increased 0.5, 1.3, 1.1 inches respectively. And the shoot length of the original, A and A1 has increased by 3, 7, 8 inches respectively. On the whole it could be concluded that there is an increase compared to the original jute bag and the treated bags. When comparing the concentration of $Mgso_4$ 1:1, 1:2 they show only minimum difference or no difference at all. Therefore, it could be concluded that the minimum concentration of 1:1 is sufficient to help the plants to grow better. Hence it could be concluded that the faster growth could be the effect of the grow bag absorbing the finished fertilizer source.

Table VII

Analysis of Tomato Plant

Parameters	Original Grow Bags	1:1 Treated Grow Bag	1:2 Treated Grow Bag
Root length (Inches)	1	2	1.5
Shoot length (Inches)	7	9	10
Number of Leaves	18	30	21
Number of branches	4	7	5

The above table clearly portrays that all the parameters root length, shoot length, number of leaves, number of branches has drastically increased when compared to the original, the root length has increased 0.5, 1 inch respectively, same as the shoot length has increased 2, 3 inches respectively, and 12, 3 leaves are more than the original and 3, 1 branch are more than original respectively. When comparing the concentrations of the finishing source 1:1 gives the better results than 1:2. Therefore, it could be concluded that the minimum concentration of 1:1 is sufficient to enhance the plant growth. On the whole it could be concluded that the result is better in the treated grow bag when comparing to the original grow bag it could be the effect of the grow bag absorbing the finishing source.

4.6 Evaluation of Soil Nutrient

The results of evaluation of soil nutrient are displayed in the below given Table VIII. The presence of the major nutrients nitrogen and magnesium is evaluated in the soil samples. The result is given in Appendix VII.

Name of the sample	Available Nitrogen (kg/ha)	Exchangeable magnesium (Cmol(p^+) kg^{-1})
O	280	20
A	345	26
A1	286	18
B	293	23
B1	310	16

O – Original sample

A – 1:1 $Mgso_4$ (Epsom salt) Treated

A1 – 1:2 $Mgso_4$ (Epsom salt) Treated

B – 1:1 coffee ground Treated

B1 – 1:2 coffee ground Treated

The above table clearly shows that the nutritive value of the treated samples is higher than the original sample. In case of nitrogen sample, A, B1 carries 345, 310 respectively whereas the magnesium content of the original sample is only 280. And in the case of magnesium sample A carries the maximum amount of 26 whereas the original sample carries 20. Therefore, it could be concluded that the increase in nutrient of the soil could be the effect of the finished source transmitting to the soil through watering. Hence it is clear that the increase in nutrient of the soil absorbing the finishing source.

Plate 9

Original Rose Plant

Plate 10

1:1 Epsom Salt Treated

Plate 11

1:2 Epsom Salt Treated

Plate 10(A)

1:1 Coffee Ground Treated

Plate 11(A)

1:2 Coffee Ground Treated

Plate 12

Original Tomato Plant

Plate 13

1:1 Epsom Salt Treated

Plate 14

1:2 Epsom Salt Treated

Summary and Conclusion

5.Summary and Conclusion

The usage of plastic bags and plastic products in every industry is increasing day by day. In agriculture, floriculture technology the usage of plastics is increased by 28% of the total production of the plastics, *[Sengupta,2022]*. According to year 2020 survey, 12.5 million tons of plastic products are used in the total plant and animal culture and 37.5 million tons in food packaging. The agriculture plastic industry forecasts that the global demand for greenhouse, mulching sheets and other agro based plastic products will increase by 9.5% in year 2030, *[Dilruba,2019]*. The crop production and the livestock sectors are the large users, accounting 10 million tons of plastics are used, followed by fisheries and aquaculture by 2.1 million tons and forestry with 0.2 million. Among that plastic nursery grow pots are one of the major usages of plastic and land fill. The grow bags are the new age replacement for the plastic grow pots, the development of those plastic grow bags is drastic and widely used because they are more economical to replace the old rigid pots which occupies more storage space, saving the growers storage cost. And another important issue of environment is chemical fertilizer, using chemical fertilizers regularly causes the pollution of groundwater sources, also called leaching. As results of chemical fertilizers use, the health of the soil and water is jeopardized, not to mention the waste of money and nutrients-deficient plants.

To avoid the side effects of these chemical fertilizer which gives infertility to the soil and to avoid the unwanted plastics used in nurseries this experiment is undertaken. Based on the up given facts the experiments have been conducted as “DESIGNING AND DEVELOPING NOVEL FERTILIZED JUTE PLANTERS”. With the following objectives:

- To study the effect of Epsom salt (Mgso4) and coffee ground on jute fabric.
- To analyse the properties of treated jute fabric.
- To prepare a grow bag out of treated jute fabric.
- To analyse the efficiency of the grow bag through plant growth test and soil tests.

EXPERIMENTAL PROCEDURE

- **Selection of Fabric**

  No chemicals or plastic so safe for nature. Since jute is a natural fibre and biodegradable in nature, by using jute instead of plastics we could save the environment by plastic pollution. Jute has large number of benefits to be selected like strength and durability. They decompose easily and give back the useful nutrients to

the soil, unlike other synthetic fibre. Grow bags made out of jute will allow the roots to breath and the air circulation makes the healthy plant and avoids most soil diseases. Considering the above given benefits of jute, it was selected for making grow bags in this research work

- **Desizing of Fabric**

  Desizing is a process by which sizing materials are removed from woven fabrics. It is a part of the pre-treatment process in textile wet processing. This is the first wet processing in the textile finishing process used to remove sized materials from the warp yarn of woven fabric. After desizing, the absorption of the fabric increases. As a result, the fabric can easily absorb chemicals, dye molecules. Among various methods this is the most basic method of desizing the fabric. Hence the jute fabric was soaked overnight in water and later dried.

- **Selection of Source**

  Epsom salt and coffee ground were selected for the study in this case. Using Epsom salt in gardening is not a new tradition, it has been a favourite fertilizer/pesticide and a best friend for some plants. Magnesium sulfate gives more goodness for the plant growth such as in seed germination, enhances the absorption rate of the plant, it also acts as a pesticide, it also gives high yield.

  Coffee grounds contain several key minerals for plant growth — nitrogen, potassium, phosphorus. Coffee grounds are **about 2% nitrogen by volume.** Coffee grounds are close to pH neutral (between 6.5 to 6.8 pH). Coffee grounds improve soil tilth or structure. Lewis Spencer says that sprinkling coffee grounds in the soil next to the plant, but others warn that you should be careful not to put too much on as the high nitrogen content but sprinkling too much can be harmful for the plant. Considering the above given facts, the used coffee ground and Epsom salt are selected for the study.

- **Finishing of Fabric by Dip and Dry Method**

Among various methods of finishing the fabric dip and dry method are one of the simplest methods employed to treat the fabric with something we need to finish the fabric with. This dip and dry method are generally known as Dip Coating. Dip coating refers to the immersing of a substrate into a tank containing coating material, removing the piece from the tank, and allowing it to drain. The coated piece can then be dried by force-drying or baking. In order to see the effect of the amount of selected sources, namely Epsom

salt and coffee ground two ratios such as the amount of water which was required for the complete immersion of the jute fabric and the same amount of source is taken (1:1). Another ratio 1:2 where in twice the amount of source taken to treat the jute fabric. In this manner four jute fabrics namely 1:1, 1:2 Epsom salt treated and coffee ground treated were prepared. The nomenclature for the samples is given as O – Original sample, A – 1:1 $Mgso_4$ (Epsom salt) Treated, A1 – 1:2 $Mgso_4$ (Epsom salt) Treated, B – 1:1 coffee ground Treated, B1 – 1:2 coffee ground Treated

- **Preparation of the Grow Bags**

  The process of preparing grow bag is carried in different stages as pattern making, cutting, and sewing of the treated jute fabric.

  - **Pattern making**

    For the construction of the grow bag the preliminary process is pattern making. An average size of grow bag for tomato and rose plant is 30cm wide and 37cm deep, according to the average size the pattern was made and the grow bags were designed.

  - **Cutting**

    The second stage of the preparation of grow bags is cutting down the fabric along the pattern made before. The pattern has been traced in the fabric and cut along the tracing line with the help of a sharp iron scissor for a neat and sharp edges.

  - **Sewing**

    The growbag designed for the study is consist of two pieces of fabric. Firstly, the hem line of the grow bag is finished with rolled hem stitch and the raw edges of the seam line is finished with plain stitch.

- **Preparation for Plant Culture Study**

  Pot culture study is an experimental analysis with serves the growth analysis for examining the changes of the plant growth such as growth rate, root length, shoot length, number of leaves and more.

  - **Preparation of Soil -** Healthy soil is the basis of healthy plants and a healthy environment. When garden soil is in good shape there is less need for fertilizers or pesticides. The garden soil is mixed with some ingredients such as sand, cocopeat and vermicompost which provides a combination of various nutrients required for healthy plant growth. Considering the above given facts, the preparation of the soil included

mixing of cocopeat – 20%, sand – 10%, to the 70% of farming soil. The soil was thoroughly mixed and used for filling the jute grow bags.

- **Selection of Plant -** Rose plant and tomato plant were selected for the study. For the plant culture study one flowering plant and one vegetable plant were chosen for the study. **Rose**, (genus *Rosa*), genus of some 100 species of perennial shrubs in the rose family (Rosaceae). Usually rose plant takes 45 to 50 days to come to flowering after sowing. Magnesium is an essential element that helps roses maintain beautiful green foliage while preventing discoloration and premature leaf fall. The most significant sign of a Magnesium shortage in the soil will be the brown blotches that appear on the leaves, while a yellowing on the inside of the leaves between the veins will also be evident.

- **Tomato** plant is a dicot and herbaceous plant. The plant forms a pile root that grows to a depth of up to 2 meters (6,6 ft.). Tomato seeds typically germinate in 5 to 10 days if given optimal conditions. After sowing the first fruit will appear within 65 to 70 days of sowing. Magnesium is an essential nutrient for the tomato plant growth, magnesium helps with seed germination, chlorophyll production, fruit development, strengthening cell walls, and improving uptake of nitrogen, phosphorus, and sulfur. based upon the information reviewed rose and tomato plants were selected for the study.

- **Sowing**

Sowing is a process of planting seeds into the soil, it plays an important role in farming. Once, after the soil is loosened and ploughed, the good, disease-free and pure quality of seeds are selected and sown into the soil. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. Among various sowing methods, rose plant were sown as small sapling and the tomato plant were sown as seeds, considering the time factor these methods were chosen for sowing.

- **Evaluation of the Treated Fabric**

The evaluation of the fabric is nothing but examining and determining the physical properties such as thickness of the fabric, weight, stiffness and absorbency of the fabric. The evaluation of the fabric is to measure the properties and the characteristic of the treated fabric. With the increase or decrease in properties shows the absorbency the finished source. Firstly, the physical properties of the untreated original fabric is evaluated and calculated, then the physical properties of the treated fabrics are evaluated and compared.

- **Evaluation of the Soil**

The diagnosis of the nutrient status of the soil by using different techniques or methods is known as soil fertility evaluation. Soil analysis is a very valuable tool in nutrient management. Most importantly, it enables us to predict and determine the proper amount of nutrients that should be added to a given soil based upon its fertility needs. Therefore, the investigator collected the soils from the original, 1:1, 1:2 treated grow bags of Epsom salt and coffee ground respectively. These soil where neatly packed and given for soil testing to evaluate the nutrients absorbed by the soil from the treated fabric the test was carried out in Tamil Nadu Agricultural University, TNAU - RI Block, Tamil Nadu Agricultural University, Lawley Rd, P N Pudur, Tamil Nadu 641003.

- **Evaluation of Plant Growth**

The plant growth and development involve the study of the growth under the controlled condition, the evaluation of the plant includes the changes in root length, shoot length number of leaves flowers and buds in response to the environmental condition such as climatic changes. Environmental factors that affect plant growth include light, temperature, water, humidity and nutrition. It's important to understand how these factors affect plant growth and development. Due to time limit the study period was restricted to 45 days. The investigator measured the number of leaves, branches and height of the root and shoot on the 45^{th} day.

- **Statistical Analysis**

All the collected data with reference to evaluation of the treated fabrics where statistically analyzed. The mean represents the average value in a dataset. The mean is important because it gives us an idea of where the center value is located in a dataset. The mean is also important because it carries a piece of information from every observation in a dataset. The mean can be used to represent the typical value and therefore serves as a yardstick for all observations. The investigator collected the data from the testing analysis and calculated the mean value for the collected data.

FINDINGS OF THE STUDY FOR TREATED JUTE FABRIC

The physical properties of the original and the treated fabric were evaluated objectively.

- In comparison to the original fabric, the thickness of the sample A1(1:2 $Mgso_4$ treated) as 28% is the maximum increase where as the minimum increase is seen in sample B (1:1 coffee ground treated).
- The weight of the sample A1(1:2 $Mgso_4$ treated) is increased maximum by21% and the minimum increase is observed in sample B and B1 (coffee ground treated).
- The stiffness is increased maximum in coffee ground treated sample B and B1 in the warp direction as 19% and 17% respectively.
- The absorbency is increased as the sinkability and the wick ability of the treated one is increased. In the case of sinkability, sinking increased by 88% as maximum increase in sample A1 in sinkability and the minimum increase in sinkability is 12% in the sample B respectively.

FINDINGS OF THE STUDY FOR PLANT GROWTH ANALYSIS

Analysis of Rose Plant

- The sown plants were observed and analysed that the plants in the treated grow bag grown faster than the original grow bag.
- In the case of rose plant, the root length of the original, A and A1 has increased 0.5, 1.3, 1.1 inches respectively.
- The shoot length of the original, A and A1 has increased by 3, 7, 8 inches respectively.

Analysis of Tomato Plant

- In the case of tomato plant, the root length has increased 0.5, 1 inch respectively.
- the shoot length has increased 2, 3 inches respectively.

- 12, 3 leaves are more than the original and 3, 1 branch are more than original respectively.
- And the major nutrients of the soil, magnesium and nitrogen is increased through the finishing.

CONCLUSION

From the study, "Designing and Developing Novel Fertilized Jute Planters", it is concluded that the finishing of the source Epsom salt and coffee ground on jute fabric improved the properties of the fabric such as thickness, stiffness, weight of the fabric, absorbency of the fabric. The faster growth in the treated grow bags show that the source acted as a fertilizer and enhanced the growth of the plant and the increase in soil nutrient is because of the transmission of the source to the soil. The major problem of current situation is usage of more plastics, and the secondary problem is usage of chemical fertilizers. The usage of these two gives many problems such as land fill, affecting ground water, and decreasing the fertility of soil. this novel fertilized jute planter is a new age solution to all these problems. The importance of the study is that it avoids the usage of the plastic and reduces the landfill and avoids the chemical fertilizers which saves the soil leaching. Since India is the second largest jute producing country, this idea can be taken up by nurseries and can even export the product to other countries. Therefore, this research can be considered as a solution for environmental issues and means for increasing the gross income of India.

LIMITATIONS OF THE STUDY

Time constrain factor forced the investigator to limit the study period for 45 days.

HIGHLIGHTS OF THE STUDY

This research was presented in a conference entitled "National Conference on Women Entrepreneurship: A Step Forward To Empowerment And Sustainability", on December 1st and 2nd 2022 organized by The Department Of Resource Management, Department Of Home Science Extension Education And Women's Studies Centre. The certificate is enclosed in Appendix VIII.

Published in a national conference held in Avinashilingam Institute for Home Science and Higher Education for women, in the book named "Women Entrepreneurship- A Transformational Scripting for Success". Under the title, "Novel Jute Planters Treated With Selected Fertilizer – An Upcoming Ecopreneurship Idea", with ISBN 978-93-92537-40-0. (Publication enclosed).

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Appendix

APPENDIX VII

Result Of Soil Evaluation

Appendix

APPENDIX I Selected jute fabric	APPENDIX II Desized jute fabric
	
Appendix Iii **1:1 Epson Salt Treated**	**Appendix Iv** **1:2 Epsom Salt Treated**
	
APPENDIX V **1:1 coffee ground treated**	**APPENDIX VI** **1:2 coffee ground treated**
	

TAMIL NADU AGRICULTURAL UNIVERSITY
DEPARTMENT OF ENVIRONMENTAL SCIENCES
DIRECTORATE OF NATURAL RESOURCE MANAGEMENT
COIMBATORE - 641 003

ANALYTICAL ADVISORY UNIT

ANALYTICAL REPORT

Nature of Sample : Soil + Coirpith Samples
Received from : Sobanappriya, Avinashilingam University, Mahima Ladies Hostel, Saibaba Colony, Coimbatore.
Parameters analyzed : As below

Result

Parameters	Available Nitrogen (kg/ha)	Exchangeable Magnesium (Cmol (P^+) kg^{-1})
Soil Sample - A1	286	18
Soil Sample - A	345	26
Soil Sample - B1	310	16
Soil Sample -B	293	23
Soil Sample - O	280	20

Note: The above results are communicated with the following conditions.

- The results indicate only the actual content of parameters requested by the stakeholders for the samples provided by them.
- In no way, this can be claimed as a complete composition / makeup of the sample
- This communication cannot be treated / recommended as a certificate
- Its use for publicity, arbitration or as evidence in legal disputes is strictly forbidden.

Professor and Head
Dept. of Environmental Sciences

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Tamil Nadu Agricultural University
Coimbatore - 641 003.

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APPENDIX VIII

Certificate for Publication

Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University Category A by MHRD, Estd u/s 3 of UGC Act 1956)
Re-accredited with A++ Grade by NAAC, Recognised by UGC Under Section 12B
Coimbatore - 641043, Tamil Nadu, India.

INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative)

NATIONAL CONFERENCE ON WOMEN ENTREPRENEURSHIP : A STEP FORWARD TO EMPOWERMENT AND SUSTAINABILITY

CERTIFICATE

This is to certify that SOBANAPPRIYA.G.M, II Msc, Dept of Textile and Clothing, Avinashilingam Institude, Coimbatore has ~~participated~~/ presented a paper entitled Novel jute planters treated with selected fertilizers-An upcoming Ecopreneurship idea in the National Conference on Women Entrepreneurship: A Step Forward to Empowerment and Sustainability on December 1st & 2nd 2022 organized by the Department of Resource Management, Department of Home Science Extension Education & Women's Studies Centre.

Dr.N.Vasugi
Convenor
Dean, School of Home Science

Dr.S.Kowsalya
Registrar

Dr.V. Bharathi Harishankar
Vice Chancellor

Publication

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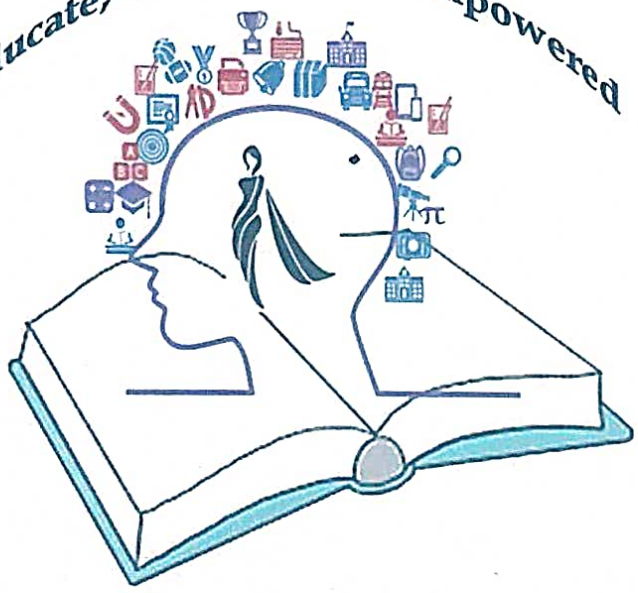

Avinashilingam Institute for Home Science and Higher Education for Women

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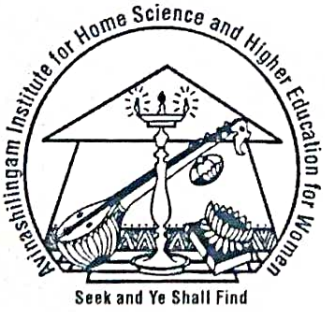
Coimbatore - 641 043, Tamil Nadu, India

Women Entrepreneurship - A Transformational Scripting for Success



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CONTENTS

Novel Jute Planters Treated with Selected Fertilizers - An Upcoming Ecopreneurship Idea

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Abstract--- Entrepreneurship is the creation or extraction of more economic value by the process of designing, launching, and running at entrepreneur's risk. Now a days many are coming up with new entrepreneurship ideas, but not all of themend up as a successful business. An environmentally sustainable entrepreneurship idea would be welcoming based on creation of pollution free earth. In the recent days use of indoplants especially for fresh oxygen supply is gaining popularity apart from the reduction in heavy/frequent fertilizers. Magnesium sulfate, the common garden fertilizers could be a part of the planters used, to slowly impart the fertilizer into the soil. Considering this a novel jute planter which is a replacement of plastic grow pot has been planned. These jute planters help in controlling depletion of natural resources by avoiding plastics and also a great entrepreneurship idea for commercialization.

Introduction

Considered the supply of innovation and new business concepts, the bourgeois definition includes a personal making a replacement enterprise and bearing the risks and therefore the rewards of the institution. Entrepreneurs mix capital, labour and natural resources to produce services and manufacture merchandise. Upon making an appropriate business arrange, entrepreneurs rent labor, acquire needed finances and resources, & offer leadership and guide the business through eligible management. They play a key role within the economy as they use their skills to review the market and produce new merchandise in keeping with the market (Morgan R. Clevenger, 2022).

Many entrepreneurship ideas are upcoming these day like jewellery making, sewing and alteration specialist, freelance developing, personal trainer, graphic developer, clothing boutique, makeup artist and blogger. But the success and sustainability for clean environment remains a big question mark. For eco-conscious entrepreneurs there is a concept called eco-entrepreneurship or ecopreneurship. Eco-entrepreneurship, or ecopreneurship, is a business behavior adopted by people who want to create a "green" business. In other words, it is a way to contribute to sustainable development while making profit. It encourages the practice of fair trade in order to maintain the company's reputation and image. Sustainable policies can be established in specific settings to achieve local consumption. It emphasis the need to keep the environment in a state of ecological balance. It focuses on supporting business development by addressing economical, social, and environmental issues. Ecopreneurship can bring benefits for both business organisation and to the society. It also enhances their business promotion among the customers, earn profit and environment is protected by the side. (Smriti, 2022).

Start-up entrepreneurs advantage of new opportunities like obtaining the potential to make innovative transition for a lot of property business paradigm, and have robust influences. Environmentally friendly initiatives produce positive company image, it provides a model for rules guaranteeing the setting protection, there area unit less tax prices

due to laws permitting the reduction of taxes for those that add the setting improvement, and also the variety mercantilism partners' collaboration will increase. Business with in experienced values is a sexy alternative because boosts the aggressiveness and there area unit heaps a lot of edges for the property of the business, folks and also t planet. Firstly, area unit the environment-conscious entrepreneurs, World Health Organization area unit cognizant environmental problems, however not of the environmental marketplace.

They have {an inclination} to pursue business-centred opportunities that have an environmental dimensio and attempt for eco-efficiency. Then, there area unit inexperienced entrepreneurs World Health Organization ar unit each attentive to environmental problems and of the environmental marketplace. They pursue environmenta centred opportunities that show sensible profit prospects. But ecopreneurs share common characteristics. The endeavour to develop healthy product by mistreatment natural ingredients, they implement healthy productio processes by minimizing their consumption of resources and reducing environmental burdens, and that they manife healthy values. (K. Demchuk – 2021).

The major impact in environment is because of the usage of plastics. The three fourth of the entrepreneurship idea has plastics as the part of them. Plastic has become one among the foremost pressing environmental problems that w tend to face these days. Bharat is generating regarding three. 5 million tonnes of plastic waste annually and also the pe capita plastic waste generation has nearly doubled over the last 5 years. "Plastic pollution adversely affects ou ecosystems and is additionally joined to pollution. (AM Amadei, 2021). More than 1 million plastic bags end up in th trash every minute. The world uses over 500 billion plastic bags a year – that's 150 for each person on Earth. World beaches are polluted by 8.3 billion plastic straws, but only 1% of straws end up as waste in the ocean. (Y Liang, Q Tan, Song. J Li - Waste Management, 2021 – Elsevier) the figure below shows the usage of plastics across the world durin the last 20 years.

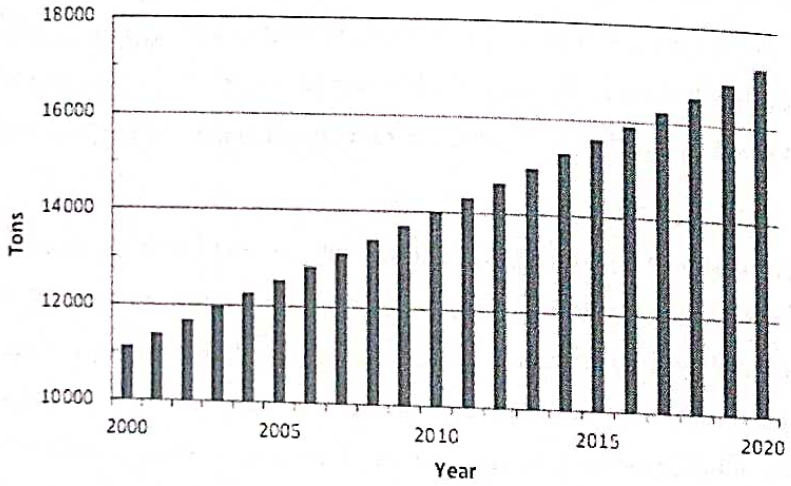

Fig. 1

The new widely opened market in nurseries are grow bags. The old traditional grow pots are now replaced by th thick rigid and flexible plastic bags. The development of those plastic grow bags is drastic and widely used because the are more economical to replace the old rigid pots and they can be fold flat so that they don't take much space i warehouse, saving the growers storage cost. The jute grow bags are the nice innovation for alternatives for those plast bags and mud pots to grow various kinds of plants. The important feature of the jute grow bags are they a biodegradable and eco-friendly. The jute grow bags are called jute planters which are created with the biggest aim create a better version on environment, with rising concerns of pollution environmentalists are strongly advising switch towards the usage of alternatives for the synthetic non biodegradables plastic grow bags.

Even in nurseries and farm houses usage of fertilizers is a common practice. This requires great skill because use of higher or lower amount of fertilizers could damage the growth of the young baby plants. Sometimes the fertilizers used may not be absorbed by the roots or washed away by excess water used during watering the plants. But if these fertilizers are a part of the grow bags which could be slowly absorbed by the plants it would be more helpful for the nursery entrepreneurs as well as a means for cost reduction.

The basic concept of this experiment is to prepare and study the properties of an eco-friendly biodegradable jute planters which is totally safe for the environment. This will be further treated with magnesium sulfate which will act as a fertilizer. This experiment aims to save the environment from the harmful effect of plastic and to save the soil from the harmful effect of chemical fertilizers. To avoid the side effects of these chemical fertilizer which gives infertility to the soil and to avoid the unwanted plastics used in nurseries this experiment is undertaken. There fore a study is undertaken to treat jute fabrics and check its absorbency and create growbags.

Methodology

Selection of Fabric for Growbags

Jute, the golden fibers is one of the most popular fiber in India. The selected sample is jute. Among varies kinds of fibres and fabric jute is selected for this, 'study on the effects of Epsom salt ($mgso_4$) and tea extract in jute fabric' because, Jute grow bags **allows the roots to breath and the air circulation makes the plants healthy and avoids most soil diseases**. It could be a perfect bags for organic gardening of vegetables and flowering plants. Since jute is a natural fibre and biodegradable in nature, by using jute instead of plastics we could save the environment by plastic pollution. Jute has large number of benefits to be selected like strength and durability. They decompose easily and give back the useful nutrients to the soil, unlike other synthetic fibre. As jute fibre are an exclusive plant product, they are accustomed to bear harsh environments. They require very low maintenance and long lasts for 12-14 months as compared to others. Considering the above given benefits of jute, the jute fabric is selected for the study.

Selection of Fertilizer

Epsom salt is additionally referred to as magnesium sulfate. Its substance created of metal, sulfate, and oxygen. Its chemical formula is Mgso4. Victimisation Epsom salt in horticulture isn't a brand new tradition, it's been a favourite fertilizer/pesticide and a relief for a few plants. Owing to its major role within the growth of plants, it plays the most effective half in ideas of 'green living' and organic horticulture. Epsom salt is growing standard among the gardeners as a result of Epsom salt is that the distinctive declare form of organic horticulture desires. It's terribly value effective, cheap to any or all styles of gardeners, plants simply settle for it and has terribly fewer aspect effects on plants. Victimisation Epsom salt is safe and it's a natural product that's accessible reception for several health and wonder uses.

Advantages of Epsom Salt in Gardening

- It enhances the absorption rate in plant.
- Acts as a pesticide.
- Gives high yield.
- Boosts germination.

Treatment of Fabric

The dip and dry method are one of the simplest methods employed to treat the fabric with something we need to finish the fabric with. This dip and dry method is generally known as DIP COATING. Dip coating refers to the immersing of a substrate into a tank containing coating material, removing the piece from the tank, and permitting it to empty. The coated piece will then be dried by force-drying or baking.

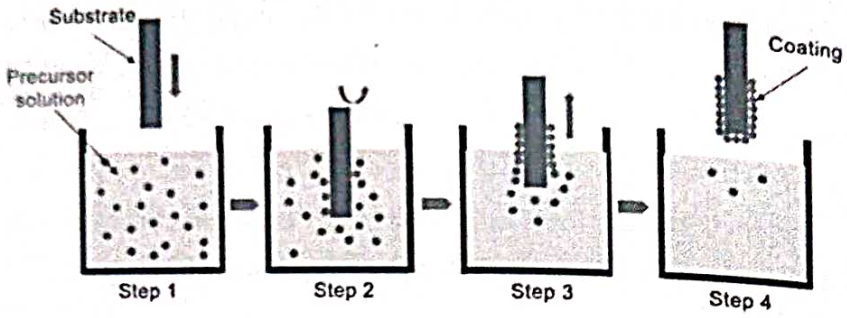

Fig. 2

Advantages of Dip Coating

The deserves of dip coating are low price and layer thickness is simply adjusted. The drawbacks of dip coating are method is slow and it's the power to dam the screen, which can produce major impact within the final product.

Testing of Sample

The treated sample is undergone some testing of properties like thickness, strength, wickability, sinking, gsm, stiffness and the results are compared and analysed. The obtained results are compared and discussed in the below given Table 1.

Table 1: Physical Properties of the Original and Treated Fabrics

Tests Undergone	Original Sample Value	Treated Sample Value	% Of Loss Or Gain Over The Original
Weight of the sample (GSM)	3.28 gms	3.95 gms	20.42 %
Thickness of the sample (mm)	1.27 mm	1.60 mm	25.98 %
Sinking ability of the sample (second)	2.23 sec	4.16sec	86%
Wickability of the sample (cms)	1.5 cm	20cms	12.33%

From the above given table we could clearly conclude the sample have absorbed the selected fertilizer, the weight of the sample is increased from 3.28 gms to 3.95 gms after the treatment, the thickness of the fabric is increased from 1.27mm to 1.60 mm, same as the sinking ability have increased up to 4.16sec, and the wickability of the fabric is also increased from 1.5 cm to 20 cms. These results shows that the sample have absorbed the selected fertilizer.

Conclusion

The need for the self-employment has created increase in entrepreneurs across the country. But the success rate of entrepreneurs does not reflect a positive response, the main reason is lack of new products. Today the awareness of environment safety is the cream of thinking for every individual. Coupling these ideas, the above research has laid the base for jute plants. The finishing of these jute planters with magnesium sulfate, a safe garden fertilizer is the core of

the research. This will save time, energy and cost by for the planters over the use of chemical fertilizers. The increase in physical properties of the fabric has proved the absorption of the fertilizers which would slowly transferred in to the soil, enters the roots and enhances the quick and fast growth.

Limitations of the Work

Time constrains has restricted the investigator from conducting the pot culture study.

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