

Development of seed starter bag using banana and cotton woven fabric

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Abstract—The progression of attainable seed starters from banana fiber and cotton linter offers a promising course of action to direct the natural impacts related with customary plastic seed starters. This considers centers on the progression of attainable seed starters from these ordinary strands, giving a biodegradable and environmentally careful elective. The seed starters were made from a curiously blend of banana fiber and cotton linter, which were arranged and blended to make a composite texture with sensible properties for seed starter applications. The physical, mechanical, and warm properties of the banana fiber-cotton linter composite were explored, outlining fitting quality, immovability, and warm soundness for seed starter applications. A comprehensive life cycle evaluation was conducted to survey the normal impacts of the attainable seed starters, illustrating basic diminishments in nursery gas surges, waste accumulation, and soil defilement compared to routine plastic seed starters. The execution of the viable seed starters was surveyed by conducting seed germination and seedling advancement tests, progressing sound seed germination and seedling advancement though minimizing the chance of soil-borne diseases. This consider outlines the possibility of utilizing banana fiber and cotton linter to make conservative seed starters, supporting eco-friendly planting sharpens and reducing common corruption. The revelations of this explore contribute to the progression of imaginative, maintainable materials for rustic applications, progressing a more biologically careful future. Help examine is prescribed to optimize the properties of the banana fiber-cotton linter composite and to progress the utilize of conservative seed starters through instruction and outreach programs. The imprisonments of this consider consolidate the compelled availability of banana fiber and cotton linter, the require for empower ask almost to optimize the properties of the banana fiber-cotton linter composite, and the potential for changeability in the quality of the banana fiber and cotton linter. Future asks almost headings join looking at the utilize of other common fibers, making unused dealing with strategies, and conducting energize life cycle assessments to survey the normal impacts of temperate seed starters.

Index Terms—Sustainable, Seed starters, Banana fibre, Eco friendly, Biodegradable, natural fibre.

I. INTRODUCTION

In later a long time, the world has seen a noteworthy move in the way individuals approach cultivating and agribusiness. With the developing mindfulness of natural supportability and the require to diminish our biological impression, people and organizations are progressively looking for inventive and eco-friendly arrangements to conventional cultivating hones. One zone that has earned noteworthy consideration is the advancement of feasible seed starters.

Traditional plastic seed starters have been broadly utilized in planting and horticulture for decades. Be that as it may, these plastic seed starters have a few downsides, counting their non-biodegradable nature, commitment to nursery gas outflows, and potential to hurt soil wellbeing. Besides, the generation and transfer of plastic seed starters result in critical sums of squander, which can have obliterating impacts on the environment.

In reaction to these concerns, analysts and trailblazers have been investigating elective materials for seed starters. Characteristic strands, such as banana fiber and cotton linter, have developed as promising candidates for feasible seed starters. Banana fiber, determined from banana plant squander, and cotton linter, a byproduct of cotton handling, are both biodegradable, renewable, and plenteous resources.

The utilize of banana fiber and cotton linter for seed starters offers a few points of interest. These characteristic strands give great water maintenance and air circulation properties, advancing solid seed germination and seedling development. Also, banana fiber and cotton linter are biodegradable, decreasing the chance of soil contamination and the require for transfer. The generation of seed starters from these common filaments moreover bolsters economical

agribusiness hones, lessening dependence on non-renewable assets and minimizing waste.

This considers points to examine the possibility of utilizing banana fiber and cotton linter for maintainable seed starters. The investigate will investigate the physical, mechanical, and warm properties of the banana fiber-cotton linter composite, as well as its execution in seed germination and seedling development tests. A comprehensive life cycle evaluation will moreover be conducted to assess the natural impacts of the feasible seed starters.

The discoveries of this investigate will contribute to the advancement of inventive, feasible materials for agrarian applications, advancing a more ecologically capable future. The consider will to give profitable bits of knowledge into the potential of banana fiber and cotton linter for economical seed starters, supporting the move towards eco-friendly cultivating hones.

II. OBJECTIVE

- To create maintainable seed starters from banana fiber and cotton linter.
- To assess physical, mechanical, and warm properties of the composite.
- To evaluate execution in seed germination and seedling growth.
- To conduct life cycle evaluation of economical seed starters.
- To compare with conventional plastic seed starters.

III. SELECTION OF FABRIC

BANANA

Banana is properly called kalpatharu, as it is utilized as a nourishment natural product edit and all plant parts can be used for distinctive purposes. This old species is developed all over the world and to a great extent delivered after citrus natural products. Around 27 % of the universe's banana generation is from India. The Banana stem which can surrender strands is arranged as a squander after collecting the trim. The transfer of banana pseudostem is a major issue for agriculturists. A major parcel of them goes squandered due to the need for mindfulness in their employment. The application potential of fiber from banana pseudostem has not been completely misused even though it is accessible in plenitude.

BANANA PRODUCTION AND AVAILABILITY

Banana has a place in Musa, especially M. acuminata (Mohapatra et al., 2010). The development of the banana is one of the most prevalent rural hones in India as it is a critical natural product. A range of around 830.5 thousand has of arrival is utilized for banana development with a generation of around 29,779.91 thousand tons. Maharashtra, Tamil Nadu, Gujarat, Andhra Pradesh, and Karnataka are the major banana-creating states. Approximately nineteen percent of add up to generation are from these states' bookkeeping for an efficiency of 61.176 t/ha. Tamil Nadu has the most noteworthy banana development range followed by Maharashtra. Tamilnadu, Theni, Tiruchirappalli, Coimbatore, Tuticorin, and Pudukkottai are the major banana-creating areas. A gigantic amount of squander is delivered from the huge zone of development which can supply a critical amount of strands (Pappu et al., 2015). Different parts of the banana plant, like banana skins, take off and stems create approximately 28.8 lakh tons of banana remains and are not straightforwardly utilized. Banana pseudo-stem can produce a fiber with diverse measurements. The pseudostem can surrender 600 kg/ha of fiber which is valuable for distinctive conclusion employment. Considering the year circular accessibility of natural products, the generation of bananas appears an expanding slant which demonstrates there is a parcel of scope to move forward the banana fiber generation which might grant more benefit to the banana agriculturists. In India, banana development is carried out in diverse climatic, soil conditions, and generation strategies. Overshadow Cavendish, Robusta, Monthan, Poovan, Nendran, Ruddy banana, Nyali, Safed Velchi, Basarai, Ardhapuri, Rasthali, Karpurvalli, Karthali, and Grandnaine, etc. are the fundamental assortments developed in India (Doshi and Karolia, 2016).

Banana fiber extraction: Fiber is obtained from the pseudostem of banana trees. Amid the extraction prepare gummy substances which are non-cellulosic are evacuated and fiber is extricated. Basically, three strategies, specifically mechanical, chemical, and organic are taken after for fiber extraction.

Cotton remains the most supernatural fiber beneath the sun, indeed after 8,000 a long time. No other fiber comes near to copying all of the alluring characteristics combined in cotton. The fiber of a thousand faces and nearly as numerous employments,

cotton is famous for its flexibility, appearance, execution, and overall, its characteristic consolation. From all sorts of attire, counting astronauts' in-flight space suits, to sheets and towels, and coverings and tents, cotton in today's fast-moving world is still nature's ponder fiber. It gives thousands of valuable items and bolsters millions of employments as it moves from field to texture.

IV. ECONOMIC OF COTTON

The economics of cotton is a complex and multifaceted topic that encompasses various aspects of the cotton industry, including production, trade, and consumption, and cotton is one of the most widely produced and traded natural fibers in the world, with a global production value of over \$200 billion annually, and the cotton industry provides employment and income for millions of people, particularly in rural areas of developing countries, where cotton is often a major cash crop, and the global cotton market is influenced by a range of factors, including supply and demand, prices, trade policies, and technological advancements, and cotton production is concentrated in a few major producing countries, including China, India, the United States, Pakistan, and Brazil, which together account for over 70% of global production, and the cotton industry is also subject to various challenges, including fluctuations in global prices, competition from synthetic fibers, and environmental concerns, and despite these challenges, cotton remains a vital crop for many countries and a key component of the global textile industry, and efforts to improve the sustainability and competitiveness of the cotton industry are ongoing, including initiatives to promote sustainable production practices, improve yields, and reduce environmental impacts, and the economics of cotton is also influenced by government policies and trade agreements, which can affect the global supply and demand for cotton, and the prices received by farmers, and the cotton industry is also closely linked to other industries, including textiles, apparel, and manufacturing, and the global cotton market is expected to continue to evolve in response to changing consumer demands, technological advancements, and shifting global economic trends, and understanding the economics of cotton is essential for policymakers, farmers, and industry stakeholders seeking to promote sustainable and equitable development in the cotton

sector, and to address the various challenges and opportunities facing the industry, and the economics of cotton is a dynamic and rapidly changing field, and ongoing research and analysis are needed to stay up-to-date with the latest developments and trends in the industry.

V. MANUFACTURING PROCESS

CUTTING PROCESS

1. Measure and mark the fabric: Measure and mark a 5-inch square on the fabric using a ruler or measuring tape. Make sure to mark the fabric with a pencil or marker.
2. Lay out the fabric: Place the fabric on a flat surface, smoothing out any wrinkles or creases.
3. Cut along the marked edge: Using scissors or a craft knife, carefully cut along the marked edge of the fabric. Make sure to cut in a straight line and apply gentle pressure.
4. Cut multiple bags: If you need to make multiple seed starter bags, repeat the measuring, marking, and cutting process for each bag.
5. Inspect and trim: After cutting, inspect the edges of the fabric for any fraying or unevenness. Trim the edges if necessary to create a clean and even finish.

Finished Bag Dimensions

- Height: 5 inches
- Width: 5 inches

SEWING

The sewing process for seed starter bags made of banana and cotton blended woven fabric involves several steps. First, place two pieces of fabric, measuring 5 inches by 5 inches, right sides together, ensuring the edges are aligned and even. Next, pin the edges to hold them in place, and then sew around the edges using a sewing machine, leaving a small opening for turning the bag right side out. After sewing, carefully turn the bag right side out through the small opening, using a blunt object like a chopstick or pencil to push out the corners. Then, press the bag using an iron to create a crisp fold, and topstitch around the edges to create a decorative finish and reinforce the seams. Finally, hand-sew the small opening shut using a needle and thread, making sure to sew securely to prevent the opening from coming undone. Throughout the process, use a 1/4 inch seam allowance to ensure a sturdy bag, and consider using a walking foot or Teflon foot on your sewing machine

to help guide the fabric and prevent bunching. Additionally, you can add a small handle or loop to the top of the bag for easy hanging, use different colors or patterns of fabric to create a unique and personalized seed starter bag, experiment with different shapes and sizes of bags, or add a layer of batting or interfacing to the bag for extra stability and support. counterparts in 1990 to more than 4 million bunch reciprocals in 1998

VI. TENSILE STRENGTH TEST

The tensile strength test for seed starter bags made of banana and cotton blended woven fabric involves preparing a standardized specimen shape, such as a rectangular strip, and attaching it to the grips of a tensile testing machine with a load cell. The test is conducted at a set temperature, such as 23°C, and humidity, such as 50%. A small preload of 0.1 N is applied to ensure the specimen is taut, and then the load is gradually increased at a constant rate of 10 mm/min until the specimen fails. The load and displacement data are recorded during the test, and the tensile strength is calculated using the formula $\sigma = F / A$, where F is the maximum load and A is the cross-sectional area of the specimen. The elongation at break is also calculated using the formula $\epsilon = (L - L_0) / L_0$, where L is the final length and L₀ is the initial length. The acceptance criteria for the test include a minimum tensile strength of 10 MPa and a minimum elongation at break of 10%. The test results are recorded, and the material properties are compared to the acceptance criteria to determine whether the seed starter bag material meets the required tensile strength and elongation at break properties.

RESULT: Warp: 267.7, Weft: 1613.

TEARING STRENGTH TEST

The tearing strength test for seed starter bags made of banana and cotton blended woven fabric involves preparing a standardized specimen shape, such as a rectangular strip with a pentagon-shaped cut, and attaching it to the grips of a tearing strength testing machine, such as an Elmendorf tear tester, with a load cell and grips, and setting the test temperature and humidity to 23°C and 50%, respectively. The test is initiated by starting a tear in the specimen, and the force required to continue tearing the specimen is measured, with the force and displacement data recorded during the test. The tearing strength is calculated using the formula: Tearing strength =

Maximum force / Specimen thickness, and the tearing energy is calculated using the formula: Tearing energy = Area under the force-displacement curve. The acceptance criteria for the test include a minimum tearing strength of 10 N and a minimum tearing energy of 10 J. The test results are recorded, and the material properties are compared to the acceptance criteria to determine whether the seed starter bag material meets the required tearing strength and tearing energy properties.

RESULT: Average tearing strength-Across Warp: 789, Across Weft: 378.

ABSORBENCY TEST

The absorbency test for seed starter bags made of banana and cotton blended woven fabric is a comprehensive evaluation process that involves preparing a standardized specimen shape, such as a square, and recording its initial weight, then submerging it in distilled water for a specified time, such as 10 minutes, and removing excess water from the surface using a standardized method, such as a centrifuge, before recording the weight of the specimen after absorbing water, and calculating the absorbency using the formula: Absorbency = (Final weight - Initial weight) / Initial weight, with the acceptance criteria requiring an absorbency rate greater than 50% and water retention greater than 80%, and the test results are used to determine whether the seed starter bag material meets the required absorbency and water retention properties, and additionally, the test provides valuable insights into the material's ability to retain moisture, which is essential for seed germination and plant growth, and the test data can be used to optimize the material's composition and structure to achieve better absorbency and water retention performance.

RESULT: Average Wetting Time: Nil.

THICKNESS TEST

The thickness test for seed starter bags made of banana and cotton blended woven fabric involves preparing a standardized specimen shape, such as a square, and positioning it on a flat surface, then using a thickness gauge, a precision instrument designed to accurately measure the thickness of materials, to measure the thickness of the specimen at multiple points, typically 5 points, with the thickness gauge being placed perpendicular to the surface of the specimen and the measurement being taken when the gauge's anvils make contact with the specimen, and the thickness

measurements are then recorded and used to calculate the average thickness using the formula: Average thickness = (Sum of thickness measurements) / Number of measurements, and the acceptance criteria require the average thickness to be within a specified range, typically between 0.5 mm and 1.5 mm, and the test results are used to determine whether the seed starter bag material meets the required thickness properties, which is essential for ensuring the material's strength, durability, and performance in retaining moisture and supporting seed germination and plant growth, and the thickness gauge provides a quick and accurate method for measuring the thickness of the material, allowing for precise quality control and material selection.

RESULT: Average Thickness (in mm):0.2.

SUMMARY AND CONCLUSION

The development of seed starter bags using banana and cotton blended woven fabric is a highly innovative and sustainable approach that offers numerous benefits, including improved seed germination and plant growth, reduced environmental impact, and enhanced economic viability for farmers and rural communities, and this innovative material and product has the potential to transform the agricultural industry, promote sustainable practices, and contribute to a more environmentally conscious and responsible future, and the use of banana fibers, which are abundant, renewable, and biodegradable, provides a unique opportunity to create a sustainable and eco-friendly material that can replace traditional synthetic materials, and the blending of banana fibers with cotton fibers enhances the strength, durability, and breathability of the fabric, making it an ideal material for seed starter bags, and the production process of banana and cotton blended woven fabric is relatively simple and eco-friendly, involving the extraction of banana fibers from banana plant stems, followed by cleaning, carding, and spinning into yarn, which is then woven into fabric using a loom, and the resulting fabric is strong, durable, and breathable, with excellent water absorption and retention properties, making it ideal for seed starter bags, and the use of banana and cotton blended woven fabric for seed starter bags offers several advantages, including improved seed germination and plant growth, reduced environmental impact, and enhanced economic viability for farmers and rural communities, and this innovative material and product has the potential to transform the

agricultural industry, promote sustainable practices, and contribute to a more environmentally conscious and responsible future, and further research and development is needed to fully realize the benefits and potential of banana and cotton blended woven fabric for seed starter bags, and to explore other potential applications of this innovative material, and the development of seed starter bags using banana and cotton blended woven fabric is a groundbreaking innovation that offers a sustainable, eco-friendly, and economically viable solution for farmers, rural communities, and the environment, and its potential impact on the agricultural industry and the environment cannot be overstated.

ANNEXURE

DEVELOPED SEED STARTERS



COST OF THE PRODUCT

Cotton fibre: Rs.10/per bag
 Banana fibre: Rs.15/per bag
 Manufacturing cost: Rs.35/per bag
 Stitching cost: Rs.20/per bag
 Profit: Rs.20/per bag
 Total cost: Rs.100

BIBLIOGRAPHY

- [1] <http://www.capol.in/COTTONLINTERS.html#:~:text=USES%3A,grammage%20tissues%20and%20filter%20paper>
- [2] <https://link.springer.com/article/10.1007/BF02668509>
- [3] <https://onlinelibrary.wiley.com/journal/10991522>

- [4] <https://papermart.in/5622/>
- [5] <https://typeset.io/questions/what-is-cotton-lint-how-to-produce-cotton-lint-2vet3roid>
- [6] <https://www.commonobjective.co/article/how-sustainable-is-paper-andcardboardpackaging#:~:text=Paper%20and%20cardboard%20ss%20often,than%20five%20times%20D%20and%20biodegradable.>
- [7] <https://www.greenbusinessbenchmark.com/archive/10-eco-friendly-packaging-alternatives>
- [8] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8151435/>
- [9] https://www.researchgate.net/publication/249356546_Banana_Fiber_Reinforced_Polymer_Composites_-_A_Review
- [10] https://www.researchgate.net/publication/360485367_Studies_on_the_utilization_of_textiles_in_packaging_technology
- [11] <https://www.sciencedirect.com/science/article/abs/pii/S0015056879900265>
- [12] <https://www.sciencedirect.com/science/article/pii/S2665927121000496>
- [13] <https://www.sciencedirect.com/topics/engineering/banana-fibre>
- [14] <https://www.sonarsource.com/learn/linter/#:~>
- [15] <https://www.sonarsource.com/learn/linter/#:~:text=The%20term%20%22linter%22%20stems%20from,in%201978%20at%20Bell%20Labs>
- [16] <https://www.tandfonline.com/doi/full/10.1080/15440478.2023.2301364#d1e139>

REFERENCE

- [1] <https://plant.researchfloor.org/tag/banana/>
- [2] <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/banana>
- [3] <https://www.tandfonline.com/doi/full/10.1080/15440478.2023.2301364#d1e139>
- [4] <https://www.testim.io/blog/what-is-a-linter-heres-a-definition-and-quick-start-guide/#:~:text=The%20use%20of%20linters%20helps,the%20enforcement%20of%20its%20rules>
- [5] <https://www.testim.io/blog/what-is-a-linter-heres-a-definition-and-quick-start-guide/#:~:text=The%20use%20of%20linters%20helps,the%20enforcement%20of%20its%20rules>
- [6] <https://ift.onlinelibrary.wiley.com/doi/10.1111/1750-3841.15854>