

Characterization of Blended Birds of Paradise and Bamban Plant Fibers as Alternative Textile Material

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Abstract: The growing environmental impact of synthetic textiles has intensified the search for sustainable, plant-based alternatives. This study aimed to develop a blended textile from birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers and to determine its mechanical properties (tensile strength and breaking elongation), chemical properties (burning rate, washability, and water absorption), and overall acceptability as alternative textile material in terms of hand feel, irregularity of the ribs, color shade, and presence of plugs. A developmental research design was employed to extract, process, blend, and test the fibers under controlled conditions. The statistical tool used was the mean, which determined the acceptability of the blended birds of Paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) textile. A total of 25 experts evaluated the product, consisting of garment shop owners, garment teachers, fashion designers, local dressmakers, and end users. An evaluation sheet was utilized to assess the blended textile. The textile underwent a series of tests to determine its mechanical and chemical properties. Findings revealed that the individual fibers of birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) were verbally interpreted as durable, while the blended fibers exhibited improved overall strength when combined and were interpreted as very durable, demonstrating enhanced load-bearing performance through fiber blending. In terms of breaking elongation, the individual fibers were verbally interpreted as least elastic, while the blended fibers were interpreted as less elastic, showing improved flexibility compared to the individual fibers, although still within the less elastic range. The burning rate test showed that the blended textile shrank easily when exposed to flame, emitted a pungent urine-like odor, and left a black, hollow, and gritty bead residue. It was interpreted as highly combustible, comparable to cotton and jute. Washability testing showed no noticeable changes after soaking in detergent for thirty minutes, indicating good color stability. The water absorption test revealed that the blended textile has low absorbency, which can be advantageous for applications requiring quick drying and resistance to moisture. Overall, the textile from blended birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) textile was rated as “Very Acceptable” in terms of hand feel, irregularity of the ribs, color shade, and presence of plugs based on its level of acceptability.

Keywords: Characterization, Blended Birds of Paradise & Bamban Plant, Alternative Textile Material

I. INTRODUCTION

The accelerating environmental impact of industrial production has intensified the global call for sustainable alternatives across sectors, including textiles. Conventional textile manufacturing, particularly the extensive use of synthetic fibers derived from petrochemical sources, has been associated with increased carbon emissions, microplastic pollution, and non-biodegradable waste streams (Ellen MacArthur Foundation, 2017; United Nations Environment Programme [UNEP], 2021). These environmental pressures have prompted research communities to explore renewable, biodegradable, and locally sourced fibers as viable substitutes for synthetic materials.

Within the Philippine context, sustainability initiatives in higher education are guided by national and international frameworks such as the Commission on Higher Education research agenda, the Department of Science and Technology Harmonized National Research and Development Agenda (HNRDA), and the United Nations Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action). These frameworks underscore the responsibility of state universities and colleges to generate innovations that are environmentally responsive, socially relevant, and economically viable. In alignment with these directions, the College of Education Research Thrusts (2024–2028) emphasize sustainability, contextualized learning, entrepreneurship, and technology transfer as priority domains.

This study on the development of a blended textile from Bird of Paradise (*Strelitzia reginae*) and Bamban (*Donax canniformis*) fibers directly responds to these thrusts. First, under Sustainability and Disaster Risk Reduction in Education, the research advances green material development by transforming abundant plant resources into eco-friendly

textile alternatives. Natural fiber innovation supports climate-responsive production models and encourages environmentally responsible practices within Technology and Livelihood Education (TLE) and related programs.

Second, the study supports Cultural Heritage and Contextualized Learning by valorizing indigenous and locally available plant species. Bamban plant (*Donax canniformis*) has long been utilized in traditional crafts, while Birds of Paradise Paradise (*Strelitzia reginae*), commonly cultivated for ornamental purposes, presents untapped potential as a fiber source. Integrating these materials into textile experimentation promotes contextualized instruction grounded in local biodiversity and community knowledge systems. Such localization strengthens cultural relevance in instructional materials and product development initiatives.

Third, the research aligns with Entrepreneurship and Community Development and Techno Transfer priorities. By developing a novel blended textile, the study establishes a prototype that may be further refined into market-oriented products, supporting school-based enterprises, livelihood modules, and research-to-market pipelines. The transformation of agricultural and ornamental plant by-products into value-added materials exemplifies applied research with commercialization potential.

Methodologically, the study employed a developmental research design to assess fiber extraction, blending processes, and textile performance characteristics such as tensile strength, tear resistance, and fabric resilience. Fiber blending, defined as the integration of two or more distinct fibers to enhance composite performance properties, has been shown to improve durability and functional adaptability in textile engineering (Mariam et al., 2025). Through systematic testing and evaluation, the research contributes empirical evidence to the limited body of literature on birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) as textile-grade fibers. Lastly, the investigation extends beyond material experimentation; it embodies the institutional commitment to sustainable innovation, contextualized pedagogy, and community-responsive research. By utilizing locally sourced, biodegradable fibers, the study positions textile development not merely as a technical endeavor but as an educational, environmental, and socio-economic intervention consistent with national research agendas and global sustainability imperatives.

II. METHODOLOGY

This study employed a developmental research design that systematically and iteratively designs, develops, implements, and evaluates educational products, processes, or interventions to enhance their effectiveness and real-world application (Tinoca et al., 2022). In this research, birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers were blended and woven using a loom, combining two plant-based fibers to produce a novel textile that could compete with existing market products. To further examine the factors that influence the quality of the resulting textile, an experimental test was applied. This approach allowed the researcher to identify which factors have the greatest impact on specific textile quality characteristics, ensuring that the final product meets desired performance standards.

Design Criteria

This study focuses on the development of blended textile using fibers extracted from the birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*), aiming to transform these fibers into fabric through traditional weaving techniques. It investigates the feasibility of converting the birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) into a functional and sustainable textile material. As a form of developmental research, the design criteria for producing textile from birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers follow the practical steps of the production process. The fiber extraction process should ensure minimal damage to the strands, maintaining their strength and length for effective weaving. The spun yarn must possess adequate tensile strength, uniform thickness, and flexibility for handloom weaving. Cleaning and drying should maintain the fiber's natural quality. Thus, it must be gentle and sustainable, avoiding harsh chemicals. The resulting yarn should be strong, uniform, and suitable for traditional handloom weaving. The final textile must be durable, functional, visually appealing, and produced using sustainable, eco-friendly, and culturally relevant practices.

Material, Tools and Equipment

The primary raw materials used in this study were fibers extracted from birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*). Forty stems of birds of paradise weighing eight kilograms and forty stems of bamban plant weighing nine kilograms were collected for fiber extraction. The extraction yielded 15 grams of fiber from birds of paradise (*Strelitzia reginae*) and 10 grams from bamban plant (*Donax canniformis*), which were used in developing the blended textile. Materials used during testing included tap water, detergent powder, pencil, pentel pen, masking tape,

lighter, and tissue paper. Tools used for harvesting and fiber extraction included a bolo, plate, knife, and scissors. Other tools and laboratory apparatus used were a winder straw, shuttle, spring balance, graduated cylinder, beakers, alcohol lamp, crucible tong, digital vernier caliper, and digital balance. A handloom was used for weaving the fibers, while a Universal Testing Machine was utilized to determine the breaking elongation of the blended textile.

Preparation and Development

The preparation and development of blended birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) textile followed a systematic process to ensure quality, sustainability, and functionality. The process began with the careful selection of stems from the birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*). Fiber extraction was performed manually using a plate and knife, taking care to preserve the length and strength of the fibers. Once extracted, the fibers were thoroughly cleaned with water to remove impurities and were then air-dried to maintain their organic properties. After drying, the fibers were softened by placing them in a pot with heated sand, enhancing their flexibility and preparing them for spinning. The softened fibers were spun into yarn using traditional methods, ensuring uniformity and strength suitable for weaving. The yarn was then wound onto a winder straw in preparation for the weaving process. Weaving was carried out using a traditional handloom, with a shuttle used to pass the weft through the warp. The design and weaving technique were kept simple to suit the texture of the natural fibers. The woven textile then underwent basic finishing procedures, including trimming, pressing, and over-edging to prevent raveling without the use of harmful chemicals.

Fabrication Procedure

The study began with the selection and harvesting of birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) stems with visible fiber content. The stems were soaked in tap water for two days before fiber extraction. Fibers were manually extracted using a plate for birds of paradise (*Strelitzia reginae*) and a knife for bamban plant (*Donax canniformis*). After extraction, the fibers were washed and air-dried to remove impurities and moisture. The dried fibers were blended and spun into yarn using traditional knotting techniques, then wound onto straws in preparation for weaving. Using a handloom, the warp and weft threads were interlaced to produce fabric with simple patterns. Finally, the textile was trimmed, pressed, and straightened to create a neat and usable fabric without applying chemical treatments, preserving its natural and sustainable qualities.

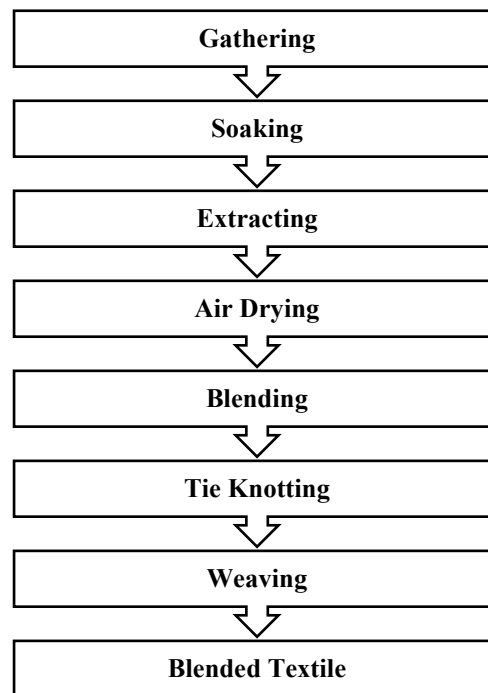


Fig. 1 Flow chart in the preparation of blended birds of paradise and bamban plant textile.

Collection of Data

Observations during the testing were conducted using three (3) trials or samples, while the final textile product was evaluated by 25 experts consisting of garment teachers, dress shop owners, fashion designers, local dressmakers, and end users through sensory evaluation. The evaluators were selected for their knowledge and expertise, such as understanding fashion trends, critical thinking, visualization skills, fabric knowledge, color sense, design and drawing expertise, creativity, sewing proficiency, precise measurement, and presentation skills (Shaikat, 2017).

The test on fibers and textiles was conducted in the laboratory. For the tensile strength test, each fiber sample was prepared with a uniform length of seven (7) inches. In the individual fiber testing, 10 strands per fiber type were used for each of the three (3) samples. For the blended fiber samples, five (5) strands of each fiber type were combined and attached to a spring balance. A gradual load was applied until fiber fracture occurred, after which the tensile strength was calculated. For the breaking elongation test, fiber samples were prepared with a standard length of seven (7) inches. In the individual fiber testing, ten (10) strands per sample were tested using a Universal Testing Machine (UTM). For the blended fibers, five (5) strands of birds of paradise (*Strelitzia reginae*) and five (5) strands of bamban plant (*Donax canniformis*) were combined and subjected to the same testing procedure. For the burning rate test, 1.09 in² swatches of the blended textile were held with a crucible tong and exposed to a lighted alcohol lamp, with the time recorded for three trials. In the water absorption test, textile swatches were weighed using a digital balance, soaked in 100 mL of tap water for 30 minutes, and weighed again to determine water uptake. For the washability test, textile swatches were soaked in a solution consisting of 100 mL of tap water with five (5) grams of detergent dissolved in it. The samples were immersed for 30 minutes, using three (3) replicates. After soaking, observations were systematically recorded to assess the textile's washability. An evaluation sheet served as the main research instrument, and the mean was used to determine the acceptability and potential use of the blended textile made from birds of paradise (*Strelitzia reginae*) and bamban (*Donax canniformis*) plants.

Statistical tools and Analysis

The researcher utilized a five-point Likert rating scale to evaluate the level of acceptability of the blended textile in terms of hand feel, irregularity of the ribs, color shade, and presence of plugs. Mean was used as the statistical tool to determine the overall acceptability of the developed textile. To determine the characteristics of the blended fibers and textile from birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*), the study also employed testing procedures for breaking elongation, tensile strength, burning rate, washability, and water absorption using the corresponding parameters and rating scales for each test.

III. RESULTS AND DISCUSSION

Tensile Strength of Blended Birds of Paradise and Bamban Plant Fibers

Table 4 presents the tensile strength results of birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers and their blended fiber under a constant fiber load of 10 kilogram-force (kgf), with measurements obtained using a spring balance. The values were expressed in N/mm² and interpreted using the established durability scale.

For the birds of paradise (*Strelitzia reginae*) fiber, tensile strength values of 40.2, 39.2, and 39.2 N/mm² were recorded, resulting in a mean of 39.5 N/mm², classified as Durable. The results indicated that the fiber possessed high tensile resistance and stable structural integrity, which may be influenced by cellulose alignment within the fibers (Fiore et al., 2016; Shahzad, 2018). For the bamban plant (*Donax canniformis*) fiber, tensile strength values of 34.3, 34.3, and 36.3 N/mm² produced a mean of 34.9 N/mm², also interpreted as Durable. Although its tensile performance was slightly lower than birds of paradise (*Strelitzia reginae*) fiber, the consistent results suggested uniform fiber structure. Studies on natural plant fibers indicate that lignin and hemicellulose content can affect tensile strength and durability (Sanjay et al., 2018; Jawaid & Thariq, 2019).

For the blended fiber, tensile strength values were 44.1, 45.08, and 44.08 N/mm², producing a mean of 44.7 N/mm². This placed the blended fiber clearly within the Very Durable category. Notably, the blended fiber demonstrated higher mean tensile strength than either individual fiber alone. The improvement suggests a complementary interaction between the structural properties of birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers. Blending likely enhances stress distribution along the fiber matrix, reducing localized weak points and increasing overall tensile resistance. Recent research has confirmed that hybridization of natural fibers can improve mechanical performance through synergistic reinforcement and enhanced load transfer efficiency (Mishra et al., 2019; Kumar et al., 2021). The consistent fiber load of 10 kgf across all tests ensured comparability and strengthened the reliability of the results.

Table 4. Tensile strength of blended birds of paradise and bamban plant fibers.

Fiber	Parameters	Sample 1	Sample 2	Sample 3	Mean	Verbal Interpretation
Birds of Paradise Fiber	Tensile Strength (N/mm ²)	40.2	39.2	39.2	39.5	Durable
	Fiber Load (Kgf)	10	10	10	–	–
Bamban Plant fibers	Tensile Strength (N/mm ²)	34.3	34.3	36.3	34.9	Durable
	Fiber Load (Kgf)	10	10	10	–	–
Blended Fiber	Tensile Strength (N/mm ²)	44.1	45.08	44.08	44.7	Very Durable
	Fiber Load (Kgf)	10	10	10	–	–

Legend:

<i>Tensile Strength</i>	<i>Verbal Interpretation</i>
40.21-50	Very Durable
30.41-40.20	Durable
20.61-30.40	Moderately Durable
10.81-20.60	Less Durable
1.00-10.80	Least Durable

The findings indicate that fiber blending enhanced the mechanical strength and structural reliability of the textile material, making it suitable for applications requiring resistance to tension and mechanical strain. These results support studies showing that natural fiber hybridization improves tensile performance (Sanjay et al., 2018; Kumar et al., 2021).

Breaking Elongation of Blended Birds of Paradise and Bamban Plant Fibers

Table 5 presents the breaking elongation results of birds of paradise (*Strelitzia reginae*) fiber, bamban plant (*Donax canniiformis*) fiber, and their blended fiber. The initial fiber length for all samples was maintained at seven (7) inches to ensure uniformity, and elongation measurements were recorded during testing.

Table 5. Breaking elongation of blended birds of paradise and bamban plant fibers.

Fiber	Parameters	Sample 1	Sample 2	Sample 3	Mean	Verbal Interpretation
Birds of Paradise Fiber	Initial Length (in)	5.0	5.0	5.0	–	–
	Elongation (in)	5.8	5.6	5.5	–	–
	Breaking Elongation (EL %)	16	12	10	12.66%	Least Elastic
Bamban Plant fibers	Initial Length (in)	5.0	5.0	5.0	–	–
	Elongation (in)	5.9	5.9	5.8	–	–
	Breaking Elongation (EL %)	18	18	16	17.33%	Least Elastic
Blended Fiber	Initial Length (in)	5.0	5.0	5.0	–	–
	Elongation (in)	6.2	6.5	6.3	–	–
	Breaking Elongation (EL %)	24	30	26	26.66%	Less Elastic

Legend:

<i>Percentage</i>	<i>Verbal Interpretation</i>
81-100	Very Elastic
61-80	Elastic
41-60	Moderately Elastic
21-40	Less Elasticity
1-20	Least Elasticity

For the birds of paradise (*Strelitzia reginae*) fiber, elongation values of 5.8, 5.6, and 5.5 inches were recorded, resulting in a mean of 5.6 with a percentage of 12.66%. According to the legend, this fell into the Least Elastic range. The low elasticity suggested that while the fiber was strong (as confirmed by tensile testing), it had limited stretchability before rupture. The rigidity of birds of paradise (*Strelitzia reginae*) fiber may be attributed to high cellulose crystallinity and low amorphous content, which restricts molecular movement and reduces fiber elongation (Shahzad, 2018; Mishra et al., 2019). For the bamban plant (*Donax canniformis*) fiber, elongation measurements of 5.9, 5.9, and 5.8 inches resulted in a mean breaking elongation of 17.33%, interpreted as Least Elastic. Although slightly more stretchable than birds of paradise (*Strelitzia reginae*) fiber, the consistent results indicated uniform fiber structure and moderate flexibility (Jawaid & Thariq, 2019).

Meanwhile, the blended fiber recorded higher elongation values of 6.2, 6.5, and 6.3 inches, producing a mean breaking elongation of 26.66%, interpreted as Less Elastic. The increased elongation suggests that blending birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers improved flexibility and stress distribution within the fiber structure. These findings support studies showing that natural fiber hybridization enhances flexibility and overall mechanical performance (Kumar et al., 2021; Sanjay et al., 2018).

Rate of Burning of Blended Birds of Paradise and Bamban Plant Fibers as Textile

Table 6 presents the burning rate results of textiles produced from blended birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers. In the first trial, a sample measuring 1.09 in² burned within 4.39 seconds, producing a blackish residue and yielding a burning rate of 0.25 in²/second. The second trial, with the same sample size, burned for 4.06 seconds, resulting in a burning rate of 0.27 in²/second and leaving a blackish dust residue. In the third trial, the 1.09 in² sample burned in 3.95 seconds, producing a blackish residue with a burning rate of 0.28 in²/second. The mean burning rate was 0.26 in²/second, which is verbally interpreted as highly combustible. Based on this burning rate, the textile produced from blended birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers was observed to burn and shrink readily when exposed to flame. The smoke emitted a pungent, urine-like odor, while the residue formed a black, hollow, and gritty bead.

Table 6. Rate of burning of blended birds of paradise and bamban plant fibers as textile.

Fiber	Variable	Sample 1	Sample 2	Sample 3	Mean	Verbal Interpretation
Blended Fiber	Area (in ²)	1.09	1.09	1.09	1.09	–
	Time (sec)	4.39	4.06	3.95	4.13	–
	Rate of Burning (in ² /sec)	0.25	0.27	0.28	0.26	Highly Combustible

Legend:

Burning rate (in ² /sec)	Verbal Interpretation
0.21-0.30	Highly Combustible
0.16-0.20	Combustible
0.11-0.15	Moderately Combustible
0.06-0.10	Less Combustible
0.01-0.05	Least Combustible

The burning rate test is a useful method for distinguishing fabrics made from natural and synthetic fibers, though it is not entirely reliable. A study on blended textiles found that burning behavior, including rate, residue, and odor, can indicate fiber composition. However, the test has notable limitations, as factors such as fiber proportion, fabric structure, and environmental conditions may influence the outcomes. Thus, while the burning rate test offers informative insights, it cannot be considered wholly conclusive (Rahman et al., 2025).

Washability of Blended Birds of Paradise and Bamban Plant Fibers as Textile

Table 7 shows the results of the washability test on textiles made from a blend of birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers, using five (5) grams of detergent powder dissolved in 100 (millimeters)

of tap water. After soaking for 30 minutes in three (3) separate trials, the textiles were observed and retained their original color, showing no noticeable changes. This outcome implies that the blended material has a stable composition, allowing it to withstand moisture without experiencing common issues such as fiber weakening, discoloration, or surface distortion. The uniformity of the results also indicates the consistency of the fiber blend, suggesting that integrating the two plant fibers produces a reliable textile in terms of wash performance. The washability of a textile affects how well it withstands laundering. Recent studies on washable fabrics have shown that repeated washing can alter properties such as electrical resistance, durability, and overall fabric structure, underscoring the importance of testing for washability in evaluating textile performance (Hossain & Bradford, 2022).

Table 7. Washability of blended birds of paradise and bamban plant fibers as textile.

Fiber	Parameter	Sample 1	Sample 2	Sample 3	Verbal Interpretation
Blended Fiber	Time Soaked (mins.)	30	30	30	–
	Textile Response	The textile showed no noticeable changes.	The textile showed no noticeable changes.	The textile showed no noticeable changes.	Excellent Quality

Legend (Verbal Interpretation of Washability):

Excellent – No changes observed after soaking/washing

Good – Minor changes in texture or color

Fair – Noticeable changes, but still usable

Poor – Significant damage or deterioration

Water Absorption of Blended Birds of Paradise and Bamban Plant Fibers as Textile

Table 8 discusses the result of water absorbency of textile from blended birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers. The textile was soaked in 100 milliliters of tap water within 30 minutes. The result showed that on the first trial, the initial mass was 0.03 grams, the final mass was 0.25 grams, and 0.22 grams of water were absorbed by the textile. In the second trial, the initial mass was 0.03 grams, the final mass was 0.27 grams, and the water absorption was 0.24 grams. In the third trial, the textile weighed 0.03 grams at the start, and the final weights were 0.26 grams and 0.23 grams for the absorbed water. In summary, its water absorbency was 23 percent. Therefore, a textile from blended birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*) fibers was verbally interpreted as Less absorbent, suggesting that it is suitable for quick-drying and moisture-resistant applications.

Table 8. Water absorption of the blended birds of paradise and bamban plant fibers as textile.

Parameters	Trials			Mean
	1	2	3	
Initial Mass (g)	0.03g	0.03g	0.03g	0.03g
Final Mass (g)	0.25g	0.27g	0.26g	0.26g
Water Absorbed	0.22g	0.24g	0.23g	0.23g
Percentage				23%
Verbal Interpretation				Less Absorbent

Legend:

Percentage Verbal Interpretation

81-100 Very absorbent

61-80 Absorbent

41-60 Moderately absorbent

21-40 Less absorbent

1-20 Least absorbent

Different fibers absorb moisture at different rates depending on their structure and hydrophilic nature. For instance, Begum et al. (2021) found that natural fibers such as cotton, banana, and pineapple exhibited varying water-absorption capacities, reflecting their distinct physical and chemical properties. These findings emphasize that fiber composition plays a key role in a textile's water uptake, underscoring the importance of measuring water absorption in evaluating fabric behavior and quality.

Acceptability of Blended Birds of Paradise and Bamban Plant Fibers as Textile

Table 9 presents the acceptability of textiles from blended fibers of birds of paradise (*Strelitzia reginae*) and bamban plant (*Donax canniformis*), evaluated by 25 experts based on hand feel, rib irregularity, color shade, and the presence of plugs. Overall, the textile was rated “Very Acceptable,” with a mean score of 4.45. Specifically, the textile received “Very Acceptable” ratings in all evaluated criteria: hand feel (4.59), irregularity of the rib (4.37), color shade (4.54), and presence of plugs (4.29). These results suggest that while the textile is generally well-received, attention should be given to improving rib regularity and reducing plugs, as these two factors received the lowest mean scores among the evaluated criteria.

Table 9. Acceptability of blended birds of paradise and bamban plant fibers as textile.

Statement	Mean	Verbal Interpretation
Hand Feel	4.59	Very Acceptable
Irregularity of the ribs	4.37	Very Acceptable
Color Shade	4.54	Very Acceptable
Presence of plugs	4.29	Very Acceptable
Overall Mean	4.45	Very Acceptable

Legend:

Mean	Verbal Interpretation
4.21-5.00	Very Acceptable
3.41-4.20	Acceptable
2.61-3.40	Moderately Acceptable
1.81-2.60	Less Acceptable
1.00-1.80	Least Acceptable

IV. CONCLUSION

Based on the findings of the test and sensory evaluations conducted on the blended textile, the conclusions of the study were established.

The blended textile from birds of paradise (*Strelitzia reginae*) and bamban (*Donax canniformis*) fibers showed strong and promising mechanical performance. Combining the two fibers improved tensile strength, making the material more durable than when each fiber is used alone. This highlights the value of fiber blending in enhancing the strength of natural textiles. In addition, the fabric displayed elastic behavior during breaking elongation, with flexibility comparable to silk. This suggests that the material is not only strong but also sufficiently stretchable, making it suitable for practical textile applications.

However, the burning rate test showed that the textile is highly combustible, behaving similarly to cellulose-based fibers like cotton and jute. Despite this drawback, it demonstrated good washability, with no noticeable color changes after repeated soaking in detergent, indicating reliable color stability. The water absorption results also revealed low absorbency, which can be beneficial for uses where minimal moisture retention is preferred.

Finally, expert evaluation rated the textile as highly acceptable in terms of hand feel, irregularity of the ribs, color shade, and presence of plugs. Overall, the results suggest that blending birds of paradise (*Strelitzia reginae*) and bamban (*Donax canniformis*) fibers produces a practical and promising alternative textile material.

REFERENCES

- [1]. Acme Mills. (2015). Definition of Textile. In Industry News & Blog. Acme Mills. Retrieved July 5, 2025, from <https://acmemills.com/industry-news-blog/definition-of-textile-importance-and-uses-of-textile/> Ahmed, E. H. (2022). Brief of Natural Fibers in Historical Textiles Manufacturer. Trends Text. Eng. Fash. Technol, 6, 765-767.
- [2]. Al-Ali AlMa'adeed, M., & Krupa, I. (2015). Fiber identification with a burning test. In Polyolefin Compounds and Materials: Fundamentals and Industrial Applications. Springer.
- [3]. Ari, M., et al. (2023). *Lignocellulosic plant fibers: Structure, properties, and applications in composites*.
- [4]. ASTM International. (2021). ASTM D3822/D3822M-14: Standard test method for tensile properties of single textile fibers. West Conshohocken, PA: ASTM International.
- [5]. Begum, H. A., Tanni, T. R., & Shahid, M. A. (2021). Analysis of water absorption of different natural fibers. Journal of Textile Science and Technology, 7(04), 152–160. <https://doi.org/10.4236/jtst.2021.74013>
- [6]. Bhardwaj, S., & Juneja, S. (2014). Performance of jute viscose/polyester and cotton blended: yarns for apparel use. Studies on Home and Community Science, 6(1), 33–38.
- [7]. Bungag, M. M. (2023). Acceptability of corn Zea mays husk fiber as raw material in fabric making. Asia Pacific Higher Education Research Journal. <https://www.po.pnuresearchportal.org/ejournal/index.php/apherj/article/view/871>
- [8]. Cabigon, Emily B. (2024). Development and Utilization of Blended Purple Nutsedge (*Cyperus rotundos*) and Lady's Finger (*Abelmoschus esculentus*) fibers as an Alternative Textile Material
- [9]. DOST–FPRDI. (2024). *Banana and bamboo fiber utilization for sustainable materials development*. Department of Science and Technology – Forest Products Research and Development Institute
- [10]. DOST–PCHRD. (2023). *Advances in Philippine natural fiber research for sustainable applications*. Philippine Council for Health Research and Development.
- [11]. Ecostandard. (2022). Deep dive: Standards to measure textile durability. Retrieved July 5, 2025, from <https://ecostandard.org/resources/report-deep-dive-standards-to-measure-textile-durability>
- [12]. Ellen MacArthur Foundation. (2017). A new textiles economy: Redesigning fashion' future. Engineering, 43(7), 2883–2892. <https://doi.org/10.1016/j.compositesb.2012.04.036> environmentally superior to glass fiber reinforced composites? Composites Part A: Applied Science and Manufacturing, 35(3), 371–376. <https://doi.org/10.1016/j.compositesa.2003.09.016>
- [13]. Galvez, L. C., Koh, R. B. L., Barbosa, C. F. C., Asunto, J. C., Catalla, J. L., Atienza, R. G., Costales, K. T., Aquino, V. M., & Zhang, D. (2021). Sequencing and de novo assembly of abaca (*Musa textilis* Née) var. Abuab genome. Genes, 12(8), 1202. <https://doi.org/10.3390/genes12081202>
- [14]. Hossain, M., & Bradford, G. (2022). Washability and abrasion resistance of illuminative knitted e textiles with optical fibers and silver coated conductive yarns. Fashion and Textiles, 9(13). <https://doi.org/10.1186/s40691-022-00313-9>
- [15]. Jabbar, M., Iftikhar, F., Hussain, T., Ahmad, S., & Ahmad, F. (2025). Preparation and characterization of sustainable plant-based blended woven fabric. Journal of Engineered Fibers and Fabrics, 20, 15589250251319322.
- [16]. Jawaid, M., & Thariq, M. (2019). Sustainable natural fiber composites: Fundamentals and applications. Woodhead Publishing.
- [17]. Komuraiah, A., et al. (2014). Characterization of natural fibers for composite applications.
- [18]. Kumar, R., Ul Haq, M. I., & Raina, A. (2021). Mechanical properties of hybrid natural fiber composites: A review. Journal of Natural Fibers, 18(12), 1917–1935.
- [19]. Lemita, N., Deghboudj, S., Mansour, R., Rekbi, F. M. L., & Halimi, R. (2022). *Characterization and analysis of novel natural cellulose fiber extracted from Strelitzia reginae plant*. Journal of Composite Materials, 56(1), 99–114. <https://doi.org/10.1177/00219983211049285>
- [20]. Lobregas, M. O. S., Buniao, E. V. D., & Leño, J. L. (2023). Alkali-enzymatic treatment of Bambusa blumeana textile fibers for natural fiber-based textile material production. Industrial Crops and Products, 194, 116268. <https://doi.org/10.1016/j.indcrop.2023.116268>
- [21]. Mariam, R., Santos, L., & Herrera, P. (2025). Performance enhancement of blended natural fiber textiles. Journal of Sustainable Materials Research, 14(2), 85–102.
- [22]. Marques, R., Oliveira, C., Araújo, J. C., Chaves, D. M., Ferreira, D. P., Fanguero, R., Silva, C. J., & Rodrigues, L. (2024). Planting sustainability: A comprehensive review of plant fibres in needle-punching nonwovens. Textiles, 4(4), 530–548. <https://doi.org/10.3390/textiles4040031>
- [23]. Malenab, R. A. J., Ngo, J. P. S., & Promentilla, M. A. B. (2017). Chemical treatment of waste abaca for natural fiber-reinforced geopolymer composite. Materials, 10(6), 579. <https://doi.org/10.3390/ma10060579>
- [24]. Mishra, R., Militky, J., & Venkataraman, M. (2019). Hybrid natural fiber reinforced polymer composites: A review. Journal of Composite Materials, 53(24)*, 3389–3404.
- [25]. Mohanty, A. K., Misra, M., & Drzal, L. T. (2002). Sustainable biocomposites from renewable resources.

- [26]. Motaleb, K. Z. M. A., Shariful Islam, M., & Hoque, M. B. (2018). Improvement of Physicomechanical Properties of Pineapple Leaf Fiber Reinforced Composite. *International journal of biomaterials*, 2018, 7384360 <https://doi.org/10.1155/2018/7384360> of *Research and Reviews in Applied Sciences*, 8(2), 194–206.
- [27]. Oliveira, R., et al. (2025). Advancements in natural fibers for sustainable textile manufacturing: Importance, sources, applications, and future prospects. *Next Materials*, 101564. <https://doi.org/10.1016/j.nxmte.2025.101564>
- [28]. PCIEERD. (2024). *Philippine natural fiber innovation and development program*. Philippine Council for Industry, Energy and Emerging Technology Research and Development.
- [29]. PROSEA. (2024). *Donax canniformis*. PlantUse – Plant Resources of Southeast Asia. Retrieved from [https://uses.plantnet-project.org/en/Donax_canniformis\(PROSEA\)](https://uses.plantnet-project.org/en/Donax_canniformis(PROSEA))
- [30]. Rahman, et al. (2025). Characterization of blended buri and jute textile materials: Burning rate and physical properties. *International Advanced Research Journal in Science, Engineering and Technology*. Retrieved from <https://iarjset.com/wp-content/uploads/2025/06/IARJSET.2025.12601.pdf>
- [31]. Ramesh, M., et al. (2023). Recently explored natural cellulosic plant fibers (2018–2022): A potential raw material resource for lightweight composites. *Industrial Crops and Products*, 192, 116099. <https://doi.org/10.1016/j.indcrop.2022.116099>
- [32]. Roces, M. (2024). Reviving, reinventing and rethinking an indigenous luxury textile: Piña cloth, and fashion in the Philippines. *Fashion Theory*, 28(5–6), 649–681. <https://doi.org/10.1080/1362704X.2024.2380079>
- [33]. Sangamithirai, K., & Vasugi, N. (2020). Banana fibre – A potential source of sustainable textiles. *Journal of Applied Horticulture*, 22(2), 133–136. <https://doi.org/10.37855/jah.2020.v22i02.24>
- [34]. Sanjay, M. R., Arpitha, G. R., & Yogesha, B. (2018). Study on mechanical properties of natural fiber reinforced polymer composites: A review. *Materials Today: Proceedings*, 5(1)*, 108–114.
- [35]. Santos, A., et al. (2024). Pre-treatment processes and performance improvement of natural fibers for composite reinforcement.
- [36]. Sarwar, Z., Ahmad, F., Ahmad, A., & Ahmad, S. (2023). A sustainable blend of Tencel/jute fibers as an alternative to cotton/polyester for clothing. *Journal of Engineered Fibers and Fabrics*, 18, 15589250231215458.
- [37]. Sayam, S. (2026). Natural fibers in sustainable materials: Extraction technologies, fiber modification, and performance–sustainability relationships. *RSC Advances*, 16, 10495–10537. <https://doi.org/10.1039/D5RA09029F>
- [38]. Seninde, D. R., Chambers IV, E., Chambers, D. H., & Chambers V, E. (2021). Development of a consumer-based quality scale for artisan textiles: A study with scarves/shawls. *Textiles*, 1(3), 483–503. <https://doi.org/10.3390/textiles1030025>
- [39]. Shaikat, M. N. (2017). Financing for textile and garments. *ORDNUR*. <https://ordnur.com/academic-study/finance/financing-for-textile-and-garments/>
- [40]. Tinoca, L., Piedade, J., Santos, S., Pedro, A., & Gomes, S. (2022). Design-based research in the educational field: A systematic literature review. *Education Sciences*, 12(6), 410. <https://doi.org/10.3390/educsci12060410>
- [41]. United Nations Environment Programme. (2021). Sustainability and circularity in the textile value chain: Global stocktaking report.