

Development and utilization of blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers as an alternative for textile material

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Abstract: Blending is a technique to overcome the poor characteristics of one fiber. It is the technique of combining fibers that emphasizes the good qualities and minimizes poor qualities of the fibers. It also makes the fabric manufacturing process economical (Bhardwaj et al., 2012). The purpose of this study was to develop and utilize blended Purple Nutsedge (*Cyperus rotundus*) and Lady's Finger (*Abelmoschus esculentus*) Fibers as an Alternative for Textile Material. Developmental method of research was employed in the weaving of the fibers into textile while the experimental method was applied for the characterization. A sensory evaluation sheet was used to determine the acceptability and utilization of the textile into *Filipiñana* blouse. The plant materials used in this study are mainly stalk of purple nutsedge (*Cyperus rotundus*) and the stem of lady's finger (*Abelmoschus esculentus*). The statistical tool used was the mean which was used to determine the acceptability of Textile from Blended Purple Nutsedge (*Cyperus rotundus*) and Lady's Finger (*Abelmoschus esculentus*) Fibers as an Alternative for Textile Material. There were twenty-five experts who evaluated the product composed of dress shop owner, and fashion designers. The product had undergone a series of testing as to its qualities. It was tested that blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers have low elongation compared to jute-cotton blend but higher tensile strength. As to the result of its burning test, the textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fiber was like a silk and wool fabric wherein it burns but does not melt. It shrinks from the flame. The odor was like of charred meat. The residue was black, hollow irregular bead that can easily resemble a gritty black powder. It was self-extinguishing and it burned itself out. That textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers was likely similar to a cotton textile in terms of shrinkage. A fabric blend of 65% Polyester and 35% Cotton absorbed the 12.5% amount of water and it was similar to the textile of blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers with 11 percent of water absorbency. Textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers soaked with 2 grams of detergent powder and the reaction of the three trials were the same wherein it became slightly dark and intact. The textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers was "Very Acceptable" in terms of feeling, presence of plugs, irregularity of the ribs, color shade, and color variation. A *Filipiñana* blouse from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) textile resulted to a "Strongly Agree" in terms of design, style, usability, authenticity, and fashionability.

Keywords: Fiber, Textile, Natural fiber, Blended fiber

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INTRODUCTION

Clothing is one of the basic human needs. Given a brief history of people and textiles, it is hard to imagine that the industry or art of making textiles has evolved into one that adversely affects the environment. With industrialization, the fabric industry transformed from one grounded in nature to one that relies heavily on synthetic materials and chemicals. The discoveries of various synthetic fibers created a wider market for textile products and gradually led to the invention of new and improved sources of natural fiber. To this effect, the researcher would like to develop a blended plant-based textile that would create a unique and environmentally friendly product that will be an alternative to man-made textiles. Blending is a technique to overcome the poor characteristics of one fiber. It is the technique of combining

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fibers that emphasizes the good qualities and minimizes poor qualities of the fibers. It also makes the fabric manufacturing process economical (Bhardwaj et al., 2012).

The researcher believes that blending of purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers have not yet done in the textile industry. Lady's finger (*Abelmoschus esculentus*) is one of the agricultural plants that is easy to cultivate and is abundant in the locality. As well as the purple nutsedge (*Cyperus rotundus*) wherein based on its characterization gives a high commendable for making textile that can be utilized into a Filipiniana blouse. This research would be developmental and experimental by both natural fibers which can be made possible to develop an authentic textile that can replace or be an alternative to a commercial one.

Statement of the problem

This study aims to develop and utilize blended Purple Nutsedge (*Cyperus rotundus*) and Lady's Finger (*Abelmoschus esculentus*) fibers as an alternative for textile material. Specifically, it aims to:

- 1) Determine the physical properties of blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers as an alternative for textile material in terms of breaking elongation and tensile strength.

- 2) Evaluate the textile of blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers as an alternative for textile material in terms of rate of burning, shrinkage, water absorption and washability.

- 3) Determine the level of acceptability of textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers as an alternative for textile material in terms of feeling, presence of plugs, irregularity of the ribs, color shade, and color variation.

- 4) Determine the utilization of textile blended fibers from purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) as an alternative for the textile material in terms of design, style, usability, authenticity, and fashionability.

METHODOLOGY

Research design

This study used the developmental method of research. This method has been defined as the “systematic study of designing, developing and evaluating instructional programs, processes and products that must meet the criteria of internal consistency and effectiveness” (Seels & Richey, 1994). The blending of purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers through loom weaving is a combination of two plant-based fibers that will vie the existing product in the market. On the other hand, “an experimental design is set up to determine the most significant factors that affect a selected quality characteristic of a textile product” (Moreb, 2007). In which it looked into the possibility of purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) can be made into a Filipiniana blouse.

Locale of the study and respondents

All observations in the development through experimentation had been done in three trials/samples while the finished product was evaluated by twenty-five (25) evaluators including dress shop owners, fashion designers and dressmakers in the locality based on sensory evaluation. The respondents/evaluators were chosen based on their expertise and knowledge of the information desired about the product such as: understand fashion trends, able to critically think, able to visualize, have fabric knowledge, have good sense of color, expert of drawing,

have creative mind, knowledgeable of sewing materials, able to perfectly measure and have good presentation skill (Shaikat, 2017).

Research instruments

An evaluation sheet served as the research instrument of the study. Mean was used to determine the acceptability and utilization of textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers.

Data analyses procedure

The statistical tool used was the mean which was used to determine the acceptability of Textile from Blended Purple Nutsedge (*Cyperus rotundus*) and Lady's Finger (*Abelmoschus esculentus*,) Fibers as an Alternative for Textile Material. There were twenty-five experts who evaluated the product composed of dress shop owner, and fashion designers.

FINDINGS AND DISCUSSION

Breaking elongation of blended purple nutsedge (cyperus rotundus) and lady's finger (abelmoschus esculentus) fibers

The data present the elongation break on the first trial of blended purple nutsedge (*cyperus rotundus*) and lady's finger (*abelmoschus esculentus*). More so, it was discovered that the fibers were 6.04 percent, and a fracture length of 215 millimeters was measured. The second trial was 7.26 percent with a fracture length of 218.4 millimeters. The third trial yielded 8.55 millimeters with a fracture length of 221 millimeters and with the same diameter of 203.6 for each trial and with the computed mean of 7.28 millimeters. The results further showed that the blended purple nutsedge (*cyperus rotundus*) and lady's finger (*abelmoschus esculentus*) fibers are least elastic than purely fibers tested which is reflected on page 58 (Rating Scale for Breaking Elongation of Blended Purple Nutsedge (*cyperus rotundus*) and Lady's Finger (*abelmoschus esculentus*) Fibers).

Based on the study of Ullah et.al., jute-cotton blended yarns have a higher elongation break of 9.492 percent when it matches the blended purple nutsedge (*cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers with a 7.28 percent it's because jute-cotton blended yarn was undergone treatment compared to a non-treated blended purple nutsedge and lady's finger fibers. Therefore, blended fibers which undergone treatment has higher elasticity percentage compared to non-treated blended fibers.

Tensile strength of blended purple nutsedge (cyperus rotundus) and lady's finger (abelmoschus esculentus) fibers

Based on the result of the test conducted, the average computed mean tensile strength of blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers was 30.82 Newton per square millimeter which showed high tensile strength when compared to jute-cotton blended yarns with 4.498 Newton per square millimeter (Ullah et.al., 2016). For the analysis, blended purple nutsedge and lady's finger fibers have the potential qualities for textile when it comes to durability. In this purview, it is interesting to find out that the product / output of this study has a tensile strength that would enable it to withstand certain pressure, hence, the durability of the fiber is proven and tested. Thus, the possibility of replicating this product into a commercial endeavor is feasible.

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Burning rate of textile from blended purple nutsedge (Cyperus rotundus) and lady's finger (Abelmoschus esculentus)

The data presents the result of the burning rate of textile from a blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers. The data showed that in the first trial measured 1.09in² the textile from a blended fibers of purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) was burned 5.10 seconds producing blackish color of dust and with a burning rate of 0.21in²/seconds. The second trial measured 1.09in², and the textile from a blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers burned for 4.77 seconds with the blackish color of dust and with a burning rate of 0.23in²/seconds. The third trial which measured 1.09in², yielded the textile from plant-based fibers of purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) after burning for 4.72 seconds with the blackish color of dust and with a burning rate of 0.23in²/seconds. For the burning rate mean was 0.22in²/sec. As to the result of its burning test, the textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers was comparable to silk and wool fabric wherein it burns but does not melt. It shrinks from the flame. It has the odor of charred meat. The residue was black, hollow irregular bead that resemble a gritty black powder. It is self-extinguishing, i.e., it burns itself out (fabriclink.com). Therefore, it was highly combustible because of the rapid burn.

Shrinkage of textile from blended purple nutsedge (Cyperus rotundus) and lady's finger (Abelmoschus esculentus)

The results showed the shrinkage of textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*). It could be gleaned that on the first trial, its initial width was 2.54 centimeters and after sixty (60) minutes soaked in forty (40) milliliter of tap water it measured 2.57 centimeters and it expanded 0.03 millimeter, the percentage of shrinkage was 1.18 percent. On the second trial, the initial width was 2.54 centimeters and after sixty (60) minutes soaked in forty (40) milliliters of tap water it became 2.56 centimeters and the expanded width was 0.02 millimeter, the percentage shrinkage was 0.79 percent. On the third trial, its initial width was 2.54 centimeters and after sixty (60) minutes soaked in a forty (40) milliliter the dimension of the textile became 2.58 centimeters and the expanded width was 0.04 mm with a percentage of shrinkage of 1.57. It was observed that in every trial there was a difference in the dimension of the textile and was increased its measurement. Therefore, blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) textile was least compressed as shown on table of page 60 (Rating Scale for Shrinkage of Blended Purple Nutsedge (*Cyperus rotundus*) and Lady's Finger (*Abelmoschus esculentus*) Textile).

Relaxation shrinkage leads to progressive changes in the width and axial dimensions of the textile, which usually results in reductions in both dimensions. However, this is not always the case, and fabric that has been excessively stretched in length during finishing and has not been effectively stabilized by heat-setting or consolidation may increase in width during the wash and wear. This problem is frequently encountered with cotton T-shirts (Cooke, 2011). Therefore, textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers was like cotton textile in terms of shrinkage.

Water absorption of textile from blended purple nutsedge (cyperus rotundus) and lady's finger (abelmoschus esculentus)

The result showed that on the first trial, the initial mass was 0.07 grams, and the final mass was 0.16 grams, and it has 0.09 grams of water absorbed on the textile. In the second trial, the initial mass was 0.07 grams, and the final mass was 0.17 grams and for its water absorbed was 1.0 grams. In the third trial, the textile weighed for its initial mass of 0.07 grams and the final weight was 0.18 grams and 0.11 for its water absorbed. When it sums up its water absorbency was 11 percent. Therefore, a textile from blended purple nutsedge (*cyperus rotundus*) and lady's finger (*abelmoschus esculentus*) was least absorbent as shown on table of page 61 (rating scale for water absorption of blended purple nutsedge (*cyperus rotundus*) and lady's finger (*abelmoschus esculentus*) Fibers).

This test was conducted because moisture in clothing has been found to be the most significant factor contributing to discomfort. The presence of sweat will increase friction between fabric and skin trigger a clingy sensation and eventually increase the level of fatigue felt by the wearer. This problem is even more severe for the clothing worn under extreme environmental conditions or at a high activity level.

A fabric blend of 65% Polyester and 35% Cotton absorbed the 12.5% amount of water and it was closely similar to the textile of blended purple nutsedge (*cyperus rotundus*) and lady's finger (*abelmoschus esculentus*) fibers with 11 percent of water absorbency. However, it was the most efficient fabric in terms of expelling water. This makes it an ideal cloth for anti-water activities as it doesn't absorb a lot of water and gets rid of the absorbed very quickly (Buch, 2012). Absorbency or moisture regain is the ability of a textile to take in moisture (Elsasser, 2010). This is relative to the comfort of textiles next to the skin. Hydrophilic fibers readily absorb moisture without making the wearer feel uncomfortable, whereas hydrophobic is when fibers do not absorb moisture.

Washability of textile from a blended purple nutsedge (cyperus rotundus) and lady's finger (abelmoschus esculentus)

The data showed the observation of the washability test applied to textile from a blended purple nutsedge (*cyperus rotundus*) and lady's finger (*abelmoschus esculentus*) fibers using 2 grams of detergent powder. The result showed that there was a ten-minute duration of soaking on the three trials and had the same reaction to detergent wherein the textile became slightly dark and intact.

Washability is seen as one of the main obstacles that stand in the way of wider market success of e-textile products. So far, there are no standardized methods for wash testing of e-textiles and no protocols to comparably assess the washability of tested products. Thus, different e-textiles that are deemed equally washable by their developers might present with very different ranges of reliability after repeated washing (Rotzler, et.al, 2021).

Likewise, most fabrics, such as cotton and polyester, degrade with each cycle. Elasticity changes, dye fades, and overall resilience is diminished. E-textiles consist of electronics and conductive components in addition to fibers. So, they will degrade just like any textile. There is also a different impact on the functionality. Conductivity and electrical resistance can both be determined with a multimeter. For many garments, we would expect them to last for anywhere from 50 to 100 washes. This standard is often too high for e-textile solutions, which can last closer to 10 to 50 wash cycles, depending on the technology.

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Acceptability of textile from a blended purple nutsedge and lady's finger fibers in terms of feeling, presence of plugs, irregularity of the ribs, color shade and color variation

The data showed the acceptability of textile from a blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers in terms of feeling, presence of plugs, irregularity of the ribs, color shade, and color variation. There were twenty-five (25) experts who evaluated the product.

Generally, the textile from blended Purple Nutsedge (*Cyperus rotundus*) and Lady's Finger (*Abelmoschus esculentus*) fibers was "Very Acceptable", having obtained an overall mean score of 4.72 percent. Specifically, textile from purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers formed a "Very Acceptable" rating in all criteria which it was evaluated, namely feeling (4.76%), presence of plugs (4.88%), irregularity of the ribs (4.60%), color shades (4.80%), and color variation (4.72%) which is "Very Acceptable" in all criteria given in the evaluation of the product.

The result implies, however, that the researcher must further develop the irregularity of the ribs and the presence of plugs since these are the factors that obtained the lowest mean score. Furthermore, the researcher should use Fiber Decorticator Machine to have equal thickness and length of fibers.

Utilization of textile from a blended fibers of purple nutsedge and lady's finger into Filipiniana blouse in terms of design, style, usability, authenticity and fashionability

The data presents the utilization of Filipiniana blouse from a blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers in terms of design, style, usability, authenticity, and fashionability.

As shown in the table, authenticity scored the highest mean of 4.84 because according to the evaluators that even though the textile was utilized into *Filipiniana* blouse the original form was still present like the color of the fibers. Followed by usability with a mean of 4.48 with most of the evaluators gave the second highest rate for it was then agreeable to be worn for specific occasion like national costume parade and political gatherings. Followed by style and fashionability with a mean of 4.44, because according to the evaluators there were many styles that would apply in sewing *Filipiniana* blouse and it cannot be worn for ordinary occasion for its characteristics and unique materials.

CONCLUSIONS AND RECOMMENDATION

In the light of the findings established, the researcher found that the Textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger (*Abelmoschus esculentus*) fibers was like a jute-cotton blend as to its breaking elongation, therefore, it was least elastic. As to its tensile strength, blended purple nutsedge and lady's finger fibers has the potential qualities for textile when it comes to durability, therefore it was durable, highly combustible as to its burning rate, least compressed as to its shrinkage, least absorbent as to its water absorbency, and had discoloration when applied to a detergent.

Textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger was "Very Acceptable", considering its feeling, presence of plugs, irregularity of the ribs, color shades, and color variation. As to the evaluators' comments, feedback, and suggestions, the product was unique and amazing. Furthermore, the local government must support locally made products.

Based on the findings and conclusions of the study, several recommendations were drawn. Firstly, textile from blended purple nutsedge (*Cyperus rotundus*) and lady's finger

(*abelmoschus esculentus*) fibers should be dry cleaned only, as this method best preserves its quality. This textile is particularly suitable for hyperactive individuals due to its durability. However, it is important to avoid any contact with fire, even small flames. Additionally, there is no need for pre-treatment, such as soaking, before utilizing this textile for quality garments, as it does not shrink.

The textile is best used in fashion accessories like bags, wallets, wall decorations, blind curtains, and national costumes, as recommended by most evaluators. Further experiments are encouraged to continually improve the textile and explore its potential applications. Continued development should focus on identifying other products that can be made from this textile. Finally, it is suggested that the textile from blended purple nutsedge and lady's finger fibers be protected by the Intellectual Property Office (IPO) to secure its unique properties and potential uses.

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