
**AN EMPIRICAL RESEARCH ON THE APPLICATION OF COCONUT LEAF
SHEATH ON JEWELLERY PRODUCTS**

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ABSTRACT

This research focused on experimental application of recycle material on jewellery products. This research experimented on suitable techniques to be applied on recycle material of jewellery products and the suitability of the recycle material to be applied on jewellery products. This research aims on how to test the durability and suitability of the recycle material being applied on jewellery products. The researcher has chosen the coconut leaf sheath material to be applied on jewellery products. A variety of experiment has been done to coconut leaf sheath that produces improvement and added value to the recycle material and at the same time suitable to be applied on the jewellery products. This research was done based on the objective which is to generate a faster profit and side income while waiting for the slow coconut palm growing process, to fulfill the manufacturing industry that needs renewable raw material especially in fiber industry, to utilize the wastes of natural fiber into profitable and marketable raw material especially for rural entrepreneurs and to introduce the improvement and new added value of mix media method to Malaysia's jewellery industry. The methodology used is experiment method in order to explore various options of technique and material used to achieve optimum results. The experiment includes coloring, shaping, forming, designing, and preserving that recycle material in order to make it ideal for application on jewellery products. The researcher only focused the experiment on the surface and not into micro molecule treatment just to make sure this experiment is easy to handle by anyone who is interested to commercialize it. This research concluded that the enhancement of recycle material will generate faster profit and provide side income to the rural coconut entrepreneurs and contribute to the development of renewable fiber in manufacturing industry. At the same time, it will provide a lot of work opportunities and a lot of vacancies for unemployed person. The researcher also concluded that the waste of natural fiber can be transformed into profitable material and the application of coconut leaf sheath on jewellery products with some new added value will be a spectacular identity of Malaysia as the largest agriculture country.

Keywords: *Empirical, application, jewellery, recycle, material*

1.0 Introduction

Jewellery is a product that functions as an ornament or artwork which enhances the beauty of the wearer. Precious and semi-precious materials are widely used in jewellery making and is brought into stone setting by using precious and semi-precious gemstones (Elizabeth Galton, 2012). There is also jewellery that uses synthetic or fake gemstones to make it more affordable. It also manifests itself as rings, necklaces, bracelets, armlets, choker and many more.

Jewellery may be appreciated because of its material properties, its patterns or for meaningful symbols. That was why some ancient jewellery only used common gold and common gemstones and it became very expensive because of its origin and sentimental value (Jack Ogden, 1992). Even though there are many arguments against lack of artisanship, craftsmanship, hand skills, and conceptual engagement is a requirement to call it as jewellery. This is because not all jewellery has these qualities.

The argument about body adornment can be incorporated into the broad category of jewellery. It has no other function than decorative, tribal marking, status, belonging and others, which could also be said of jewellery. These arguments and contemporary acceptance in jewellery design provide an opportunity for the jewellery industry to consolidate recycle material as an enhancement material.

Coconut leaf sheath is identified as a potential material to be used. Coconut leaf sheath is a natural fiber that functions to cover up the base of coconut leaf. These coconut leaf sheaths have a wood characteristic that is built from plant cells. This plant cells have cell wall that functions to maintain the form of this fiber. It was a waste when this coconut leaf sheath was left without any courage to explore their potential to be a valuable new material.

Agriculture remains an important sector of Malaysia's economy, contributing 12 percent to the national GDP (Gross Domestic Product) or also known as GDI (Gross Domestic Income) and providing employment for 16 percent of the population (Abdul Rahman Dahlan, 2015). The researcher has taken this opportunity to expand this potential material in jewellery sector. This interesting and spectacular material can be mixed and combined together with silverwares and jewellery product. It is the same as combining recycled plastic, glass, rubber, and fabric on silverwares product. This coconut leaf sheath can also be nicely combined with jewellery product. When this coconut leaf sheath material is being applied on the jewellery product, it will also apply the Malay culture, heritage and origin as an agriculture country and at the same time will be a new Malaysian jewellery identity.

2.0 Statement of the Problem

The researcher identified several factors regarding this research as a platform of the study. The factors are:

2.1 Coconut palm growing process takes a long period to generate profit. Coconut palm will only produce fruit when it reaches adult period, but while the growing process, coconut palm will produce a lot of leaf sheath that can generate income if this coconut leaf sheath is being commercialized as a high quality fiber as it is very valuable. The abundance of coconut palm in Malaysia will make the whole world invest in coconut leaf sheath material. Other than that, this research will produce new job opportunities and new income sources to Malaysians that depend upon coconut palm to survive and at the same time it will help the Malaysian government to eradicate poverty.

- 2.2 Manufacturing industry needs a renewable raw material in many industry sectors. When the petroleum price amazingly increases, all the materials that are based on petroleum or oil will automatically rise up. The plastic that is usually made from monomer from oil will have an increasing of price. When many materials become so expensive, people will need an alternative to produce new and cheaper material. The fiber from coconut leaf sheath will also support the green technologies that are well known to conserve the natural environment and resources, and to curb the negative impacts of human involvement. Sustainable development is the core of environmental or green technologies. This research will also create the new 'made in Malaysia' material.
- 2.3 Coconut leaf sheath will just be a waste without generating any profit. Malaysians needs knowledge on how to reuse and recycle the waste material to be a precious material. They also need more exposure on the potential of natural fiber to be commercialized and at the same time will generate income. For example, wood fiber had been commercialized, recycled and used widely in furniture industry. When the revolution in hybrid technologies begun, people will be more attracted to nature-base material that is cheaper and supports green technologies.
- 2.4 The Malaysian jewellery needs a new touch and improvement with some mix media technique. The mix media with the coconut leaf sheath will be a new media that is suitable and interesting to be combined together with jewellery product. This product can bring out to the international level and be commercialized. It is also a concept design of Malaysia's jewellery identity. When the new identity of Malaysia's jewellery is being introduced, the whole world will remember the jewellery mixed with coconut leaf sheath manifested in Malaysia.

3.0 Research Objectives

This research has a few objectives to be achieved which are:

- 3.1 To generate a faster profit and side income while waiting for the slow coconut palm growing process.
- 3.2 To fulfill the manufacturing industry that needs renewable raw material especially in fiber industry.
- 3.3 To utilize the wastes of natural fiber into profitable and marketable raw material especially for rural entrepreneurs.
- 3.4 To introduce improvement and new added value of mix media method to the Malaysia's jewellery industry.

4.0 Review of Related Research and the Literature

According to the article 'mechanical strength of polyester matrix composites reinforced with coconut fiber wastes' by Sergio N. Monteiro (2005), the mechanical and characteristic of coconut fruit fiber incorporated with polyester matrix composites wastes were evaluated. It shows the potential of natural fiber especially fiber from coconut tree to be developed and commercialized as a multi-purpose fiber and at the same time can be applied on the jewellery products.

According to the article 'Application of Natural Fiber Composites for Constructive Parts in Aerospace, Automobiles, and Others Area by Researcher of Institute of Structural

Mechanics, German Centre for Aerospace, Lilienthal Platz, 7, D-38108 Braunschweig, Germany, the researcher has stated that fiber-reinforced polymers (FRP) has been applied largely to the area of aerospace technology because of its strength and light-weight characteristic. Unfortunately, the man-made fiber is a very stable compound and it is difficult to be disposed; thus, that material needs to be recycled to save the budget because of its non-renewable raw material. Following to that, the development of renewable resources that consist of natural fiber or biopolymer has an extensive opportunity being a suitable and spectacular biopolymer and at the same time, it is very suitable to be applied with the jewellery products.

According to the book 'Sustainable Waste Management' by Ravindra K Dhir, Moray D Newlands, Tom D Dyer (2003), the waste management has been highlighted as a popular issue in many developed countries worldwide and how to control resource use through regulation of waste disposal. Following to that, recycling the material will overcome this issue and the renewable raw material development should be done to overcome this problem.

According to the book 'Fiber Science and Technology' by Premamoy Ghosh (2004), the natural fiber is important in terms of production volume, industrial activity, and usage patterns. However, only cotton, flax, wool and silk have been used widely as they are popular. It is because clothes industry development is rapidly improving with appearance of the interesting and potential material. Other than that, it is suitable for the application in non-appealing areas such as yarns, cards, canvas, ropes, woven sacks, mats, carpets, and others. Following to that, the application of coconut leaf sheath on appealing and attractive products such as jewellery products will make it more appealing and very outstanding.

5.0 Methodology

This research will be carried out through the process of design, material suitability, and material application. It is an experimental research. The method of design, material suitability and material application is applied in order to experiment and get an attractive jewellery product with coconut leaf sheath material being applied on it. The researcher chooses the experimental method because it could help achieve several objectives. The experiment will first allow the determination of suitability coconut leaf sheath material on the jewellery product. The second objective is suitability of etching, repouse, chasing, and raising, doming and piercing technique to be used to produce the coconut leaf sheath motif, texture or shape on jewellery product. The third objective would be for the researcher to let the public realize that coconut leaf sheath is one of the potential materials to be explored and developed throughout the natural fiber industry. This research targets on market or research area that will also affect the popularity and effectiveness of the research. The origin of this research is based on the coconut leaf sheath itself when the researchers find the potential of natural fiber in manufacturing industry.

The final objective is to make public realize that the luxury and attractive design of jewellery can be produced from the application of coconut leaf sheath material and all the shape, texture or form of coconut leaf sheath material on it. The experiment will be conducted by the researcher without the assistance from anyone else.

The experiment will take the following sequence. First, prepare all the materials and instruments needed to conduct the experiment on coconut leaf sheath material to be applied on jewellery products.

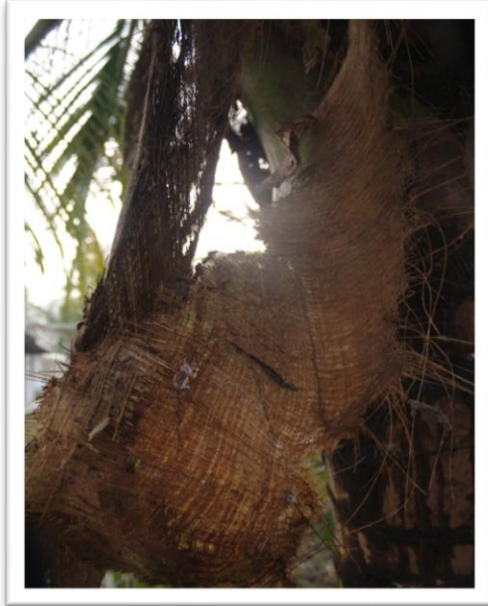


Figure 1: coconut leaf sheath origin



Figure 2: coconut leaf sheath

The materials and instruments consist of coconut leaf sheath, PVC glue, Batik dye, wood varnish, piercing frame with piercing blade, drill bit, tweezers, G clamp, and brushes. After all the stuff needed in the experimental is well prepared, it begins to produce the sheet of coconut leaf sheath. The sheet will contain several coconut leaf sheaths that have been layered to make it thick and durable. The layering process will need a lot of PVC glue usage and this will cause a messy environment. As shown in figure 3, PVC glue is applied on the first layer, followed by the second layer that combines it as well as possible.



Figure 3: Applied PVC Glue

As shown in figure 4, this step will be repeated until it becomes desirable with suitable thickness. The wide and thickness of this coconut leaf sheath layer sheet thickness are based on how many types of experiment we wish to conduct. The more type of experiment we wish to conduct, the more we need to produce the coconut leaf sheath layer sheets.



Figure 4: Paste Another Layer

As shown in figure 5 and figure 6, coconut leaf sheath layer sheets were stuck together with a few layers, and the sheets must be in pressing condition while it is being dried and become hard. The pressing process will need a two piece of metal sheets and 'g-clamp'. Cover the top and the bottom surfaces of that coconut leaf sheath layer sheet with the metal sheet like a sandwich making technique.



Figure 5: clip the layer sheet



Figure 6: press by using the G-clamp

Then, clamp the metal sheet with the desirable and suitable pressure to make sure the sheet nicely compressed and let the sheet dry completely under the normal room temperature before proceeding to the next stage.

Secondly, as shown in figure 7 and figure 8, wide coconut leaf sheath layer sheet needs to be cut into small pieces to make it easier to be conducted while running the experiment. The small specimen needs a small material that will be tested together with this coconut leaf sheath. The researcher begins the experiment by cutting the coconut leaf sheath layer sheet using piercing saw into irregular shapes to see the suitability of that sheet to be cut

with piercing saw. The result is that the sheet can be cut nicely and smoothly by using jewellery piercing saw.



Figure 7: coconut leaf sheath being cut

Figure 8: cutting the coconut leaf sheath

The hard and durable characteristic of coconut leaf sheath layer sheet after being layered together by using PVC glue makes it suitable to be cut with piercing saw without any obstacle and problem. After hardness and durable of this coconut leaf sheath layer sheet had been tested, the resilience on decay must be tested to make sure this coconut leaf sheath material is suitable for long term use. As shown in figure 9, a wood varnish is usually used to make it become more resilient towards decay. It also makes the wood have water-proof characteristic. Based on observation, the researcher makes an early hypothesis that any wood-like material like this coconut leaf sheath will not decay if the wood varnish is being applied on it.



Figure 9: coconut leaf sheath being varnished

The researcher begins to varnish that coconut leaf sheath layer sheet by using the brushing method when a piece of that layered sheet is being covered by wood varnish. The tangle and the thickness of that layer sheet cause the wood varnish not to achieve hundred percent covering process when the inner area of that sheet is not covered.



Figure 10: immerse the coconut leaf sheath



Figure 11: coconut leaf sheath being varnished

Based on that observation, as shown in figure 10 and figure 11, the researcher uses the immerse method by soaking the whole coconut leaf sheath layer sheet into the wood varnish and the result is that the whole layer sheet including the inner area is successfully covered by wood varnish.

The natural color of this coconut leaf sheath is wood brown which makes it look more like a wood fiber. Following to that, the researcher makes the color of this coconut leaf sheath becomes fancier and at the same time reveals the beauty inside the fiber texture of this coconut leaf sheath layer sheet. The type of color material must have good absorbing characteristic to make the color absorbs until the inner side of that coconut leaf sheath layer sheet. As shown in figure 12, the researcher uses the batik dye to colour the coconut leaf sheath layer sheet based on the good absorbing characteristic of batik dye on fabric surface. The researcher prepares three basic colours of batik dyes that consist of red, blue and yellow.

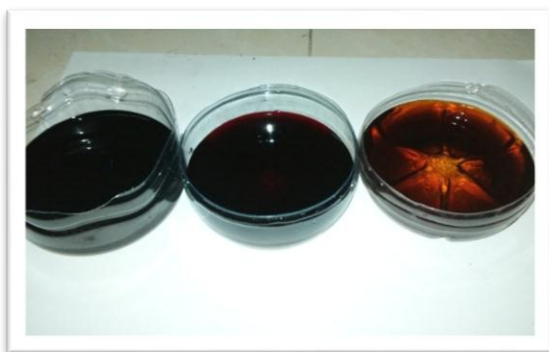


Figure 12: Batik dye

These three basic colours are separated on three containers which have enough quantity to soak the testing piece of coconut leaf sheath sheet into it. After that, the researcher begins to immerse the testing specimen of this coconut leaf sheath layer sheet into red, blue and yellow colours of batik dye.



Figure 13: immerse in yellow color



Figure 14: immerse in blue

In the first experiment, as shown in figure 13 and figure 14, the researcher observes that if the coconut leaf sheath layer sheet is being soaked too long in the batik dye that is water-based colour, the layer of the sheet is automatically separated. Based on that observation, the researcher soaks that layer sheet for not more than one minute, but the whole coconut leaf sheath layer sheet must be fully sunk. After that, dry off that piece of coconut leaf sheath layer sheet in a suitable area.

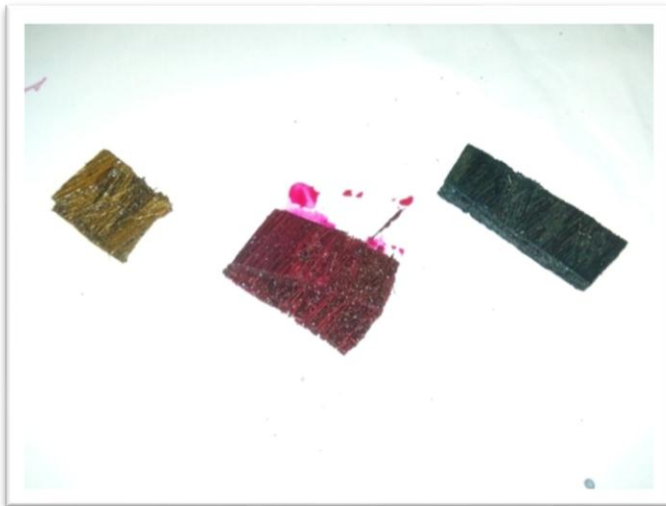


Figure 15: colored coconut leaf sheath

As shown in figure 15, the batik dye fades if it is being affected by water because of its water-based characteristic. Based on that observation, the researcher must cover the whole surface of the coconut leaf sheath layer sheet with water resistant material. By considering the early experiment, the wood varnish has successfully made this coconut leaf sheath layer sheet became water resistant. Based on that observation, as shown in figure 16 and figure 17, the researcher uses the same method by soaking the coconut leaf sheath layer sheet into the wood

varnish after soaking it into the batik dye to make the colour becomes permanent. All three basic colours of coconut leaf sheath layer sheet are being soaked into the wood varnish and it is let to dry completely to see the effectiveness of this method.

Figure 16: immerse into varnish

Figure 17: immerse into varnish

As shown in figure 18, this experiment produces shiny, smooth and interesting colour of coconut leaf sheath layer sheet.



Figure 18: varnished coconut leaf sheath

6.0 Analysis and Findings

6.1 Analysis

6.1.1 Coconut Leaf Sheath Reinforced Method

Based on the earlier experiment, the researcher has analyzed the information that will be synchronized through the academic study writing. The coconut leaf sheath material has a wood-like characteristic and similar to the paper sheet characteristics. This is because the coconut leaf sheath can be nicely attached together by using PVC white glue. The strength of that attachment is similar to the attachment of wood with another wood. By letting the glue to completely dry, the coconut leaf sheath cannot be separated without damaging the material. The strong attraction between the fiber makes that coconut leaf sheath cannot be separated after being attached with glue. The researcher has analyzed that coconut leaf sheath can be attached and reinforced by combining or layering the coconut leaf sheath together using the white PVC glue. That results the suitability of PVC white glue to be used as attachment material.

6.1.2 Coconut Leaf Sheath Staining Method

Based on the experiment, the coconut leaf sheath has been dyed into the batik dye to make it appear with different colours from its natural color of brownish wood color. The researcher has experimented with a primary color of red, yellow and blue. Following to that, the yellow colour results a similar color to the natural brownish color, but the blue and red colours look more outstanding and elegant. Finally, the researcher decided the red color of coconut leaf sheath to be applied on jewellery products. This is because the researcher has a plan to make the jewellery using brass material that is similar to gold colour material and if the coconut leaf sheath is being applied on gold jewellery, it becomes nice and spectacular.

6.1.3 Suitability of Coconut Leaf Sheath to be Applied on Jewellery Products

The world of jewellery has revealed that a lot of organic materials can be applied together with metal jewellery. The materials include plastic, rubber, glass, wood, and others which had been widely used in jewellery production. Based on that, this coconut leaf sheath has no problem to be applied together with jewellery products. The differences between this coconut leaf sheath with the other materials are that this coconut leaf sheath is one of the natural fibers, and it has never been used in jewellery making process. The durability, attractive added value, and attractive natural fiber structure make this coconut leaf sheath seriously suitable to be applied on jewellery products.

6.2 Findings

6.2.1 Designing Process

The researcher begins the designing process to find the suitability of coconut leaf sheath to be applied on jewellery products by producing the sustainable design development to the design proposal. It starts with the preparation of all the materials and instruments needed to make a design proposal with the development of idea based on the coconut leaf sheath origin to be applied on the jewellery products. The instrument includes glue, mechanical pencil, drawing pencil set, a few different colours of ball pen, drawing pen, drawing paper, water color, eraser, ruler, circle template, oval template and brushes. After the entire instrument that is needed in the development of idea and design proposal has already been well prepared, the researcher begins to produce the spectacular interesting design based on the coconut leaf sheath and its origin.

The entire design proposal is based on the subject matter that is similar to the recycled material applied in the jewellery products. It follows the subject matter which is the coconut leaf sheath and is combined with its origin.

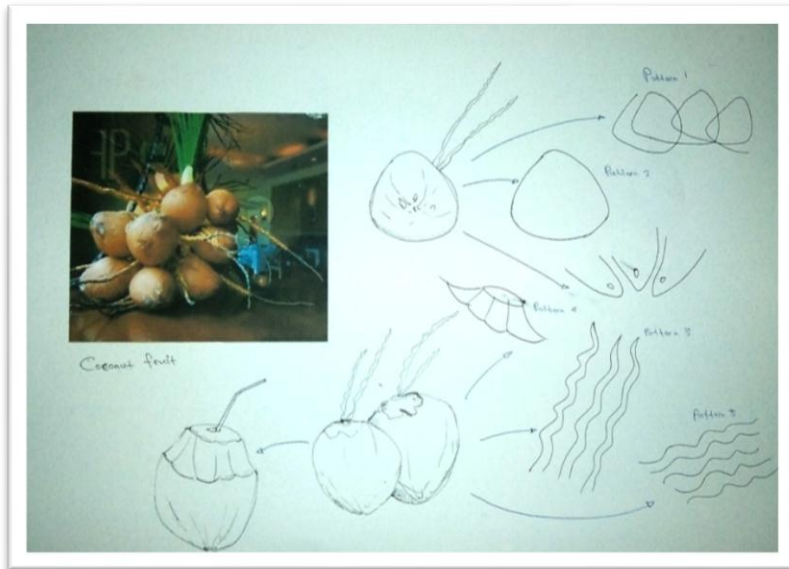


Figure 19: Basic shape and pattern

Based on figure 19, the coconut fruit that is related to the coconut leaf sheath will be modified and developed to get a pattern, texture and also applied on jewellery products. The entire shape, pattern and form includes those that possibly can be brought out from the coconut fruit.

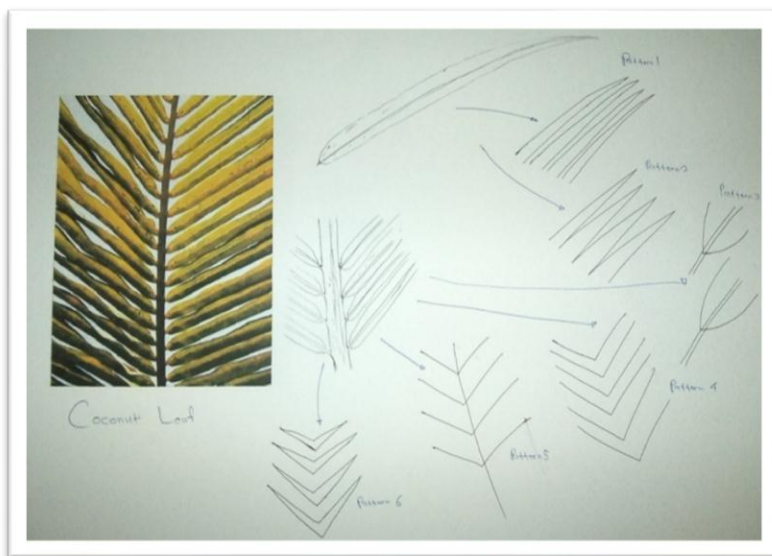


Figure 20: Basic shape and pattern

Based on figure 20, the coconut leaf that is also related to the coconut leaf sheath will be modified to bring out the pattern, shape, and form to be developed and applied in producing spectacular and interesting jewellery design.

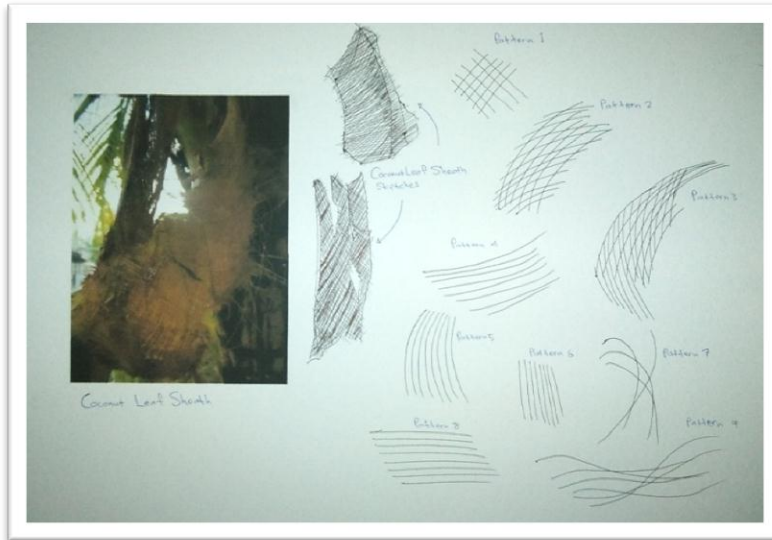


Figure 21: basic shape and pattern

Based on figure 21, the coconut leaf sheath itself is also modified and explored to bring out as much as possible the pattern, shape and form to be applied and developed into jewellery product design. Micro observation on the subject matter will help to bring out as much as possible interesting and spectacular pattern, shape and form.

After all the pattern, shape and form from the subject matter had been identified, the researcher begins the development of idea. The coconut leaf sheath micro pattern is also being applied to the design to maintain the origin of the subject matter. The recycled material is also being applied on the product by using rivet technique and others. The earlier effective experiment makes this coconut leaf sheath material suitable to be applied on jewellery products.

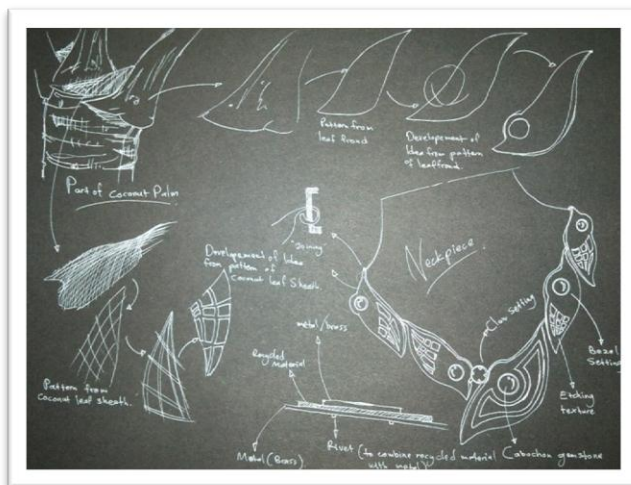


Figure 22: Design proposal

Next, based on figure 22, the combination between coconut leaf sheath with a base of coconut leaf frond is developed to produce a different neck piece design. The entire coconut leaf sheath and leaf frond basic pattern are developed into a neck piece form and the origin pattern is also applied into the design. All this combinations produce fresh new spectacular design based on flora motif.

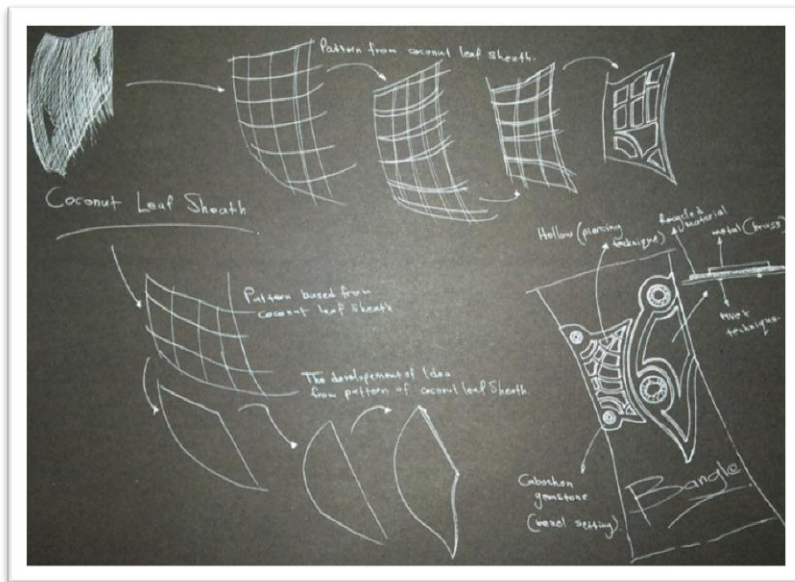


Figure 23: Design proposal

Based on the figure 23, the researcher develops the coconut leaf sheath to become a bangle design. The pattern is similar to net pattern until it is in the bangle basic form and modified into interesting bangle design. Based on figure 23.0, the coconut leaf sheath material is applied on the jewellery products by using rivet technique. All the designs from the coconut leaf sheath origin went through the same process before it became the jewellery products. The coconut leaf sheath material is also applied nicely on the jewellery products.

6.2.2 Final Design

The last step in designing process is that the researcher must choose the final design. This final design must have suitable spectacular design based on subject matter. All aspects must be considered in the final design making process. The measurement, technique, material and type of jewellery must be identified to overcome any complicated problem while producing this product. In this project, the researcher makes a decision to make a buckle and applied it together with recycled material coconut leaf sheath.

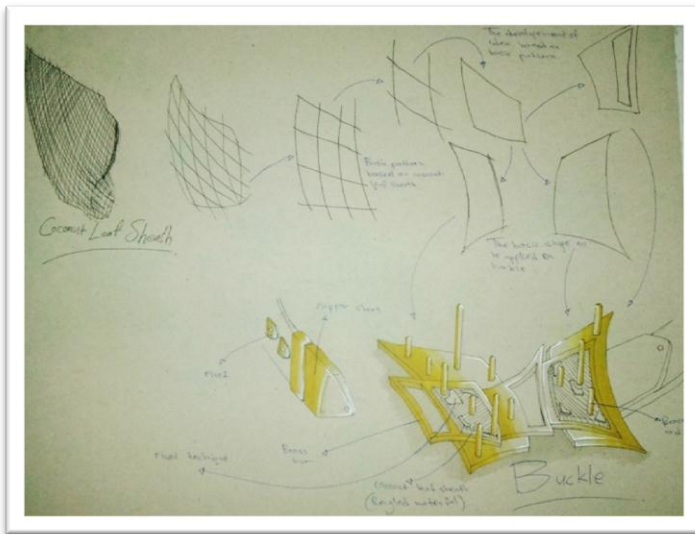


Figure 24: Final design proposal

Based on figure 24, the researcher carries out the development of idea based on the subject matter of coconut leaf sheath. The micro observation has revealed an interesting pattern of this natural fiber. Based on this micro observation, this interesting pattern is developed methodically to get the best design of development flow process. The development process will simplify the actual pattern into an attractive form and at the same time it is nicely suitable to being transformed into a buckle design.

This final design applies the repetition concept when the same shape is repeated to get the buckle design. The repetition design technique is stylized by repeating its layer by layer. This repetition design concept is parallel with the recycle theme when the same shape is being reused to get another stunning spectacular better design. Other than that, the researcher also applies the multi-purpose element on the design. This multi-purpose concept is based on the coconut origin that is normally known as a multi-purpose tree. The multi-purpose concept is being applied on the design by adding two functions on the buckle. The first function is to use it as a buckle and the second function is to use it as a pendant. The pendant component is combined together with the buckle to hide it and at the same time it will bring an element of surprise.

The researcher has limited and identified the sizes of belt that will be used and combined together with this buckle. The fixed size of belt that will be used is wider than 3.5 centimeter. This is because the big size of that buckle will need suitable width of belt to make it comfortable while being worn and styled.

The outstanding new design is really important in this research because regular and common design will not attract people to buy this product and at the same time the coconut leaf sheath material research objective will be unsuccessful. Following to that, if attractive and new interesting stunning design is being produced, the objective of this research will achieved successfully, and at the same time it will bring the name of new outstanding natural fiber called coconut leaf sheath in the eyes of the world that will also resemble Malaysia as an agriculture country.

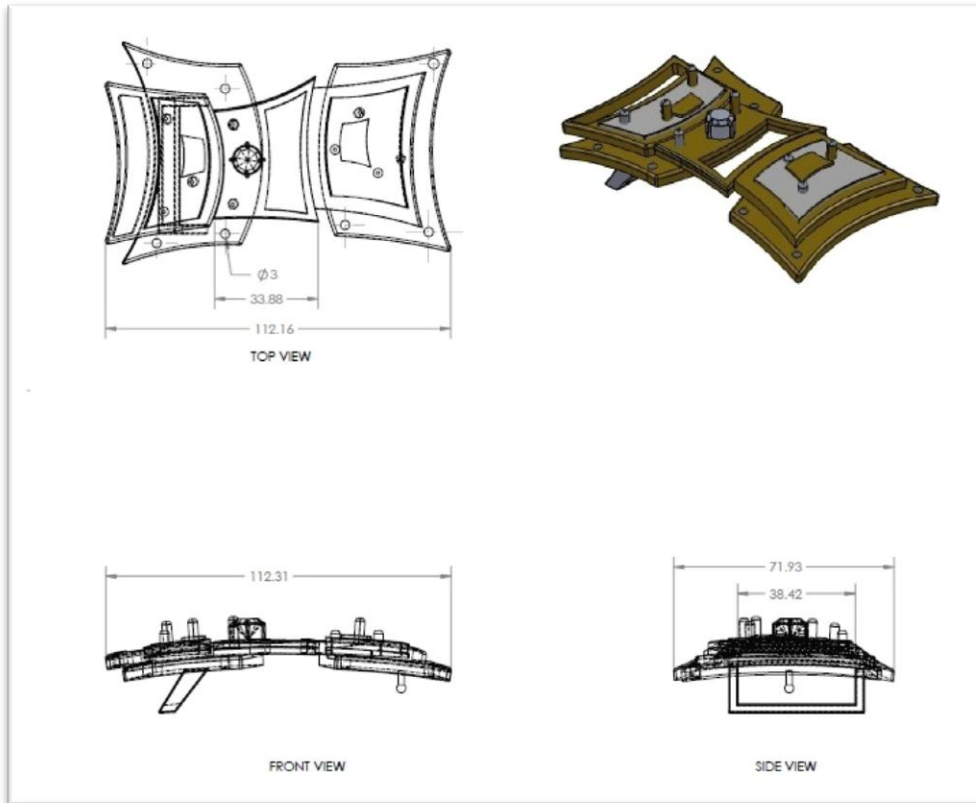


Figure 25: Buckle's technical drawing

Figure 25 shows technical drawing of final design. This final design will use a few techniques in their making process. The techniques that will be used are metal cutting, piercing, drilling, doming, rivet, soldering, polishing and finishing. The recycled material (coconut leaf sheath) will be applied on this buckle by using rivet technique. This rivet technique has enough durability to set up the coconut leaf sheath layer sheet on buckle.

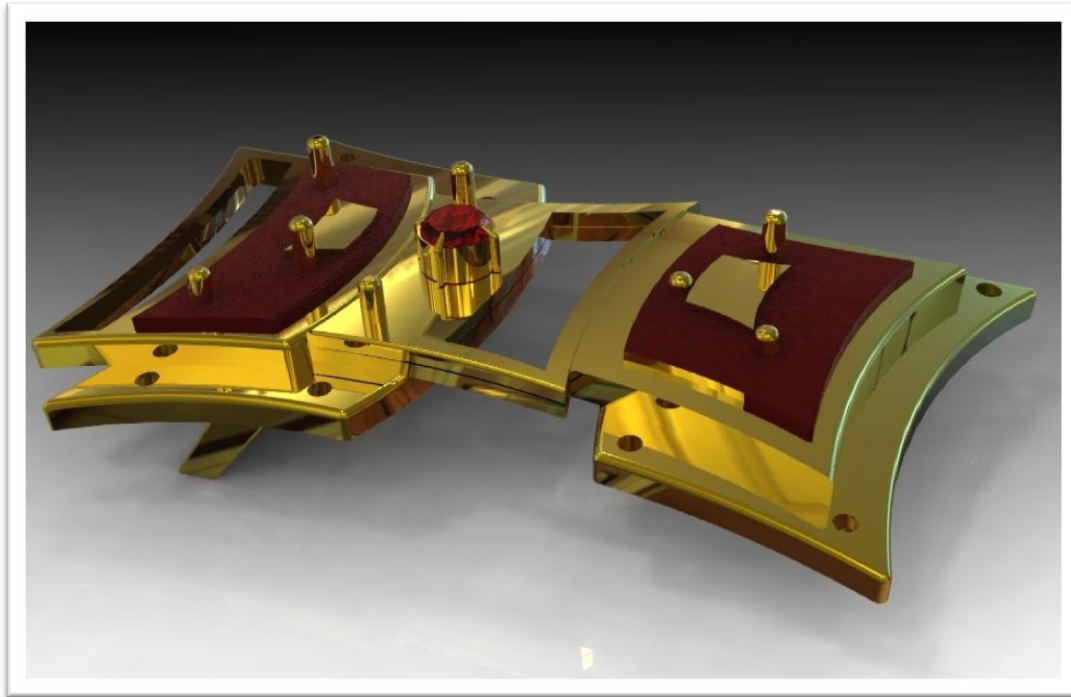


Figure 26: Buckle's computer rendering

Figure 26 shows the full isometric view of computer rendering of the final design. The diagram above shows the complete design of buckle with the hidden pendant component on it. The multi-purpose concept that is parallel with the coconut palm also known as multipurpose tree produced interesting and smooth designing flow process.

6.2.3 Prototype Making Process

Prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from. The prototype buckle making process which is applied to the waste material (coconut leaf sheath) is given below:



Firstly, prepare a brass bar. The researcher chooses the brass material because the color of brass is similar to gold that exposes the coconut leaf sheath to luxury level.



Next, paste the template on the brass bar to make the cutting process becomes easier and smooth.



After that, by using the jewellery piercing frame, cut the brass bar by following the template.



Cut all parts that are necessary in this making process. Make sure the cutting process is done with carefully because sharp piercing blade can cause injury to the handler.



After that, prepare the template and paste it on the brass bar to make the pendant part. This pendant will assemble together with the buckle, so the buckle will have two functions; being used as buckle and have the pendant on it.



Next, prepare the brass rod to make a pole on the buckle surface. Make sure all the brass rods have the same diameter.



After that, rounded the end of that brass rod by using the sander machine. Make sure this process is being done carefully, because the rough surface of sander machine can cause major injury to human skin surface.

	<p>After that, do a finishing to that brass rod by using the drill machine. This method will make the pole finishing process becomes easier and make sure the end of that pole is completely round and smooth.</p>
	<p>Next, begin the assembling process of the buckle. Arrange the entire part nicely and make sure all the parts are being arranged correctly before starting the soldering process.</p>
	<p>After that, by using the flame torch combine all the parts together. This soldering process must be done carefully and must have a good flame control to avoid the brass from melting and at the same time damaging the product.</p>



After the soldering process had been done, do a minor finishing removing the unnecessary soldering effect that can produce bad looks for the buckle.



Next, begin the pole assembling process. Make a hole on the buckle main part to make the assembling and soldering process of pole becomes easier. Put the pole on the round hole, and start the soldering process to combine it.



After all poles have been assembled together with the buckle main part, do the minor finishing again before proceeding to the next step.






Next, begin to assemble the pendant part with the main buckle part. The pendant on buckle will fulfill the multipurpose needs with the coconut origin as a multipurpose tree.



That pendant is assembled with buckle by slotting the hole on the buckle by slotting the hole on the pendant to the pole on the buckle. The pendant will stay still on the buckle and it will do a camouflage on that buckle.



The buckle is not complete without the knob below the buckle. This knob will hold the belt while being worn. By applying the turning process, make a small knob from the brass rod.

	<p>Next, set up the gemstone on the pendant that will be assembled together with the buckle. The researcher has chosen a claw setting to be applied on the pendant.</p>
	<p>After that, proceed a major finishing to the buckle before proceeding to the waste material (coconut leaf sheath) combining process. This is because, after the waste material is already applied on the buckle, the buckle cannot be polished anymore. This is because the waste material will cover up the buckle surface.</p>
	<p>Next, prepare the coconut leaf sheath. Cut the coconut leaf sheath by following the correct shape. After that, make a hole on the coconut leaf sheath layer sheet. This hole will be inserted in the pole on the buckle surface.</p> <p>Make sure the coconut leaf sheath layer sheet is being smoothen before been applied on the buckle.</p>

	<p>After that, set up the coconut leaf sheath layer sheet on that buckle.</p>
	<p>Next, make a permanent fastener part. This part is called rivet technique.</p>
	<p>After that, do a permanent fastener to the coconut leaf sheath layer sheet on the buckle. Finally, the spectacular coconut leaf sheath material being applied on the jewellery product is complete.</p>

Table 1: Prototype fabrication process



Figure 27: Buckle with coconut leaf sheath

Figure 27 shows the coconut leaf sheath layer sheet being applied on the jewellery products.

7.0 Conclusion and Suggestion

7.1 Conclusion

For the conclusion, the researcher concludes that this research helps to generate faster profit or provide side income to the rural coconut entrepreneurs and at the same time contribute to the development of Malaysia's agriculture industry. Other than that, the researcher concludes that this research contributes to the development of renewable fiber in manufacturing industry and at the same time provides a lot of work opportunities and a lot of vacancies for unemployed person. The researcher also concludes that the waste of natural fiber can be transformed into profitable natural fiber and the application of coconut leaf sheath on jewellery products with some new added value will be a spectacular identity of Malaysia as the largest agriculture country.

7.2 Suggestion

The researcher states the suggestion that is related to the coconut leaf sheath application that can contribute to the development and profitable of natural fiber and. Firstly, the researcher suggests the application of coconut leaf sheath on wares products such as hollow wares and silverwares. This is because the wares products such as silverwares have a good potential to be developed together with the application of coconut leaf sheath material on it. The luxury silverware products will popularize the coconut leaf sheath material at the same level with plastic, rubber and leather. Other than that, the researcher also suggests this coconut leaf sheath is being used as wall decoration or home decoration. By mixing it with suitable hardener such as raisin, epoxy and others, this coconut leaf sheath material will be suitable to be used as a wall decoration or used in tile

manufacturing. Besides that, the researcher also suggests this coconut leaf sheath to be used in fashion sector. This coconut leaf sheath also has a potential to be applied together with shoe, wallet, handbag, hat, and many more.

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