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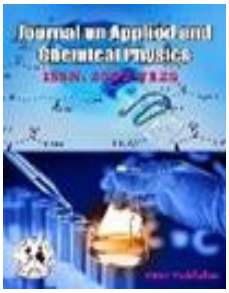

Functionalization of Natural-Fiber Using the WSM Methods

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Abstract: *Global environmental concerns and renewable green Next generation due to resource awareness Environmentally friendly and biodegradable for composition products A lot of efforts have been made to deliver the goods. This research paper is green from natural fibers and uniquely exemplifies the use of compounds, especially chitosan, natural-fiber-rolled Especially chitosan, natural-fiber-rolled the development of chitosan nanocomposites and characteristics. Durability Natural fiber composites are less expensive, have Less weight, more Specific strength, abrasion Absent, equally good engine properties, environmental friendliness and it has many advantages like biodegradability. Research significance: Abaca uses WSM methods, Hemp, sisal, kenaf, and coconut. Abaca, hemp, sisal, kenaf, and Natural fibers like coconut were considered in the present study. Jute Fiber: It is a golden thread Also known as. Compared to other natural fibers These fibers are cheap and Durable. Sisal Fiber: Sisal fibers are made from sisal leaves that can be obtained or extracted. It is also known as Brazilian fiber. Abaca Fiber: this fibrous plant is Also obtained from the stem. Another of these threads the name is Manila Fiber. The advantage of the WSM method is that It is proportional to raw data is a linear transformation. comparison scale of standardized scores It means that the sequence is equal. This method is WSM's Consider it a change. And other in problem solving It is more efficient than methods. The natural fiber is another solution to the problem WSM method is more efficient than methods. The weighted Sum Model (WSM), WSM is the general approach used, and natural-fiber solutions are used in these methods. To solve individual decision-making problems This technique is used by researchers. Evaluation preference: Diameter (µm), Density (g/cm3), Tensile strength (MPa), Young's Modulus (GPa). Alternative: Abaca, Jute, Sisal, Kenaf, Coconut. Result: As a result, coconut is ranked first while abaca is ranked lower.*

Keywords: *Abaca, Jute, Sisal, Kenaf, Coconut, Natural-Fiber, WSM.*

1. INTRODUCTION

Global environmental concerns and renewable green Awareness of resources Due to the next generation combination the products are eco-friendly and biodegradable A lot of efforts have been made to deliver the goods. This review article is about natural fiber-reinforced Chitosan biopolymers, chitosan composites, and the Development of chitosan nanocomposites Among the characteristics, natural fiber, especially chitosan Uniquely use of green compounds exemplifies. Durability, low cost of natural fiber composites, Low weight, high specific strength, Abrasion free, equally good Mechanical properties, environment It is friendly and biodegradable It has many advantages like Natural fiber is mainly cellulose, Hemicellulose, lignin, Pectin, wax, ash, and Moisture is lignocellulose made of matter. Natural fiber hair or thread-like in nature with higher ratio products, and of these fibers Application Low cost, lightweight and biodegradability, etc. There is a high demand due to the benefits. However, natural fibers in nature Hydrophilic Nature Come with inherent drawbacks. The hydroxyl group absorbs moisture and damage and Prevents decay. Natural fibers are animal, vegetable, and mineral fibers divided into three categories. Abaca, cotton, jute, flax, jute, and coconut are A variety of natural fibers such as Used for industrial applications. Recently, in natural fiber composites in various areas of research and innovation, there has been rapid growth. Natural fibers such as plant fibers are light in weight, many advantages including low cost and biodegradability provide. of chitosan-based green composites Mechanical properties at their full potential in specific applications They also allow the ability to be used. Natural fibers are natural and animals, from plants and minerals Derivatives, are abundant. Sisal, jute, pineapple, and other fibers derived from plants such as Research being done. The benefits of natural fibers are limited Density, easy biodegradability, cheap, and Fewer health risks. High availability, low pollutant, Comparable mechanical properties, and lower cost are joint ventures and have attracted Researchers in this field. are natural fibers specific to Different thermostats for applications and are bonded to thermoplastic matrices. This grows in the soil fibers in nature hydrophilic; It is with hydrophobic resin and does not mix well. These chemical components are fibrin Determine the tensile strength Not the same factors. Fiber age, maturity, location, and with fiber source factors such as processing methods Some fiber tensile Also affects strength. These

properties of natural fibers in engineering applications make them an integral part. Natural fibers are human and manufactured Their needs of the department Positive environmental impact and economic Complements with perspective. This review is basic Provides information and extraction of mechanical properties of natural fibers and provides the study, thus Future research, and natural fiber-reinforced for studies on compounds Creating opportunities. In this article, fibers as reinforcement Importance and by fiber, fiber length, and Influence of factors like architecture being reviewed. In addition, cellulose, lignin, and A natural fiber containing hemicellulose the description of the compounds are discussed. The results of this review, the spiral of a plant species Angle, density, cellulose, hemicellulose the contents vary from one to another and Ultimate tensile strength and Young's modulus A and how they affect fiber reinforcement shows. Resins and their manufacture Natural compounds based on processes are categorized. Tensile strength, flexural strength, Various such as impact strength, hardness, and density Mechanical properties of the hybrid fiber are natural in this review for fiber composites including composites are discussed. Fiber-reinforced epoxy / Polyester/Polypropylene has excellent mechanical properties Contains and is an alternative to synthetic compounds It can be concluded that can be used. Natural fiber composites are less expensive, Lightweight, eco-friendly, and such as biodegradability have various properties. Current study alkanes and nature Based on natural dyes called fibers Contains multi-functional fabrics Focuses on preparation. The main purpose of this work is hybridization Natural fiber-reinforced in Thermal properties of composites as a result of chemical treatment to examine. Natural fibers (jute, ramie, sisal etc.) Croa) and adhesion between the polymer matrix Various chemical treatments was used to improve. The main objective of this work is to develop hybrid natural fiber- On Thermal Properties of Reinforced Composites (NFRCs). To study the effect of chemical treatment. Natural fibers (jute, ramie, sisal, and crown) and Various to improve the adhesion between the polymer matrix Chemical treatments were used. Calorimetry, Thermogravimetry, and Dynamic Mechanical Hybrid NFRC to study analyzed Thermal characteristics of contrast scanning. To increase the thermal stability of composites Chemical treatments were invented. Scan electron microscope images Chemical treatments are natural when done to alter the morphology of fibers. In the case of alkali-treated fiber A hard surface was observed, whereas, during the combination treatment, A thin coating on the fiber surface layer is created. Advantages of synthetic fibers (ie, Low cost, low density, abundant availability, Eco-friendly, non-toxic, high flexibility, renewal, and biodegradability) due to synthetic More and more natural fibers instead of fibers are used. Among the most common natural fibers Includes Hemp (Corchorus capsular), Croa (Ananas), sisal (Agave sisal Ana), and Coconut (Cocos nucifera). Natural fibers Mainly cellulose, hemicellulose, and lignin content, Also the cell of fibers These organic components in the wall Give strength and stiffness. to various plant species and plant bodies At different stages (like leaf, stem, and seed) The largest number of fiber types are natural fibers Can be used technically in mixtures. Key to natural hybrid compounds Among the benefits is environmental reduction.

2. MATERIALS AND METHODS

Natural rather than synthetic fiber composites are less mechanical and have properties. Therefore, in the present study, Glass with natural fiber fibers Mixed by blending the Mechanical properties of material has been improved. Evaluation Option: Diameter (μm), Density (g/cm3), Tensile Strength (MPa), Young's Modulus (GPa). Alternative: using WSM methods for abaca, jute, Sisal, kenaf, and coconut. Natural fiber blends are more synthetic than fibrous composites and have low mechanical properties. Hence, in the present investigation, glass Natural fiber composite by mixing with fibers The mechanical property of the material improved. Natural fibers and their environment Polymer due to its friendly nature and Suitable reinforcement for base mixes are considered material. The increasing global Energy crisis, among urban researchers, has created an interest in natural fibers. Natural fiber-reinforced composites, Wide range of Artificial glass purposes Reinforced composites have reached a high level of adaptation. The reason is that in some cases glass with reinforced composites Based on natural fibers compared to Composite materials best provide properties. Besides, natural fiber composites are A significant alternative for business purposes. Also, it is non-corrosive and cheap, Plenty still has some merit; Non-toxic, biodegradable, and natural fiber door panels and package trays and Structures including automotive sectors make it ideal for applications. Area and season of harvest, nature of the soil, Maturity period of the plant, and rain and sun condition Depending on the unpredictability of these fibers Character and inconsistencies are the main drawbacks. However, for various applications, natural fiber- For making reinforced biocomposites Researchers are investigating the possibility. The purpose of this research paper is to Hemp, jute, and sisal Engineering reinforced with natural fibers such as Examining the current status of plastics, automotive, and Their use in space and marine applications It is also to explore. Engineering reinforced with natural fibers Properties of plastics and Processing techniques is also studied. Flax, jute, jute, and sisal Natural fibers are Usually polymers Used as reinforcement in composites, Because of their desirable properties And are easily available. The complexity criterion is a multivariate solution to this problem (MCDM) approach to decision making It attracts us to use it. In this paper, to represent data ranges We use numbers and substitute A weighted sum for rating and ranking We propose a model (WSM). OF this article Contributions are two-fold. First, natural fiber We're solving a big problem that doesn't include, i.e. ranking and investor Preferences scale are expressed as weights. Second, from time to time To indicate the performance of different evaluation criteria Traditionally using gray numbers We extend the weighted sum model (WSM). The Weighted Sum Model (WSM) is a simple and Many are frequently used Criterion in the decision method. This method is arithmetically

Using the instructions Based on a weighted average. Evaluation of each alternative Scored by decision makers will be allocated directly Relative importance weights for that attribute A measured value given to the substitution For all criteria by multiplying The products can be calculated briefly. The advantage of the WSM method That is, it is the raw data is a proportional linear transformation. Many alternative design solutions for buildings Criterion Decision Making (MCTM) Methods can be successfully evaluated using Complex construction There are several methods to support the results. However, previous research Tasks are different MCDM Different ranking methods can produce results, Accordingly, for optimality Three criteria, i.e. WSM (Weighted Sum Model), and the combination of the latter method is used, Based on the WSM method Ranking optimization, general and One for business facades A case study was presented. WSM (Simple Additive Weighting (also known as (SAW) mode) is a simple and commonly used MCDM is one of the methods. This method is for each alternative Adding criterion values together and individual criterion weights Include using Generally, WSM advantage Criteria only deals with Accordingly, the cost before normalization (reducing) criteria as an advantage (increasing) change is necessary. Converting cost criteria to benefit is an It can be achieved through a simple process: For each cost criterion, the max Add scale value. For the minimum criterion value, Subtract the criterion value under consideration. Such a change Continued, low price The scale value becomes larger, And the larger the price, the smaller the value. This is on the cost scale Following the transformation, utility values A new initial group is created using only Each criterion value and its rows Dividing by the sum, each criterion value By its relative weight Normalized by multiplying The team will be created. Values for all alternatives Once integrated, with more value The alternative is the best solution will be selected. Natural fiber-reinforced polymer (NFRP) Interest in Collective Transportation Especially metals and synthetic fiber composites Alternatively, this sector is growing rapidly. The purpose of this research paper Like flax, jute, jute, and sisal Engineering reinforced with natural fibers Current plastics Review status, Automotive, Aerospace, and Marine To explore their use in applications. Engineering reinforced with natural fibers Properties of plastics and Processing techniques is also explored. Natural over synthetic fibers Additional advantages of the raw material include low cost, Renewable, Recyclable, Biodegradable, Carbon neutrality, friction Nonexistent quality, limited Health hazards, noise, Thermal and electrical insulation properties, and disposal included. Based on the source, Natural fibers are animal fibers, plant fibers, and Mineral fibers are classified as Plant fibers are divided into six types: Bast fiber, leaf fiber, seed/fruit fiber, Straw/stalk fiber, grass fiber, and wood fiber. A natural fiber classification is presented. Based on their usage, Plant fibers are primary and secondary types are categorized. Hemp, hemp, kenaf, and Sisal is the primary fiber group They are for their fiber are raised. Pineapple, oil palm, And coir belong to the second category.

3. RESULTS AND DISCUSSION

BMW, Audi Group, Volkswagen, Mercedes, and Cambridge are like many German Industrial Automotive Companies Interior of their cars and Many for outdoor applications Fiber composites for parts Nature is accepted to create. The automotive industry, construction, and Apart from construction industry, Sports, nature in space Applications of fiber and other composites have been found, for example, Panels, windows, frames, decking, and bicycle frames. Advantages of natural fiber composite Limited density, high strength-to-weight ratio and break during processing Resistance, low energy content, and includes recycling. Natural fiber-reinforced transport of compounds, Building and construction industries (partition boards, roof panels), military applications, In consumer products, and packaging are used. Composite materials are high strength and exhibit stiffness, They are for automobile applications are suitable. Properties of Natural Fibers A plant fiber Varies from category to category and in different geographic regions For the same fiber type and the same plant Can also differ between extracted fibers. Alternate: Using WSM methods abaca, jute, sisal, kenaf, and Coconut. Jute fiber: It is also known as a golden fiber is called Compared to other natural fibers These fibers are cheap and durable. Sisal Fiber: Sisal fiber can be obtained from sisal leaves or extracted. It is also known as Brazilian fiber. Abaca Fiber: This fiber is Also obtained from the stem of the plant. Another name for this fiber is Manila fiber.

TABLE 1. Natural-Fiber in WSM Methods

	Diameter (µm)	**Density (g/cm3)**	**Tensile Strength (MPa)**	**Young's Modulus (GPa)**
Abaca	255	1.5	717	18.6
Jute	300	1.3	400	25
Sisal	230	1.41	400	12.8
Kenaf	83.5	1.2	282.6	7.13
Coconut	396.98	1.2	160	4

Natural fiber by WSM method is high in this table Shows value and minimum value. Alternatives: abaca, hemp, sisal, kenaf, coconut Table 1 is given in. The potential of natural fiber Applications in various industries Reinforced for applications composites (NFC) is investigated. In the present work, three Mechanisms of different NFCs and clothing

behavior were Analyzed. Abaca, jute, sisal, and kenaf, Like coconut Natural fibers present were considered in the study. Physics of Natural Fibers and Fiber in mechanical properties diameter, fiber density, Tensile strength Strength and Young's Modulus Includes value. In terms of diameter, jute fiber At its greatest diameter is about 255 µm. This is followed by coconut. Its value is 396.98 µm, and kenaf has the lowest value of 83.5 µm. Abaca and jute fibers are dense, weighing about 1.5 g/cm. The tensile strength of jute reaches 400 to 800 MPa For strength, refers to the resistance of fibers. This was followed by Abaka and, The values are 160 MPa Its further tensile strength, Cement mortar, and polymer- Reinforced composites Machining of such compounds improves properties or is Used as a reinforcement to improve. Abaca fiber is about 160 MPa high has tensile strength, And its strength is no nature As good as the fibers. Therefore, it is usually produced externally Passengers used Vehicles, where it is stone can resist attacks, However, abaca fibers have not been thoroughly studied as a compound.

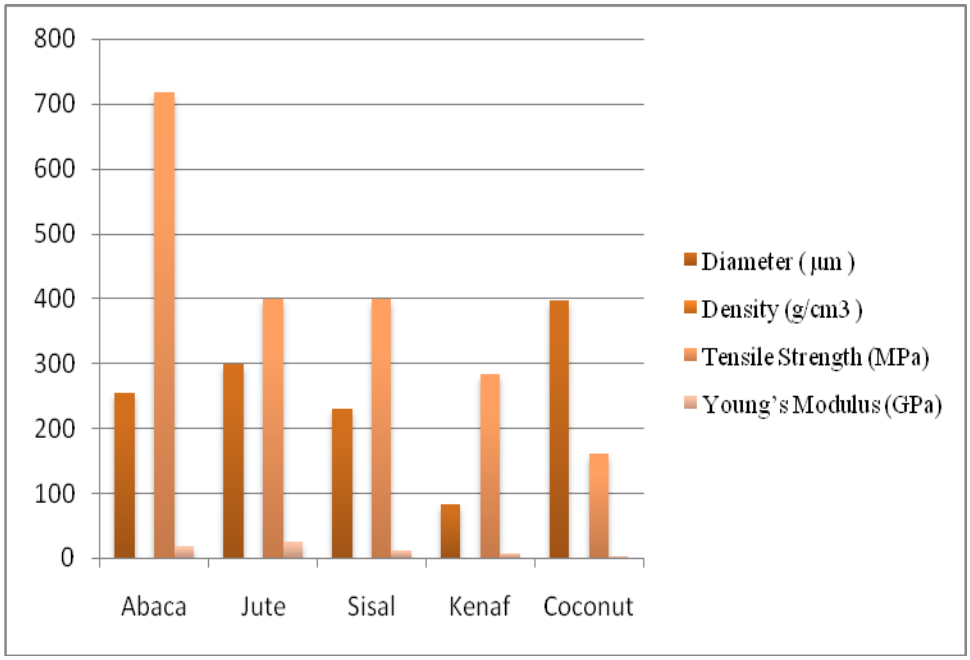

FIGURE 1. Natural-Fiber in WSM

Figure 1. Display natural fiber in WSM mode. Natural fibers such as plant fibers have Less weight, less Cost, and less biodegradability They offer many benefits including Chitosan based Mechanical properties of green composites at their full potential in specific applications They also allow the ability to be used. Evaluation Option: Diameter (µm), Density (g/cm3), Tensile Strength (MPa), Young's Modulus (GPa). Alternatives: abaca, jute, sisal, kenaf, and coconut in various values are illustrated in Figure 1.

TABLE 2. Natural-Fiber in Normalized data.

	Diameter (µm)	**Density (g/cm3)**	**Tensile Strength (MPa)**	**Young's Modulus (GPa)**
Abaca	0.64235	1.00000	0.22315	0.21505
Jute	0.75571	0.86667	0.40000	0.16000
Sisal	0.57937	0.94000	0.40000	0.31250
Kenaf	0.21034	0.80000	0.56617	0.56101
Coconut	1.00000	0.80000	1.00000	1.00000

Table 2 Natural-fiber max or Displays the minimum value. Advantages of synthetic fibers More than natural fibers are on the scale. Natural fiber-reinforced polymer Compounds, for practical applications with good mechanical properties Sustainable, is a new innovative category product. Based on the above studies, Synthetic and natural fibers. importance of hybrid compounds containing It is clear that they get and components of hybrid compounds, Content, Stratification and Sequence and a number of layers are considered.

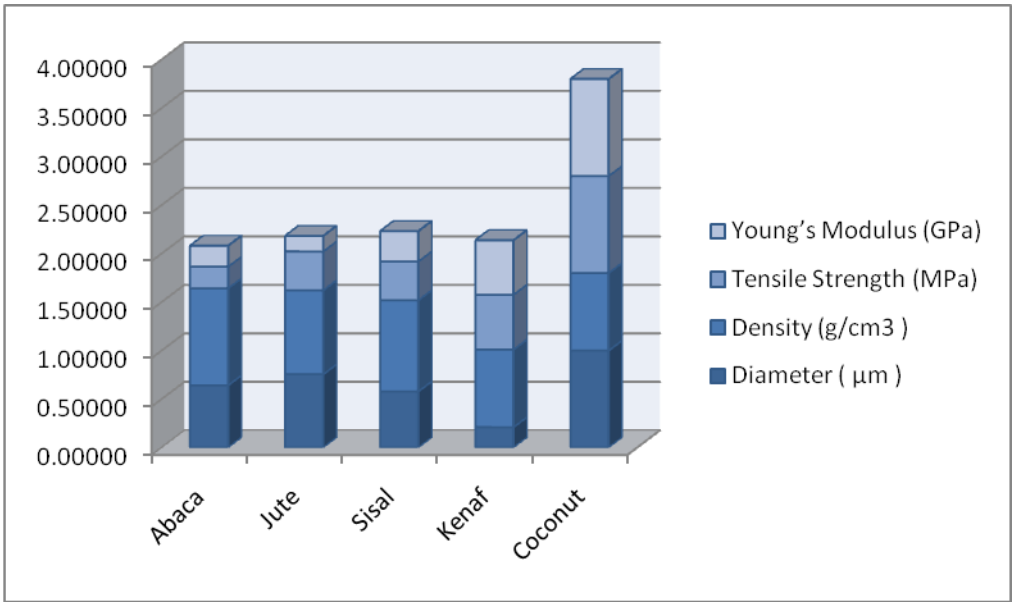

FIGURE 2. Natural-Fiber in Normalized data

Figure 2. Nature with the different values shown- WSM method in fiber. Alternatives: abaca, hemp, sisal, kenaf, coconut Evaluation Option: Diameter (µm), Density (g/cm3), Tensile Strength (MPa), Young's Modulus (GPa) WSM as shown in Figure 2 using methods different value.

TABLE 3. Natural-Fiber in Weight.

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 shows the weight of natural fiber in this table. All are the same in this table A value of 0.25 shows the weight. Eco-friendly products Required in many light-medium load applications An alternative to man-made synthetic fibers To work on natural fibers It has motivated researchers. In recent years, natural fibers Research has been carried out in the area, It is made of man-made fibers Dealing with problems that arise. Natural fibers and their properties To develop improved polymer composites Researchers have reinforced that In the manufacture of many lightweight products Natural fibers are used. Bark, stem, root, and leaf A variety of such plants You can get them from areas. of natural fibers properties are their chem Depends on the mix.

TABLE 4. Natural-Fiber in Weighted normalized decision matrix

Weighted normalized decision matrix			
0.160587	0.25	0.055788	0.053763
0.188926	0.216667	0.1	0.04
0.144844	0.235	0.1	0.078125
0.052585	0.2	0.141543	0.140252
0.25	0.2	0.25	0.25

Table 4. Nature displayed at different values Fiber-weighted normalized result matrix. Densitometry for the present study, fiber 1.2 kg/ proved to have a low density of m3, It is natural with synthetic fibers and high density significantly more than fibers. In this table Weighted normalized The resulting team of natural fibers in A higher value indicates a lower value.

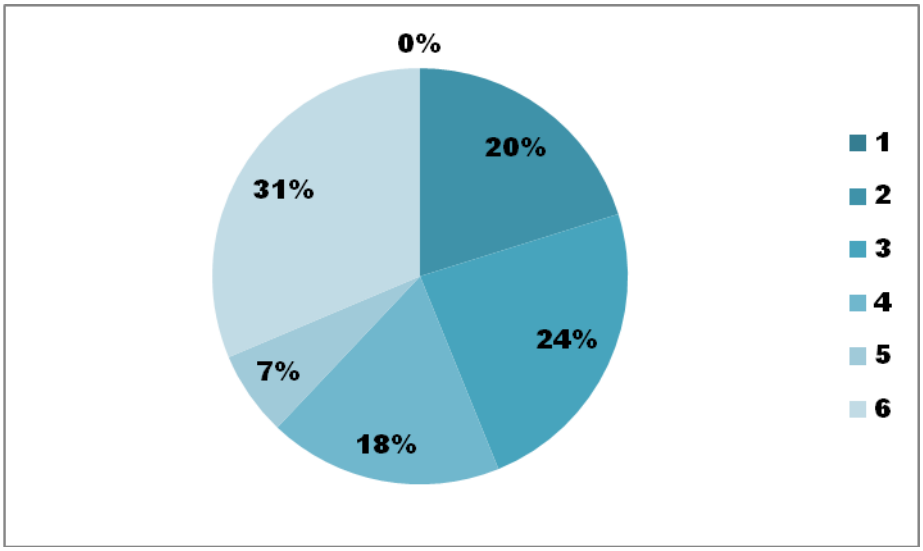

FIGURE 3. Natural fibers Weighted normalized decision matrix.

Figure 3 Natural fiber weighted normalized result matrix. Environmentally friendly chemicals used More in-depth research to explore treatment is needed. Toxicity of substances and bacteria Resistance properties, thus due to natural fibers Reinforced composite materials May perform better in future.

TABLE 5. natural fibers in Preference Score

	Preference Score
Abaca	0.520138882
Jute	0.545593061
Sisal	0.557968569
Kenaf	0.534379784
Coconut	0.95

TABLE 5 shows natural fibers in the Preference Score value. Substitutes: abaca, jute, sisal, kenaf, and coconut are illustrated in WSM methods at various values. This table shows that coconut has a high value of 0.95 in preference score. This table's low value is abaca for a 0.52 preference score.

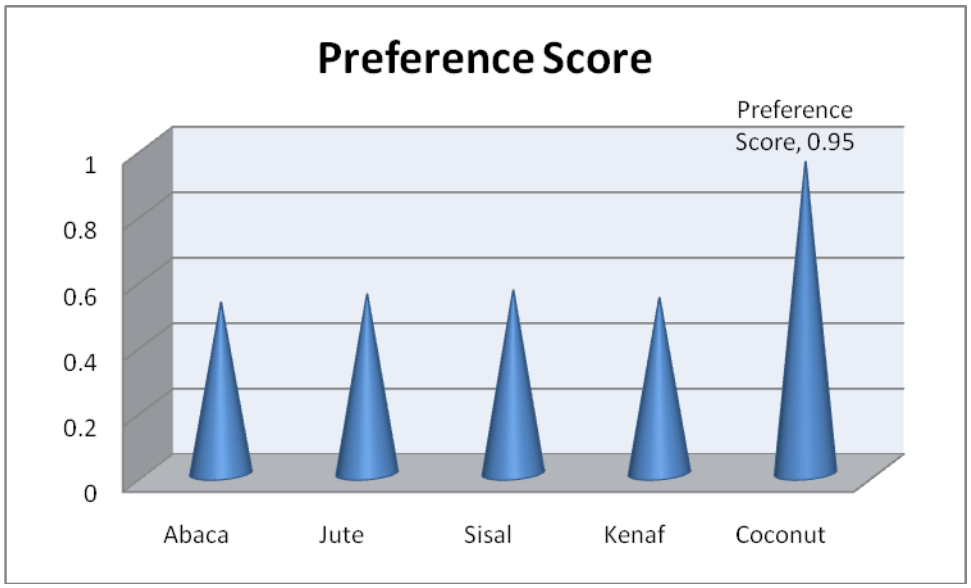

FIGURE 4. Natural fibers in Preference Score

Figure 4 shows natural fibers in preference score. Abaca, jute, sisal, kenaf, and coconut show different values in WSM methods in this table. Jute fiber: It is also known as a golden fiber. These fibers compared to other natural fibers Cheap and durable. Sisal Fiber: Sisal fibers are sisal Can be obtained or extracted from the leaves. It is also known as Brazilian fiber. Abaca Fiber: This fibrous plant is Also obtained from the stem. Another name for this fiber is Manila fiber.

TABLE 6. Natural fibers in rank

	Rank
Abaca	5
Jute	3
Sisal	2
Kenaf	4
Coconut	1

Table 6 shows different grades of natural fibers. Abaca, jute, sisal, kenaf, and coconut are ranked differently in this table. Available synthetic/natural The properties desired to compete with fibers for natural plant fibers containing Thirst is of plant fibers The result of the discovery is a novel of high quality. Previous studies are good with a matrix of interfacial bonding and fibers Compounds with high crystallinity These are the aspects that you want to consider while preparing.

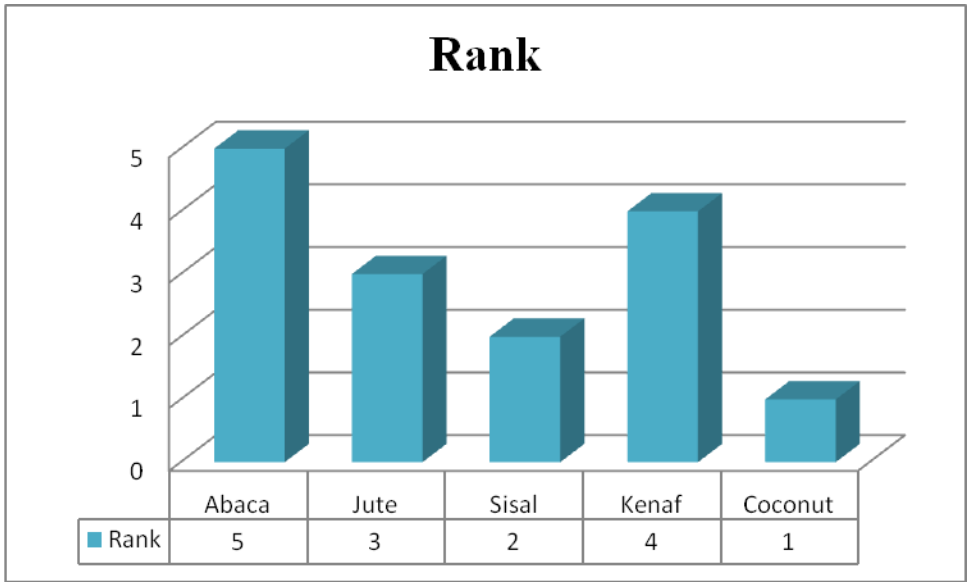

FIGURE 5. Natural fibers in rank

Figure 5 shows natural fibers at different levels. Abaca, jute, sisal, kenaf, and coconut are ranked differently in this map. Figure 5 shows the final result of this paper, coconut ranked 1st, abaca ranked 5th, jute ranked 3rd, sisal ranked 2nd, and kenaf ranked 4th.

4. CONCLUSION

Natural fibers are Wood fibers and wood fibers into two main groups Can be categorized because Wood fibers include wood, paper, Paperboard, tissue, and paper from materials such as are extracted, to make fibers containing hemp fiber The highest used Cellulosic content: Also known as As a golden thread. These threads along with other natural fibers Relatively cheap and Lasting. Sisal Fiber: Sisal fiber is made from sisal leaves that can be obtained or extracted. It is a Brazilian fiber Also known as Abaca Fiber: This fiber plant is also obtained from the stem. Another name for this fiber is Manila fiber. In the future, industrial applications of compounds based on the application can completely replace synthetic fibers, this reduces environmental pollution. Environmentally friendly to use Chemical treatment and materials To investigate the toxicity and antibacterial properties More in-depth research is needed. Thus, natural fibers Reinforced composites in the future Can work better. Abaca fiber has high tensile strength, and its strength is no nature Better than fiber too. Physics of Natural Fibers and fiber diameter In mechanical properties, fiber density, Tensile strength, and Young's modulus value includes Natural fibers for a greener planet Contribute and better agriculture And more manufacturing practices can play a big role. The present study of natural fiber Analyzed its structure and properties. Fibers extracted from fibers, relatively high fiber with several textile fibers of diam The longer the length, the higher the comparison Showed moisture and strength. Instead of plastic and synthetic fibers, In using eco-friendly materials

Attention is paid. Made from natural fibers Scientists researching new composite materials This is the primary concern of being overly interested. Natural fibers recently in polymeric composites their synthetic counterparts as reinforcements have attracted more attention than This is because in polymer matrix composites Artificial use as reinforcements with synthetic fibers Compared to Natural fibers Gets more. Low cost, biodegradable, recyclable, Lightweight, and non-toxic. As a result, coconut ranks first, and Abaca is also low.

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