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A STUDY ON THE HUMAN HEALTH BENEFITS, HUMAN COMFORT PROPERTIES AND ECOLOGICAL INFLUENCES OF NATURAL SUSTAINABLE TEXTILE FIBERS

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Abstract:
The aim of this paper is to illustrate the human health benefits, human comfort properties and ecological influences of natural sustainable textile fibers. Natural sustainable textile fibers are beneficial for human health benefits, human comfort properties and they have significant importance on environment those are deliberated concisely in this paper. The findings of this paper established that sustainable textile fibers are got from natural sources those are ecological, biodegradable, decomposable, cheap and easily obtainable. Natural sustainable fibers are porous in character with the capabilities of permeability and breathability those provide comfort properties to the wearer. Synthetic fibers do not

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have such capabilities of permeability and breathability to provide comfort properties to the wearer. Synthetic fibers trap air and generate heat to the body, which produce sweat and discomfort. Natural sustainable fibers have absorbency, breathability, permeability and moisture wicking capabilities with the ventilation process of air through their porous structure. These fibers have anti-bacterial and anti-microbial properties, which defend personnel from allergies. Sustainable fibers are recyclable that's why they can be used repeatedly after end-use but manmade synthetic fibers cannot be used repeatedly, even they are not decomposable to soil. The cultivation of natural sustainable fibers such as cotton, jute, hemp, ramie, silk, bamboo, banana, wood, sisal, coir etc. is a direct source of oxygen production and they absorb carbon dioxide and carbon mono oxide from surroundings. These fibers directly contribute to the betterment of the environment without releasing toxic chemicals, liquids, gases and byproducts to the environment. Carbon dioxide gas, carbon-mono-oxide gas and non-decomposable byproducts are produced while manufacturing manmade plastic fibers. These dangerous gases are the causes of global warming and it influences greenhouse effect. By farming sustainable fibers, by applying them and by avoiding plastic materials from our everyday life we certainly can improve the environment.

Keywords: sustainability, breathability, biodegradable, absorbency, comfort properties, moisture wicking properties, hypoallergenic properties, insulating capabilities

1. Introduction

There is a great importance of this paper in textile field since the application of sustainable textile fibers are increasing daily. Sustainable textile fibers are the first choice for the textile experts due to so many ecological reasons. These fibers are biodegradable, easily obtainable, ecological and cost effective [1]. These fibers are easily decomposable with soil after use. These fibers have too many environmental benefits that’s why technologist prefer to use it with top priority [2].

Different scholars worked related to these papers at different times where literature review exposed different results. Some of which were similar and some of which were widely dissimilar. Due to range of variables involved, if any property of the fibers were changed, the properties of the finished materials were also changed. Sustainable textile fibers refer to fibers those are obtained from ecofriendly natural sources those are biodegradable in nature. Sustainable fibers are economical, recyclable and easily obtainable from natural sources.

Textile manufacturing involves various process operations like the release of toxic into environment, the release of water into river and the release of byproducts into earth. All these incidents are directly polluting the environment daily [3]. Cultivation of textile products such as cotton, silk requires insecticides, fertilizer, compost and pesticides which are also polluting environment although they are natural [4].

Sustainable natural fibers are like cotton, jute, hemp, silk, coir etc. are obtained directly from natural sources like plants, vegetables, trees etc. Cultivation of these fibers are beneficial for the environment [5]. Cultivation of such fibers is significant since they are good for the environment. They do not need fertilizer, insecticides and they do not pollute the environment. Production of natural fibers release oxygen. On the other hand, production of manmade fibers releases carbon dioxide to environment. They are not ecofriendly at all [6].

It has been found that the cultivation of organic cotton does not require any chemical or fertilizer, that is why the environment pollution is 98% less compared to the production of conventional cotton [7].

Bamboo is a good example of sustainable crop that grows rapidly and does not need fertilizer [8]. Bamboo is self-regenerated by its own root that's why it does not need to be replanted. Where, cultivation of cotton requires huge amount of water irrigation, pesticides, fertilizer and labor [9].

The examples of sustainable textile fibers are like cotton, jute, hemp, ramie, bamboo, coir etc. [10].Cotton is called the king of all textile fibers since it is one of the most commonly used textile fibers that represents about half the fabric used in the textile factories [11].

Natural fibers are flexible to wear, they are sustainable, recyclable, biodegradable and they can be used without injuring the environment [12].

2. Influence of Sustainable Textile Fibers

2.1 Better Comfort

Natural fibers are sustainable, and they are habitually permeable and breathable that provides with better comfort and good feel when come in contact of body parts. Synthetic fibers are manmade where they do not have such capabilities or qualities to provide natural comfort to the body parts [13]. Synthetic fibers do not have pores in their structure ultimately, they cannot transfer heat, so these fibers have a habit of trapping heat. Due to this reason synthetic fibers are painful and provide discomfort to the body parts. Figure 1 shows the sustainable cotton plant.

Figure 1: Sustainable Cotton Plant [14]

2.2 Moisture Wicking Capabilities

Natural sustainable fibers are popular for their wondering moisture wicking capabilities. Moisture wicking capabilities of fabrics have added a new dimension to the comfort level of the wearer with overall satisfaction [15]. Natural sustainable fibers have better absorption quality with superior permeable power, which influence the textile materials enormously breathable, particularly in the warm, damp, wet or humid weather [16]. These fibers have the unique experiences of moisture wicking competences through the ventilation process of air [17]. Besides, these fibers can improve the condition of dampness by the circulation of air through the pores of fibers in any condition. Figure 2 shows the jute fiber extraction process.

Figure 2: Jute Fiber Extraction [18]

2.3 Hypoallergenic Capabilities

Sustainable natural fibers like cotton, jute, silk, linen, hemp, bamboo etc. are basically hypoallergenic [19]. These sustainable fibers have wonderful properties of anti-bacterial and anti-microbial, which helps to protect personnel from allergies [20]. These fibers are soil resilient, hence it is easy to clean them and prepare them against dust. It's true that, people who are vulnerable to allergies can protect themselves wearing the cloths of sustainable fibers [21]. On the other hand, manmade fibers are not good to the health, they create discomfort to the body parts and sometimes create allergenic problems. Figure 3 shows the ecofriendly hemp fibers.

Figure 3: Ecofriendly Hemp Fiber [22]

2.4 Insulating Capabilities

Natural sustainable fibers such as wool, bamboo, silk etc. can behave like good insulators [23]. These sustainable fibers have the wonderful capabilities to act as thermal fabrics when required. These fibers can adjust their temperature as requisite to the weather demand [24]. People seen to have worn cloths made up of silk and wool when it is winter [25].These fibers have the abilities to trap air inside the body and behave as an insulator to create heat during the cold weather [26]. In some cases, manmade fibers also produce heat by trapping the air inside, but this process may not suit to the most body parts since they only trap air but not evaporate moist when it is generated. Figure 4 shows the biodegradable flax fibers.

Figure 4: Biodegradable Flax Fibers [27]

2.5 Renewable Capabilities

Sustainable fibers are obtained from natural sources. These fibers have the abilities to use them when it is time to throw them away after use [28]. Manmade fibers like polyester, polypropylene, nylon etc. can be used once and cannot be recycled where natural fibers like cotton, jute, wool, hemp, coir etc. have the characteristics to use them again and again after using once, twice or thrice [29]. These fibers can be decomposed in soil after

throwing them away where manmade fibers are no decomposed and contaminates the environment. Figure 5 shows the recyclable ramie fibers.

Figure 5: Recyclable Ramie Fiber [30]

2.6 Ecofriendly Characteristics

Sustainable fibers are obtained from natural sources and these fibers are good for the environment when grown as a plant [31]. Sustainable fibers are grown in nature that is an environment friendly process, where the production of manmade fibers pollutes the environment by releasing toxic gas or chemicals as byproducts to the environment [32]. Different types of chemicals and toxic materials are used while producing manmade fibers [33]. Contrary, growing the plant of natural fibers is a good source of oxygen too. Figure 6 shows the natural silk fibers.

Figure 6: Natural Silk Fiber [34]

2.7 Sustainable Fibers are not Reliance on Fossil Fuels

The raw materials for most of the manmade fibers like polyester, polypropylene, nylon etc. generally come from hydrocarbons, which mainly exist in natural energies like coal, gas, oil, petroleum etc. [35]. These manmade fibers are dependent on fossil fuels where sustainable fibers like cotton, jute, hemp, ramie, coir et care obtained from natural sources and they are not dependent on fossil fuels [36]. Production of natural fiber is environment

friendly and they directly influence to the improvement of the environment from being polluted. Figure 7 shows the natural coir fibers from green coconut fruits.

Figure 7: Natural Coir Fibers from Green Coconut [37]

2.8 Sustainable Fibers Control Temperature

Sustainable fibers are obtained from natural sources without releasing toxic chemical to the environment [38]. Most of the manmade fibers release carbon dioxide to the environment when burning [39]. These increased amounts of carbon dioxide directly contributing to raise the temperature of the earth [40]. On the other hand, sustainable natural fibers are recyclable without burning. If sustainable fibers are thrown away, they get mixed with soil due to their easily decomposing characteristics [41]. Even, burning of sustainable fibers does not release carbon dioxide as much as burning of plastic materials. Figure 8 shows the biodegradable door mat by jute fibers.

Figure 8: Biodegradable Door Mat by Jute Fibers [42]

2.9 Better Quality and Comfort

The quality and comfort level of the natural sustainable fibers are always better than any other manmade fibers [43]. Synthetic fibers have the capabilities of trapping heat inside the body that produce perspiration and increase the level of discomfort since they do not have absorbency, breathability, permeability etc. [44]. On contrary, natural sustainable

fibers have wonderful capabilities of both warmth and breathability [45]. Sustainable fibers like wool, silk etc. can increase body temperature but maintaining permeability [46]. Figure 9 shows the natural wooden textiles.

Figure 9: Natural Wooden Textiles [47]

2.10 Sustainable Fibers Increase Oxygen Production

Sustainable fibers are obtained from natural sources like trees, plants, crops, vegetables etc. [48]. Cultivating of natural fibers such as cotton, jute, silk, coir, hemp, wood etc. are good for the environment since they make the atmosphere healthy by releasing oxygen [49]. Oxygen is essential for the breathing of both men and animals [50]. By cultivating sustainable fibers and by using them we can influence to increase the level of oxygen to nature [51]. Besides, production of these natural fibers does not release any toxic chemicals, liquids, gases or any byproducts to the environment that's why they are ecofriendly [52]. Figure 10 shows the biodegradable wooden carpet.

Figure 10: Biodegradable Wooden Carpet [53]

2.10 Sustainable Fibers Decrease Carbon Dioxide and Carbon Mono Oxide Production

Each and every day, people are releasing carbon dioxide by burning fuels, coals to the environment. Carbon mono oxides are also released by vehicles, mills etc. [54]. Production of manmade plastic fibers also a great source of carbon dioxide while

manufacturing them and destroying them [55]. Even they are not decomposed in soil. Manmade plastic fibers are continuously destroying the environment directly or indirectly [56]. Besides, trees, plants, crops, vegetables etc. take carbon dioxide and carbon mono oxide from atmosphere [57]. Carbon dioxide is the cause for global warming, and it impacts greenhouse effect [58]. By cultivating natural sustainable fibers, using them and by avoiding plastics from our daily life we can make the environment better for sure [59].

2.11 Sustainable Textile Fibers Control Odor Pollution

Natural wool fibers have the wonder capabilities of controlling odor. It is a fiber like component that can work as a good insulator besides allowing to circulate air inside it [60]. On contrary, manmade fibers can trap air and can generate heat but they are unable to air circulation. But wool has the abilities of both insulation and circulation [61]. While circulation of air this fiber allows secretion, perspiration, exudate and odor to pass from the body. Wool absorbs about 30% of their own weight in water devoid of feeling damp, permitting it to vaporize and feel less clinging against skin [62]. This characteristic helps to protect against bacterial attack and save the body skin. Since, this fiber is obtained naturally from animal, this fiber does not pollute environment while being manufactured and easily decomposed in earth after being end used. Figure 11 shows wound dressing cloths made up of cotton fibers.

Figure 11: Wound Dressing Cloths Made up of Cotton Fibers [63]

2.12 Protection against Ultra Violate (UV) Rays

Natural sustainable textile fiber such as hemp has the wonderful capability to provide protection against Ultra Violate (UV) rays. UV ray cannot do severe harm to the cloths made up of hemp fibers [64]. This is the reason that is why hemp made cloths is not faded in sunny condition. Practically, hemp made cloths protect more than 50% of UV rays than cotton does. Sunlight that comes to the earth contains both UV-A and UV-B rays. UVA is a long wave ray and UVB is a short wave ray [65]. UVA penetrate deep into the body skin where UVB severely burns the upper layer of the skin. Textile fiber hemp has the ability to filtering UVB rays and it protects human skin [66].

2.13 Sustainable Fibers Contain Cannabinoids

Sustainable textile fibers such as hemp contain Cannabinoids, which has tremendous health benefits to human body. Human body has endo annabinoids system, which hampers our brain, nervous system, immune system, endocrine system [67]. On contrary, clothing made up of hemp fibers that contain cannabinoids help to get protection against these problems. Cannabinoids enhances bone, skin, tissues, chronic and oncologic diseases [68]. Cannabinoids from hemp fiber is also beneficial to healing inflammation and protection against cancer. It also helps to get protection against nerve damage [69].

2.14 Sustainable Textile Fibers Prevent Diseases

Hemp fiber contains cannabinoids that helps to protect against dermatitis, acne and psoriasis diseases. It bears anti-bacterial and anti-inflammatory properties [70]. Hemp is the most suitable natural sustainable textile fibers that helps to filtering against UV rays but allows air to pass through the fabric surface. Sustainable hemp fibers also support to improve body condition along with reducing common diseases [71].

2.15 Sustainable Textile Fibers are Good for Problematic Skin

Natural sustainable textile fibers like line is the most clean fiber that is good for antibacterial and antiseptic properties, which prevents bacterial growth and good for problematic skin [72]. Even after using for long time, line fabric assists to kill microbes, protect microbial growth, prevents fungal diseases and inflammation [73]. Linen is used for medical textiles like bandage, wound dressing etc. since they have good aseptic and permeability properties. This fabric is used in medicine for interior suture. Linen bedding helps to get relief from pain [74].

2.16 Sustainable Textile Fibers Prevent Asthma

Pure flax linen fabric is good to give protection against asthma, allergies and skin hitches. Dermatologists suggests to use cloths made up of flax linen and to use bed clothing of flax linen as they are good to quicken healing, various skin diseases, allergies etc. it also helps a person to get rid of nervous and psychotic breakdowns. It has antistatic aptitude to decrease static in the human body [75].

2.17 Medical Benefits

Natural sustainable textile fibers have too many medical benefits such as linen bandage helps to fast healing and pain recovery [76]. It helps to reduce post operational complications. It is beneficial to reduce fever, inflammation condition, improve ventilation and raise immunoglobulin level. Clothing made up of linen helps to get protection against microbes and viruses [77].

2.18 Therapeutic Treatment

Clothing made up of linen fibers are used for therapeutic treatments due to having highest vibrating characteristics. For giving treatments to cancer patients, flax linen

fabrics are used. It has neurological illness assistances [78]. It helps to microscopic breakdown, stimulate blood circulation, influence muscular system etc. It gives good sensational feelings. This fabric can act as a good thermo regulator [79].

2.19 Flame Resistance Properties

Natural sustainable textile fibers wool is flame resistant since wool fibers are structured in a way that wool needs more oxygen than is accessible in the air to be flammable. That is why wool needs more amount of oxygen in the nearby environment for burning [80]. Wool is stiffer to burn than any other textile fibers. When cotton started to burn at 255°C, wool fibers are burnt at 570–600°C. Polyester fibers melt at 252–292°C [81]. Wool fibers do not melt so there are fewer chances to stick wool fibers with skin like many other common synthetics fibers [82].

3. Conclusion

It was seen throughout the paper that sustainable textile fibers were influential for the human comfort properties and human health benefits. Besides, these fibers have vital importance on environment. Sustainable textile fibers are biodegradable that's why they are easily decomposed in nature and they do not pollute the environment while destroying them. Productions of manmade synthetic fibers are not ecofriendly since they release gases and toxic chemicals to the environment. Where, sustainable natural fibers are obtained from natural sources either by cultivation or from animal, soil etc. these fibers have so many health benefits and human comfort properties. They are the good source of oxygen production. Carbon dioxide gases are consumed while cultivating these sustainable fibers. Natural sustainable fibers give so many health benefits such as prevention of asthma, cancer, allergies etc. These fibers protect harmful UV rays, odor pollution etc. Natural fibers are flame resistance, permeable, breathable but synthetic fibers trap air and provide discomfort to the body parts. Sustainable textile fibers provide good both insulation properties and permeability for an example wool. Sustainable textile fibers have great influence on controlling global warming. Considering all these issues natural sustainable fibers the first choice to the textile experts.

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