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Strategies of the Online Bamboo Viscose Clothing and Textiles Retailers

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Abstract

Recently, bamboo has been broadly studied for textile use. Most of the studies concluded some difficulty producing natural fibers. However, textiles associated with bamboo have entered the market. This study on 115 online retailers around the world found that 81.74% of the apparel products associated with the word "bamboo" were viscose that were mainly produced in China and largely retailed in developed countries: USA (42.61%), Australia (17.39%), and the UK (12.17%). Only 9.91% of the retailers labeled their product as "viscose from bamboo" and 41.44% mentioned viscose in descriptions of their products. Furthermore, 87.82% did not include any process description and 53.04% highlighted the properties of the bamboo plant rather than that of the product. Terms such as Sustainable (52.63%), Eco-friendly (46.32%), and Organic (34.74) were used in descriptions of the apparel to capture eco-caring consumers. Other terms such as Soft-Feeling (87.50%), Antibacterial activity (65.18%), Comfortability (58.04%), Moisture absorbency (57.14%), Thermo-regulating (56.25%), Breathability (50.89%) and other properties were advertised in descriptions of the viscose apparel without scientific substantiations. This study also provides insights into business strategies and other interesting findings from the current global online bamboo viscose retailing market.

Keywords: Bamboozling; Bamboo apparel; Rayon/viscose textiles; Online retailers; Business strategies; Business ethics

Introduction

In recent years, changes in weather and depletion of resources have changed consumers' consideration towards eco-friendly products. Many studies suggest that consumers are more interested in such products and there is a positive impact on sales when products are advertised or labeled as environmentally friendly [1-9]. Aware of the environmental concerns and responsibilities, some consumers also find it stylish and attractive when they wear eco-labeled products [10]. It was also observed that a portion of the consumers are willing to pay higher prices for the products that are eco-friendly and produced through environmentally safe processes [3,4,6,11].

An increased purchase intention is found to be connected with products that are associated with ecological information in advertising, processing, labeling, packaging, or any such terms [1,9]. When communicating with consumers or describing a product's information, a positive message about the environment affects consumer's preference towards the products and increases sales by the retailer [6]. With such a trend, manufacturers and retailers of eco-products are flourishing. However, this trend can also lead advertisers to use the term eco-friendly in an ambiguous manner suggesting misleading and unsubstantiated information about their products. The retailers of bamboo viscose products frequently claim many of the unique properties of bamboo in their goods but there is no evidence of these claims provided [12]. The repetitive advertisement of misleading or false information may lead the consumers to believe the information as true and thus some retailers gain profit unethically [13]. Thus, by exploiting the modern consumers interest of eco-friendly products, some unethical retailers are using a greenwashing strategy to deceive and deprive the eco-seeking consumers of supporting products that they value [5].

Whenever a plant, including bamboo, is processed through rayon/viscose processing, everything from the original plant is lost except the cellulose as rayon/viscose fibers [14,15]. So, although a plant may have many useful properties, they are destroyed by the process that creates rayon, a regenerated cellulose. It may be possible to retain some of the plant's properties if the fibers were produced in their natural form (cellulosic portions) along with some natural-property-containing elements. However, this is an expensive and challenging endeavor to produce natural bamboo fibers [8]. Though the rayon is mostly advertised as very soft, the natural bamboo fibers are found to be less soft and more challenging to put into yarn production [16,17].

As a result, very few to no producers are found to be working on creating natural bamboo fiber for textile use. In contrast the pulping process (a common process used in paper industries)

is used for rayon/viscose production with a starting product of bamboo or any other cellulose source. Bamboo clothing retailers offer the products that have bamboo as a starting material at a higher price than regular rayon textiles, perhaps adding to the idea of exclusivity. This study was aimed to provide information about market-share by textiles from natural bamboo fiber and viscose fiber from bamboo, and to explore the strategies and advertising terms modeled by the online textiles and apparel retailers who deal in products from bamboo plants.

Literature Review

Not only is bamboo the fastest growing plant on the earth, but the bamboo plant is also identified as one of the most ecological plants. It has a high percentage (60-80%) of holocellulose, a combination of cellulose and hemicellulose, and is a very good potential source of fiber for textiles [18]. However, extracting natural fiber from bamboo is a very complex and time-consuming process and currently the conventional chemical-dependent viscose process is mostly used for extracting reconverted cellulose from the bamboo biomass [8,17,19]. As aforementioned, the viscose process does not allow other components to be retained except cellulose and no special properties of the original plant source are preserved. Regardless of the starting material, bamboo viscose fibers are considered the same as other rayon or viscose fibers. In contrast to this, online retailers are consistently claiming several unique properties of the viscose fibers with the starting material as bamboo plants. Some retailers appear to use ambiguous language to describe their products in such a way that consumers are not sure whether the product was made from natural bamboo fibers of from viscose. Sometimes, the retailers are just describing the properties and benefits of the bamboo plants rather than the product itself and leading the consumers to believe that the products have those properties. As a result, the Federal Trade Commission (FTC) had to announce a policy under the "Textile Fiber Products Identification Act" and the "Textile Fiber Rule" to stop labeling or using misleading information about viscose from bamboo: a textile good cannot be labeled as bamboo textile/clothing/fabric unless it is directly made from actual bamboo fibers [20].

Unfortunately, this was not enough to stop retailers from using false claims or misleading information about bamboo viscose. The FTC charged several companies that deceptively labeled and advertised their products as made of bamboo fibers rather than rayon/viscose from bamboo. The commission also announced that "bamboo-based textiles, actually made of rayon, are not antimicrobial, made in an environmentally friendly manner, or biodegradable" [21,22]. The FTC continued alerting the retailers to avoid bamboozling the customers and it had to warn 78 of the nationwide US top retailers to refrain from advertising false claims and labeling products as "bamboo" [12,23].

When selling and advertising the products from bamboo, clothing and textiles retailers have other strategies along with incorrect labelling, to convince consumers to purchase their products- such as describing the bamboo as an eco-friendly plant with little or no information on the rayon process, relating the fiber production processes as ecological, emphasizing that clothes have unique properties, and so on [24-27]. Many of the online retailers also post or allow reviews to be posted by the unverified consumers on their websites. This is one of the successful business strategies that attract customers. In many cases, the reviewers are offered a rebate or financial gain to post reviews [28,29].

Although some properties of the bamboo viscose are advertised as unique, this is not actually the case: whatever the source of origination, regenerated celluloses like tencel, lyocell, viscose or rayon share many common properties if, no special modifications have been made, as they are produced by solely extracting cellulose from plant biomass [26,30]. Bamboo viscose was actually observed as thermally less stable than Tencel. Though it is most often advertised to be stronger and more durable than cotton, the viscose made from bamboo starting material was found to have less strength than cotton [31]. However, some unique properties of bamboo could be retained if they are produced in their natural fiber structure and with some inborn components. Studies suggest that the majority, if not all, of the fabrics from bamboo on the market, are mainly either rayon or from charcoal produced from the bamboo plant.

Both rayon and charcoal are not regarded as eco-friendly, biodegradable or a natural fiber [15]. While pulping industries and rayon industries do not emphasize their processes as eco-conscious, it is very common among the bamboo viscose producers to describe their process as closed loop or eco-friendly. Though sometimes described as environmentally safe or a closed loop process, the viscose process requires some chemicals that greatly affect workers' health, machines, and environments in different stages of production [26,32,33]. The focus of this study is to find how much of the "bamboo" textiles are actually rayon and what methods are employed in informing and attracting consumers to the textile goods advertised as "bamboo."

Research Methodology

Sample

This study was conducted on online retailers around the world. Although there are many retailers all over the world, 115 unique retailers were found to be accessible from different locations of the world by online users. Sometimes, it was found that there was a group of retailers selling products from the same manufacturer and they had similar types of claims and descriptions on their websites. So, only one retailer from such a group was randomly selected. However, the retailers selling products from the same manufacturer but with the different styles of web-design, claims, advertisements, and descriptions were all chosen for this study. Some retailers have multiple branches of their outlet with different names. So, only the main branch of retailers was chosen unless

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they are clearly identified as separate entities. Some of the online retailers were detected as bamboo clothing sellers but they were found to have extremely insufficient information on their websites about the products. This study did not include such retailers with inadequate information or access to determine what was being sold. Most of the online retailers in this study were from the USA corresponding to 42.61% even though many retailers were found to have multiple local and online branches. The four countries, the USA, Australia, the United Kingdom (UK) and Canada, totaled almost 80% of all online retailers' origins (Figure 1). Along with India, Netherlands, Sweden, and Germany, other involved countries were Denmark, France, Switzerland, Russia, Japan, Israel, Sweden, Czech Republic, Spain, Belgium, Philippines, and New Zealand.

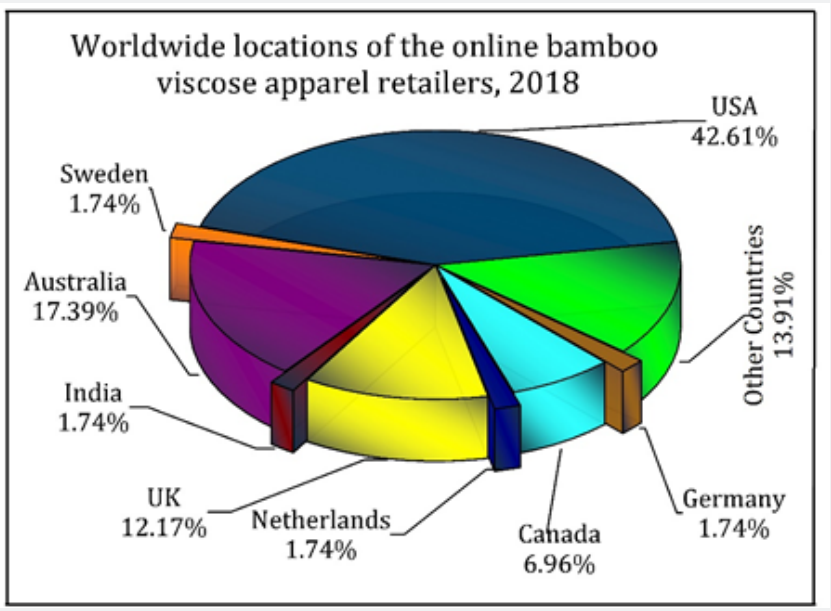

Figure 1: Percentages of the world online retailers of bamboo viscose clothing and textiles based on the survey, 2018.

Research questions

Since the main focus of this study was to identify what types of bamboo textiles and clothing (natural or regenerated viscose) are available in the global market, and what are the business strategies by the online retailers in terms of advertisements, claims, descriptions, and labeling, the research questions were designed accordingly to extract such information. The questions were: What type of products are being sold that are made of fibers originated from bamboo, apparel or home goods? What are the major manufacturing and/or retailing countries? Do the retailers mention their product as viscose? Do they label the product as viscose? Do they sell 100% bamboo originated products or blends? Do they advertise or infer their products as eco-friendly? How many of the retailers advertise or infer their products as eco-friendly? What are the common terms used by the online bamboo viscose retailers to claim or infer the product as environmentally friendly? One of the most pronounced myths about bamboo viscose is-it is antibacterial. Researchers have concluded that there is no reason for bamboo viscose to show antibacterial activity as it is a regenerated cellulose. The nominal activity may come from the chemicals that are used in the process [26,27,34,35]. This information of antibacterial properties not being associated with regenerated cellulose, led to "How many of the online retailers mention their products to be antibacterial" as a key question in this study. Another question was-what other properties are mentioned as unique properties and how often? Type of fibers (for example cotton, spandex, rayon) and their respective percentages in a fabric was defined as '*composition*' and any discussion related to the product by an online retailer was taken as '*product description*' when gathering data for the proposed questions.

Data collection and evaluation

Since the Google search engine preferably shows the retailers' name and initial information based on the location of the IP (Internet Protocol) address, IP address changing software was used to access websites and Google search engine in different locations of the world. The selected retailers' websites were reviewed thoroughly to extract as much information as possible. All the data and information were collected only when they were exclusively used to describe apparel or textiles originated from bamboo or blended with it. The origin countries of the manufacturers were identified by accessing retailers' website, reading product labels, or email communications.

Unfortunately, a large number of inquiry emails were not answered by the retailers. Only a very few Chinese retailers were found and their online websites either had limited access or

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insufficient information. Therefore, the Chinese online retailers did not make up a large number of the retailer websites that were reviewed. The types of products were categorized into two groups only: apparel related to human use of wearing, and home goods that are related to household use or for non-wearing usage. It should be noted that most of the manufacturers were recognized from China.

A thorough search on the retailers' websites was conducted to identify the type of fibers in the products: viscose or natural fibers from bamboo. This part of the research was one of the most challenging as most of the retailers described "Bamboo fiber/fabric" or "Bamboo X" where X is the type of the product, for example, Men's Bamboo Midweight Long Sleeve which could lead the consumers to assume the product as made of natural fibers directly from the plant. But the compositional information revealed that the fibers were actually viscose, for example, the above-mentioned product's composition was defined as "68% Viscose from Bamboo / 29% Polyester Fiber / 3% Spandex".

Some retailers did not even mention "viscose" or "rayon" anywhere in the product description but defined their process somewhere in the website pages or when answering frequently asked questions. Therefore, the product was identified, by the researcher, as viscose when a process of pulp preparation, use of carbon disulfide (CS2) and sodium hydroxide (NaOH), dissolving bamboo plant in a chemical solution, or similar terms were used in the process description. An assessment was accompanied with identifying the retailers who clearly described their process in a separate section in their websites. For collecting labeling information, whether the products were labeled as viscose or not, the product descriptions and the images with labels were assessed. Similarly, the information was collected on whether the products were 100% bamboo originated rayon fibers or blended with other fibers.

All the selected retailers' websites were thoroughly investigated to extract the terms that were used to refer to a product as eco-friendly. The terms, eco-related, that explicitly referred to the products partially or fully made of viscose or natural fibers from bamboo were only considered for this investigation. A part of this investigation was also to identify how many of those retailers described the properties and benefits of the bamboo plant rather than that of the products.

Descriptions of the properties as exclusive or exceptional in the clothing and apparel that originated from bamboo was also collected. A list of such claimed properties was produced. Several terms were used to describe the antibacterial activity, such as antibacterial, antifungal and antimicrobial. So, when any one of these terms were discovered, they were categorized under the antibacterial property. It should be noted that some retailers did not mention all the properties or claims under a section of every product. So, the claims were compiled for a retailer based on all the products that originated from bamboo on the retailer's website.

Results and Discussions

Manufacturing countries

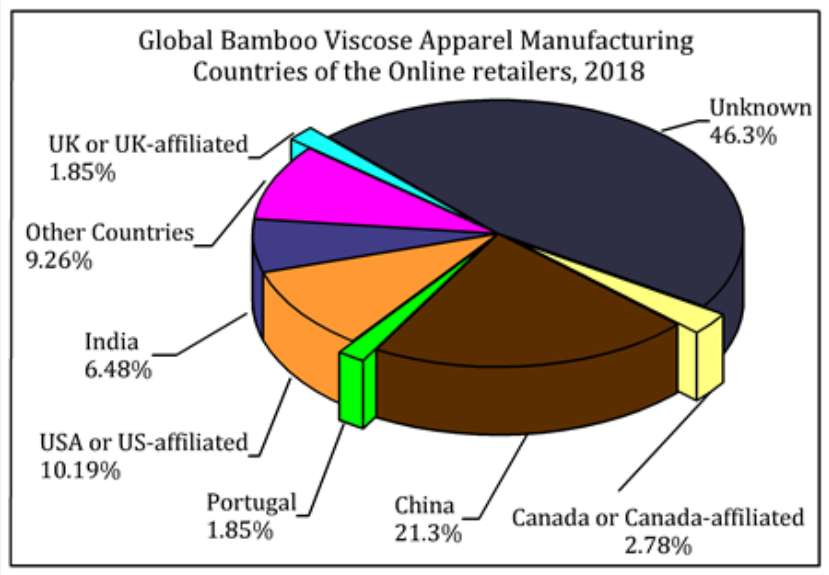

Figure 2: Global bamboo viscose apparel manufacturing countries of the online retailers based on an online survey of 115 retailers, 2018.

Since this study was conducted on randomly selected bamboo viscose apparel retailers that were available around the world depending on the accessibility to their websites and it was found that most of them expressed some unverified claims, the authors of this article did not expose their identity to avoid any negative effect on their business. It was found that the majority, 46.30%, of

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the retailers did not mention the country of manufacturing of their products. Of those who mentioned the country of manufacturing, China was found to be the leading country with 21.30% (Figure 2). It was noticed that some retailers reported their apparel to be locally produced. This strategy can be used to attract consumers. Evidence was not always given of the origin of production, so it is unknown as to whether local production was true in every case. So, some of the manufacturing countries might be falsely identified in some geographic regions biased by online retailers. Figure 2 shows a summary of the global bamboo viscose apparel manufacturing countries. The US, Canada, and UK retailers reported that they have production industries in other countries. Such industries were documented as an affiliated industry. For example, a US-owned manufacturer in Nepal was considered a US- affiliated industry. Manufacturing countries were found to be, USA or US-affiliated (10.19%), India (6.48%), Canada or –affiliated (2.78%), UK or –affiliated (1.85%) and Portugal (1.85%). Other countries involved in bamboo viscose manufacturing are Australia, Germany, Indonesia, Nepal, Philippines, Scandinavian, Spain, Sweden, Sri Lanka, and Vietnam.

Bamboo viscose online marketing status and strategies

Almost half of the online retailers, 47.83%, were based only on selling apparel products (Table 1). Most of the products were baby dresses, sleepwear, socks, undergarments and underwear. If people are careful about these types of garments due to direct contact with skin, the manufacturers and the online retailers could use this concern to convince consumers to make a purchase by advertising the "naturalness" of bamboo generated fibers. This capitalizes on the idea of bamboo plant being natural, eco-friendly, and green. Another portion of the online retailers sold both apparel and household products (46.95%) from bamboo viscose. Apparel was still the major product of the online shops. The household products included bedding and bathroom items, such as covered pillows, duvet cover, pillowcases, fitted cot sheets, towels, bath towels, bath sheets, baby towels, robes, bath mats, nappies, and handkerchiefs. Only 5.22% of the online bamboo viscose retailers were documented as selling solely household products along with non-bamboo related products.

Table 1: Summary of the results on online retailing of the bamboo viscose apparels.

Type of Products Sold	
Only apparel products	47.83%
Both apparel and household products	46.95%
Only household products	5.22%
Type of Fibers	
Viscose/Rayon	81.74%
Clearly identified as Natural Bambo fibers	0.00%
Unknown	18.26%
Products made of	
100% Bambo viscose fibers	7.82%
100% Bambo viscose fibers, and blended with other fibers	24.35%
Blended with other commercial fibers	60.00%
Composition unknown or not mentioned	7.83%
Products Labels as Viscose or not?	
Yes, labeled or clearly described as viscose	9.91%
No, nowhere clarified as viscose even though products were of viscose fibers	48.65%
"Viscose" mentioned in the composition	41.44%
Process Description Given	
Yes, clearly described their process	8.70%
Yes, but vague and incomplete	3.48%
No, no production process described	87.82%
Emphasis on the Bamboo Plant	
Yes, described process of bamboo plant separately to emphasize the product's attractiveness	53.04%
No, no direct description about the plant to emphasize the products	46.96%

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Though descriptions and claims in the advertisement by most of the online retailers sounded like the products were made of natural bamboo fibers, none of the 115 online retailers' products was clearly identified as so. However, 18.26% of the retailers' products were not identified as either viscose or natural bamboo fibers. Using product information, composition, production procedure, manufacturers' and partners' websites were used as a source to identify type of the fibers, 81.74% products were able to be identified as viscose or rayon (Table 1). This provides us with the information that the bamboo viscose is the predominate clothing product in the bamboo originated market rather than clothing from natural bamboo fibers. It follows that the product descriptions and claims are expected to be for viscose or rayon fibers unless the products are clearly substantiated as of natural fibers.

Although the online retailers mainly described the properties of bamboo viscose fibers, when a product description was given, the majority of the retailers (84.35% = 60% + 24.35%, Table 1) were involved selling products made of bamboo viscose blended with other commercial fibers. The composition of 7.83% of the retailers' products were unidentified. Generally, cotton, hemp, nylon, spandex, lycra, and elastane were involved in the blends. The properties of the blends were not described as different from 100% viscose. Only 9.91% of the online bamboo viscose retailers labeled or clearly described their products as 100% viscose (Table 1). A trend was found where the product was mentioned as viscose in the composition but not in the title of the product in advertisements.

The products were mentioned as a "bamboo product", for example a "bamboo T-shirt" had an actual composition of 80% rayon made from bamboo, 13% nylon and 7% spandex. This was misleading as some consumers may not check the compositional information when buying a product and may only focus on the product title. According to "Textile Fiber Rule" by FTC (FTC, 2009a), it is illegal to just say "Bamboo fiber" rather than "Viscose from bamboo." At least 48.65% of the 115 retailers advertised the product simply as "Bamboo" for example as "Bamboo Yoga Pants", "Bamboo Sweater Tank", "Women's Bamboo Motion-V", "Spun Bamboo Tee", "Bamboo Athletic V-Neck" and so on. Nowhere was it declared in the description that the product was viscose even though they were identified as viscose in the manufacturers' websites, companions' websites or by email communications.

This tactic may lead a retailer to an unethical business practice and the consumers to misunderstanding what the product is. However, 41.44% of the retailers mentioned "viscose" in the composition of the relevant products even though they have unsubstantiated claims about the product properties. A tendency was also noticeable that some retailers stated bamboo (say, bamboo X% and cotton Y%) in the composition and added an endnote to bamboo as "*rayon made from bamboo". Describing production processes is a modern approach that is frequently used by manufacturers or retailers to inform consumers about their own techniques and to educate the consumer. This tactic is very useful to draw environmental conscious consumers when the production includes eco-friendly or a less harmful processes. In case of bamboo viscose, this method of describing the production process may lead the product to be identified as regenerated fibers and as a result there may be less purchasing by consumers.

The majority of retailers in this study were found to be avoiding the description of production processes. Only 8.70% of the retailers described their production process. Of those retailers who reported the fiber production process, many emphasized that their process could be considered eco-friendlier by stating the process to be a closed-loop method with recycling of process chemicals. A smaller group of retailers, 3.48%, gave some vague description that could mislead the consumers to make an assumption that the fibers were natural rather than regenerated cellulose (viscose). Even though many of the retailers stated their processes or products to be eco-friendly, 87.82% of them did not include any description of the production processes (Table 1).

Another widely used tactic by the online retailers of bamboo viscose products was giving a description of the unique and beneficial properties of the bamboo plant in conjunction with the viscose products. Accordingly, 53.04% of the retailers were found to be involved in highlighting the plant's properties rather than explaining the properties of the fibers in the actual products (Table 1). On the other hand, even though the rest of 46.96% of the retailers did not associate the plant's features in the description, many of them claimed or advertised some properties that cannot be claimed for unmodified rayon.

Eco-friendly claims (by the viscose retailers)

The most pronounced claim about bamboo viscose is- it is eco-friendly. The claim is usually associated with the plant rather than the production processes. As a fast-growing plant, it consumes a higher amount of carbon dioxide (CO2) to convert it into biomass and releases oxygen(O2) to the environment. Thus, the plant plays an important role in maintaining environmental balance. However, 'how using harmful chemicals and processes for manufacturing regenerated cellulose or viscose fibers by deforestation can still be environmentally friendly' has been questioned [36,26]. This study provides a conclusion that only 18.26% of the online retailers avoided the direct use of eco-friendly terms in case of bamboo viscose products (Figure 3).

The remaining portion of 81.74% of the retailers stated terms to establish the products as eco-friendly. In addition, it was found that most of the retailers used more than one such term to emphasize their product to be environmentally safer. Many of the descriptive terms are only loosely defined and leave much to interpretation by the consumer. One thing that all the terms have in common is a positive connotation toward the environment that is appealing. It was observed that 52.63% of the retailers mentioned *Sustainable* at least once under the description of a bamboo viscose product. The term *Eco-Friendly* was in the next

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most (46.32%) used terms by the retailers while advertising such products. Among the 115 retailers, the terms *Organic*, *Ethical*, *Ecological*, *Environmental*, *Environmentally friendly* and *Socially Responsible* were stated by 34.74%, 14.74%, 10.53%, 9.47%, 6.32% and 5.26% of the retailers respectively (Figure 3). Furthermore, *Eco-product, Eco-wear, Green/greener, Renewable, Eco-clothing, Eco-fashion,* and *Eco/environmentally conscious* were mentioned by retailers as shown in Figure 3.

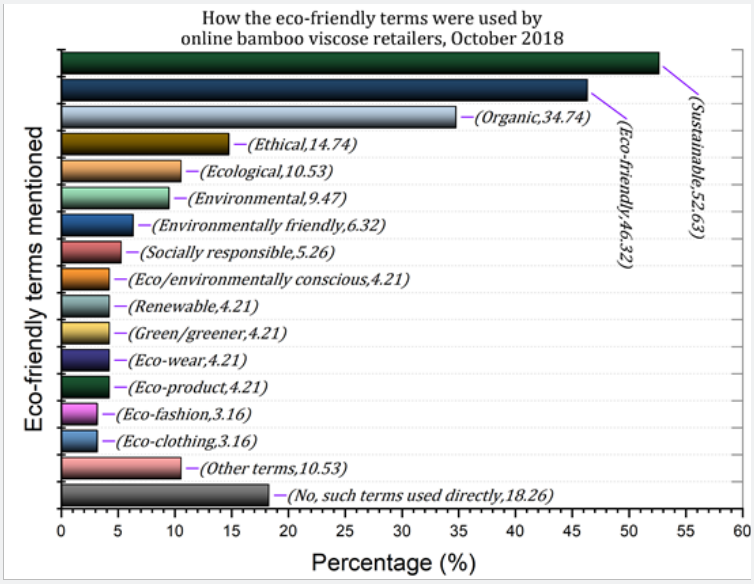

Figure 3: The most frequently used eco-friendly terms by online bamboo viscose clothing retailers.

Other terms corresponding to 10.53% of the retailers included *Ecodesignz*, *Earth-friendly*, *Eco restorative*, *Eco-luxury*, *Eco-rayon*, *Eco-standards*, *Eco-textiles*, *Planet friendly* and *World's most sustainable*. It was also noticed that the retailers who described their viscose product with one of the eco-friendly related terms, used more than one of the terms repeatedly. Such retailers have a trend to describe composition with eco-friendly terms as well. For example, the retailers described products' composition *as "70% viscose made from organically grown bamboo, 25% Organic Cotton and 5% spandex"* or *"68% organic bamboo, 27% cotton, 5% spandex"*. It should be noted that not all the retailers documented organic certification, so there is a question whether the term "organic" is being used correctly.

Claimed properties

Bamboo viscose products have been advertised with controversial claims among clothing and textiles. Many of the properties have been claimed so broadly that the US and Canadian government initiated rules and restriction on labeling and advertising on bamboo viscose textiles, and some of the retailers have been fined for unsupported claims [20-23,34]. Though some properties are common among the cellulose-based fibers, both natural and regenerated cellulosic fiber, they are described as exceptional in case of bamboo viscose. For example, though regenerated cellulose or rayons are generally soft fibers, 87.50% of the online retailers of bamboo viscose advertised the products as extra-ordinarily soft-feeling (Figure 4). The following terms were used to emphasize this property: amazingly soft, elegant soft, exceptionally soft, extra- soft, extremely soft, incredibly soft, luxuriously soft, naturally soft, softer than cotton, softest, super-soft, supremely soft, surprisingly soft, ultra-soft, and unbelievably soft. This kind of claim would be incorrect if the fibers were produced in their natural forms by mechanical or other means.

Natural bamboo fibers are described as rough and less soft than other natural fibers. The probable reasons behind this may include retention of lignin and coarser fibers [8,17,18]. Some of the retailers actually gave information about the difference in hand of the two different fibers in the 'frequently asked questions' sections. One retailer has included as follows– "*why do some bamboo fabrics not always feel as soft as other bamboo fabrics?*" and answer was included as– "*The first possibility would be that the fiber that was used is the mechanically produced variety, which does not produce a soft fabric, as opposed to the chemically produced type, which produces a very soft fabric.*"

Though the bamboo rayons are advertised as antibacterial and UV resistant, some studies found them to be less than reported or having no such activities (Hardin et al., 2009; Michael, 2008; Xi et al., 2013). Studies also suggested that processing chemicals may be responsible for a nominal antibacterial activity in the viscose

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products (Xi et al, 2013). However, 65.18% of the online retailers made the claim that their products was naturally antibacterial, antimicrobial, or antifungal (Figure 4). The antibacterial activity was a highly accentuated unestablished claim. There is no scientific explanation behind the claim that a fiber can still retain natural properties after removing all other components except cellulose with a regeneration process. For example, a retailer claimed as follows– "*bamboo is antibacterial, forever. By killing almost all bacteria, bamboo stays fresher and odor free for longer is more hygienic and healthier.*"

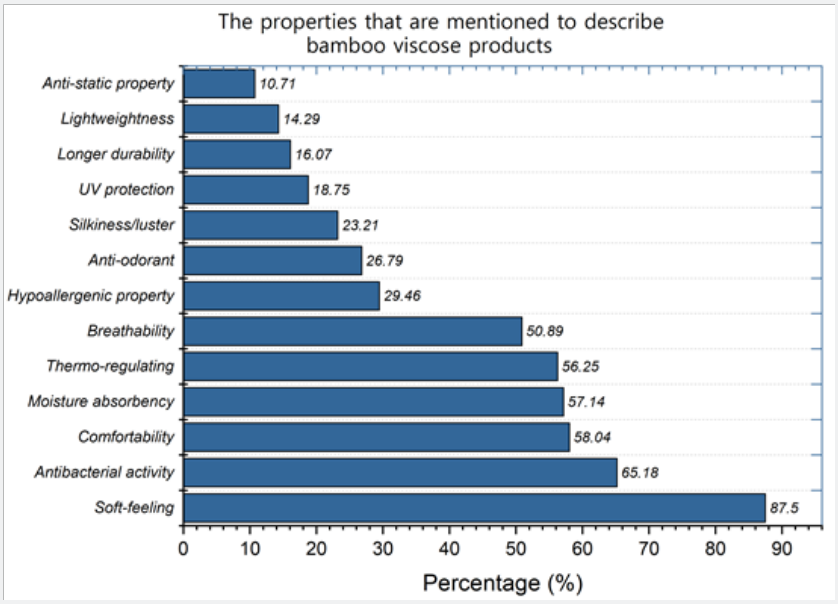

Figure 4: Different properties described as unique by online bamboo viscose clothing retailers.

The regenerated cellulose or rayon products were advertised by more than 50% of the retailers as having higher comfortability, moisture absorbency, and thermally regulating properties (Figure 4). Scientifically, there is no proof that the regenerated fibers have these properties on their own. The regenerated fibers would have to have been treated with specific finishes to create these properties. This study also compared the prices of the bamboo viscose products with cotton or other rayon products and it was observed that the former was being sold with at least 150-300% higher price. For example, the listed price for a 100% cotton V-Neck T-Shirt was $13.99 but the price for a similar T-shirt made of 96% Bamboo Viscose and 4% Spandex was $68.00 and price of other rayon T-shirts were $10.00-24.00. Other properties claimed without a clear basis were hypoallergenic activity, odor resistance, silkiness, ultra-violet ray (UV) protection, long-time durability or serviceability, lightweightness, and anti-static property (Figure 4). None of these properties has been confirmed for bamboo viscose with scientific investigations.

Since this study was an almost 3-year (2016-2018) investigation of online retailers of bamboo viscose textiles, there were some changes in strategies by the retailers over this time period. Some retailers changed their labeling information, descriptions, advertises, claims, and prices. Some retailers changed their business platforms, for example some retailers were found to stop their websites but continued their business through different social media—Facebook, Instagram, Twitter, Amazon, eBay and so on.

The online retailers in the USA and Canada seemed to have less forceful ads and claims than the retailers from other countries. Surprisingly, only one retailer was very clear about the products declaring, "*... bamboo fiber is actually nothing more than rayon made from plants... We have to call our fabric, 'viscose from bamboo' to avoid conflict, though our bamboo fiber passes global organic textile standards.*" Some retailers who had products from the same manufacturers but were selling their products in different countries had dissimilar claims and ads. In contrast, some retailers took ques from their manufacturers as they provided the same claims and ads as on the manufacturers' websites. It is difficult to tell which was directly responsible for the faulty information.

Conclusions

As this study suggests, bamboo viscose clothing and textiles are popularized by some overemphasized advertisements and unestablished claims about the properties of viscose from bamboo. This study also provides an understanding of how the online retailers of bamboo viscose established themselves by using different business strategies. Even though many retailers suggested they sold natural bamboo fiber products, this study did

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not find any unequivocal proof of natural bamboo fibers among the studied 115 online retailers. Instead, 81.74% of the retailers were found to be selling bamboo viscose products by information given on the websites. The remaining retailers were ambiguous about the type of fiber. Most of the online retailers of such products reside in developed countries such as the US (42.61%), Australia (17.39%), the UK (12.17%) and Canada (6.96%). Strangely, 46.30% of the retailers did not report their manufacturers' name or information. However, of the manufacturers reported, China was found to be the largest country with bamboo viscose production industries. It was also observed that 60% of the viscose products were made of viscose fibers blended with different natural and synthetic fibers. After application of the governmental laws on labeling in some countries, there was a noticeable adjustment in labeling and ads which was observed during the 3-year period (2016-2018). Therefore, a total of 51.35% (9.91%+41.44%) of the retailers at least labeled or mentioned "viscose from bamboo" in their descriptions. Further, governmental actions, international trading rules or awareness may help to prevent continued unethical business strategies in this product type. It was also evident that most of the retailers (87.82%) stayed away from process description. If the process description had been included, the consumer would have another source of information to help them make decisions. For the bamboo viscose products, it was found that more than half of the online retailers (53.04%) emphasized properties of bamboo plants rather than the products themselves. A large number of terms were used by the retailers in descriptions to establish the viscose textiles as eco-friendly where *Sustainable* (52.63%), *Eco-friendly* (46.32%) and *Organic* (34.74%) were used by most of the retailers. Similarly, many terms were used to stress the soft-feeling property of the fabrics. Among the numerous properties of the bamboo viscose textiles, *Soft-Feeling* (87.50%), *Antibacterial activity* (65.18%), *Comfortability* (58.04%), *Moisture absorbency* (57.14%), *Thermo-regulating* (56.25%) and *Breathability* (50.89%) were highlighted by more than half of the 115 online retailers studied. Other properties mentioned by the retailers were *Hypoallergenic, Ani-odorant, Silkiness, UV protection, Longer durability, Light weightness,* and *Anti-static property*. Though these properties were advertised widely by the retailers, most of the properties are not established with any scientific proof as properties of viscose fiber. This raises the question of truthful descriptions of the products. The study provides information on business and advertising tactics of online retailers of viscose from bamboo. This gives us a window to view how retailers may use changes in consumer demands, such as limiting environmental impact and "natural" products, to aide in sales. Future studies of new online retailers that enter the "sustainability" market would further this study.

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