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18 Unconventional Materials for Fashion

Abstract: The fashion industry has begun to introduce garments made from relatively sustainable fibres that were little known until recently. Some natural fibres – that can be derived from various sources including animals, insects, minerals and plants – have unique characteristics making them suitable in the industry. Hence, we see the fashion industry evolving to include a new focus on the production of fashion products based on these fibres. These fibres can be used alone or in combination with others, to create innovative clothing and other fashion products, but when mixed become less easy to recycle. This chapter discusses the potential of some unconventional materials.

Keywords: sustainability, fashion, materials, bamboo, hemp, Pinatex, ramie

Introduction

Clothing can be made from a variety of materials, including natural fibres such as cotton, silk and wool and synthetic fibres including nylon, polyester and spandex (Allary, 2021). The actors who mould the fashion industry – including designers, manufacturers, retailers and fashion media – are constantly evolving, with new trends and styles emerging on a regular basis. Among these trends is the consideration and increasing use of unconventional fibres.

Sustainability has become a key focus (Balslev & Dana, 2022) of the fashion industry, with increased recognition that being sustainable is not merely a short-lived trend but a means of surviving. Consequently, fibres with greater natural sustainability and minimal environmental impacts are being developed. Examples of sustainable, natural fibres that are becoming increasingly common within the textile industry include (among others): abaca (a species of banana); bamboo; flax; hemp (cannabis); jute (a common cordage fibre usually obtained from the bark of patsun); ramie; and sisal (native to southern Mexico).

While significant amounts of resources are consumed in the process of making of clothes, textile manufacturers are now taking sustainability aspects into consideration. In general, natural fibres are believed to offer greater sustainability than those that are synthetic (Nayak et al. 2020). It is generally assumed that the process of pro-

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https://doi.org/10.1515/9783110795431-018

ducing natural fibres consumes fewer resources than is the case with synthetic fibres; however, a variety of factors should be considered; for example, while producing synthetic fibres consumes a significant amount of resources, the effects of cultivating cotton are also significant as large volumes of water, fertilisers and pesticides are used in this process (Bevilacqua, 2014). Cotton that is organic or that has minimal chemical levels offers a more sustainable option compared to traditional cotton due to its socio-environmental advantages, as neither fertilisers nor pesticides are used to produce organic cotton.

Furthermore, the ethical and social effects of producing fibres should be considered. There is concern about carbon emissions that arise from the production of synthetic fibres, and this has led to calls for fibres that are carbon-neutral – including those from plants such as bamboo and lyocell. In the growth process, such plants are capable of absorbing sufficient carbon dioxide from the environment to compensate for the amount released in the production process, and this aids with cleaning the atmosphere; such natural plant fibres sourced from natural resources are inherently environmentally-friendly, consume less resources and can be recycled.

Bamboo

Due to its eco-friendly properties, there has been considerable focus on bamboo in the textile industry. Unlike man-made materials such as polyester, bamboo offers breathability, stretchability and durability (Dong, 2020). It is widely used in the textile industry for the purpose of manufacturing a variety of different products. A wide range of home products including towels, sheets and blankets now contain bamboo. As a result of their antibacterial properties, textiles made from bamboo are frequently used in the production of socks, T-shirts, undergarments and similar products. Garments made from bamboo have become increasingly popular in the clothing sector as they are soft and durable.

Due to their ability to wick moisture, textiles manufactured from bamboo are also used to make performance garments. The ability to control perspiration has particular appeal to hikers.

Although bamboo is certainly more beneficial for warm environments, it can also provide benefits in cold weather (Nan et al., 2020). During winter, sweating makes people feel cold. In contrast to synthetic fabrics that retain moisture, the moisture-wicking properties of bamboo render the latter ideal for colder environments.

Bamboo viscose and associated semi-synthetic fibres are neither soft nor flexible, but an advantage is that they are undeniably more effective at preventing the growth of bacteria while synthetic materials cannot.

Hemp

The plant hemp belongs to the Cannabaceae family and is a source of bast fibres, which are soft and woody in nature and can be found in dicotyledonous plants' stems (Kozlowski, 2005). Hemp was one of the initial plants cultivated by people and was historically regarded as being a key agricultural crop. Hemp is indigenous to the Central Asian region and evidence dating back to 2800 BC shows that civilisations grew the plant to obtain its fibres (McPartland, 2019). In the Middle Ages, countries in the Mediterranean region also cultivated hemp.

In comparison to cotton, the effects of hemp on the environment are lower as almost no pesticides and minimal volumes of fertiliser are needed in the growth process (Dhondt 2021), while its levels of productivity per land unit are significantly increased. In fact, it was demonstrated by an LCA analysis that hemp grown in an organic manner is significantly more eco-friendly compared to polyester or even cotton (Cherrett et al., 2005). Nevertheless, the diffusion of hemp in the garment industry is significantly limited as the properties of its fibres increase the complexity of production and reduce the appeal to consumers (Cherrett et al., 2005).

Pinatex

Numerous firms in the fashion industry now utilise cost-effective and vegan alternatives to leather. Pinatex – a leading alternative to leather – is produced from fibres of cellulose found in the leaves of pineapples. The result is a leather-like material produced from pineapple waste that can be considered significantly more ethical than the production of actual leather sourced from the skins of animals (Meyer, 2021).

Most artificial leathers contain polyurethane, a thermoplastic polymer, which is fully synthetic but causes no direct harm to animals (Kemona 2020). Although it is not completely sustainable, it can be argued that it is more ethical and eco-friendly than traditional leather.

Since it was launched commercially in 2015, Pinatex has been used by at least 500 manufacturers. Pinatex pineapple leather is now being utilised by large brands in the fashion industry – including H&M, Hugo Boss and Paul Smith.

Ramie

Ramie is a vegetable fibre, the usage of which can be traced back across millennia. Egyptians used the material for wrapping mummies between 5000 and 3000 BC, and it has a long history of being grown in Chinese culture (Schoeser, 2022).

Ramie belongs to the group known as bast fibre crops. Due to the versality of ramie as a textile material, it has numerous applications. In terms of furnishings, ramie fibres are employed in the production of stylish napkins and tablecloths as well as superior blankets and pillowcases.

With respect to the fashion industry, the fabric is largely utilised by fashion brands focused on sustainability: scarves, trousers and shirts made of ramie are coveted by those who truly appreciate natural fabrics.

Conclusion

Overall, the use of natural fibres in the fashion industry offers numerous benefits, and future manufacturers might very well make increasing use of the materials discussed above and others such as MuSkin, which is produced from mushrooms. These fibres are often more sustainable and environmentally friendly than synthetic fibres, and they can provide unique characteristics and added value to fashion products. In addition, the use of unconventional natural fibres can be more profitable for the industry and help to drive innovation in product design. As the fashion industry continues to evolve, it is likely that the use of unconventional fibres will play an increasingly important role in the creation of sustainable and high-quality fashion products.

References

Allary, T. (2021). Future Fashion. *Industrial biotechnology*, *17*(4), 190–203.

Balslev, H., & Dana, L.P. (2022). Opportunities for entrepreneurial sustainability initiatives to advance Sustainable Development Goals. Conference paper for *Global production, innovation and sustainable development goals*, University of Southern Denmark, Odense, Denmark, February 7–11.

Bevilacqua, M., Ciarapica, F.E., Mazzuto, G., & Paciarotti, C. (2014). Environmental analysis of a cotton yarn supply chain. *Journal of Cleaner Production*, *82*, 154–165.

Cherrett, N., Barrett, J., Clemett, A., Chadwick, M., & Chadwick, M.J. (2005). *Ecological footprint and water analysis of cotton, hemp and polyester*. Stockholm Environmental Institute.

Dhondt, F., & Muthu, S.S. (2021). The environmental and social impacts of hemp. In *Hemp and sustainability* (pp. 15–35). Springer.

Dong, K., Peng, X., & Wang, Z.L. (2020). Fiber/fabric-based piezoelectric and triboelectric nanogenerators for flexible/stretchable and wearable electronics and artificial intelligence. *Advanced Materials*, *32*(5), 1902549.

Kemona, A., & Piotrowska, M. (2020). Polyurethane recycling and disposal: Methods and prospects. *Polymers*, *12*(8), 1752.

Kozlowski, R., Baraniecki, P., & Barriga-Bedoya, J. (2005). Bast fibres (flax, hemp, jute, ramie, kenaf, abaca). *Biodegradable and Sustainable Fibres*, 36–88.

McPartland, J.M., Hegman, W., & Long, T. (2019). Cannabis in Asia: its center of origin and early cultivation, based on a synthesis of subfossil pollen and archaeobotanical studies. *Vegetation History and Archaeobotany*, *28*(6), 691–702.

Meyer, M., Dietrich, S., Schulz, H., & Mondschein, A. (2021). Comparison of the technical performance of leather, artificial leather, and trendy alternatives. *Coatings*, *11*(2), 226.

Nan, X., Yan, H., Wu, R., Shi, Y., & Bao, Z. (2020). Assessing the thermal performance of living wall systems in wet and cold climates during the winter. *Energy and Buildings*, *208*, 109680.

Schoeser, M. (2022). *World Textiles*. Thames & Hudson.