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'Better for the environment': an exploration of dyestuff preference data gathered at 'talking colour: huddersfield's dyeing heritage'.

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ABSTRACT

This article investigates dyestuff preference data gathered from researcher's 2023 exhibition around the history of dyestuffs in Huddersfield. The exhibition in question was part of the researcher's MRes into dyestuff experiences in Huddersfield from the nineteenth century, documenting oral history of dyestuff usage and manufacture.

This topic is important across multiple fields, ranging from the environmental sustainability of textiles to nineteenth-century colonial trade networks. There is a lack of public history in historical investigations, and this article demonstrates the validity of using an exhibition to source consumer perceptions and preferences around dyestuff usage. Additionally, there is little exploration of using exhibitions to gather consumer data surrounding textile usage and manufacture, therefore this article is to comment on the researcher's own experiences in the hopes of prompting further exhibitions that directly involve attendees.

This research aimed to highlight the effectiveness of using a public history approach in gathering research around dyestuff choice, as well as seeing whether there would be a market available for more costly naturally dyed textiles. Natural dyestuffs are not inherently superior to synthetic dyestuffs and are not the single solution to extensive pollution from global textile industries. Instead, by understanding consumer's habits and dyestuffs perceptions areas of unsustainable textile manufacture can be identified, and thus solutions can be formulated.

Introduction

This article will provide a commentary on data gathered from the 'Talking Colour: Huddersfield's Dyeing Heritage' exhibition in the June-July 2023 season at the Colne Valley Museum, linking it with environmental issues and how people's responses hint towards a greater acceptance of natural dyestuff-produced textile shades. Similarly, this article will demonstrate how current environmental attitudes believe 'natural' production will fix textile pollution issues, when in fact a multitude of solutions need to be taken about rampant consumerism and consumer signalling to reduce

textile environmental pollution. Furthermore, this article will illuminate how the nineteenth-century dyestuff trades were inextricably linked with colonialism.

Textiles have been coloured using dyes derived from various sources for thousands of years, more recently being used as forms of status symbols and as a way to belong to social groups (Auty & Elliot, 1998). Dyeing is an essential part of textile manufacture but conversations around sustainability in textile manufacture are focused on consumer fibre preference (Sigaard & Laitala, 2023). Until 1856 only dyestuffs derived from natural sources were used for textile dyeing. For clarity, natural dyestuffs are from sources that would 'naturally' occur whilst synthetics are being created chemically, typically from crude oil derivatives. Perkins' 'Magenta' dye was created from coal tar in 1856, with many more coal tar dyes being explored and discovered through the nineteenth century. These coal tar dyestuffs ensured consistent colours in industrial textile manufacture in comparison to natural and were thus used primarily in textile manufacture from 1908 onwards (Olney, 1908, p.141). However, with the rise of environmentalism and climate change discussion in the public arena, this research aimed to learn whether people would prefer natural or synthetic dyestuffs after learning about natural dyestuffs in more detail as part of the 'Talking Colour: Huddersfield's Dyeing Heritage' exhibition. This data of dyestuff preference was gathered as part of my MRes Thesis conducted September 2022-September 2023, investigating dyestuff perceptions and experience in Huddersfield.

Procedure of Voting

Each audience member was asked to participate in this research, understanding their participation was voluntary. The exhibition had three points to which they could contribute, a voting box, a book in which they could explain their voting choice and a book documenting oral history of dyeing and dyestuffs. The voting question was 'Which dyes do you think are better, Natural or Synthetic?'. This question was presented to gather an overall preference of the contributor, concerning aesthetic preference as well as environmental sustainability. Voting tokens comprised of light and dark-coloured leather circles, with black buttons being used for the 'both' option that was added on 10/06/2023. This extra option was added due to feedback from exhibition attendees, with many textile professionals and artisanal crafters informed on dyes commenting on how they could see the negatives and positives of both types of dyestuffs. Votes were cast in a covered tin box to prevent 'herd behaviour', swaying the vote in favour of the current majority. Typically, informants voted after a presentation which included touching and smelling various coloured yarns, dyed using synthetic or 'natural' dyestuffs. Participants were asked which yarns they thought were naturally or synthetically dyed, in which no attendee answered correctly. This was encouraged, to increase participation and learning of dyestuffs, as well as knowledge of nineteenth-century Huddersfield's prominence in the textile industries. Additionally, smell and touch are both considered important senses to assist in forming perceptions and preferences, therefore this exercise was necessary to gather preference information (Sell & Churchill, 2006, p.151), (Etzi et al., 2014). Part of this experience was an explanation regarding different nineteenth-century sources of 'typical' dyestuffs, with a map detailing the international sources of popular dyestuffs such as indigo, cochineal and logwood. Saffron was included as well, but that was due to having an extra pin and wanting to exhibit a glass bottle of saffron we had collected, alongside bottles of refined indigo, crushed cochineal beetles and whole cochineal beetles. This map and bottles are relevant to today's discussions around textile industries, especially as the textile manufacturing process is globally interconnected, with transport incurring carbon costs to fulfil the process.

Data Findings

Over 280 people attended the exhibition, with 78 people participating in the vote. Of these, cumulatively 50 voted that natural dyestuffs were

superior, with 21 voting for both and 7 for synthetics. From these figures, we can see that preference for natural dyestuffs dominated the votes, and synthetics were considered the inferior dyestuff to the exhibition attendees.

Going into this study, there was an expectation that there would be an overwhelming preference for natural dyestuffs in textile manufacture without any consideration by the voter of the actual environmental impact. This was concluded due to the general public perception that natural dyestuffs were superior to synthetic ones (Mabuza et al., 2023, p.4-6). The findings themselves did show an overwhelming preference for natural dyestuffs on the grounds of environmentalism, but it was found that this environmentalism was not based on the belief that a switch to natural from synthetic would fix environmental problems. Instead, it was with the expectation that reduced textile manufacture with a more local focus was more environmentally sustainable than global industrial usage of synthetic dyestuffs. Additionally, the data collected disproved basic marketing theory surrounding fabric preference.

It is largely believed in fabric and garment marketing that consumers require aesthetically pleasing bright colours to purchase textile products (Waters, 1995, p.24). However, in the voting explanations, multiple people referenced the 'subtlety' of the colours, and directly referenced that in why they thought natural dyestuffs were superior. This indication of preference dispels the belief that bright or vivid colours are the only way to make a fabric attractive. Instead, this data represents exhibition attendees having a larger preference towards purchasing environmentally sustainable garments or fabric.

Graph 1:
Graph showing results of dye preference vote.

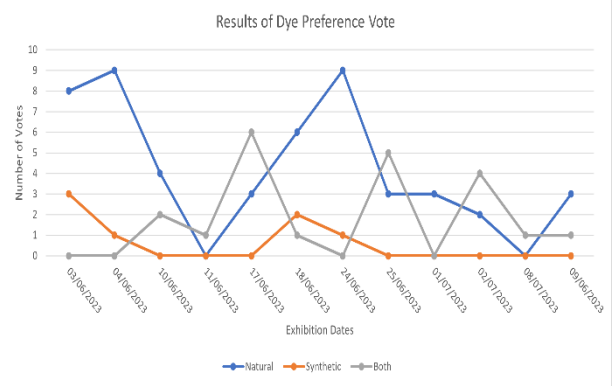
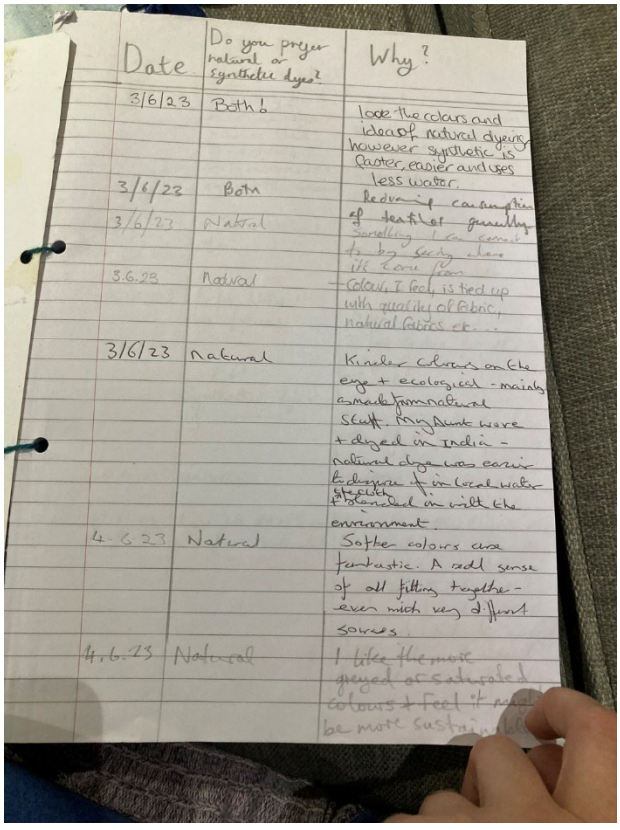
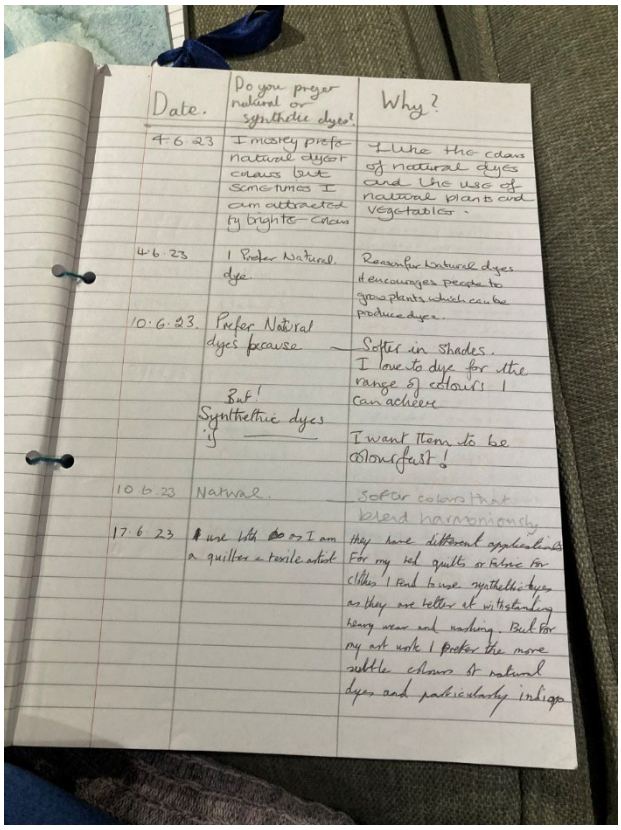
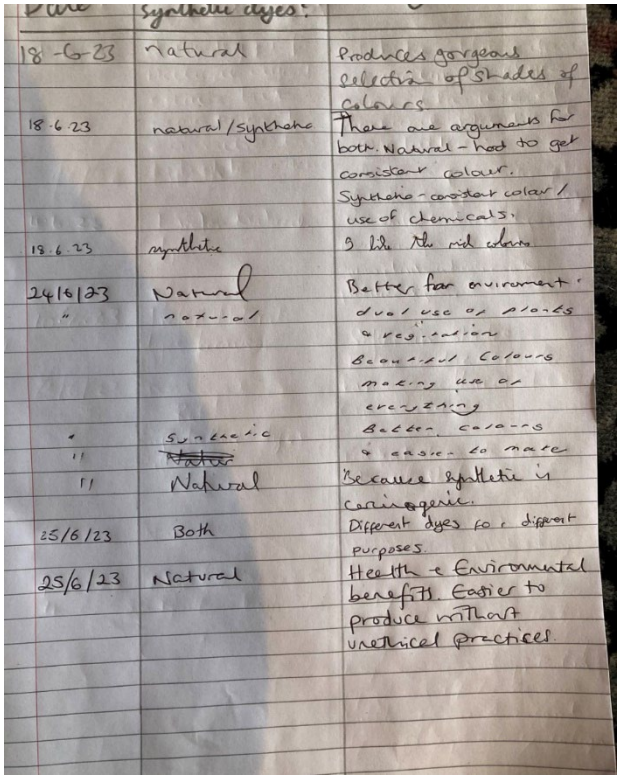


Figure 1:
Entries made in 'Why do you prefer natural or synthetic dyes?' book.

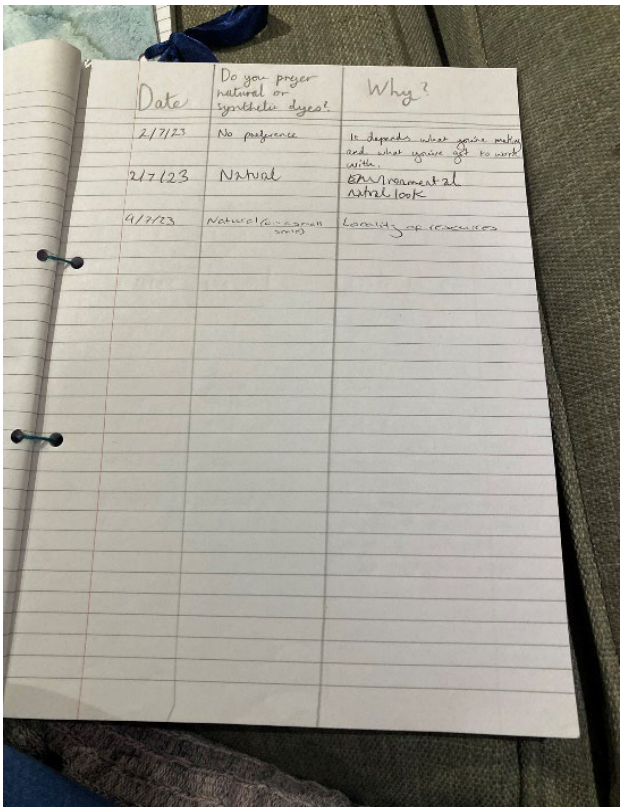




Date.	Do you prefer natural or synthetic dyes?	Why?
4.6.23	I mostly prefer natural dyes colours but sometimes I am attracted by bright colours	I like the colours of natural dyes and the use of natural plants and vegetables.
4.6.23	I Prefer Natural dye	Reason for natural dyes it encourages people to grow plants which can be produce dyes.
10.6.23.	Prefer Natural dyes because	Softer in shades. I love to dye for the range of colours I can achieve
	But Synthetic dyes if	I want them to be colourfast!
10.6.23	Natural	Softer colours that blend harmoniously
17.6.23	I use both as I am a quilter + textile artist	they have different applications For my wall quilts or fabric for clothes I tend to use synthetic dyes as they are better at withstanding heavy wear and washing. But for my art work I prefer the more subtle colours of natural dyes and particularly Indigo



Date	Synthetic dyes?	
18-6-23	Natural	Produces gorgeous selection of shades of colours
18.6.23	natural/synthetic	There are arguments for both. Natural - hard to get consistant colour. Synthetic - constant colour / use of chemicals.
18.6.23	synthetic	I like the rich colors
24/6/23	Natural	Better for environment. dual use as shades & vegetation
"	natural	Beautiful Colours making use of everything
"	Synthetic	Better colours & easier to make
"	Natural	Because synthetic is carcinogenic
25/6/23	Both	Different dyes for different purposes
25/6/23	Natural	Health + Environmental benefits Easier to produce without unethical practices



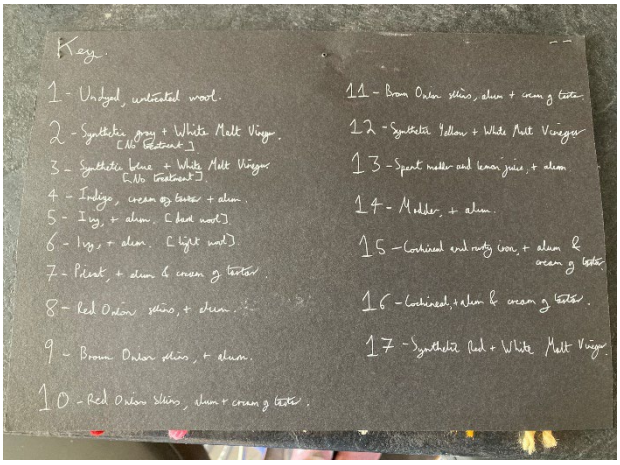
Date	Do you prefer natural or synthetic dyes?	Why?
2/7/23	No preference	It depends what yarns making and what yarns get to work with
2/7/23	Natural	Environmental Natural look
9/7/23	Natural/a-small amount	Limited of resources

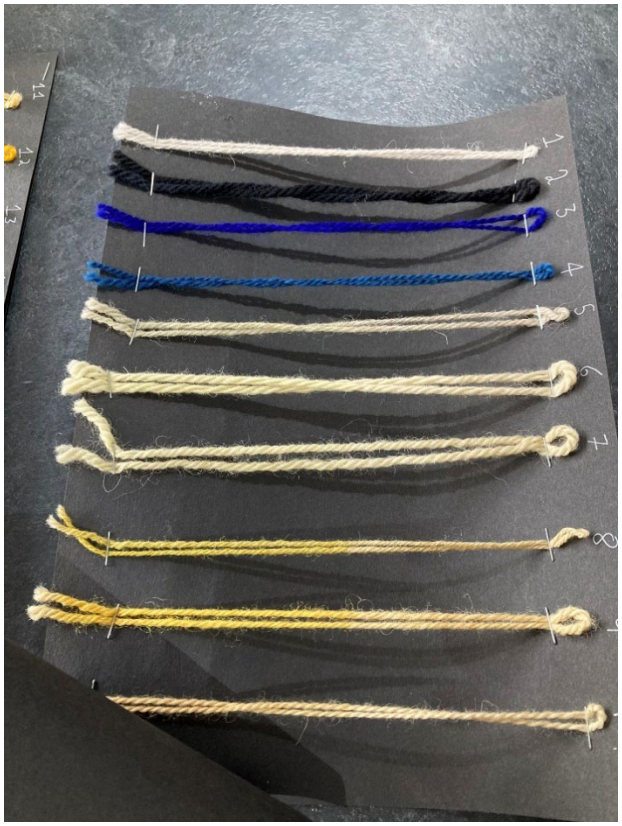
Consumer decisions behind choosing apparel/textiles and implications upon marketing

Various factors go into a consumer's choice of textiles, with a minimum of two factors when picking out apparel or furnishings, for the textiles in question to have aesthetically pleasing colours/patterns and to have colour permanence (Elsasser, 2014, p.201). Additional factors cover the tactile feel of the textile, exclusivity of the fabric, fibre status in the hierarchy of fabrics, as well as the cognitive associations of the consumer with these types of fibres (Hemmings, 2012, p.3), (McGuire, 1978), (MacInnis, 1994), (Barrera-Verdugo & Villarroel-Villarroel, 2022). Compared to synthetically dyed fabrics, naturally dyed fabrics have poor colour permanence and fade much faster. Using the sample yarns dyed for the exhibition, a lightness test was conducted. Lightness tests are part of a wider series of tests to inspect the durability and quality of fabric. Fabric inspection is a common practice in industrial textile manufacturing to reduce rejection and avoidable costs (Singh, 2020). This test consisted of snips of

yarn being exposed to sunlight through an upstairs window, with half being covered to more easily see how the colour held up to being bleached by the sun.

Figure 2:
Images of Yarn Test with key.





This test demonstrated how natural dyestuffs are photosensitive to sunlight, with nearly all of the naturally dyed yarns having a profound colour difference between the non-exposed and exposed parts of the yarn. In comparison, the synthetic colour samples had minor visible changes. This factor was pointed out multiple times throughout the presentation, listing many of the factors in which synthetic dyestuffs were inevitably superior to natural dyestuffs. These factors include better rubbing fastness, lesser shade variation between batches, and less weight of dyestuffs. With natural dyestuffs, it was incredibly difficult to shade match, as factors such as time of the product harvesting, chemical content of the water, temperature of the water or method of transporting the dyestuff all have a possible impact on the shade. With synthetics being able to be replicated chemically using one recipe, it meant uniformity in the shade. Taking into account all of the benefits synthetics have over natural dyestuffs, overwhelmingly people voted for natural dyestuffs as the superior dyestuff, seemingly discounting common sense according to practicality. Instead, the data suggests perceptions

of environmental sustainability have become a major factor in the purchase of garments and fabrics.

Consumers are increasingly becoming more aware of their environmental impact, with COVID-19 supposedly leading to a rise in consumers buying 'sustainable' fashion (Granskog et al., 2020). 'Sustainable' in this context largely refers to a garment of good quality created using ethical working practices, with certifications, traceability and organic materials (Mandarić et al., 2022, p.176). The 'sustainable' fashion market grew to $7.5 billion in 2022, with expectations of growth to $11.1 billion in 2027 (Research and Markets ltd, 2023). Consumers are now demanding sustainable garments and fabric, especially as the textile industry is one of the most environmentally polluting industries, with up to a third of all water pollution being caused in some shape or form by textile manufacturing (S&D, 2023). This rise in demand for sustainable fashion means that companies now employ 'greenwashing' tactics to appear sustainable or 'green' to promote purchases (Rausch & Kopplin, 2021). A recent example of this greenwashing would be the fast fashion giant SHEIN, in 2022 setting up an 'Extended producer responsibility fund' with over $50 million to tackle textile waste (BBC, 2022). Another example is of a Chinese factory tour that Instagram fashion influencers were invited on, with factory workers claiming good conditions and benefits, using the influencer's audiences to claim ethical working conditions across all SHEIN manufacturing factories (Mendez II, 2023). This form of using a singular example of a factory to claim good working conditions across the board is heavily in conflict with both a 2021 investigation by Swiss newspaper Public Eye and a 2022 Channel 4 investigation which claimed extensive breaches of labour laws in at least two SHEIN supplier factories (Kollbrunner, 2021), (The Guardian, 2022). As these examples demonstrate, marketing sustainability and implementing sustainable practices in textile manufacturing are two separate procedures. Thus, if marketing claims sustainable tactics have been used and the company does not implement them at all stages there will be repercussions towards the perception and income of the company.

Perception of dyestuffs' environmental impact

Generally, there is a global perception that 'natural' dyestuffs are more environmentally friendly than any synthetic dyestuff, both from the creation stage to the disposal of by-products (Atav et al., 2020, p.15). Similarly, synthetic fabrics are commonly seen as 'bad' and natural fibres as good', with natural fibres being made of renewable resources and synthetics linked to chemical pollution and factory production (Fletcher, 2014, p.11). This is present in the sources by Fletcher, Elsasser and Atav et al., with comments in Elsasser pointing out how this perception fails to account for the pesticides, fertilisers and destruction of nature for land used to produce cotton, silk and wool fibres (Elsasser, 2014, p.247).

General literature around environmental sustainability of textiles, and to 'fix' fast fashion, focuses more on the production of natural fibre textiles in place of synthetic fibres such as polyester. This single-frame solution is not viable to fix the entire fast fashion problem, as single approaches cause 'unforeseen and unwanted consequences elsewhere' (Fletcher, 2014, p.9). The Earth's biosystems, that textile waste is dumped into, are incredibly delicate and any substantial disrupting factor can throw off the balance and stop successful coexistence (Wanderful Stream, c.2020, p.15). Instead, there needs to be a restructuring of the fashion industry to prioritise long-wearing garments and well-made garments (Sahimaa et al., 2023, Abstract). The responses of exhibition attendees about why they think natural dyestuffs are superior seem to be along this attitude, suggesting that the public is not well-informed about how damaging natural or synthetic dyestuff pollution can be to the environment and ourselves. An element included in the exhibition was an 1868 Commission which investigated pollution of the Colne Valley Rivers primarily caused by wastewater from textile manufacturers. Typically when encouraged to read this commission there was

extensive shock by the attendees, as it seemed to challenge their assumptions that natural is good and beneficial to the environment. Some responses cover the reduction of textile consumption as their preferred environmental option but still voted for natural dyestuffs cultivated in the 'local' area. This suggests that a multi-pronged approach including switching from synthetic to natural dyestuffs, as well as reduced textile consumption is the preferred solution by the public for minimising local textile environmental impact.

Actual environmental impact

Research conducted as part of this work assists in dispelling this myth, with numerous accounts of river pollution and animal depletions in Huddersfield attributed to the disposal of 'natural' dyestuffs in the water. It was concluded that to achieve the vivid colours consumers now prefer, copious amounts of natural dyestuffs had to be used, further demanding more of the dyestuff source and polluting local water sources. This production level is made more concerning when it is realised that nineteenth-century dyestuffs regularly used a variety of natural dyestuffs such as plants and insects, resources that can be cultivated but are considered unsustainable for industrial textile manufacture (Saxena & Raja, 2014, p.73). Examples of these dyestuffs range from indigo, a blue dye derived from plants, to cochineal beetles, a Peruvian parasite that is crushed to create a red dye. There is a cost to any action, and to produce fantastically red fabrics tonnes of beetles were sacrificed. When talking about environmental impact, it is not only the impact on the land, water and air around humanity, humanity itself counts as part of the environment. Therefore, an account must be taken of how many of these colonially controlled countries were forced to industrially produce and export various dyestuffs, countries such as India. India was the world's producer of indigo in the nineteenth century, however, there were unforeseen impacts on the workers' health and livelihoods, often with planters being forced into debt and causing unforeseen illness to industrial indigo manufacturers (Balfour-Paul, 2000, p. 72), (Bauer, 2023).

Natural dyestuffs are not always superior to synthetic dyestuffs in terms of environmental impact, it all depends on the disposal of waste dye water and sources, as well as the ethical and sustainable production of dyed fabrics.

Limitations of data

The data gathered from this exhibition is limited in the examination of factors, such as gender, age, occupation, ethnicity and income, and their impact on how the participants chose to respond. Additionally, it has to be considered that this exhibition was part of the WOVEN in Kirklees festival, a series of events based around sustainability and textile making. The people who would have been attracted to the exhibition due to this festival are likely people already interested in environmentalism and textile sustainability, therefore they would be predisposed to the 'environmentally friendly' dye option compared to the general population. Alongside this limitation, over 280 people attended the exhibition throughout its duration but only 78 voted, with 21 going into further detail about their decision. This sample size is far too small to provide assumptions for even the village of Golcar where it was held, therefore it cannot be taken as proof of consistent demand for environmental sustainability for the entire UK. However, it can be taken as an indication of sustainability interest in garment manufacture, with a potential emerging market for textile manufacturers.

Another limitation would be the number of people in the exhibition space; from personal experience, small groups of up to four could all be presented to and involved in conversations about the sustainability of dyestuffs. The exhibition space had the capacity for many more, with one occasion having a group of 15 present. Unfortunately, this meant that in large volumes the presenter could not personally encourage as many people to engage with the vote. Further work would be into gathering more in-depth data around what consumers consider the most important factors when they purchase a garment, or when they decide

to purchase textile-based items. This would be achieved through the usage of detailed surveys as well as individual interviews; additionally allowing for a greater understanding of consumer's perceptions of sustainability in textiles.

Conclusion

The gathered data from this exhibition indicates a clear shift in public perceptions around garment purchasing and fabric choice. Natural dyestuffs are consistently perceived as an environmentally friendly option when compared to synthetics, but the reality is more nuanced. However, this data shows that there is knowledge among general consumers that decreasing demand and consumption is the greatest solution to decreasing the environmental impact of textile manufacturing. Environmentalism and eco-sustainability are significant factors considered in consumers' choice of fabric and garment, therefore modern textile manufacturers have to take their product's sustainability throughout its lifespan into account. Fabric manufacturers can take advantage of any process sustainability by marketing to increase profits and additionally set a precedent in global textile manufacture.

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