Preliminary characterisation of Natural fibres for enhancement of concrete

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Introduction

Reinforced concrete with steel is one of the most used construction materials in the world. The addition of short bio-based fibres into the concrete mixture for the production of elements lightly loaded can avoid concrete cracking while reducing risks, time of production, costs with reinforcing bars and also, the steel mill pollution. There has been limited exploration to date of the potential use of natural fibres for the enhancement of concrete and this paper presents a literature review about potential vegetable fibres to be considered for this purpose.

Methods

The systematic review produced was conducted by the scientific databases ScienceDirect and Google Scholar, from March 2018 to April 2018. The terms used for search were: “natural fibres”, “fibre reinforced concrete”, “cement matrices” and “plant-based fibres”. There was no criteria related to the publication date. The selection of articles was defined by the original information presented about fibres extracted from coir, bamboo, jute, ramie, sisal, sea-grass, banana, abaca pineapple, flax, bagasse and curauá. When references repeating results were found, the newest were rejected.

Results and Discussion

- Vegetable fibres are one subdivision of natural fibres and can be extracted from seeds, basts, leaves, stalks, canes, grasses and reeds. The vegetables sources are numerous as is shown in Fig 1.

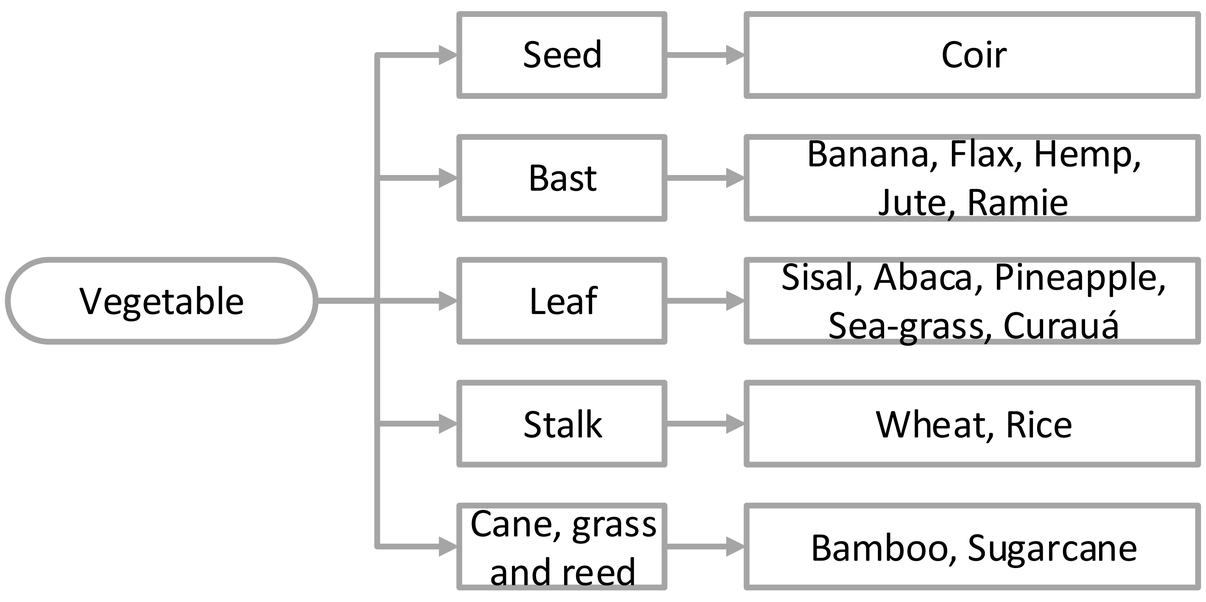
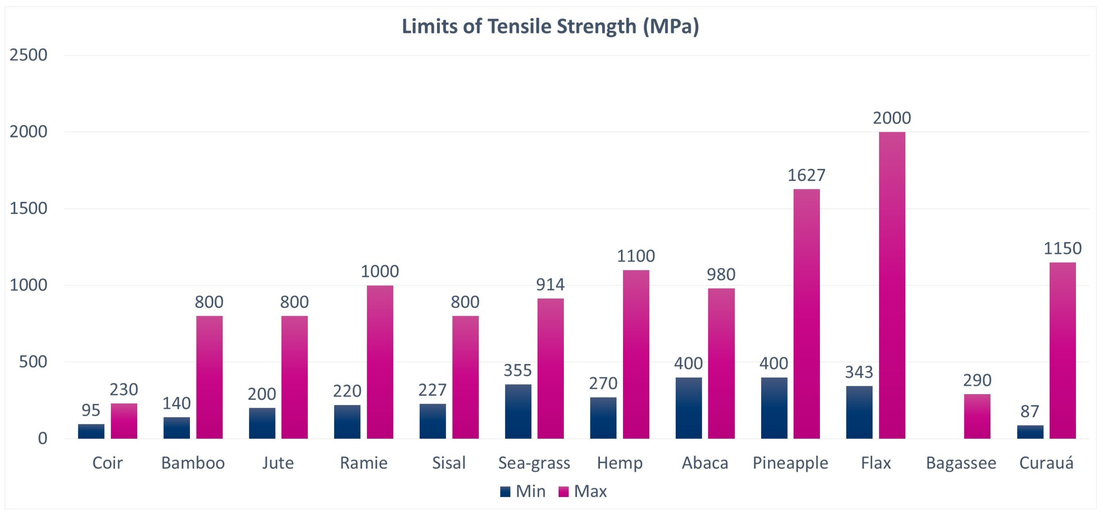


Figure 1: *Classification of vegetable fibres (Adapted from [1] and [2])*

- The extraction of the fibres can be conducted by different forms, depending on the type of source. After extracted, the fibres are submitted to specific chemical or physical treatments to reduce levels of lignin, moisture, waxes and other components that could interfere in their mechanical properties during a short or long-term analysis.

- As showed in Graph 1, studies show that vegetable fibres can achieve up to 2000 MPa of tensile strength, however the results obtained from different authors for the same type of fibres can be significantly different, [3] affirm that this occurs due to the fact that there is no technological control about the production of natural fibres.



Graph 1: *Limits of tensile strength for the same source of vegetable fibres found in literature [4—10]*

Next Steps

The next steps are:

- To select a number of different fibres among the possibilities studied;
- To define different treatments to submit the fibres to;
- To conduct a preliminary characterisation of the selected fibres in terms of their potential benefits to concrete elements;
- To exam physical and mechanical properties of the fibres;
- To compare the results obtained with the numbers presented in literature;
- To analyse possible relations between the type of treatments and results obtained;

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Acknowledgements

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