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Chapter 1

Introductory Chapter: An Overview of Bamboo Research and Scientific Discoveries

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.77094

1. Introduction

The group of plants belonging to a family of giant woody grasses is called bamboo. Among the wide spectrum of uses of bamboo are conceivable purpose, like scaffolding to boats, cooking utensils, furniture, food, fuel, landscaping, ornamental display and a thousand other uses [1]. Despite the enormous importance of bamboo to our social and economic well-being, researchers are still exploiting the potential derivable from most bamboos, in accordance to the International Network for Bamboo and Rattan (INBAR) vision 2015–2030 to carry out sustainable development goals. Furthermore, the food and agricultural organization in collaboration with INBAR (FAO/INBAR) has devised a strategic goal by promoting innovative solutions for poverty and environmental sustainability using bamboo and rattan [2]. However, there is a need to set a direction and define a road map for green development through research and expansion of research breakthroughs using bamboo as a natural fiber source. Being an example of natural fibers, bamboo is renewable, carbon neutral and biodegradable and also produces waste that is either organic or can be used to generate electricity or make ecological housing material [3]. It provides socio-economic benefits, since natural fibers not only come from the environment, but also benefit it.

2. Overview of bamboo research

In order to achieve the above goals, information about the latest empirical breakthroughs with respect to bamboo research scientific discoveries is very pertinent. It is assumed that these findings will further enhance the previous contributions of researchers on the latest scientific applications of bamboo fibers and result of research activities. These are necessary

indicators that might be used to assess progress towards these and future milestones. Efforts have been focused in the past towards addressing some of the most pressing contemporary socio-economic issues that bother on the solutions for poverty and environmental sustainability using bamboo. It has been revealed that, apart from the very long species of bamboo, there exist dwarf bamboo which are distributed in areas like northern part of Japan [4]. The growth characteristics of different species of bamboo with respect to geographical locations are therefore important in order to have an idea of the distribution of this dominant forest floor bamboo species in the respective region.

A review of microfungi, i.e., bamboo ascomycetes, with brief appraisal of major morphology and phylogeny of bambusicolous ascomycetes needs to be highlighted, while various species of fungi associated with bamboo need to be enumerated. Moreover, the history, distribution and importance of bamboo ascomycetes to agricultural and economic development as well as research prospects of bamboo ascomycetes will assist in examining the physico-mechanical and thermal studies of bamboo fiber [5]. The knowledge of the fundamental characteristics of bamboo fiber to maximize bamboo utilization in the area of providing mechanical and physical properties of bamboo has been seen as panacea which affects the bamboo durability and strength.

Another area of utmost interest is the modification of bamboo for sustainable product development. Both chemical and thermal modifications of bamboo otherwise called pyrolysis of bamboo enhance the properties of bamboo by extending the bamboo fiber applications [6]. Chemical treatments assist in reinforcing bamboo by modifying the bamboo surface and improve its compatibility with polymer matrix [7]. One of the major by-products of the charcoal collected during the pyrolysis of the charcoal is bamboo vinegars. The potential usage of charcoal from bamboo pyrolysis as safe pigment for food and natural moisture-proof material is another area of paramount research interest. The end use of these modificational approaches on bamboo is for food, energy, pulp, paper, buildings, etc.

The potential of bamboo as a new renewable energy is another breakthrough in the development and scientific cultivation of bamboo. This has been reported to greatly influence people's sociocultural lifestyle and emergence of natural fibre-based composites from various types of bamboo. The influence of type and form of bamboo fibers as fillers and reinforcements has further promoted the performance of bamboo composites. Bamboo production for traditional and modern applications as the country develops and emergence of new economic activities with bamboo resources utilization is very prominent specifically in forest-depleted region like China [8]. Furthermore, the application of bamboo in friction material and as reinforcement materials in concrete structure has been reported as safe and comfortable and could provide simple house for poor families. Recently bamboo is being used as reinforcement in thermoplastic polymers [9], since natural fiber such as bamboo exhibits comparable reinforcement effects to that of conventional glass fibers [10]. The changes in engineering properties of the thermoplastic matrices after the incorporation of untreated and treated bamboo are few of the uses of bamboo in polymer composite. The recent report of the suitability of the alkaline sulphite anthraquinone and methanol pulping on bamboo culms, i.e., *G. scortechinii*

bamboo species, has been attracting the attention of polymer scientists [11]. Its use in industrial production of pulp and paper packaging was buttressed by the biometric characterization of the bamboo culms together with the optimum pulping parameters.

3. Conclusion

Since bamboo has high potential socio-economic value, more efforts should be geared towards unraveling possible application of the various forms of bamboo. With the aim of maintaining a good balance between the fundamental and practicability of bamboo utilization, critical approach to meeting new challenges of technology and innovations is a task the researchers should prepare to surmount.

Acknowledgements

The author is thankful to the School of Industrial Technology, Universiti Sains Malaysia (USM), for contributing effectively towards the success of this book.

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