International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Study of Properties and Prospects of Areca Fibres and its Applications

Manjula Harish[1], Dr. Arunkumar H R[2]

[1]PhD Scholar, Principal, IIFT College of Fashion Technology, Bangalore

[2]Managing Director, Karnataka Trade Promotion Organization, Whitefield Industrial Area, Bangalore – 560 006, India
Corresponding Author Email: *arunhr1234[at]yahoo.co.in*

Abstract: ***Eco - friendly or natural fibre clothing is one of the ongoing trends in the fashion world. At present natural fibres are gaining tremendous importance as a material for the preparation of Yarns and fabrics. Areca is a commercial crop growing in Western Ghats districts - Shivamogga, Chikamagaluru, Udupi, Kundapur, Davangere, Tumkur, and other places for betel nut only. The husk is been unused and discarded. The Areca fibres have been extracted from this unused husk using the Areca fibre extraction machine designed and developed during this research. Areca fibres are having excellent properties such as good strength, resistance to fungi, excellent insulation, tough and durable, resilient, static - free, biodegradable, and not easily combustible. It is abundantly available, inexpensive, and eco - friendly. The natural Areca fibres are inexpensive, naturally available, and have a very high potential perennial crop. The scientific nomenclature of Areca is Areca Catechu Linnaeus and it belongs to the Arecaceae (Palmae), palm family, and Arecoideae subfamily. The Areca fibres have good technical properties in terms of length, moisture absorption, fineness, tensile property, elongation at break, and flexural rigidity. These properties will enhance spin - ability and weave - ability. The average filament length is 4cm, and Areca fibre length is shorter than the other natural fibres. In this research study, the unused husk has been converted into textile fibre and studied its various physical, chemical, and mechanical properties and suitability in the textile industry.***

Keywords: Agro Textiles, Areca fibres, Composites, fibre extraction machine, Geo Textiles, Resilient

1. Introduction

Areca/Beetle nut fruit are divided based on types of maturity level, i. e.,

- Raw: - Green color - soft husk
- Ripe: - yellow to golden color, quite spongy
- Matured fruit: - Brownish shades with coarse fibres

Figure 1: (A) Arecaplant (B) Arecafruit (C) Areca sheath (Dried) (D) Softened Areca sheath (before extraction)

The husk of Areca fruit constitutes about 60 - 80% of the total weight and volume of the Areca fruit and it is a hard - fibrous material. The Areca fibre is mainly cellulosic fibreand contains different proportions of hemicellulose (35 - 64.8%) and lignin (13.02 – 26.0%), pectin, and protopectin (1 - 3%) respectively. This highly cellulosic material is used as fuel in the Areca nut process. The average fibre length is found to be 4cm. Areca husk fibre is too short compared to other bio fibres.

1.1 Areca fibre chemical composition

Areca fibres will be extracted from the Areca husk and generally lignocellulosic, helically wound cellulose microfibrils in an amorphous matrix of lignin content and hemicelluloses. The fibre properties of Areca are mainly depending upon the biochemistry and its structure. The proportions are alpha cellulose 53.20%, hemicelluloses 30 - 64.8%, lignin 7 - 24.8%, 4.4% - 4.8% of ash, 11.7% of moisture, and a very negligible percentage of pectin and wax. Approximately 2.50 to 2.75g of Areca fibre can be segregated from one Areca fruit husk.

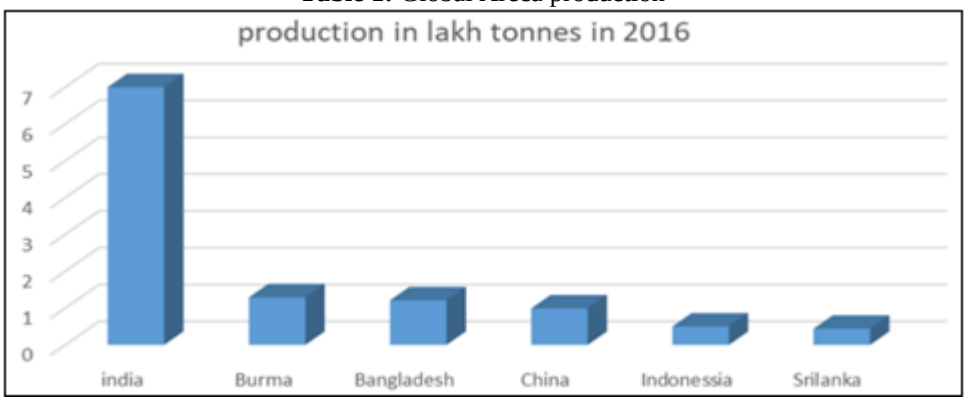
Figure 2:/ Extracted Arecafibres

1.2 Global scenario of Areca

Global Areca production: The global production of Areca is about 12, 14, 064 tons, in that India is the largest producer

with 7, 03, 000 tons, followed by Burma [1, 29, 170 tons], Bangladesh [1, 21, 113 tones], China [99, 992 tons].

Table 1: Global Areca production



1.3Areca production in Karnataka

Karnataka is the largest producer of Areca in India covering approximately 218.01 thousand hectares with a production of 457.56 thousand tones constituting about 45.8 percent of total area and 51.3 percent of total production in the country in 2013 - 14. The area under Areca in Karnataka has almost doubled during the last 15 years.

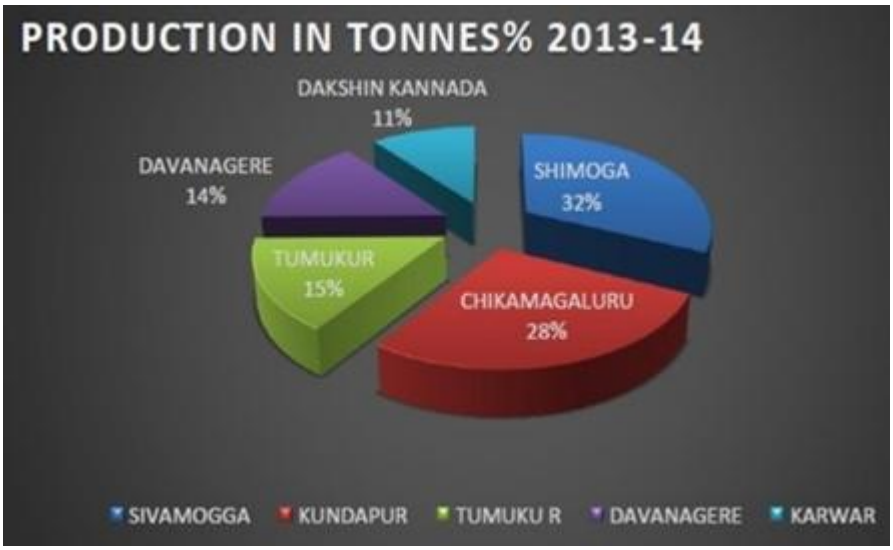


Figure 3: Areca production in Karnataka

2. Materials and Methods

2.1 Arecafibre Extraction

Traditionally to extract fibre, the Areca husk is soaked in water for about 2 to 3 days and the wet Areca husk will be exposed to sunlight for drying. By doing this some biological activities take place which makes Areca husk soft and loosenfibre. These loosened fibres were extracted manually. This way of extracting fibre from Areca husk requires more time and cannot be adopted in producing large scale. This manual method of Areca fibre extraction requires more laborers and hard work. Hence machine extraction is preferred for bulk production of Areca fibre.

2.1.1 Initial preparation

Areca husk was slightly crushed to smoothen, soaked in water, anddried for two days. The crushing is done manually by moving heavy vehicles over the Areca husk, which removes dust, and also the weight of the husk is reduced which facilitates the extraction of Arecafibre from the Areca husk.

2.1.2 Working principle

The fibres were extracted by using the Arecafibres extracting machine. The rotary action of the blades breaks the husk and differentiates them into coarse fibres and fine fibres. The fine fibres are the individual fibres and coarse fibres are the cluster of fibres. The coarse fibres come out through the opening provided at the lower side of the casing. The clusters of fibre are fed again into the machine and the process is repeated to get individual fibres.

Figure 4: Different views of the Areca Extraction machine

Figure 5: (A) Areca sheath (B) Softened Areca sheath (C) Areca Extraction machine (D) Extracted Areca fibres

2.1.3 Drying and cleaning of fibre:
The Areca fibres are soaked in water for one hour, dried, and cleaned in the blowing machine, pith content and the hard bits are removed in the process. Special care is to be taken, toremove hard bits to the fullest extent.
These cleaned Areca fibres are processed further.

3. Results

3.1 Areca fibre properties

Staple Length: 1.2 - 4 cm
Diameter: 0.21 - 0.56 mm
Tenacity: 0.93 – 1.17 g/D
Breaking elongation: 0.9 – 1.12%
Moisture regain: 5.48 – 6.6%
Contains: Hemi - cellulose: 30 – 60%, Pectin and Proto - pectin: 1 – 3%, Lignin: 7 – 24.8% andAsh &Wax: 2 – 4%

4. Conclusions

At present Eco - friendly fibres are gaining colossal importance and usage in the Textile and Fashion Industry, as the properties of these eco - friendly fibres are having excellent advantages such as good tensile strength, cost - effectiveness, abundance, and naturally available, inexhaustible, and bio - degradable properties, and the only way to be eco - friendly.

References

[1] Sanjay MR, Arpitha GR, Naik LL, Gopalakrishna K, Yogesha B, “Applications of Naturalfibres and its composites: An overview”, Natural Resources, 2016 Mar, 11, 7 (3): 108 - 14
[2] Yusriah L, Sapuan S M, Zainudin E S, Mariotti M, “Characterization of physical, mechanical, thermal and morphological properties of agro - waste betel nut (Areca catechu) husk fibre”, Journal of Cleaner Production, 2014 Jun, 1, 72, 174 - 80
[3] Sampathkumar D, Punyamurthy R, Bennehalli B, Venkateshappa SC, “Effect of esterification on moisture absorption of single areca fibre”, International Journal of Agriculture Sciences, 2012 Jan, 1, 4 (4): 227
[4] Kumar GM, “A study of short areca fibre reinforced PF composites”, In Proceedings of the World Congress on Engineering, Research Gate, 2008 (Vol.2, pp.2 - 4)
[5] Mohankumar GC, “Natural Areca fibres and their composites”, In Workshop on Natural fibre Composites, Research Gate, 2008 July, Vol.2