



DEVELOPMENT OF BIODEGRADABLE MULCH MAT USING *Borassus flabellifer* COTTON BLENDED FIBER

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ABSTRACT

Agriculture is the backbone of India. With the continuous increase in population worldwide, importance on agricultural crops has increased. So it is necessary to increase the yield and quality of agro-products. In recent years, many textile materials are incorporated in agriculture fields. The natural fiber based agro-textiles not only serve the specific purpose but also after some year they degrade and act as natural fertilizers. In this project work, a natural and eco friendly agro textiles product mulch mat was developed using needle punching method. The two major natural fibers namely *Borassus flabellifer* (Palmyra fiber) was extracted and cotton fiber was sourced and it was converted into a mulch mat. This eco-friendly mulch mat has been successfully studied and analyzed for its water retention and absorption property, weed control. This mulch mat can be used with all types of plants and trees such as fruits and vegetables, ornamental, medicinal and aromatics.

Keywords: *Palmyra fiber, cotton fiber, needle punch method, non woven, Mulch mat.*

1. INTRODUCTION

Technical Textiles are usually considered as those produced from specific materials by specific processes and technical textiles are known by their end uses. One of the major classification under technical textiles are agro textile¹. Agro textile is one of the most rapidly expanding sectors in the technical textile market. Agriculture, forestry, horticulture, floriculture, fishing segments, landscape gardening, animal husbandry, aquaculture and agro-engineering all these sectors combined together are popularly called as agro-tech sector. Agro textile products can be either made from woven, non woven or knitting techniques². The natural fiber based agro-textiles not only serve the specific purpose but also after some year they degrade and act as natural fertilizers. Hence, the Palmyra fiber is a natural fiber obtained from Palmyra (*Borassus flabellifer*) tree and cotton fiber was selected and processed into needle punched non woven product. Non-woven materials are produced by mechanical, thermal or chemical processes, but without being woven and without the need to convert fibers

into yarn, since the fiber webs are bonded together as a result of the inherent friction entanglement from one fiber to another thanks to these non-conventional processes.

Mulch mat also comes under this agro textile category. Mulch mat is a useful hairy mulching disc which helps to suppress the weeds, lower water loss from the soil surface and this also reduce the need for herbicides. Mulch Mat is an essential cultural technique that can reduce the amount of work involved in gardening³. Mulch is any material applied to the soil surface as a cover it can be divided in two general groups namely organic and inorganic. Organic mulches decomposes quickly and it is bio degradable. Mulch Mat will help us to meet the agricultural needs⁴. This bio-degradable Mulch mat can withstand for longer duration than other organic Mulch mat.

2. METHODOLOGY

2.1 Selection and extraction of natural fiber

The natural plant fiber named *Borassus flabellifer* (Palmyra fruit fiber) was selected and collected from southern part of Tamilnadu. The fibers were extracted from ripened *Borassus flabellifer* fruits by manual method. Firstly the black husk of the fruit was removed, then seeds are separated from it and finally it was washed and shade dried.

2.2 Sourcing of natural fiber

Borassus flabellifer (Palmyra) fruit fiber cannot be processed into a textile material, without blending with other fibers due to the machinery developed for certain fiber processing. Hence, cotton is selected as other natural fiber due to its beneficial properties and blending with cotton fiber increases the strength of a textile product.

2.3 Mulch mat formation

The two natural fibers are blended together at the ratio of 35:15 and formed as a web and needle punched with 50 punches per minute with 60mm feeding. Thus, finally it is formed as a needle punched non woven agro textile mulch mat. The Process of MULCH MAT is given as follows.



Fig: 1 Palmyra fruit fiber



Fig:2 Cotton

+



Fig: 3 Carding machine



Fig: 4 Web formation



Fig: 5 Needle punching



Fig: 6 Mulch mat

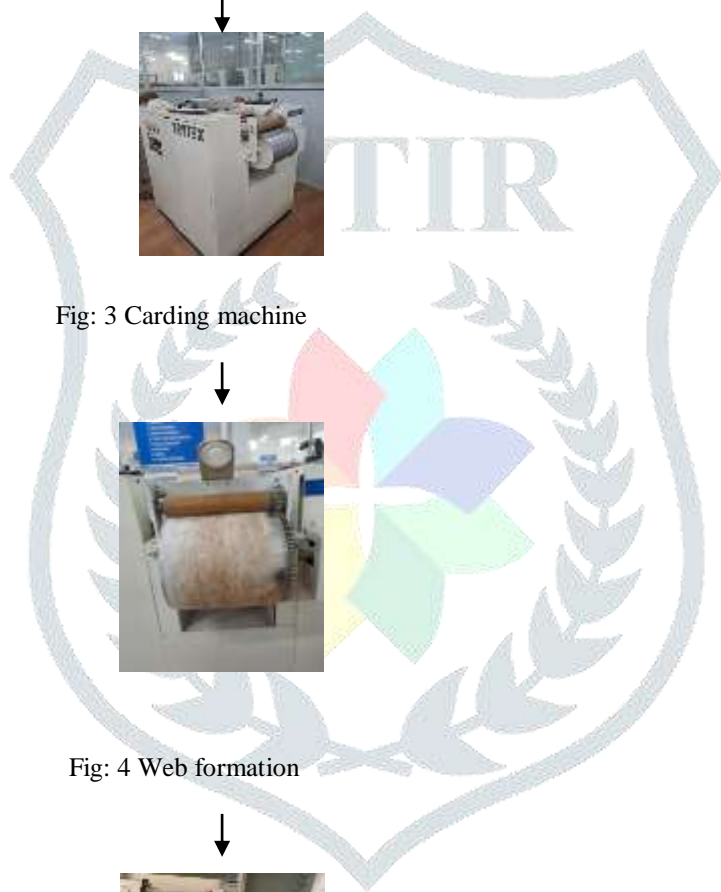




Fig: 7

Fig: 8

Fig: 7 Mulch mat covered on the plant

Fig: 8 Mulch mat covered on the plant

Mulch mat specifications:

Table 1: Mulch mat specification

S.NO	SPECIFICATION
1.	Color: Whitish brown
2.	Length: 1meter
3.	Width: 1 meter
4.	Weight: 110 grams
5.	Slit Length and Opening: 50cm

3. RESULT AND DISCUSSION

Borassus flabellifer (Palmyra fruit fiber) and Cotton are selected for its strength, elongation, ability to withstand sunlight and moisture regain properties. The mechanical properties of the natural fibers are discussed in the given below table.

Table 2: Properties of natural fibers

S.No	Fiber type	Fiber properties		
		Strength(inMPa)	Elongation %	Moisture regain
1.	Palm fiber	423	22	13
2.	Cotton	410	9	9

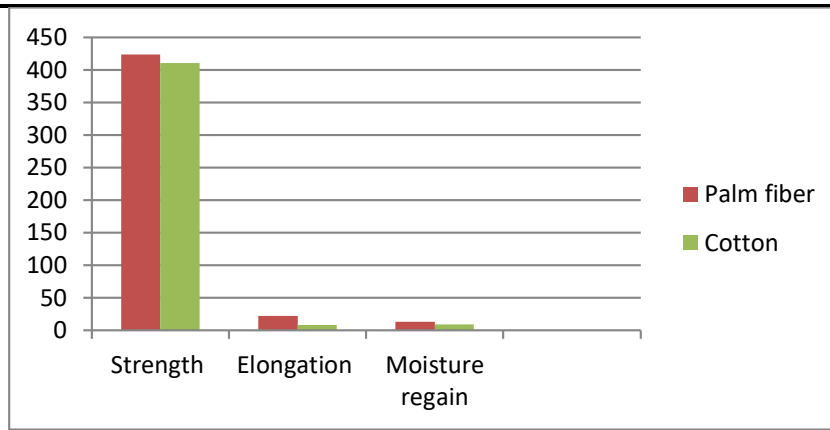


Fig 9: Properties of mulch mat

From the above Table 2 results, it was proven that *Borassus flabellifer* (Palmyra fruit fiber) have more strength, elongation, and moisture regain property than cotton fiber.

The Physical evaluation result of mulch mat is given in the table no: 3

Table 3: Analysis of mulch mat’s physical property

Product name	Physical Properties	
	Strength (C.V%)	Elongation (%)
Mulch mat	16.9	7.7

Hence the Mulch mat made from blending of both Palmyra fruit fiber and cotton fiber had shown a strength of C.V% 16.9 and elongation of 7.7%.

The Mulch Mat is spread on the plant and qualitatively studied for 10days. The evaluated data are given in the table no: 4

Table 4: Qualitative analysis of eco friendly mulch mat

S.No	Day	Water absorption	Weed control (%)	Degradation
1.	1	20%	5%	No
2.	2	40%	10%	No
3.	3	45%	25%	No
4.	4	60%	35%	No
5.	5	65%	45%	No
6.	6	70%	60%	No
7.	7	75%	72%	No
8.	8	80%	85%	No
9.	9	85%	93%	No
10.	10	90%	100%	No

After evaluating mulch mat for 10 days, it was proven that mulch mat had showed 90% of water absorption property and 100% efficiency in weed control at 10th day. There was no degradation of mulch mat till 10th day.

4. CONCLUSION

Agricultural textile is one of the most rapidly expanding sector in the technical textile market. It is necessary to increase the yield and quality of agro-products due to increase in population. Hence, this development of agro textile mulch mat using natural fibers would be beneficiary. The Organic or biodegradable MULCH MAT can be effectively used in landscaping, horticulture, plantation, agricultural fields and terrace gardening. The mulch mat can also be used for a winter protection shield for the plants. This mulch mat controls the soil erosion and absorbs water and retains it for a longer period, thus the plant needs only less amount of water and grows faster. This mulch mat also controls the growth of weeds, hence it reduces the use of pesticide in agricultural fields and gardening. The eco friendly mulches are a greater alternative to the synthetic mulches.

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