

Development of Needle Punched Mulch Mat using Natural Fibers

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Abstract: Agriculture is the backbone of INDIA. In recent years many textile materials are incorporated in agriculture fields. It has very widened and evident advantages like degradable. In this paper the natural and bio-degradable non-woven MULCH MAT were developed using needle punching method. This MULCH MAT can be used in all types of plants and trees such as fruits and vegetables, ornamental, medicinal and aromatics. The three major natural fibers namely Sisal, Jute and Banana were sourced and converted into a needle punched mat. This bio-degradable MULCH MAT has successfully studied and analyzed for its water retention property, control on soil erosion, maintains uniform temperature and slow down's the weed growth.

Keywords: Mulch Mat, Sisal fiber, Jute fiber, Banana fiber, Needle punching, Non-woven

1. Introduction

MULCH MAT is an essential cultural technique that can reduce the amount of work involved in gardening. This MULCH MAT helps in producing organic plants and trees. MULCH is any material applied to the soil surface as a cover it can be divided in two general groups –organic and –inorganic. Organic mulches decompose quickly and does not remain in the environment for an indefinite period of time. In-organic MULCHES such as plastic sheeting don't decompose quickly and may actually remain in the environment for an indefinite period of time. Both types have been used for aesthetic reasons to create and attractive background for plants; however, the benefits provide by organic MULCH MAT may outweigh the use of inorganic types. Most types of MULCH are available by the plastics and non-degradable materials. It is convenient un-useful to cover the plant or tree with the organic MULCH. By understanding the characteristic of natural or bio-degradable MULCH MAT will help us to meet the agricultural needs. This bio-degradable MULCH MAT can withstand for longer duration than other organic MULCH MAT, and also can be used in hard waters.

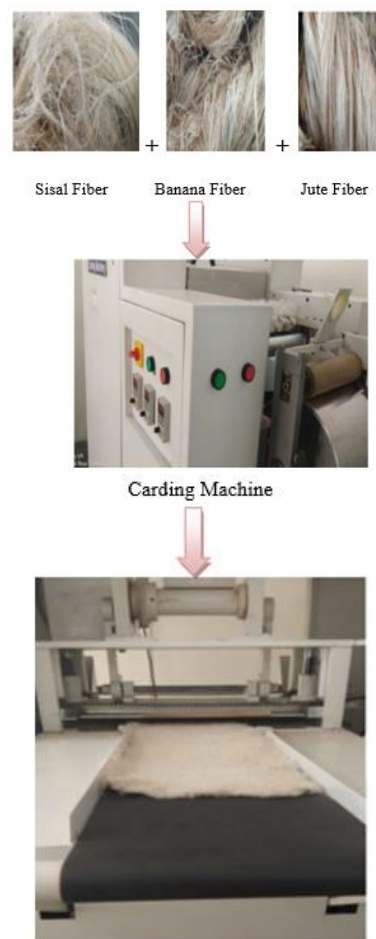
2. Objectives

- To study the organic Mulching practices.
- To avoid pollution against using synthetic material.

- To develop organic product in agro textile.
- To prove the strength of Sisal fiber (natural fiber).
- To improve the usage of natural materials on agricultural practices.

3. Methodology

The fibers were sourced and carding process is done and needle punched for 500GSM. The Process of Fiber to MULCH MAT is given as follows.





- Colour: Brown
- Length: 1meter
- Width: 1 meter
- Weight: 250grams
- Slit Length and Opening: 50cm

5. Result and discussion

The sisal fibers were smooth, straight and yellow in colour. The sisal fiber is selected for its strength, durability, ability to stretch and resistance to deterioration in salt water. Mechanical Properties of the Natural Fibers are given in the below table.

Table 1
Properties of natural fibers

S.No	Fiber Type	Fiber Properties		
		Tensile Strength (Mpa)	Elongation %	Toughnes (Mpa)
1	Sisal	580	4.3	1250
2	Banana	540	3.0	816
3	Jute	160	27.0	3200

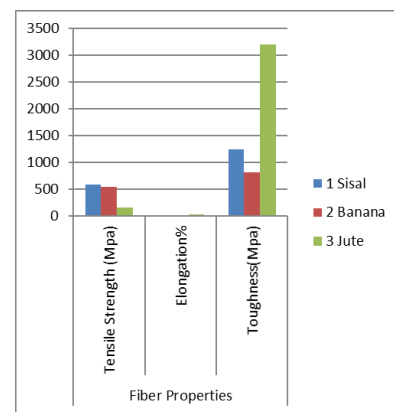


Fig. 1. Properties of natural fiber

It can see that sisal fiber have more tensile strength when compared to banana and jute fibers. The jute fiber has more Elongation% when compared to sisal and banana fibers. The Toughness of the jute is very high when compared to sisal and banana. The Mulch Mat is secured on the plant and qualitatively studied for 10days. The studied data values are plotted in the Table given below.

Table 2
Qualitative Analysis of Organic Mulch Mat

S.NO	Day	Water Absorption	Degradation	Weed Control
1	1	40%	No	Yes
2	2	40%	No	Yes
3	3	40%	No	Yes
4	4	40%	No	Yes
5	5	40%	No	Yes
6	6	50%	No	Yes
7	7	50%	No	Yes
8	8	60%	No	Yes
9	9	70%	No	Yes
10	10	80%	No	Yes

4. Materials and methods

The Grade - B Sisal, Banana and jute fibers were sourced and subjected to a carding process with a speed of 400mm per min and the needle punches is 50 punches per min with 30 mm feeding.

Technical Specification:

6. Conclusion

The Organic or biodegradable MULCH MAT can be effectively used in Landscaping, horticulture, revegetation and plantation. The mulch mat can be used for a winter protection shield for the plants. This MULCH MAT controls the soil erosion and absorbs water and retains it for the longer periods of time, thus the plant need less amount of water and grows faster. This organic MULCH MAT is cost effective, controls the pests and can be used in hard waters. The Ground staples can be used for the effective placement of MULCH MAT.

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