

# PROPERTIES CO-RELATIONSHIP IN BAST FIBRE-HEMP VS COMMERCIALY USED FIBRES COTTON, FLAX AND JUTE

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## Abstract

iHemp (Industrial Hemp) is a variety of Cannabis sativa L. plant species of the mulberry family. It is a sustainable crop having multiple applications in various fields like in textiles, paper, insulation, automobiles, bio fuel, food industry and medicinal field. In today's purview it has many advantages of it being organic, renewable and having a low carbon footprint. But unfortunately, its banned in India due to the presence of psychoactive component tetrahydrocannabinol (THC). However, most of countries are now using industrial hemp having low THC content. The use of iHemp is sustainable asset can be used for getting benefits in natural, social and monetary conditions in the regions of country, where it is appropriate to grow. Practically, iHemp is a multi-beneficial crop as each and every part of crop has been used and also environmental friendly. Hemp is known as a **bast fiber plant**. Its stem is known as "**bast**". The fibres obtained from it, has a high fibre strength and tenacity as compared to other natural fibres, so it is used in textile products commercially. Industrial Hemp can be blended with other commonly used fibers like silk, polyester to make new products with better quality and properties. India has right geographical conditions that suits this crop for cultivation. So, the Indian Government shall look into to lift the ban on its cultivation for fibre production looking the positive side of it and support financially the small and marginal farmers.

The aim of this paper is to present an experimental study which shows that hemp can be successfully used in textile industry for home furnishing items and other textile products. It can be used as a replacement or alternative to other commercially used natural fibres cotton, flax and jute.

**Keywords:** Cannabis Sativa L., iHemp, THC, Bast.

## Introduction

Industrial Hemp is a plant species of the mulberry family. It is of the height 1 metre to 5 meters. Another variety of it called Marijuana. Both Industrial hemp and marijuana belong to the same species, i.e. Cannabis sativa L, but are available in variety in world [3]. Hemp is grown for use as a fiber, seed and/or oil, while Marijuana varieties are grown for psychoactive uses due to THC (delta 9 tetrahydrocannabinol, the primary psychoactive ingredient). To a layman eye Industrial Hemp and Marijuana may look similar but a trained person is able to differentiate between them. Industrial Hemp and Marijuana has a THC content between 0.05% to 1% and 3% to 20% respectively. Industrial Hemp can be used for variety of purposes and for making a wide range of products. Its stem can be spun into fibres. Commercially it is used for making rope, textiles, biodegradable plastic, paper, biofuel, food products, animal feed items, medicines etc. Hemp is called a **bast fiber plant**. Its stem is known as "**bast**". It has inner woody core. Hemp is having a high fibre strength as compared to other natural fibres, so it is used in textile products. Industrial Hemp can be blended with other commonly used fibers like silk, polyester to make new blended fabrics. It can be used to produce paper items and fiberglass. The other uses are to generate renewable energy like biogas, bio-fuel and bio-ethanol. Moreover, concrete blocks made by mixture of lime and hemp shives also called "hemp hurds" have been manufactured by recently developed projection process [2]. The hemp-based nourishment items like cooking oil is very beneficial for health. The customers are becoming aware of benefits of hemp items now a days. Hemp is a rich source of omega-3 and omega-6, amino acids, and proteins. It can help insulin balance and heart work.

Historically, Hemp is one of the earliest known textile fiber. China is known for its cultivation for fibers 27 centuries before the Christian era, and about a century ago hemp and flax were the main textile fibers of vegetable origin [1].

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latitude suits for hemp production [4]. In India, the geographical conditions of Uttarakhand state extends from 28-43'North to 31-27'N longitude and 77-34' East to 81-02' East latitude best suits for Hemp cultivation.

In India the Hemp cultivation is banned under “ **The Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985**” .We mistook it for Narcotics and not seen its positive uses. But as of now our Textile sector has prepared a few proposals to commercialize Industrial Hemp for use as a fibre. Indian Industrial **HEMP** Association (IIHA) in India, which is a non-profit national organization, promote Indian industrial hemp and its products globally. Presently, 1st Hemp Cultivation License given to Indian Industrial Hemp Association (IIHA) as a pilot project by Uttarakhand Government (Published on July 11, 2018), which is a positive step in the direction of its Commercialization [5] .

Moreover, the good news is that UN Commission on Narcotic Drugs (CND) recently reclassified it out of the most dangerous category of drugs (Published on 5 December 2020). This will lead to better use of this plant globally.

Presently, China growing in the international industrial Hemp fibre market. While there is high demand for the plant in the export market and the byproducts of it like fibre and seed. If our Government provide a policy relaxation, it can explore much in the industries like textiles, medicines, paper, bioplastics, cosmetics, food etc.

### The Goal of the Research

The aim of the study is conducting the experimental study on hemp yarn ,which is used as a raw material for production of home furnishing items and other textile items and compare its characteristics with respect to Cotton Yarns, Flax Yarn and Jute yarns commercially used today in the textile industry. Thus, checking the feasibility of hemp to be used as a substitute or alternative to the commercially used fibres.

### Materials and Methods

1. Materials: Hemp Yarn, Cotton Yarn, Flax Yarn, Jute Yarn of same Count were taken for testing.

#### 2. Methods

The Indian Standards IS 1670:1991 is used for Tenacity, Elongation at break [6], Laboratory developed methods are used for Fat/Wax content, Water soluble matter content, Lignin content, Pectin content, Hemi cellulose content, Cellulose content and the Indian Standard IS 667:1981 is used for identification of textile fibres.

#### 3. Conditioning:

Samples are Conditioned for 24 hrs in Temperature 25 deg C, Relative Humidity 66% prior to mechanical testing for maintaining moisture equilibrium.

## Result and Discussion

**Table 1: Mechanical Test Results**

S.No	Fiber	Tenacity (cN/Tex)	Elongation at break (%)
1.	Hemp	56	1.5
2.	Flax	48	1.7
3.	Jute	32	1.4
4.	Cotton	28	6.2

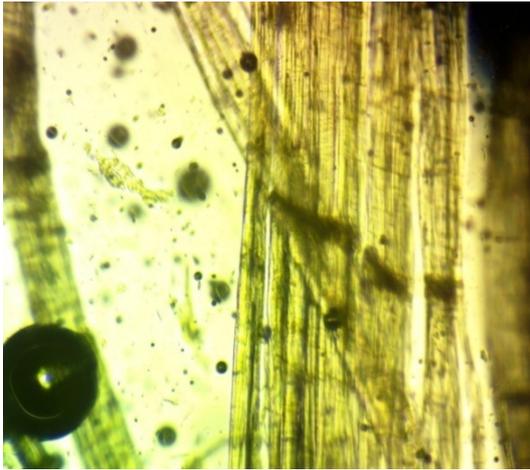
**Table 2: Chemical Test Results**

S. No	Fiber	Fat/Wax Content (%)	Water Soluble matter (%)	Lignin Content (%)
1	Hemp	0.74	2.16	4.13
2	Jute	0.53	1.08	12.79
3	Flax	1.47	3.9	3.84
4	Cotton	0.57	0.98	0.0

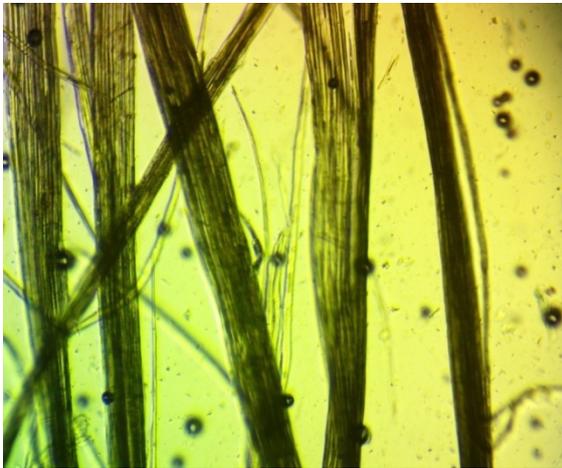
S.No	Fiber	Pectin Content (%)	Hemi Cellulose Content (%)	Cellulose Content (%)
1	Hemp	0.78	17.78	74.41
2	Jute	4.2	12.3	69.1
3	Flax	1.97	18.4	70.42
4	Cotton	0.0	5.67	92.78

### Microscopic View of Hemp, Jute, Flax and Cotton

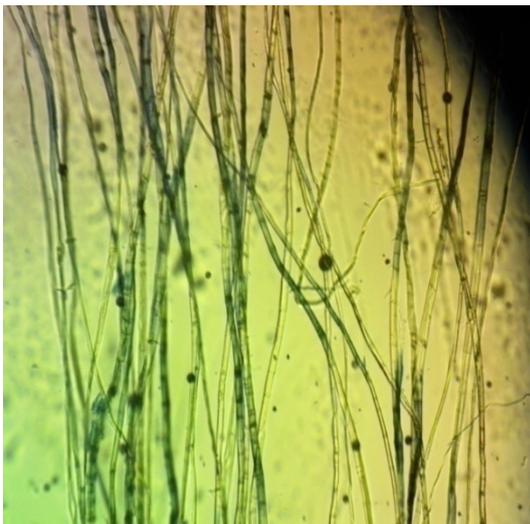
The microscopic slides for the Hemp, Jute, Flax and Cotton fibres are prepared and checked using photographic standards for fiber structures given in test method. The following longitudinal structure are obtained ,which confirms the fibres Hemp, Jute, Flax and Cotton used in analysis.



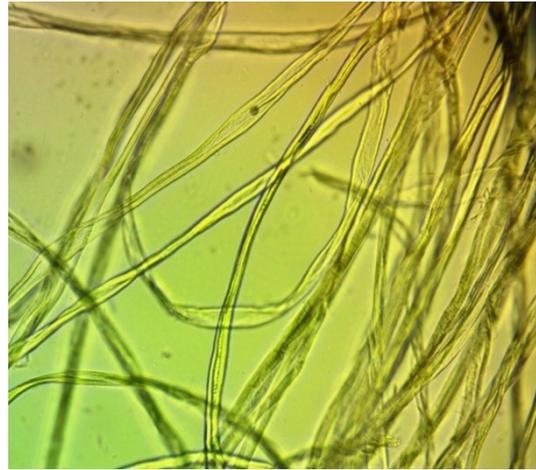
**Figure 1: Longitudinal Microscopic Image of Hemp**



**Figure 2: Longitudinal Microscopic Image of Jute**



**Figure 3: Longitudinal Microscopic Image of Flax**



**Figure 4: Longitudinal Microscopic Image of Cotton**

The test results for Mechanical test Tenacity and elongation at break of yarns suggest that Hemp has maximum Tenacity as compared to other fibres. It means it is strongest among these commercially used fibres. But it has low elongation at break (%).

The test results for Chemical tests shows that Bast fibres - Hemp and Flax (Linen) have almost similar test results for Chemical testing, while Jute has similar test results for few tests. It points to the fact that properties of Hemp would be comparable to flax, and slightly matching with jute. But the test results obtained for cotton are entirely different.

### **Conclusion**

The test results for Chemical tests and Mechanical tests shows that Hemp has comparable test results with Bast fibre Flax and slight similarity with Jute. So, the properties of Hemp fibre would be comparable to Flax and Jute, however in strength it is best among all fibres.

The test results of Cotton are different than the bast fibres Hemp, Flax and Jute, so the properties are different and vary accordingly.

Results of this study suggest that all the bast fibres iHemp, Flax and Jute fibers can be used in home furnishing and other textile applications as they are meeting the required standard and these can be alternative to one another.

So, it is established that iHemp can be alternatively in place of other bast fibres and can be seen as a replacement for these fibres. Moreover, Hemp plants are relatively easy to grow, they can be act as an alternative source for other fibres.

It has to be focused, that conducted study was preliminary and experimental due to less sample

size, and undoubtedly require elaboration. But, the results found, build the basis for future process implementation in the industrial conditions.

Undoubtedly, it is now need of time that Indian government shall look forward to amend the policy with respect to industrial Hemp for multiple advantages with respect to enhancement of Indian economy, employment generation and bringing diversity of fibers used in Textile Industry.

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