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Physical Test on Soyabean Oil-Stained Jute Fabric with Chemically Treated Jute and Raw Jute Fabric

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A B S T R A C T

Nowadays, Jute fabric is widely used in different decorative home textile purposes as a form of diversified jute products. In this study four types of samples were treated in different group to evaluate the physical parameters such as brightness level, FTIR, and shrinkage test. The use of jute fabric arises some problems during its multi-purpose of utilizes and in marketing process. This study will give clear results to know the physical test result performance of sample specimen of different types of jute fabric. To identify the characteristics of oil-stained treated fabric by different physical method, some jute fabrics were treated with different recipes of chemicals at different temperature, concentration and at different time interval. It has observed that Sodium carbonate exhibited comparatively better result (46.08).

Keywords:Brightness level, FTIR, Shrinkage test, Diversified jute,

1. Introduction

Jute is the second most important vegetable fibre after cotton due to its versatility [1]. Nowadays the development of environment friendly products is at its peak due to the constant search for practical solution to environment. Jute is the most suitable replacement of synthetic fabric and packaging materials [2]. It is also urgent need to shift from non-renewable products to renewable products. Staining of jute product is a common problem to use as packaging, carpeting, clothing, curtaining, covering purposes. The problem with oil staining is that instead of leaving a brightly stained area, they tend to leave a slightly darkened area that may be difficult to notice right away [3]. Again, if the piece of clothing and oil stain become dry then it can be set permanently. It also creates odd mark on fabric and a toxic surface which accumulate dirt and reduce the aesthetic view of the product. It becomes hazardous for our health and nature. It is needed to produce oil stain removing reagent for jute fabric and products for healthy life. The staining of textile materials due to microorganisms constitutes a serious problem and is the cause of considerable loss in various industries [4].

The staining of jute items, particularly in storage and transit, has been known since the inception of the jute manufacturing sector, and such stained commodities are sometimes rejected on aesthetic grounds by foreign importers, even if there are no other signs of damage [5]. Although acids at certain concentrations can turn jute materials yellow, these stains are typically attributed to a biological source, notably the growth of mildew, as they are typically accompanied by a temporary heating of the fiber, a musty odor, and a relatively high material recovery [6]. The surplus moisture may be derived from the processing water or from the atmosphere; in the Calcutta region, the primary center of the jute industry, the average relative humidity remains above 80% for nearly four months of the year during the monsoon. Typically, the spots that form on jute goods are yellow, but other hues, such as red or black, have been observed. The mycelium or spores of dark fungus, some of which strongly degrade jute and cellulose, typically generate black stains, which are more prevalent on weather-exposed materials than on kept ones [7]. Red or pink stains are quite uncommon and appear to be formed by the secretions of numerous common species. cellulose-decomposing on jute, Fusarium species that are known to cause similar stains on cotton are rarely observed [8]. In the industry, mildew and staining are so closely related that a material is frequently referred to as mildewed only after stains have occurred. In fact, routine testing of samples over many years, including compromised materials or materials from burned bales, has revealed that fungal growth is significantly more prevalent than staining; that is, only a small percentage of mildewed samples exhibit stains. Due to this ostensibly abnormal outcome, the subject has remained little understood to until, and the goal of the reported effort was to conduct a systematic examination of the issue. Although not all details are apparent, it has been demonstrated that only a small number of fungus cause jute discoloration [9].

2. Materials and Methods

Three types of fabrics were collected from the wet processing Department of pilot plant which were normally used for producing different jute bags and other products. Among them two were natural colored (only bleaching was done on it and other one was colored fabric. These were cut into 10"x10" in length and width and their G.S.M was identified. Three type of jute fabrics were treated with different chemicals at different ratio, at different temperature, in different time interval. These reactions with different parameters were noted down. At first different solutions were made by varying its chemical percentage and M:L ratio. Some experiments were done by keeping the solution at room temperature and other was treated with boiling at different temperature

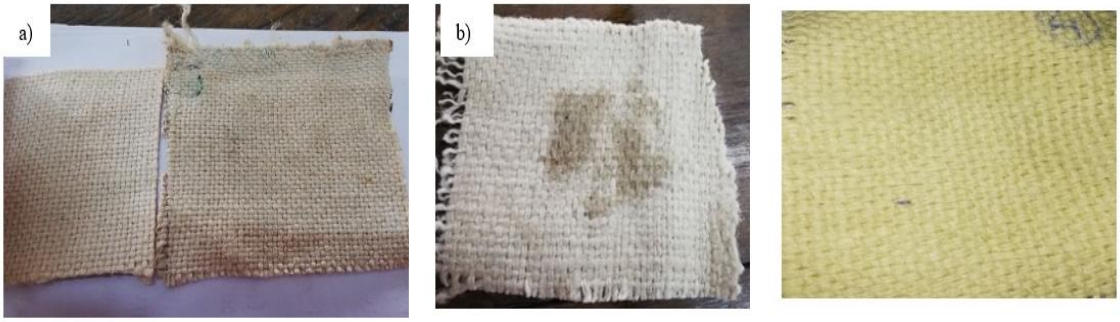

Fig. 1 - (a) Raw jute fabric; (b) oil-stained jute fabric; (c) bleached jute fabric

Four sample was prepared for the comparison study. **Sample A:** Treated with sodium carbonate 2.5%, lissapol 1.5%, Temp80℃,time 10min on heat and 40min keeping in rest, washing the sample. **Sample B**: Treating with sodium carbonate2.5%, lissapol 1.5%, Temp 80℃and optical brightener. **Sample C**: Sample without treatment **Sample D**: Sample stained with soybean oil. Brightness percentage on different samples are shown in Table 1.

Figure 2. Photo volt machine (Model 577)

Table 1: Brightness percentage on different samples

Sample no	Sample A	Sample B	Sample C	Sample D
Brightness percentage found in (%)	45.2 49.7 54.2 49.7 49.7 54.2 54.2 54.2 54.2 49.7	40.7 40.7 41.7 40.5 45.2 45.2 45.2 40.7 45.2 42.5	40.7 45.2 40.7 40.7 45.2 40.7 45.2 40.7 45.2 44.2	27.1 31.6 36.2 31.6 27.1 31.6 27.1 27.2 30.8 29.2
Average brightness (%)	46.08	42.76	42.85	29.95

3. Results and Discussion

3.1 Study of Brightness level

From the figure 3, it can be observed that the brightness level is decreasing due to the different types of samples with various treated procedure. The sample D is the oil-stained sample, which is showing the lowest level of brightness, it would be happened because of bad impact on oil stained mark on jute fabric.

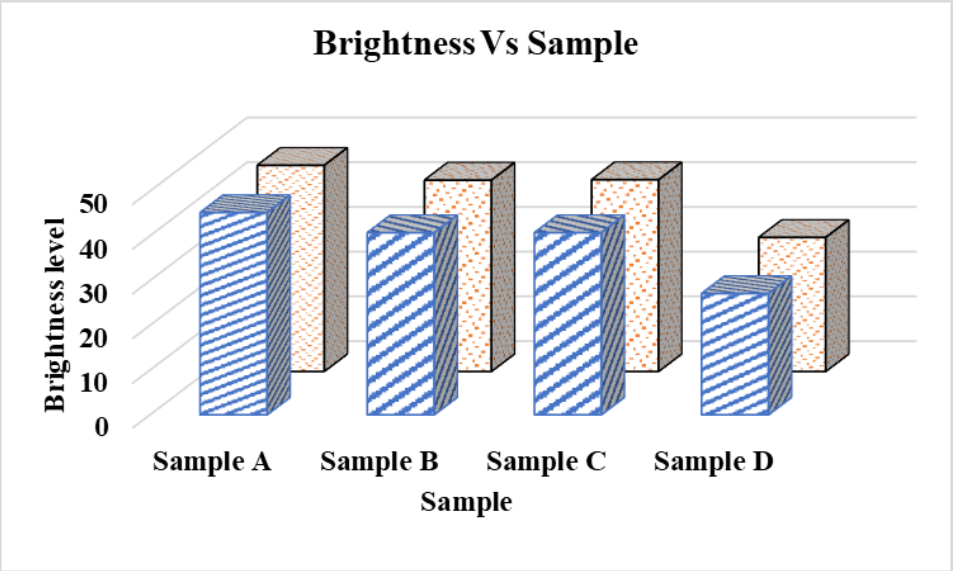

Figure 3. Brightness level of different samples

3.2 Study of FTIR

Fourier transform infrared spectroscopy (FT-IR) was used to identify the functional group of the prepared composite materials. The FT-IR-atteunated total reflectance (ATR) machine (L1600300 Spectrum TWO LiTa, Serial Number 97505, Made in LIantrisant UK) was used to identify the functional group.

FT-IR analysis was done to find the functional group of the different samples. As there was no chemical bonding occurred during the preparation of the composites, no extra functional group was identified by the FT-IR machine. A similar peak was observed for the four samples of the fabrics. All the sample showed a common peak in the fingerprint region (400-1300 cm-1) at the same intensity. In Figure 4, we see the Treated sample with sodium carbonate 2.5%,lissapol 1.5%,Temp80℃,time 10min on heat and 40min keeping in rest, washing the sample. There was a peak for the presence of the CH3, CH, and CH2 group at around 1450 cm1 (for sp3 bending). The functional groups of the C=O bond showed a peak at 1724 and 1726 cm1 [14,15]. There was a second peak for the -CH group at around 2900 cm1 (the numbers aren't quite right) (for sp3 vibrational stretching). There was a peak at 3400 cm1 in the spectra, indicating the presence of polymeric -OH group. Sodium silicate treatment resulted in composites with no supplementary peaks. Fibre, unsaturated polyester resin, and sodium silicate did not react chemically with one another. It's because of this that equivalent IR peaks were detected. An FT-IR instrument was used to study the fabrics functional groups. Prepared sample exhibited peaks with a similar profile. All samples showed the same spectrum at the fingerprint area. Figure 6 depicts a color sample, a non-color sample, and two non-treated fabric exposed to gamma radiation (as no extra peak was appeared all the dye percentages and all gamma radiation doses are not listed here). Peaks for the presence of CH3, CH, and CH2 groups were seen around 1450 cm1 (for sp3 bending). C=O functional group peaks were found at 1724 and 1726 cm1. sp3 vibrational stretching has caused a new peak for the -CH group to appear around 2900 cm1. A peak at a wavenumber of 3400 cm1 was observed, indicating the presence of polymeric -OH group. The oils stained fabric that was treated with soyabean oil show any unexpected peaks. Since no chemical bonding took place during the preparation of the sample D, the FT-IR machine was unable to detect any additional functional group in the sample D. However, a covalent bond was formed between the fabric and the oil during treatment. No new peak was initiated from the dye treatment of fiber because the newly formed, and similar dye treatment results are presented elsewhere. Sharp peaks was foud within 1000-2000 range (Figure 7) ,that is oil reduced from the sample by treating with the correspond reagent. In the figure 5, we observed that sharp peaks are visible in between 1000-2000 spectrum which indicating, sample contain unsaturated double bond COOR and R-O-R group. pure soybean oil contains those groups Fig4: FTIR of sample A. Fig7: FTIR of sample B. As optical brightener was used, could not remove oil properly.

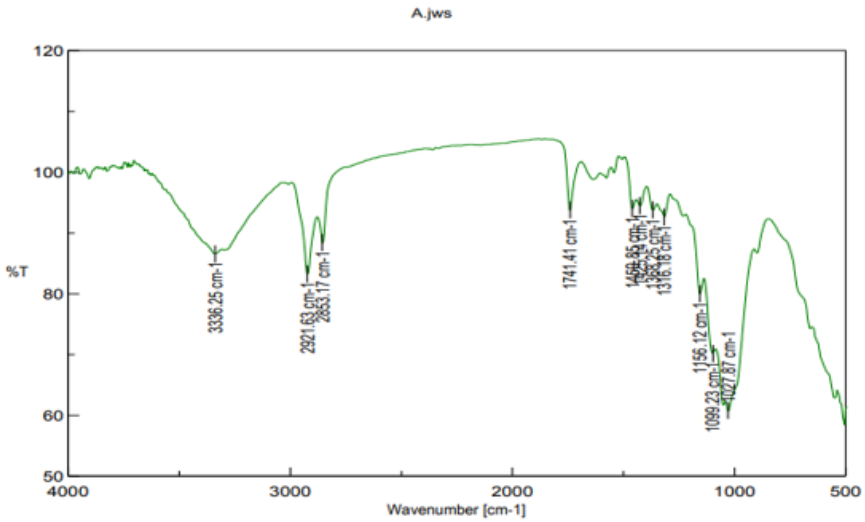

Figure 4. Treated sample with sodium carbonate 2.5%, lissapol 1.5%,Temp80℃,time 10min on heat and 40min keeping in rest, washing the sample

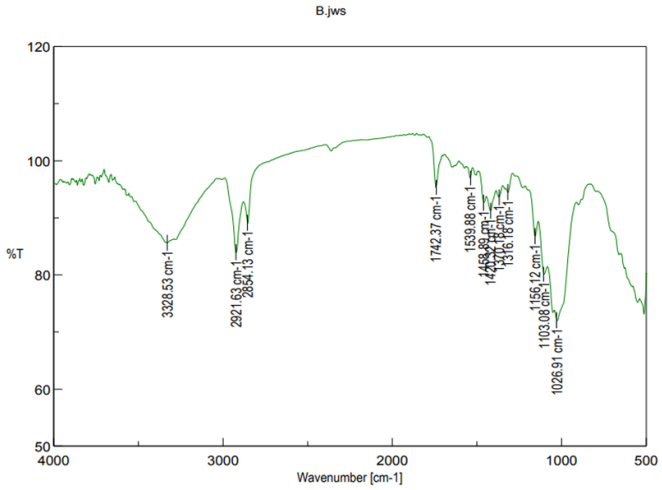

Figure 5. Treating with sodium carbonate2.5%, lissapol 1.5%,Temp 80℃and optical brightener.

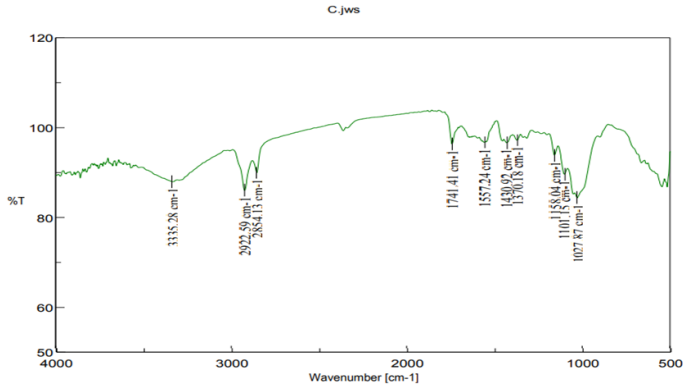

Figure 6. Sample without treated

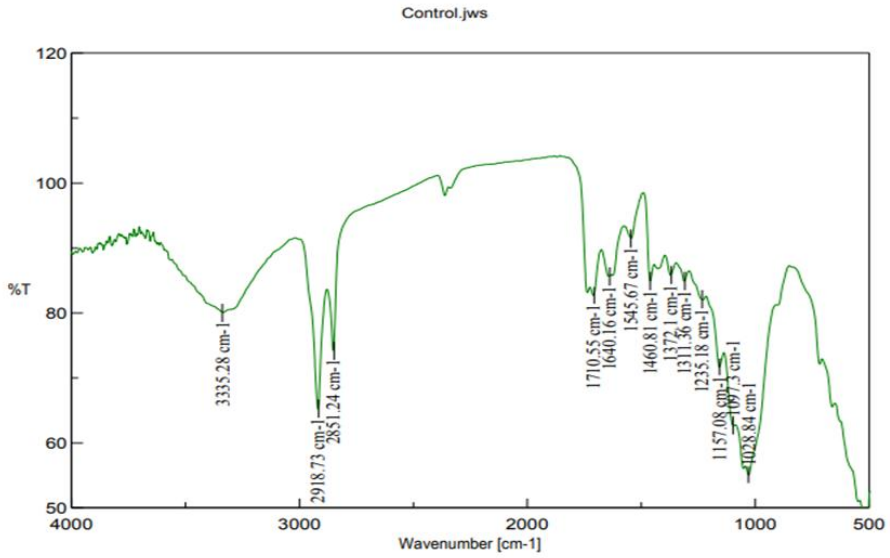

Figure 7. Sample stained with soybean oil.

3.3 Study of shrinkage test

Srinkage percentage={(fabric length before treatment-length after treatment)/fabric length before treatment}×100

sample treated by PVA have percentage 1.07%Sample treated by sodium Carbonate and lissapol only is 4.83%

Shrinkage occur much on weft 2.159%

Shrinkage occur less on warp 7.5 %

We used PVA to reduce shrinkage. But PVA did not gave much good result. Shrinkage occur at minimum range. It can be overcome by using ironing.

4. Conclusion

From this experiment, it was revealed that Sodium Carbonate gave the best result in terms of brightness level and FTIR results as well. Again, using anti creasing agent helps to reduce shrinkage of fabric. Optical brightener cannot increase the brightness in satisfactory level. Further experiment and different tests are to be done to ensure the perfect result and to identify strength parameters.

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