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RESEARCH ARTICLE

PROCESSING OF WATER HYACINTH FIBER TO IMPROVE ITS ABSORBENCY

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Abstract

Water Hyacinth (Eichhornia crassipes) is a free floating perennial aquatic plant. It is becoming a serious problem in many countries by reducing the oxygen level in water, decreasing the flow of water ,often killing fish, hindrance to boating etc. When not controlled, water hyacinth will cover lakes and pond entirely now it is considered as serious threat to bio diversity. But it has various positive aspects like it has rich fiber content, water absorbency which is equal to the cotton fiber. So to effectively utilize it by converting into staple fiber, Water hyacinth fiber is extracted from water hyacinth stem part then additional chemical treatment is given to the fiber to improve the quality of the fiber. Different treatments are given to the fiber. In this study, water hyacinth fiber is treated by sodium hydroxide and soap solution. Samples are prepared and tested for their absorbency.

INTRODUCTION

Water hyacinth fiber is new approach to get wealth out of waste. It has good tensile property but also have high C.V% value so, it is not suitable for tensile related products but it is used for disposable products. It has good water absorption comparatively equal to cotton. Now a days water hyacinth plant is used for decorative purposes and it plays main role in hand craft products like hand bags, wallets, flower pots, fashion accessories, mats etc. Many creative and decorative home furnishing products are manufactured from water hyacinth stem. Water hyacinth is consider as one variety of lotus plant. It is one of the fastest growing plant. It is considered as waste plant but it has many useful properties in textile, leaves are used to extract dyes and flowers are used in medicating the skin of horses. Water hyacinth is used for various purposes as such in fertilisers, paper making and handcraft products. Most of the product are done successfully by using water hyacinth plant. Paper making process is done with good result but the fiber alone does not make a good paper, when it is blended with waste paper or jute the result is good.

Material and Methods

The processing of fibre is explained in the following flow chat.

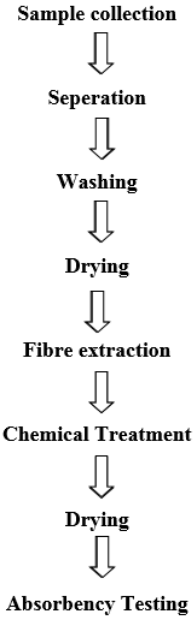
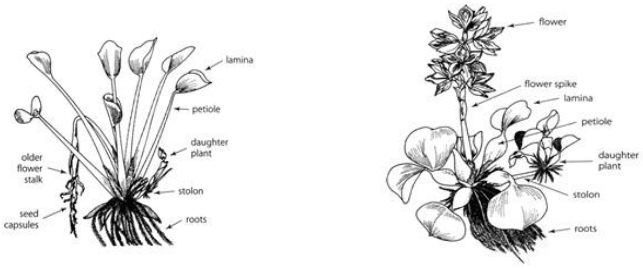


Fig-1: Process Flow Chart

Selection of Plant – Water Hyacinth

Water hyacinth (Eichhornia crassipes) is free floating perennial plant native to tropical and sub- tropical South America. The water hyacinth plant is easily spread over the water. It has both negative and also positive aspects. Water hyacinth grow over a variety of wetland types from lakes, ponds, streams, ditches, waterways and black water areas. The plant height may vary from a few inches. It may rise above the water surface as much as 1 meter in height. The leaves are 10-20 cm in diameter which floats above the water surface. They have long, spongy and bulbous stalk. The feathery freely hanging roots are purple color. Each plant can produce thousands of seed each year and these seeds can remain viable for more than 28 years. The common water hyacinth is double their population in two weeks.



(a) (b)

Fig-2: Parts of Water Hyacinth Plant
(a) Immature plant (b) Mature plant

Fibre Extraction

The matured water hyacinth plants were identified and collected about 15-30 inches long and 0.15-1.2 inches in diameter. Collected plants are washed well in water after washing, leaves and roots were separated from stem. Finally stem was taken for chemical treatment to improve absorbency of the fibre.


(a)


(b)

Fig-3: (a) Water Hyacinth plants spreaded over the pond (b) Water Hyacinth Plant


(a)


(b)


(c)


(d)

Fig-4: Extraction of fibre from Water Hyacinth plant
(a) Separation of stalks (b) Washing (c) Dried Stalks (d) Water Hyacyinth Fibre

Chemical Treatment

Water hyacinth stem was soaked into the sodium hydroxide and soap solution with normal water and boiled water in separate bath tubs and submerge them completely in it. Sample are soaked it for three hours, after this treatment Rinse the stems with water to remove excess sodium hydroxide and soap solution present in the fibre and kept it in dark place to maintain the moisture present in it. Same procedure followed for all the other samples.

Absorbency Testing

The samples were soaked in water for a minute and then weighted in weighing balance without squeezing the absorbed water. Thus the absorbency of the fibre was calculated.

Result and Discussion

Table-1: Absorbance of Sample

Chemical treatment of samples	Untreated fibre	Treated Water Hyacinth fibre							
		Water				Boiled water			
		Water	NaOH	Soap	Soap & NaOH	Water	NaOH	Soap	Soap & NaOH
Nomenclature	*(O)*	*(a)*	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*	*(h)*
Water absorbance in %	512	535.6	1103.2	829	537.45	838.4	334.7	623.9	424.9
Samples									

From this following table, the water hyacinth fibre was treated with water, NaOH, soap and soap + NaOH in water and also treated in boiled water. Among this processes the fibre treated with NaOH in water *(b)* gives best

absorbance than all other processes. The absorbency of the fibre was found to be equally good among the samples which is treated with soap in normal water *(c)* as well as fibre treated only in boiled water *(e)*. The absorbency is reduced after treatment as in the case of fibres treated with boiled water along with NaOH *(f)* and also with Soap + NaOH *(h)*.

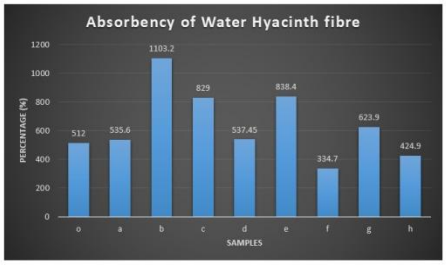


Chart-1: Absorbency of Water Hyacinth fibre

The above chart describes that the absorbency of the Water Hyacinth fibre is found to be excellent in sample *b* and was good in sample *c* and *e*. The samples *f* and *h* shows that the absorbency for Water Hyacinth fibre was reduced after the treatment.

Conclusions

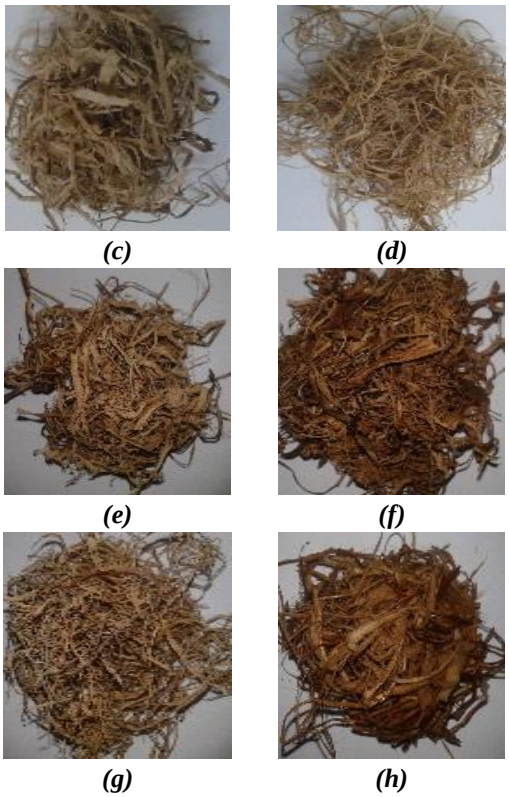
Water Hyacinth plants found in most of the water sources which takes the nutrients and oxygen from the water. It also prevents sunlight to enter the water. As it caused total darkness, makes the water sources unfit for biological organisms. Hence the water hyacinth plants are cleaned by many organizations as well as corporations regularly. These are only dumped as waste. Here we are not inducing the cultivation of water hyacinth plants as such this study is mainly concentrated on utilizing such wastes by extracting the fibre and used for textile materials. As the fibre extracted is found to be harsh, it is treated with chemicals to improve its softness as well as its absorbency. From this study, we conclude that the pre-treated Water hyacinth fibre shows absorbency of about 5 to 11 times higher for their weight. So it could be used for an absorbency material of various end uses.

Appendices

(O)

(a)

(b)



(c) ***(d)***

(e) ***(f)***

(g) ***(h)***

Note: (O) Untreated fibre *(a)* Water *(b)* Water + NaOH
(c) Water + Soap *(d)* Water + Soap + NaOH
(e) Boiled Water *(f)* Boiled Water + NaOH
(g) Boiled Water + Soap *(h)* Boiled Water + Soap + NaOH

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