Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2015, 7(5):260-264

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Quality enhancement of jute fibers by treatment with N-N-dimethylamine-N-ethylamine chitosan

S. A. Aswar[a], P. R. Taide[b], G. S. Kakad[c], S. K. Soni[c], P. S. Rahangadale[c], D. Ubarhande[c], V. S. Yeul[d] and Pundlik Rambhau Bhagat[a]*

[a]*Organic Chemistry Division, SAS, VIT, Vellore, TN(India)*
[b]*Chemical Engineering Department, Yavatmal, MH(India)*
[c]*Textile Engineering Department, JDIET, Yavatmal, MH(India)*
[d]*Chandrapur Super Thermal Power Station, Chandrapur, MH(India)*

ABSTRACT

In present study improvement against biodegradation of the jute fibers due to microbes in moist environment investigated by treatment of jute fabric with N-N-dimethylamine N-ethylamine chitosan. The effectiveness assessed by employing moist soil burial test which gives favorable environment for microbial attack and strip test which confirms the effects of chemical treatment, changes in structural details. The jute fibers on treatment showed excellent potential against microbes and indicates positive performance on strip test.

Keywords: Jute quality, strip test, N-N-dimethylamine N-ethylamine chitosan.

INTRODUCTION

Jute the golden fibers are most abundant, natural biodegradable and recyclable lingo-cellulosic polymers. Jute chemically consists of α-cellulose, lignin and hemicelluloses as major component. Due to high cellulose percentage got easily attacked by microbes during use and storage[1][2][3]. The large historic markets for jute fibers are sacking, carpet backing, handicraft materials, paper products and wide variety of blended products. A great deal of research in recent years on jute in geotechnical applications is underway [4].

N-N dimethylamine N-ethylamine chitosan reported by our group [5][6] showed excellent antimicrobial activity for treatment of cotton [7][8] prepared from chitosan which is a natural, biodegradable, nontoxic biopolymer and exhibits considerable antibacterial activity against broad spectrum of bacteria [9][10]. Jute fiber normally degraded in six months and less durable in acidic moist environment and this is the main concern area of researchers.

In present study quality improvement in terms of resistance against microbial attack on jute fibers were investigated with treatment of N-N dimethylamine N-ethylamine chitosan (Figure 1a. and 1b.)

EXPERIMENTAL SECTION

The jute fiber fabric was collected from the local market and treated with1% acetic acid to remove any impurities. Solutions of different concentration were prepared by dissolving N-N dimetylamine N- ethylamine in double distilled water.

The treatment was given to all fabric samples by dip and dry method [11] and buried in soil for 15 and 30 days with for biodegradation under the influence of moist environment.

The strip test

The jute fabric pieces used in test were 2 inches wide and 8 inches long in size. The tentative textile standards No. 46 was followed during test [12].

Chemical composition and physical properties of jute fibers used for experimentation were given in Table 1. and Table 2. And change in strip strength and weight loss was presented in Table 3.

Table 1.Chemical Composition of Jute fiber

Alpha cellulose	59- 65%
Hemicellulose	12-14%
Lignin	9-11%
Pectin	0.2-0.5%
Fats & wax	0.3-0.4%
Proteins	1-1.5%
Mineral materials	0.7-1%

Table 2. Physical properties of Jute fiber

Density	1.48 gm/cc
Avarage extension at break	1.20%
Avarage stiffness	331 gm/denier
Avarage toughness index	0.03
Hygroscopic	14%

Table 3. The result of strip strength and weight loss%

			Strip strength(Kg)		Weight loss %	
		Concentration µg/ml	15 days	30 days	15 days	30 days
Samples	Untreated		40	29	4.21	6.72
	Treated	25 µg/ml	43	34	3.65	5.92
		50 µg/ml	46	37	3.54	5.45
		100 µg/ml	49	38	3.08	5.1
		250 µg/ml	56	44	2.1	4.9

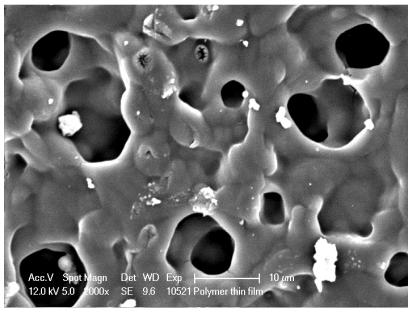

Figure 1a. SEM image of N-N dimetylamine N- ethylamine chitosan

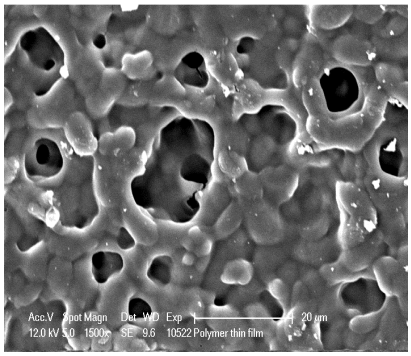

Figure 1b. SEM image of N-N dimetylamine N- ethylamine chitosan

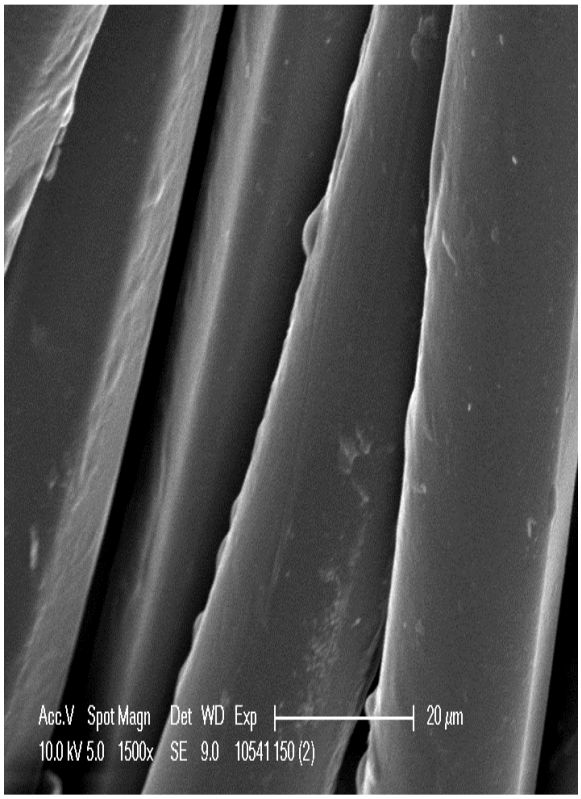

Figure 2 a. SEM of jute fibers after treatment with N-N dimetylamine N- ethylamine chitosan

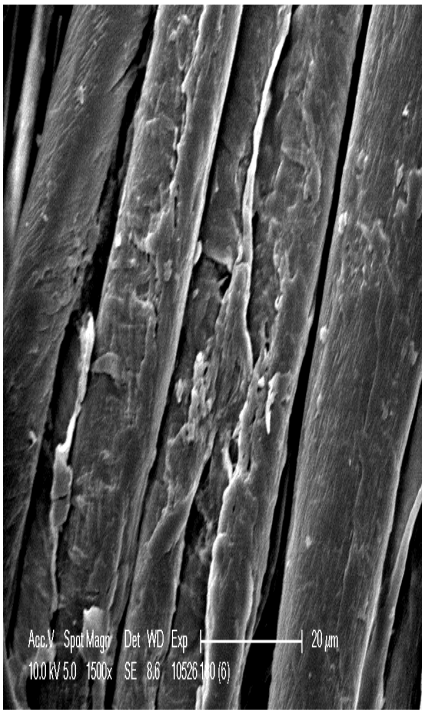

Figure 2b. SEM of treated jute fiber after test (15 days)

Figure 2c. SEM of treated jute fiber after test (30 days)

Jute textile material treated with N-N dimetylamine N- ethylamine chitosan (Figure 2a.) showed different levels of resistance properties and all samples were undergone some amount of degradations as microbial attack in moist soil on jute fibers was predominant[13]. After 15 days (Figure 2b.) and 30 days (Figure 2c.) of biodegradation at 250 µg/ml concentration of N-N dimetylamine N- ethylamine showed improved resistance as it showed good strength retention in strip tests which indicates the positive performance of the treatment.

CONCLUSION

For quality of jute fabric one of the element which contributes is strength for jute product which depends on strength of jute fiber and Strip strength test clearly showed that N-N dimetylamine N- ethylamine treated samples of jute fabric had good strength (fresh jute fabric strength was 65 kg/ sq.mm) i.e. 44 kg per square millimeter on 250 µg/ml concentration after 30 days under test indicates the quality enhancement against biodegradation in unfavorable environment.

REFERENCES

[1] A Samanta, *Colorage***, 1995**, 37.
[2] J Vartiainen, R Motion, H Kulonen, et al. *Journal of applied polymer science*, **2004**, 94, 986-993.
[3]S Vuoti, E Laatikainen, H Heikkinen, LS Johansson, E Saharinen, & E Retulainen, *Carbohydrate polymers*. **2013,** 96, 549-569.
[4] O Kenny, T J Smyth, D Walsh, CT Kelleher, CM Hewage, & NP Brunton, *Food Chemistry*,**2014**, 161,79-86.
[5]PR Bhagat, SA Aswar, VS Yeul, *Res. J. Chem. Environ*, **2015**,19(4) 59-62.
[6] SA Aswar, PR Bhagat. *Int. J. of Knowledge Engineering*, **2012,** 3(1),135-136
[7] Pundlik Rambhau Bhagat *et al*. *J. Pharm. Chem. Res*., **2015**, 7(4), 1117-1119.
[8] Pundlik Rambhau Bhagat *et al*. *Der Pharma Chemica*, **2015,** 7(4),216-218.
[9] CH Su, CS Sun, SW Jaun, CH Hu, WT Ke, MT Sheu. *Biomaterials* **1997**,18,1169.
[10] RAA Muzzarelli. *Cell. Mol. Life. Sci.* **1997**, 53,131-140.
[11] M Sumitra, *J. Textile Sci Engg*, **2013**, 2, 3.
[12] B.S. 2576:**1959**. Breaking load and extention of strips of textile fibers. B.S. Handbook No.11, p.249.
[13] Supriyo Chakraborty *et al Asian Textile Journal*, **2010**, 48-52.