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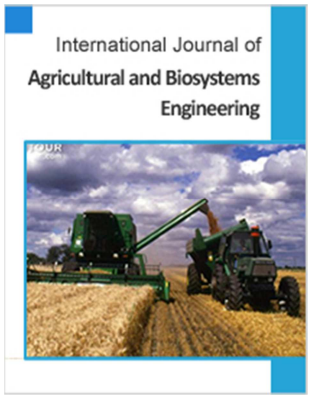

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Industrial Research Advances of Jute in Bangladesh

Md. Mahbubul Islam*, Md. Saheb Ali

Agronomy Division, Bangladesh Jute Research Institute, Manik Mia Ave., Dhaka, Bangladesh

Email address

mahbub_agronomy@yahoo.com (Md. M. Islam), csoagronomy@bjri.gov.bd (Md. M. Islam)

*Correspondingauthor

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Abstract

The secondary information was collected from different sources of the Library of Bangladesh Jute Research Institute, Dhaka during the period from April to till December, 2015. The data sources were IJSG reports, BJRI reports, Bangladesh Journal of Jute and Fibre Research; Jute and Jute fabrics, Bangladesh, News letter of BJMA, BJMC and BJSA, DAE, FAO statistics, different books, direct communications with related office and persons. Total labour force in agriculture 32 million in 2011 of which 4 million farmers are engaged in jute cultivation. There are 219 jute mills in Bangladesh. Among them 86 are under BJSA, 106 are under BJMA of which 88 are running and 27 are under BJMC. There are approximately 1,65,501 workers employed in the jute mills of Bangladesh. The average production of BJSA mills, BJMA mills and BJMC mills are 422,000, 160,000 and 172,923 MT of jute products, respectively. The long staple fiber has high tensile strength and low extensibility. Its luster determines quality. It also has some heat and fire resistance. Jute is a biodegradable features. Jute includes good insulating and antistatic properties, as well as having low thermal conductivity and moderate moisture regain. Jute has the ability to be blended with other fibres, both synthetic and natural, and accepts cellulosic dye classes such as natural, basic, vat, sulfur, reactive, and pigment dyes. Jute can also be blended with wool. If proper research and development works in the different stages of manufacture of jute fibre/yarn/fabrics with special emphasis on the developments in the mechanical and chemical machinery sides are carried out, jute will get a good place in the textile world along with cotton, wool and such fibres.

1. Introduction

Jute is the main cash crop of Bangladesh, is a natural fiber popularly known as the golden fiber. It is known that jute occupied a world market for quite a long time because of its unique properties like high strength, rough handling, easily degradable, environment friendly advantages. It is one of the cheapest and the strongest of all natural fibers and considered as fiber of the future. Jute is second only to cotton in world's production of textile fibers. India, Bangladesh, China and Thailand are the leading producers of Jute. It is also produced in southwest Asia and Brazil. The jute fiber is also known as Pat, kosta, Nalita. Once it was only the single biggest foreign exchange earner of the country. Despite, the conventional uses of this commodity is being reduced and has been facing severe challenge from the products made of synthetics and allied fibres for the last few decades. So, non-conventional jute products are sought in the wider textile fields at present. Such attempts need improvement of the associated drawbacks of jute fibre / fabric in various directions. Amongst the fibres of commerce jute is next to cotton. It is a lignocellulosic multi- cellular fibre composed of cellulose, lignin,

hemi-cellulose, waxes, pectin, protein and mineral matters. Jute is physically coarse, harsh, irregular and short in length and diameter. On account of these characteristics jute is used mainly for making conventional products like carpet backing cloth (CBC), Hessian, sacking, twines and ropes. If proper attention is given in the field of research and development it could, however be used for many other uses in specific areas as well as sophisticated textile products like blanket, furnishing fabrics, wearing apparel, knitting yarns, jute-geo-textile, light weight shopping bags, sanitary napkins etc.

A brief of jute agriculture in Bangladesh

Total land area of Bangladesh is 13 million ha of which 8.44 million ha belongs to agricultural land. In 2010-11, 0.803 million ha land cultivated for jute. Jute cultivation area was 6% of total land area. Jute cultivation area was 10% of agricultural land area. Jute production was 26% as of all agricultural crops. Annual jute seed requirement was 5,000-5,500 MT. Seed average sowing rate 7-8 kg/ha for fibre. Jute seed supply was from i) Public: 2,187 MT and from ii) Import 3,617 MT in 2010-2011 (IJSG, 2012). Below the image 1 showed the jute growing areas of Bangladesh (Source: Islam, 2013). Production of raw jute was 1.5 million MT by volume in 2010-11 and USD261 million by value in 2009-10. Share of raw jute production in agriculture was 1.401% by value in 2010. Average yield of fibre was 1.9 ton/ha in 2009-10 (Figure 2 & 3). Total labour force in agriculture 32 million in 2011 of which 4 million farmers are engaged in jute cultivation. Total labor force was 75.42 million. Share of labour force in jute agriculture was 12.5%. Male: Female ratio of labour force in jute agriculture was 3:1 (IJSG, 2012). Bangladesh, the drainage basin of big rivers being bestowed with alluvial soil and availability of non-stagnant water for jute retting has a distinct agro-ecological comparative advantage in production of jute. With the increasing environmental awareness, eco-friendly and bio-degradable products are gaining popularity both in developed and developing countries for retardation of ecological balances and degradation due to green house effects. Jute and jute products not only retard ecological degradation but conserve environment and atmosphere as a whole. All these propelling factors have created a new scope of reinventing jute and jute products leading towards their effective exploitation. At present many technologies and process are available for commercialization of jute diversified products (JDPs). To capitalize this competitive edge, it is essential to achieve general improvements starting from increasing the yield and improving quality. Adoption of newly developed and improved technologies and processes for production of high value jute diversified products and alternative use of jute (Annon, 2009).

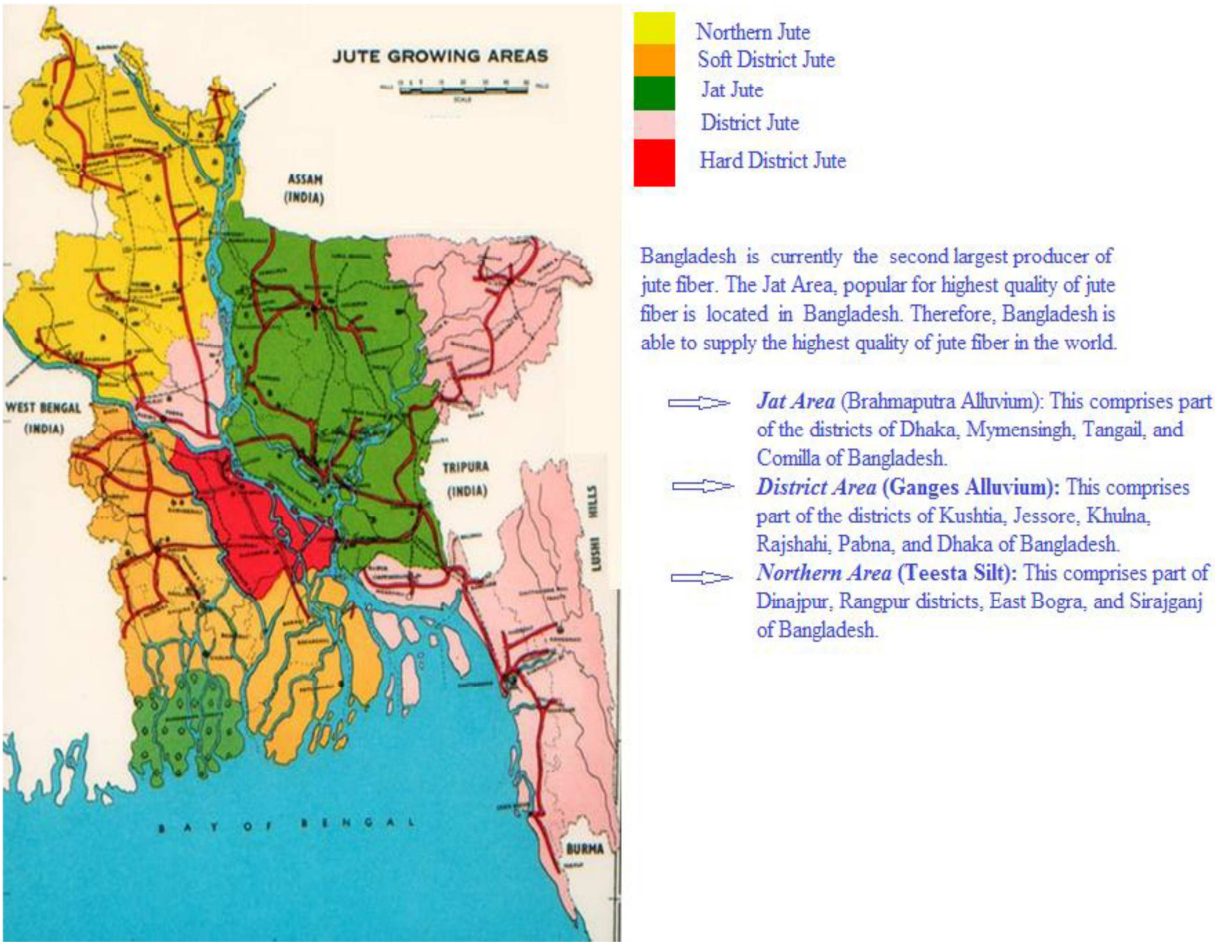

Figure 1. *Jute growing areas of Bangladesh (Source: Islam, 2013).*

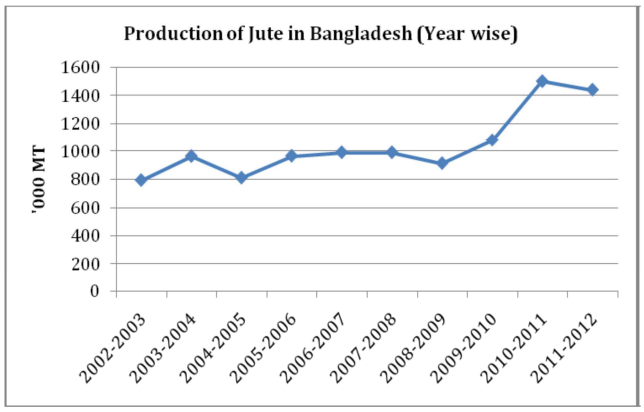

Figure 2. *Production of jute fibre in Bangladesh from 2002-03 to 2011-12.*

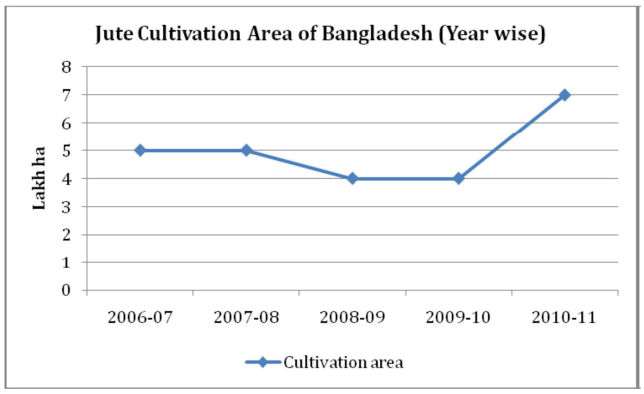

Figure 3. *Jute cultivation areas of Bangladesh from 2006-07 to 2010-11.*

There are 219 jute mills in Bangladesh. Among them 86 are under Bangladesh Jute Spinners Association (BJSA), 106 are under Bangladesh Jute Mills Association (BJMA) of which 88 are running and 27 are under Bangladesh Jute Mills Corporation (BJMC). While in India there are 83 mills most of which are composite mills. There are 1,65,501 (approximately) workers employed in the jute mills of Bangladesh. The average production of BJSA mills, BJMA mills and BJMC mills are 422,000, 160,000 and 172,923 MT of jute products, respectively. Among these the BJSA mills export 3,42,195 MT of yarns/twines while BJMA and BJMC export 48,000 MT and 21,000 MT of hessian and sackings mainly to Middle East countries, Europe, USA, etc. Yarn sector in Bangladesh has flourished tremendously over the last decade compared to the composite mills. The closed mills of various countries (Algeria, Italy, France, Belgium, UK, Bulgaria, Brazil, Thailand, etc.) have been relocated in Bangladesh which started production of jute yarns of various counts to meet the requirement of foreign consumers. In 2011 Bangladesh exported about 3, 93,000 MT of jute yarn to various countries, Turkey being the lead importer with 37% of the total yarn export. Composite mills, however, could not fare so well because of shrinkage of export market for hessian, carpet backing cloth, etc.

Jute fibres are composed primarily of the plant materials, cellulose (major component of plant fibre) and lignin (major components of the wood fibre). It is thus a ligno-cellulosic fibre that is partially a textile fibre and partially wood. It falls into the bast fibre category (fibre collected from bast or skin of the plant) along with kenaf, industrial hemp, flax (linen), ramie, etc. The industrial term for jute fibre is *raw jute*. The fibres are off-white to brown and 1 - 4 meters (3 - 12 feet) long. Jute fibre is often called hessian and jute fabrics are also called hessian cloth. Jute sacks are called gunny bags in some European countries. The fabric made from jute is popularly known as burlap in North America. The suitable climate for growing jute (warm and wet climate) is the monsoon season. Temperatures ranging 20 to 40°C and a relative humidity of 70 - 80% are favorable for successful cultivation. Jute requires a weekly rainfall of 5 - 8 cm with an extra amount during the sowing period. Due to its good spinning quality, it is a good textile fibre. This paper reviews jute (*Corchorus* spp.) industrial research and product diversification advances in Bangladesh and other most related important affairs.

2. Materials and Methods

The study was based on secondary data. The secondary information used was collected from different sources of the Library of Bangladesh Jute Research Institute, Dhaka during the period from April to till September, 2015. The data sources were International Jute Study Group (IJSG) reports, IJSG website, BJRI reports, Bangladesh Journal of Jute and Fibre Research; Jute and Jute fabrics, Bangladesh, News letter of Bangladesh Jute Mills Association (BJMA), Bangladesh Jute Mills Corporation (BJMC) and Bangladesh Jute Spinners Association (BJSA). Department of Agricultural Extension, Food and Agriculture Organization statistics, different books, direct communications with related office and persons, accessing internet and using different national and international journals.

3. Results and Discussions

Important features of jute

a. Jute fibre is 100% bio-degradable and recyclable and thus environment friendly. They are possibly the world's largest source of lingo-cellulosic bast fibre which is extracted from plants by a natural microbial process known as retting (Pan *et al*., 2000, Roy *et al*., 2002, Mohiuddin *et al*., 1987).
b. It is a natural fibre with golden and silky shine and hence called *The Golden Fibre*.
c. It is the cheapest vegetable fibre procured from the bast or skin of the plant's stem.
d. It is the second most important vegetable fibre after cotton, in terms of usage, global consumption, production and availability.
e. It has high tensile strength, low extensibility and ensures better breathability of fabrics. Therefore, jute is very suitable in agricultural commodity bulk packaging.
f. It helps to make best quality industrial yarn, fabric, net

and sacks. It is one of the most versatile natural fibres that has been used in raw materials for packaging, textiles, non-textile, construction and agricultural sectors. Bulking of yarn results in a reduced breaking tenacity and an increased breaking extensibility when blended as a ternary blend (Basu *et al*., 2005).

g. Advantages of jute include good insulating and antistatic properties, as well as having low thermal conductivity and a moderate moisture regain. Other advantages of jute include acoustic insulating properties and manufacture with no skin irritations (Pan *et al*., 2000).
h. Jute has the ability to be blended with other fibres, both synthetic and natural, and accepts cellulosic dye classes such as natural, basic, vat, sulfur, reactive and pigment dyes. As the demand for natural comfort fibres increases, the demand for jute and other natural fibres that can be blended with cotton will increase (Sreenath *et al*., 1996; Basu *et al*., 2005). The resulting jute/cotton yarns will produce fabrics with a reduced cost of wet processing treatments. Jute can also be blended with wool. By treating jute with caustic soda, crimp, softness, pliability and appearance is improved, aiding in its ability to be spun with wool. Liquid ammonia has a similar effect on jute, as well as the added characteristic of improving flame resistance when treated with flame proofing agents (Basu *et al*., 2005, Pan *et al*., 2000).
i. Some noted disadvantages include poor drapability and crease resistance, brittleness, fibre shedding and yellowing in sunlight. However, preparation of fabrics with castor oil lubricants result in less yellowing and less fabric weight loss, as well as increased dyeing brilliance. Jute has a decreased strength when wet and also becomes subject to microbial attack in humid climates.
j. Jute can be processed with an enzyme in order to reduce some of its brittleness and stiffness. Once treated with an enzyme, jute shows an affinity to readily accept natural dyes, which can be made from marigold flower extract. In one attempt to dye jute fabric with this extract, bleached fabric was mordanted with ferrous sulphate, increasing the fabric's dye uptake value. Jute also responds well to reactive dyeing (Chattopadhyay *et al*., 2004). This process is used for bright and fast coloured value-added diversified products made from jute.
k. Dioxane acidolysis lignin was isolated from jute stick. Jute seed cake was found low in protein and high in lysine, isoleucine and fibre content (Ahmed *et al*., 2001).

Jute being natural is biodegradable

a. It does not plug the natural pore of the earth soil and surface.
b. It has no adverse effect on human body and the Mother Nature as a whole. Protecting environment is one of the major activities it does for all our tomorrows.
c. When burned, it emits the same fume as a burning wood as we know, is nothing dangerous.
d. The ignition temperature of jute is 193°C. It thus remains very stable up to near ignition point. Even at boiling temperature, its intact physical properties guard it from undergoing possible distortion.

Industrial Research Advances

a) Properties of Jute

Jute is one of the strongest natural fibers. The long staple fiber has high tensile strength and low extensibility. Its luster determines quality; the more it shines, the better the quality. It also has some heat and fire resistance. Jute is a biodegradable features. Jute includes good insulating and antistatic properties, as well as having low thermal conductivity and a moderate moisture regain. It include acoustic insulating properties and manufacture with no skin irritations. Jute has the ability to be blended with other fibres, both synthetic and natural, and accepts cellulosic dye classes such as natural, basic, vat, sulfur, reactive, and pigment dyes. Jute can also be blended with wool. By treating jute with caustic soda, crimp, softness, pliability, and appearance is improved, aiding in its ability to be spun with wool. Liquid ammonia has a similar effect on jute, as well as the added characteristic of improving flame resistance when treated with flame proofing agents (Annon, 1962; Pan *et al*., 2000).

Table 1. *Average Values of the Main Properties of jute Fibre.*

Properties	Amount
Ultimate:	
Length	2.5mm
Diameter	18μ
Single Fibre:	
Diameter	40μ
Tensile Strength	105kg/mm^2
Extension at Break	2.6%
Helix angle	8^o
Moisture Regain (65%R.H.):	
Absorption	12.8%
Desorption	14.6%
Specific Gravity	1.48
Refractive Index	1.536
Birefringence	+0.041

(Source: Annon, 1962; Pan *et al*., 2000)

a1) Physical Properties of Jute fibres

The major physical properties of jute fibre briefly presented in the following table.

Table 2. *Physical Properties of jute fibre.*

Macro & Micro Structure		
Ultimate Cell Length (L)	Average	2.50mm
	Range	0.8-6.0mm
Ultimate Cell Breadth (B)	Average	18µm
	Range	10-25µm
L/B Ratio	Average	110
Fibre Fineness		1.3-4.0tex
Fibre Length (after Carding)		2-50cm
Density	True	1.46g/cc
	Apparent	1.10-1.34g/cc
Bulk Density		0.4-0.5g/cc
Degree of Crystallinity (X-ray)		55- 60%
	Moisture Absorption	
Moisture Regain	At 65% RH	13.8%
	–at 100% RH	36.0%
Transverse Swelling in water	Diameter-wise	20%
	Cross-sectional area-wise	45%
Water holding Capacity		500%
Thermal Properties		
Specific Heat		$1.36x10^3Jkg^{-1}K^{-1}$
Thermal Conductivity		$427.3mWm^{-1}K^{-1}$
Heat of Combustion		17.5J/g
Ignition Temperature		193°C
Heat of Wetting		18.2calories

(Source: Pan *et al*., 2000; IJSG)

a2) Chemical Properties of Jute Fibre and Stick

The chemical composition of jute fibres and sticks are given in the following tables

Table 3. *Chemical composition of jute fibre.*

Constituents (in % of Bone Dry Weight of the Fibre)	Jute	
	***C. capsularis* L.**	***C. olitorius* L.**
Alphacellulose	60.0–63.0	58.0-59.0
Hemicellulose	21.0–24.0	22.0–25.0
Lignin	12.0–13.0	13.0–14.0
Fats &Waxes	0.4–1.0	0.4–0.9
Pectin	0.2–1.5	0.2–0.5
Proteins / Nitrogenous matter, etc.	0.80–1.9	0.8–1.6
Ash	0.7–1.2	0.5–1.2

(Source: Surand Amin, 2010; Pan *et al*., 2000)

Table 4. *Chemical composition of jute sticks.*

Constituents	Jute Stick (in % of Bone Dry Weight of the Fibre)
Alphacellulose	40.8-47.5
Hemicellulose	23.0-23.6
AcetylContent	3.6-4.7
Lignin	22.2-23.5
Fats &Waxes	1.7-2.4
Pectin	0.5-0.7
Ash	0.6-0.8

(Source: Surand Amin, 2010; Pan *et al*., 2000)

Chemical composition of fibres of different pipeline varieties of jute (*C. capsularis* and *C. olitorius)* has been studied for the selected promising varieties (C-718, C-2005, C-2193, C-2035 and OM-1). The varieties moisture content (%), cellulose content (%), hemicellulose content (%), lignin content (%), ash content (%) and fat content (%) were studied in three different parts of the plant -top, middle and bottom. Moisture content was found the highest (12.68%) in the bottom part of C-2035 and the lowest (8.24%) in the top part of C-2005. In the bottom part of C-718, cellulose content was found the lowest (58.24%) and the highest in the top part of C-2035 variety. The hemicellulose was found the highest (23.73%) in the top part of OM-1 and the lowest (16.39%) in the middle part of C-718. The lignin content was 17.98 in the bottom part of C-718 which seems to be the highest and the lowest (13.61%) in the top part of C-2193. In the top and bottom parts of C-2005, ash content was found the lowest (0.112%) and the highest (0.995%), respectively. Fat content was highest (2.172%) in OM-1 and lowest (1.099%) in C-2193 (Ahmed *et al*., 2003).

Hussain *et al*. (2002); Table 1) analyzed the lignin content of different jute samples where the values of the lignin content as determined from the Kappa Numbers of different samples of jute showed conformity with the values of Klason lignin estimated by sulphuric acid method.

Table 5. *Klason lignin, Kappa Number and Kappa lignin of different jute samples.*

Samples	Klason lignin (%)	Kappa number	Kappa lignin (%)
Hard jute cutting	14.60	91	14.10
Raw jute fibre	12.50	78	12.09
Over retted jute	11.60	74	11.47
Mercerized jute	12.00	79	12.24
Sulphonated jute	8.50	67	10.38
Half bleached jute	7.20	60	9.30
Bleached jute	6.70	52	8.06
Double bleached jute	3.50	30	4.65

(Source: Hussain *et al*., 2002)

Choudhury (2010) reported that natural technical textile in the name of Jute Agrotextile (JAT) is highly effective in agri-horticulture and forestry for higher agricultural yield. Extensive R&D work and field study have been conducted by IJIRA with the support of IJMA & JMDC in collaboration with reputed organizations in this field with encouraging results. Efficacy of the products have been established and documented. Application areas of JAT covered under the study are conservation of surface soil, weed management, afforestation in semiarid zone, growth of sapling in nurseries, air layering, plant wrapping etc. This paper discusses the effect of application of Jute Agrotextile for higher agricultural output. Faster and better growth of seedlings due to better aeration of roots of seedlings, evening out of temperature extremes, non-formation of ice within the sleeves and spread of roots through fine openings of the jute sleeves. High survival rate (90%). No extraction at the post-plantation stage was necessary, Unlike in the case of poly sleeves. Jute sleeves are evidently superior to poly sleeves in performance, installation and after care. The cost of jute sleeves is, of course, higher than poly sleeves.

Jute Agrotextile is a kind of natural technical textile, usually either in woven or non-woven form, made from 100% natural eco-friendly bast fibre of jute plant used on soil to achieve higher agricultural productivity by improving agronomical characteristics of soil and by reducing growth of unwanted vegetation. Constituents of jute fibre are alpha and hemi cellulose-85%, lignin-11.5%, ash-1.6%, nitrogenous compound-1% and others- 0.9%. Jute Agrotextile provides the natural answer to ensure faster crop-and-plant growth. JAT helps retain soil humidity at conducive levels, arrests desiccation of soil and attenuates extremes of temperature due to the inherent characteristics jute. It absorbs water / moisture up to about 5 times of its dry weight. On biodegradation, jute coalesces with soil, increasing its permeability and supplementing its nutrient level. JAT fosters growth of vegetation even in arid and semi-arid zones much faster than under control conditions without use of manures. On top of it, the non-woven variety of JAT can suppress weed-growth effectively without use of chemical herbicides. JAT provides all these advantages without affecting eco-ambience adversely at affordable and competitive cost.

Development and Modernization of Processing Machinery

As recognized by most studies, modernization would include development and adoption of new generation machinery as jute needs to be processed at a technological level equivalent to that used by other fibres for its survival against the competition from competing alternative fibres. New machinery need to be designed to process greater volumes, process faster with higher standards, consume less power and be cheaper and easy to maintain. Electronic retrofits need to be introduced in these machines for effective quality control and continuous monitoring.

A number of jute mill machinery manufacturers like Lagan Engineering Company Ltd, Milltex Engineering (P) Ltd, GSL, India and Zhejiang Golden Eagle Co., Ltd, China manufacture and supply jute processing machinery to the jute industry of Bangladesh and India.

Modern machinery which can be adapted to work successfully with jute are high output spreaders, new design high output Breaker and Finisher cards, high speed & high output drawing frames, ring twisters, shuttle less looms, precision winders, etc. Installation of shuttle less looms like Sulzer, STB, Dornier, ATPR, etc would improve the productivity and quality as well. Ring spinning may be adopted to produce fine yarns which will be subsequently used in making light weight fabrics to be used for making various products like shopping bags, decorative, household items, handicrafts, etc. Establishment of an automatic jute bag sewing unit would increase the productivity to a great extent (IJSG, 2012).

Wet processing of jute and jute materials

Jute fibre is neither a staple fibre like cotton nor a true filament fibre like silk or viscose filament, but a composite fibre of alpha-cellulose molecules and cementing materials being lignin and hemicelluloses. This gives rise to complications in wet processing of jute. Jute fibre and its products for sophisticated textile uses have to undergo some chemical processing in wet stage. On gradual removal of these constituents of jute there is slight loss of strength and a stage comes when the constituents are disintegrated with complete loss of fibre quality. So, in the chemical processing of jute fibre materials, this aspects is to be taken care of. The wet processing of fibre and its products are of recent origin, as the conventional jute products do not need chemical processing in the wet stage. Some methods have been developed in the chemical process for jute materials which are given below-

Woolenisation and slack mercerization

Weelenisation or slack mercerization of jute fibre and products is an important wet process. At different stages from fisbre to fabric when the material is treated with caustic soda at certain concentration and lower temperature some interesting changes are observed. The fibrfe becomes more circular with increased fineness i.e. it becomes lustrous, crimpy with reduction in length, when the crimp is fully produced the resultant fibre is termed as modified jute or woolenised jute, as it appears like wool, the process is known as woolenisation.

The percentage composition of the fibre also changes with the materials loss (10-20%), the loss are mainly due to the removal of hemicelluloses. There is loss of strength but with increase in extensibility. The crimp property, reduction in diameter and length, loss of weight and strength are all dependent on concentration of alkali, time and temperature of the treatment.

A process of hot woolenisation of jute fabrics with less loss of strength, more softness and greater economic value has been developed. Desizing and scouring processes are not required to be done in the case of hot woollenisation of jute fabrics

Scouring: Before prior to bleaching and dyeing jute materials some pretreatments are necessary. Raw Jute contains impurities consisting mainly of natural waxes, peptic substance which are insoluble in water but can be removed by treatment with hot alkalis. The impurities prevent the eacy wetting out of jute in the dye bath and consequently prevent easy penetration of the dye solution in the fibre.

Secondly, the warp threads of jute fabrics often contain sizing materials (starch) in addition to natural impurities for facilitating weaving the fabrics. If it is not removed, it makes very difficult to obtain solid well penetrated even dyeing. It is therefore, necessary to remove them by impregnating with some desizing agents followed by scouring with soda ash, caustic soda and wetting agent at 90-100°C for 1 hour. The natural coloring matters must be removed by bleaching before dyeing.

Bleaching: This is another chemical process for whitening and preparation of jute materials prior to dyeing. Oxidizing bleaching agents like hypochlorite, chlorite and hydrogen peroxide are cmployed here. Jute materials are generally bleached in one stage and mostly in two stages. BJRI has developed economic standard bleaching methods for jute materials. It has been observed that instead of bleaching the jute materials in one stage with higher concentration of a bleaching agent if it is done in two stages with lower concentration of two active components better whiteness and uniform products are obtained with less loss of strength. In this type of combination bleaching in two stages it is better to use hypochlorite in the first stage and hydrogen peroxide in the second stage. The total loss in weight and strength in the above process of woollenisation and bleaching are 15-18% and 30-40% respectively. These losses of weight and strength do not have any adverse effect for production of end uses of jute products.

Dyeing: Some standard and economic dyeing methods have been developed for jute materials in order to obtain satisfactory washing light and rubbing fastness.

Dyeing is done by using selected dyes suitable for jute. Direct, Reactive, Sulfur, Vat and Basic dyestuffs are used for dyeing jute. Methods/recipes are now available for dyeing of jute with these dyestuffs. Selections of dyes are dependent on the end uses of the products.

Jute fabrics and jute cotton union fabrics are generally dyed in jig-ger machine and yarns in open vat or in hank dyeing machine.

Printing: Printing is essential and popular for jute fabrics. It has got positive impacts on diversified jute products. Screen printing methods for furnishing fabrics have been developed with Reactive and Pigment dyestuffs. Methods are ready to transfer the technology to the concerned industries for commercial production.

Finishing: Jute and Jute materials are generally harsh and hard in feel. After dyeing/printing jute and jute materials are treated with some silicon based non-ionic softener, such as Siligen, Basosoft EUK (BASF) to make then soft. Some cross-linking agents like Fixapret CPN, Fixapret Ecos, Kaurit-W etc. melamineformaldhyde type of resin finishing agents are also used for imperties of jute fabrics. Besides these fibre retardant, rot proofing, water repellent finishing treatment etc. have been developed for jute for diversified uses of jute products.

Improvement of low quality jute

Low quality jute like SMR and jute cuttings may be improved by enhancing the growth of micro organism in the fibre or by the application of microbial enzymes. The technology provides opportunity for improving and using low grade jute for manufacturing different products while reducing the cost of raw materials.

Jute Furnishing

Jute is a plant fiber that is used to create a vast assortment of household furnishing items such as carpets, chair coverings, curtain, cloths, sacks, and more. There are two types of jute fiber namely White Jute and Tossa Jute. White Jute has a little coarse texture whereas Tossa Jute is much softer, silkier, and lustrous. To manufacture Jute Furnishing Items, mostly Tossa Jute is used with classic textile traditions. Jute fibers are then dyed in almost any color to get the desired color-combination such as vibrant red, gold, gray, and more. Jute furnishings are trendy and thus a perfect accessory to decorate a lifeless interior by adding some products made from natural fiber.

Jute Furnishing gives a homey and cozy look to the interiors with the impressive texture, lively appeal, and unique color-combination. As the jute fiber is incredibly tough and fibrous, the products made from it, is durable. Yet, jute is capable of looking delicate and being soft which make it completely unique. So now, attractive range of Jute Furnishing Items can be made in a completely delicate form such as flowers, flower pots, leaves, soft table mats, and more. Jute fiber can be easily dyed as well in any color; as a result, customer can conveniently get a product in a color of their choice.

Availability of a variety of designs, shapes, sizes, and colors make Jute Furnishing Items appealing for all and one. These are ideal to give a natural look to the house and augment the touch of culture and ethnic appeal. Moreover, jute products are lively, bio-degradable, and Eco-friendly that also keep the interiors healthy and prevent the usage of harmful plastics. Besides, Jute Furnishing Items are much cheaper and are available at competitive rates in almost anywhere in India.

4. Conclusion

In conclusion it may be pointed out that any fibre can make better place in the tomorrow's world fibre market if it is backed by proper research and development works. It is equally applicable to jute also. If proper research and development works in the different stages of manufacture of jute fibre/yarn/fabrics with special emphasis on the developments in the mechanical and chemical machinery sides are carried out, jute will get a good place in the

textile world along with cotton, wool, and such fibres. We shall have to open the future possibility through coordinated efforts for a new vision for jute in this direction.

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Biography

Md. Mahbubul Islam (Corresponding Author) awarded PhD in 2008 from the Department of Agronomy of Bangladesh Agricultural University especially on Jute seed quality, plant establishment and yield. He had done his M.Sc. (Agriculture) in Agronomy and B.Sc. Agriculture (Hons.) from the same University. He is working at Bangladesh Jute Research Institute (BJRI) since 1989. At present he is serving as Chief Scientific Officer & Head of Agronomy Division. He has 6 books, 67 scientific papers and more than 70 popular articles published in international and national journals, newsletters etc. He visited United Kingdom, Malaysia, India for training, seminar, workshop purpose.