The Possibility of Using the Blending of Plants Waste (Bagasse) in Some Textile End Use

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Abstract: This research concerned with emphasizing the importance of the contribution of the textile industry in the province on the ECO-system so as to reduce pollution resulting from various agricultural and industrial wastes, where we used one of these plants waste which found in the Arab Republic of Egypt is(Bagasse). Bagasse is considered of secondary waste that results from squeeze the stalks of sugar cane, which is used in the manufacture of sugar, black honey and fresh juice. Using Bagasse fibers need some of treatments to remove lignin from fibers which gave stiffness to the stalk of sugar cane plants, then we had to blending Bagasse fibers with other fibers to get all the properties of these fibers in the textile end product. Two types of blending were used, the first: blended Bagasse fibers with other natural bast fibers (Linen, jute) to produce variation counts of spinning yarns, the second: blended Bagasse fibers with man-made fibers (poly propylene) to produce nonwoven fabrics. In this study tests were conducted on each of the steps and all test methods were explained and results were discussed to demonstrate the possibility of using samples produced from the blending of plants waste (Bagasse) in the field of textile.
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Key words; Plants waste, Bagasse fibers, sugar cane, bast fibers, man-made fibers, nonwoven fabrics.

1. Introduction

Textile industry has evolved in the current era big development, and has expanded its fields significantly even become one of the important industries which is one of the pillars of the economy. Therefore necessary to take advantage of what was produced by scientific and technological revolutions, both in the raw material, production technology or human thought.

Technology textile industry has a dynamic, diversity of raw materials, textile compositions, machinery engineering technology, various processing operations at all stages. As well as textiles involved in a number of diverse technological industries which has been divided into twelve section [(1)], which are subject to a number of environmental textile tests to emphasize on the quality of these products and the provinces on the ecosystem which includes more than 128 test according to the specifications (Eco- Tex standard100) **[(2)].**

As for the green fibers some of which are used in textile field (such as cotton - linen - Jute - ….) since 6000 BC which became her other modern uses in the areas of environment-friendly (eco- friendly) and used in numerous applications, such as (ores construction - insulation materials -….) because these materials do not have any detrimental effect on the ecosystem, where it is biodegradable after its consumer expected life. Statistics shows that there are more than 2.5 million tons of cellulosic materials in the present time, which is expected to reach 38-40 million tons by the middle of next century [(3)].

Some of which is used as food for humans and animals, which results in plant residues unfit for use, accumulation may lead to serious environmental problems if there is no modern uses for that, so many of the current studies seeking to find scientific solutions to deal with this waste plant in ways that eco-friendly.

According to the objectives of the specification (ISO 14000) concerning the maintenance of the ecosystem, which includes the following objectives **[(4)]:**

- -Reduction of emissions and radiation
- -Conservation of natural resources
- -Efficient performance by making better use of modern technology
- -The continuous improvement in environmental performance
- - Undergo to the laws of local and international environmental

Currently significantly the textile industry participated in the preservation of the ecosystem by recycling waste plant and used clothing in order to reduce the proportion of waste generated by this industry, where it is in accordance with the ecosystem approach in the developed world there are four steps to curb the spread of the pollution that is (prevention - treatment - recycling – regulation) **[(5)].**

In this research we used in the manufacture of some textile products one of waste plants spread in the Arab Republic of Egypt is bagasse resulting from sugar cane juice

2-Theoretical studies

Bagasse is the remnants of sugarcane stalks fibers resulting from the sugar factories after the juice, which consists of a solid crust and soft pulp, consisting mainly of cellulose, lignin fibers, quintet sugars and minerals, incidentally bagasse have a variety of uses, through this research, there is attainable goals are:

- Contribute to minimize the bagasse resulting from sugar cane juice.
- The use of bagasse in the textile field which increases the types of materials that can be used in this area.
- The possibility of the use of bagasse in the production (yarns - woven fabrics - non-woven fabrics)
- To obtain the fabrics made of natural materials, helps produce fabrics harmless

So can the use of bagasse in the textile industry, there were some problems that had to be taken into account, namely:

- Difficult to use bagasse as a spun fibers.
- The need to extract the sugar in bagasse before use.
-The possibility of separating the veneer of sugarcane from the inner bark.
- Permanent cracker, which is on the sugarcane fibers during the process of juice may cause damage to this fiber.

2-1 sugarcane plant

Sugarcane follows grassy family (Gramineae), and it is a muammar herbaceous plant grows in tropical and subtropical areas around the world in large areas of it, and the scientific name of it is (Saccharin officinaruml) [6], and sugarcane varieties can be divided according to the purpose of the planting into two groups [7].

-The purpose of the first Group varieties is sugar and honey.

- The purpose of the Second group varieties is sucking and juice.

2-1-1 Structural composition of plant sugarcane:

- In the natural environmental conditions the length of sugarcane plant up to (1.5 - 3.0 meters) and its diameter (1.8-5 cm).

- Sugar cane stalk is cylindrical, color of the surface of the plant stalk can be green or yellow or red and this surface is covered with a thick layer of wax.

Sugar cane stalk consists of a number of minds and each mind has a node, these nodes separating between the mind and each other as is shown in Figure (1).

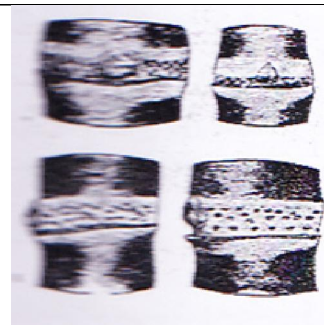


Figure (1): Nodes separating between the mind and each other

The Number of mind, their lengths and diameters on one stalk varies depending on the product; the length of the mind varies between (5 to 25 cm). The bottom mind is the longest mind and it is the most in-diameter thickness as it is the oldest in the age by comparing it with the upper minds, also the form of the minds may be (Puffy - cylindrical - compressed from the middle - curved - semi-conical), and the surface of the minds often smooth, contains longitudinal cracks in some kinds and so-called growth cracks as is shown in the Figure (2).

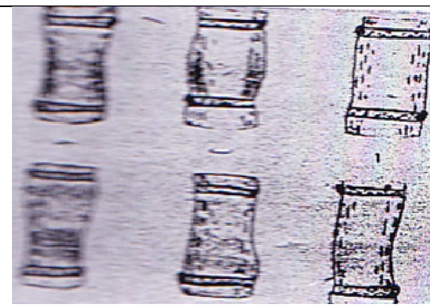


Figure (2): Minds in sugar cane stalks

- When we take a cross section in stalk plant we note the presence of two overlapping layers: the first known as the cortex(rind) and represent the solid outer layer, and the second is the inner layer(pith) it is a region of the soft fiber which have a simple color where fiber links are stable and well-established.

-The outer layer varies in thickness and texture along the stalk, as well as the internal fibers are connected with each other by lignin, Alheimcilauluz and this links determines the hardness fiber.

-Development and growth of the plant increases until the time of flowering and when the plants reach full maturity it has a stock of sucrose and lignin as a result of the physiological changes that occur to it at the time of flowering [8].

2-1-2 The chemical composition of the sugar cane plant:-

Sugar cane is a plant cellulose fibers, which are similar in their chemical properties with the rest of the other cellulosic fibers, table (1) shows the chemical composition of sugar cane:-

Table (1) The chemical composition of sugar cane

material	Percentage
Water (moisture)	74.5
Ash	00.5
Bagasse fibers	10.00
Sugars (soluble solids)	14.00
Nitrogenous substances	00.40
Fats and waxes	00.20
Pectin	00.20
Free acids	00.08
Multiple acids	00.12
Total	100.00

2-2 Secondary products from the sugar industry:

Remaining of the sugar industry of sugar cane many secondary products both of which are found in the fields after cultivation and broken sugarcane or after the juice and the sugar industry, these residues are as follows:

2-2-1 Field crop residues:

This waste is to residues in the field prior to shipping to factories and is used as green fodder for animals[9].

2-2-2 Bagasse:

Bagasse is the most important products of sugar cane juice and an estimated 32-35% of the weight of cane crushed, and Bagasse produced after extracting the juice from sugar cane stalk after passing on a set of cascading squeezers, which comprise each and every one of them at least from three heavy cylinders[9&10]

2-2-3 Molasses:

Molasses is the remaining portion of the concentrated juice after extracting sugar from it, molasses importance due to it contains about 25% of total sugars, which are extracted from sugar cane, and this percentage varies depending on the efficiency of industrial processes of purification, evaporation and crystallization[9&10]

2-2-4 Sugar cane wax:

Sugar cane wax is another product resulting from the sugar cane industry and covers the plant stalk in the form of wax layer founded on two fatty compounds; they are fatty lipids and waxy lipids.

2-2-5 Filter cake:

A portion removed from the juice after the nomination process by filters includes impurities present in the juice, nitrogenous substances, mud, sand and crumbs Bagasse, used in the fertilizer industry - wax - Install sand dunes.

2-3 Physical properties of the fibers Bagasse:-

2-3-1 Fiber length:

-Fiber length up to about hundred multiples compared with fiber diameter, for this property the fiber have portability of twists to get spun yarns.

-Fiber may be having not finished length similar to the industrial fibers, but the length must not be shorter than 20 mm that the fiber will not hold together after spinning, because the actual length of the fiber is an important factor to determine the feasibility of this fiber for spinning.

-The amount of lignin within the plant affects the durability and portability sprains to determine the viability of fiber for spinning and weaving operations.

2-3-2 Humidity:

Humidity in Bagasse up to about 9% in the standard Atmosphere, which vary according to the seasons of the year, where it is (10-20%) in the summer, while it is (12-20%) in winter.

Table (2) the proportion of the components inside the wall of Bagasse

NO	the proportion of the components inside the wall of Bagasse	Percentage %
1	Cellulose	26% - 43% at dry weight
2	Hemicelluloses	17% - 23% at dry weight
3	Pentosans	20% - 33% at dry weight
4	Lignin	13% - 22% at dry weight

3- The experimental work:-

To use Bagasse fiber in the textile field, first we must treatment these fibers by means of passing on a number of mechanical and chemical stages, and then mix these fibers with other textile fibers (natural, industrial) in order to improve the properties of the samples produced in this study, where it cannot be use Bagasse fiber individually due to its hardness, and we find that the highest percentage can be mixed from Bagasse fiber with another fibers is 70% [11].

In this study was to obtain the two types of samples that require each and every one of them passed at different stages to get the final product.

The first type of samples: spinning yarns blended of bast fibers which are: Bagasse – Linen – Jute.

The second type of samples: non-woven fabrics blend of two materials which are: Bagasse – Polypropylene.

3-1 Method of implementation of the research samples:

3-1-1 The first type of samples: Spinning yarns blended of bast fibers:

3-1-1-1 Fiber Preparation:

Bagasse fibers:

Pass these fibers on a number of preparatory stages to get rid of lignin and converted into fibers separate from each other and with flexibility relative make them suitable for use in the textile field, has found that the best treatment methods for these fibers is to use the method of explosion sudden steam in the presence of a low percentage of solution (NaOH) [(12)].

In this study, we have benefited from previous experiences and the expertise of specialists scientists at the National Center for Research to treat Bagasse fibers, and the method of treatment used in this study were in accordance with the following steps:

-We have got on the Bagasse fibers from sugar cane juice shops scattered in the Arab Republic of Egypt for the period 2010 - 2011.

-Paring the pressed sugar cane stalks to be separated from the inner core (pith) and the removal of the mind as is shown in the figure (3).

Figure (3): sugar cane stalks after separated from the inner core and the removal of the mind

-Put the equipped peel in hot water for an hour to get rid of sugars and colors.

- Then drying the peel in the air until it is ready for chemical addressing.

-Put the peel in an alkaline solution of sodium hydroxide for one hour and a half hours at boiling, and the proportion of the bath components are (1 fiber: 10 alkaline solution) in the presence of soap as an adjunct factor (13).

-Wash the peel well in hot water twice with the good pressing every time.

-Put the peel in a diluted solution of Hydrochloric acid HCL (0.4%) on the cold to address the residual alkali in fibers.

-Then wash the fiber with cold water.

-Squeezing the fiber well and then left to dry in the air to be as shown in figure (4).

This fiber will be ready for use in the textile field, and then the fibers were separated from each other on the opening machine in order to be able to blend with other fibers as shown in figure (5).

Linen fibers:

Equipped and prepared flax fibers in the General Company for Linen in Sharqia governorate

Figure (4):Bagasse fibers after chemical treatment

Jute fibers

Equipped and prepared Jute fibers in the General Company for jute products in Belbais city

3-1-1-2 Fiber spinning:

After that ring spinning method is used

Fiber blending with each other manually so that the blending ratios are as follows:

The first sample: 25% jute: Bagasse` 25%: 50% linen. The second sample: 50% jute: 50% Bagasse.

Then each sample is taken from previous samples to the ring spinning machine for the following stages:

- Stage of opening fiber:

The objective of this phase to obtain the homogeneous blending of fibers.

-Stage of preparing fiber:

Published an emulsion consisting of (mineral oil + water + adjuvant factor) on the fiber by about 22-35% of the fiber, then fiber are stored into stores called (bin) for a period of time ranging from (2:14 on), to be the fermentation of fiber and high temperature to provide a suitable environment for the growth of bacteria that feed on lignin remaining on the surface of the fiber to get fibers separate from each other completely.

- Stage of carding:

This stage is divided into three stages (the first carding – second carding - final carding) and we get from this stage on a regular carding bar.

- Stage of draw:

This stage is divided into two stages (the initial draw - the second draw) to get the bar less in thickness and weight, and more in the regularity and quality.

- Stage of the final spinning:

To get spinning yarns in different numbers as required.

3 – 1- 2 The second type of samples: non-woven fabrics Blend of two materials which are: Bagasse – Polypropylene:

-Where were blending Bagasse fibers (after opened) with polypropylene fibers (resulting from the exhaust of spinning factories for industrial fiber) and the blending ratio representing (1 Bagasse: 2 polypropylene).

- After was blending the fibers manually, passed inside the carding machine to increase the blending and regularity of fiber to get fiber screen.
- The resulting screen is passing inside needle punch machine to get a layer of non-woven fabrics; table (5) shows the specification of needle punch machine.

Table (3) Specification of spinning machine used for producing samples of yarns under study:

Machine Name	MACKIE – FINISHER JUTE – DRAWING FRAME
the country of origin	NORTHERN IRELAND
Name of the manufacturer - the date of manufacture	JAMES MACKIE&SONS, LIMITED - 1963
The speed out for the first carding bar	30 m / min
The speed out for the second carding bar	25 m / min
The speed out for the third carding bar The weight of the bar	25 m / min 75 g / m
The speed out for the first drawing bar The weight of the bar	28 m / min 42.5 g / m
The speed out for the second carding bar The weight of the bar	26 m / min 22.5 g / m
The speed out for the spinning yarn	15 - 25 m / min

Table (4) the specification of the samples were produced on the line of jute spinning under study:

No.	the blending ratios	Yarn number by Jute count
1	100 % jute	20/1
2	50% jute: 50% Bagasse	20/1
3	100 % linen	20/1
4	100 % jute	40/1
5	25% jute: Bagasse` 25%: 50% linen	40/1
6	100 % linen	40/1

Table (5) Specification of needle punch machine used for producing samples of non-woven fabrics under study

Machine Name	DILO
the country of origin	German
Machine width	260 cm
needles Specification	R-333G10023*25*18*15
Needle length	3.2 Inch
The depth of penetration needles	130mm
The speed of feeding	1.2 m/ min
The speed of entry	3.2 m / min
The speed of exit	4.8 m / min
Density of needles	2600 needles × 2 rulers

Then this layer of non-woven fabrics was been entering to the thermal piston to become a good cohesion between the fibers as a result of melting part of the industrial fiber which was embedded in the fabric layer, in addition to reducing the thickness of the fabric layer, table (6) shows the specification of thermal piston used .

Table (6) Specification of thermal piston used for producing samples of non-woven fabrics under study:

Machine width	350 cm
Layer width	230 cm
Atmospheric pressure	220 atmospheric pressure

The difference between samples of non-woven fabrics produced under this study, in accordance to the change in the heat treatment time as shown in the table (7).

Table (7) the specifications of the non-woven samples were produced under study:

S. No.	Heat treatment time
1	Without heat treatment
2	Heat treatment for 2 minutes
3	Heat treatment for 5 minutes

3-2 Laboratory Tests that have been applied in this study:

3 -2 -1 Fiber tests:

3 -2 -1 -1 Determine the longitudinal and cross section of the fiber:

This test was carried out by using SCANNING Electro Micrograph, so that the zooming power (500 × -1000 ×).

3 – 2 -1 -2 Determine the fiber diameter:

This test was carried out by using Amage Analysis device according to the Egyptian Standard specifications of (N2568-2007).

3 – 2 -1 -3 Determine the length of fiber:

This test was carried out by using Fibrograph device according to the Egyptian Standard specifications of (N755-2008).

3 – 2 -1 -4 Determine the Tensile strength and the elongation of fiber:

This test was carried out by using Stelometer device according to the Egyptian Standard specifications of (N2214-2006).

3 -2 -2 Yarn **tests:**

3 -2 -2 -1 Determine the yarn count:

This test was carried out by using Electronic Balance device according to the Egyptian Standard specifications of (N2778-2007), for determining the yarn number by using jute system.

3 -2 -2 -2 Determine the number of twists for yarn:

This test was carried out by using Zweigle device according to the Egyptian Standard specifications of (N2778-2007), for determining the number of twists of Yarn by using jute system.

3 – 2 -2 -3 Determine the Tensile strength and the elongation for yarn:

This test was carried out by using device (ATLAS – Textile Testing) device according to the International Standard (ISO 2060 Threads).

3 -2 -3 Non-woven fabrics tests:

3 -2 -3 -1 Determine the weight per square meter for non-woven fabrics:

This test was carried out by using Electronic Balance device according to the Egyptian Standard specifications of (N2169-2007),

3 -2 -3 -2 Determine the thickness for non-woven fabrics:

This test was carried out by using device (SDL – Thickness Gauge) according to the American Standard specifications of (ASTM-D5729-2004).

4- Results and discussion:-

Results of experimental tests carried out on the produced samples were statistically analyzed and presented in the following tables and graphs.

4-1 Results of fiber tests:

4 -1 -1 The longitudinal and cross sector of the fiber:

This test was carried out for the fiber used in the research are: Bagasse- Jute - Linen - Polypropylene

4 -1 -1-1 The longitudinal and cross sector of Bagasse fiber:

-Longitudinal sector of Bagasse fibers are containing linear cracks and holes scattered on the surface of the fiber as shown in figure (6)

-Cross sector be semi-round and there are succulence gaps within plant cells as shown in figure (7).

4 -1 -1-2 The longitudinal and cross sector of Jute fiber:

-Longitudinal sector of Jute fibers is smooth and straight and do not has cross lines as shown in figure (8).

-Cross sector be multi- ribs, either five or six as shown in figure (9).

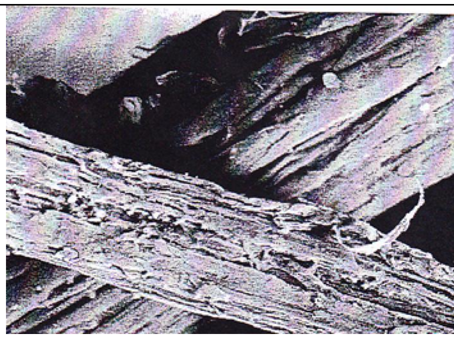


Figure (6) Longitudinal sector of Bagasse fibers

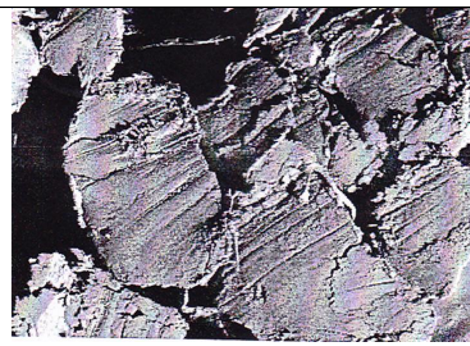


Figure (7) Cross sector of Bagasse fiber

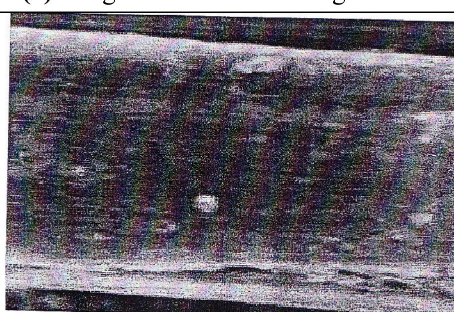


Figure (8) Longitudinal sector of jute fibers

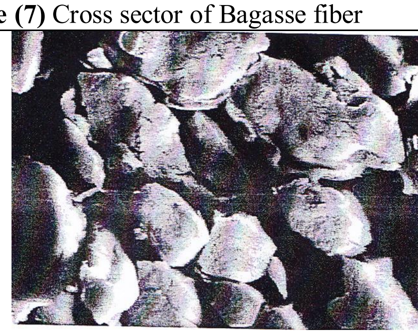


Figure (9) Cross sector of Jute fiber

4 -1 -1-3 The longitudinal and cross sector of Linen fiber:

- Longitudinal sector of Linen fiber appears in the form of soft cylindrical packages contain some bulging areas along the fiber and is characterized by the presence of transverse cracks when bloating places as shown figure (10)

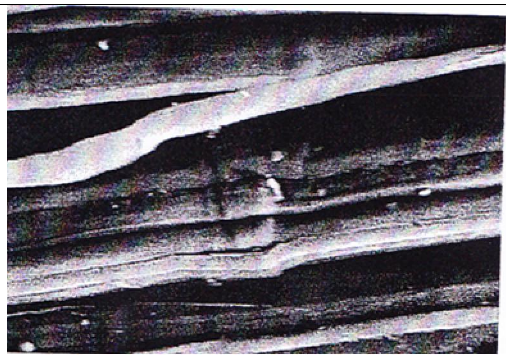
- Cross sector is characterized as non-rounder but is a multi-ribs, it seems either pentagonal or hexagonal as shown in figure (11).

4 -1 -1-4 The longitudinal and cross sector of Polypropylene fiber:

-Longitudinal sector of polypropylene fiber is characterized as smooth and silky as shown in figure (12).

4 -1 -2 Physical properties of the fibers:

Tests were conducted to study the properties of different fibers used in this research, the results of these tests were as shown in table (8).



Figure(10) Longitudinal sector of Linen fiber

Figure (11) Cross sector of Linen fiber

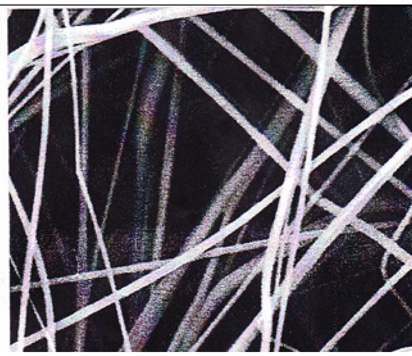


Figure (12) Longitudinal sector of polypropylene fiber

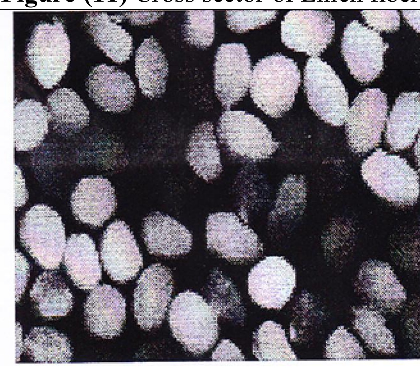


Figure (13) Cross sector of Polypropylene fiber

Table (8) Fiber test results used under study:

Fibers	fiber diameter Micron	length of fiber mm	Tensile strength g / tex	fiber elongation %
Bagasse	58	59	20	5
Jute	30	193	43	9
Linen	21	445	44	5
polypropylene	43	96	38	20

4-2 Results of yarn tests:

The results of tests on samples yarn under study, which describes the impact of each variation of the count and blending ratio on the properties of the yarn, as shown in the tables (9),& (10).

Table (9) The results of tests yarn count 20/1(the theoretical count that has been studied):

yarn	The actual count (by jute count)	Tensile strength (Newton)	elongation %	Number of twists / m	The direction of twisting
100 % linen	16/1	74	4	147	Z
50% jute: 50% Bagasse	21/1	31	4	121	Z
100 % jute	23/1	61	4	140	Z

Table (10) The results of tests yarn count 40/1(the theoretical count that has been studied):

yarn	The actual count (by jute count)	Tensile strength (Newton)	elongation %	Number of twists / m	The direction of twisting
100 % linen	32/1	82	3	95	Z
25% jute: Bagasse 25%: 50% linen	42/1	166	8	103	Z
100 % jute	38/1	103	6	106	Z

4-2 -1The results of tests for yarn count 20/1:

4-2 -1 -1 The impact of the different type of raw material on the tensile strength for yarn count 20/1:

Table (9), Figure (14) show the effect of different blending ratio on the tensile strength for yarn count 20/1.

Results after statistical analysis indicated the following:

- Tensile strength for yarn affected by material properties its constituent .,

-Highest tensile strength achieved in the yarn of 100% Linen, the interpretation of this is due to the natural tensile strength of Linen fibers that increase more than the natural

tensile strength of both jute and sugarcane as shown in the table (8), and this is in addition to increasing the number of twists that increases the tensile strength for yarn.

- Less tensile strength achieved in the yarn of 50% jute: 50% Bagasse, the interpretation of this is due to the lack of homogeneity of the blending in the thin count, as well as lower of tensile strength for fiber of each of the jute, Bagasse in the yarn, added to the lack of the number of twists that reduce the tensile strength for yarn.

4-2 -1 -2 The impact of the different type of raw material on the percentage of elongation for yarn count 20/1:

Table (9), Figure (15) show the effect of different blending ratio on the percentage of elongation for yarn count 20/1:

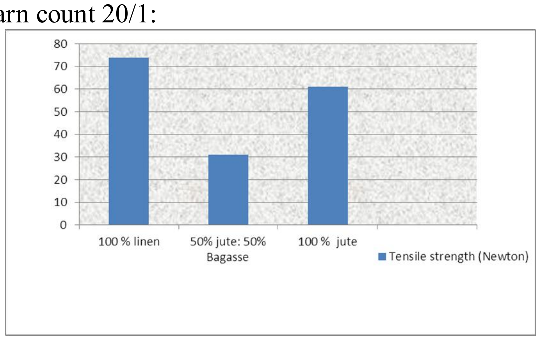


Figure (14) The effect of different blending ratio on the Tensile strength for yarn count 20/1

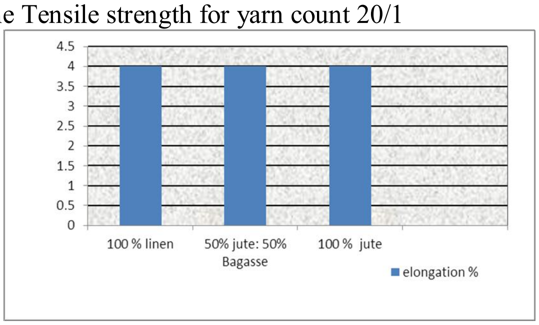


Figure (15) The effect of different blending ratio on the percentage of elongation for yarn count 20/1

Results after statistical analysis indicated the following:

- Samples of different yarns produced under study are similar with each other.

-The interpretation of this is due to the parity resulting between each of the characteristics of the fibers in the yarn and yarns installation properties, which leads to the fiber's ability to movement within the yarn, where the linen yarn that achieved the biggest value in tensile strength gives percentage elongation equal with jute yarn and another yarn blended from 50% jute: 50% Bagasse.

4-2 -1– 3The impact of the different type of raw material on number of twists / m for yarn numbering 20/1:

Table (9), Figure (16) show the effect of different blending ratio on the number of twists / m for yarn count 20/1.

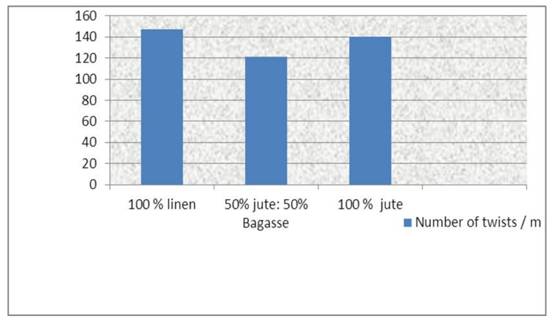


Figure (16) The effect of different blending ratio on the number of twists / m for yarn count 20/1:

Results after statistical analysis indicated the following:

-The number of twists / m for yarn affected by material properties its constituent.

-Highest number of twists / m achieved in the yarn blending from 100% Linen, the interpretation of this is due to linen fibers' ability to more twisting than jute and Bagasse, Due to that fiber linen is the largest bark fiber in the flexibility, In addition, the diameter of linen fiber is the lowest compared to other fiber used in this research as shown in the table (8).

- Less number of twists / m achieved in the yarn of 50% jute: 50% Bagasse, the interpretation of this is due to the increase in the hardness of jute fibers and Bagasse blended in this yarn and their larger diameter compared to linen which impedes the process of twisting fiber.

4-2 -2The results of tests for yarn count 40/1:

4-2 -2 -1 The impact of the different type of raw material on the tensile strength for yarn count 40/1:

Table (10), Figure (17) show the effect of different blending ratio on the tensile strength for yarn count 40/1.

Results after statistical analysis indicated the following:

- Tensile strength for yarn affected by material properties its constituent.

-Highest tensile strength achieved in the yarn of 25% jute: Bagasse 25%: 50% linen, the interpretation of this is due to presence linen by rate 50% in yarn which is characterized by high tensile strength which increases the tensile strength for the yarn, in addition to increasing the number of twists that increase the tensile strength for the yarn.

- Less tensile strength achieved in the yarn of 100 % jute, the interpretation of this is due to the small number of twists that led to the low tensile strength of the yarn.

4-2 -2 -2 The impact of the different type of raw material on the percentage of elongation for yarn count 40/1:

Table (10), Figure (18) show the effect of different blending ratio on the percentage of elongation for yarn count 40/1:

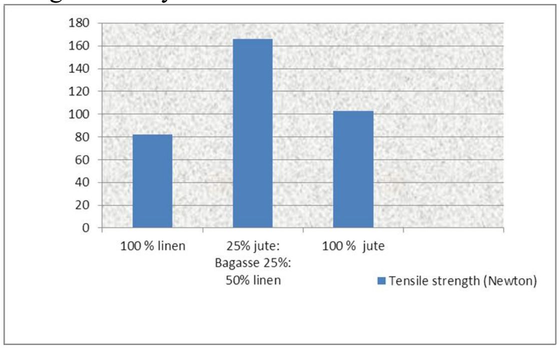


Figure (17) The effect of different blending ratio on the tensile strength for yarn count 40/1

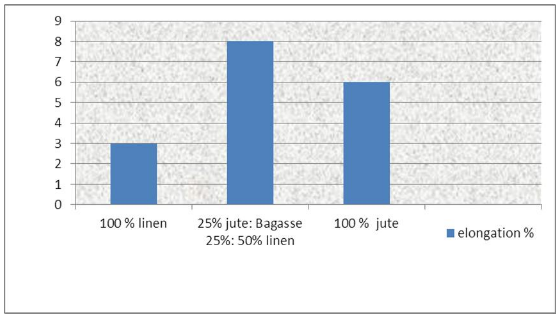


Figure (18) the effect of different blending ratio on the percentage of elongation for yarn count 40/1.

Results after statistical analysis indicated the following:

-The number of twists / m for yarn affected by material properties its constituent.

-Highest number of twists / m achieved in the yarn blending from 100% jute, the interpretation of this is due to the regularity of spinning in the yarn where we find that jute fiber represent the average value of the diameter and length between linen fiber and Bagasse as shown in the table (8).

- Less number of twists / m achieved in the yarn of 100 % linen, the interpretation of this is due to the increase in the length of the linen fiber as shown in the table (8), as it is the greater length of fiber the fewer number of twists.

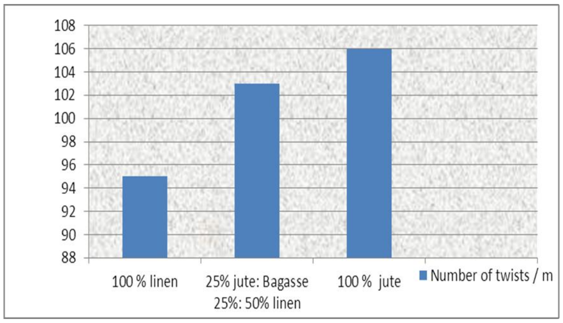


Figure (19) The effect of different blending ratio on the number of twists / m for yarn count 40/1.

4-3 Results of non-woven fabrics tests:

The results of tests on non-woven fabrics samples under study, which describes the properties of these fabrics with the change in the time of exposure to the heat treatment, and the results of tests carried out as shown in the table (11).

Results after statistical analysis indicated the following:

- The percentage of elongation for yarn affected by material properties its constituent.

-Highest percentage of elongation achieved in the yarn of 25% jute: Bagasse 25%: 50% linen, the interpretation of this is due to the combination of the properties of more than one type of fiber in yarn

- Less percentage elongation achieved in the yarn of 100 % linen, the interpretation of this is due to the rigidity and low of elongation for linen as shown in the table (8).

4-2 -2– 3The impact of the different type of raw material on number of twists / m for yarn count 40/1:

Table (10), Figure (19) show the effect of different blending ratio on the number of twists / m for yarn count 40/1.

4-3 -1 Regression line equations for non-woven fabrics samples under study:

An equation of the regression line for samples of non-woven fabrics under study was calculated using the program COSTAT.

- Regression line equation for samples of non-woven fabrics under the load weight 5 grams:

$Y= 1.49 X + 0.01$

- Regression line equation for samples of non-woven fabrics under the load weight 115 grams:
Y= -0.8 X + 0.01
- Regression line equation for samples of non-woven fabrics under the load weight 295 grams:
Y= 2.2 X -5.92
- Regression line equation for samples of non-woven fabrics under the load weight 655 grams:
Y= 1.67 X +4.11
As Y= thickness (mm); X= weight (grams)

Table (11) the results of tests for non-woven fabrics samples under study:

The sample	Weight gm/m^2	Thickness (mm) at load weight 5 grams	thickness (mm) at load weight 115 grams	thickness (mm) at load weight 195 grams	thickness (mm) at load weight 655 grams
The first sample Without heat treatment	290	3.6	2.56	1.92	1.84
The second sample When the heat treatment time (2 minutes)	272	3.24	2.74	2.32	2.02
The third sample When the heat treatment time (5 minutes)	261	2.72	2.18	1.80	1.54

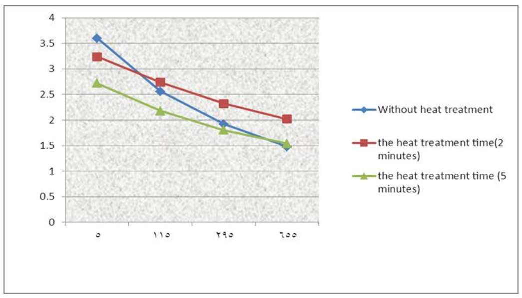


Figure (20) The linear relationship between each of the change in load weight and its affect on the thickness of fabrics

4-3 -2 The impact of different heat treatment time and load weight on the thickness of the samples:

4-3 -2 -1 The impact of different heat treatment time on the thickness at the load weight of 5 grams:

Table (11), Figure (21) show the effect of different heat treatment time on the thickness of the samples under study at the load weight of 5 grams.

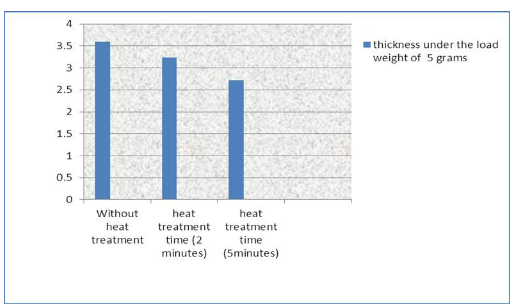


Figure (21) The effect of different heat treatment time on the thickness of the samples under study at the load weight of 5 grams

Results after statistical analysis indicated the following:

- The highest thickness was for the first sample (without heat treatment), as polypropylene fibers did not have any change occurs in thickness as not exposed to the effect of heat, which led to no change in the thickness of the sample under the influence of load weight.

-The greater the heat treatment time the less the thickness of the samples, which indicates the existence of an inverse relationship between the heat treatment time and the thickness of the sample, this due to fiber propylene affected by heat, where it spoke melting of some of polypropylene fibers as a result of exposure to heat, which leads to reduced thickness of the sample the more time heat treatment.

4-3 -2 -2 The impact of different heat treatment time on the thickness at the load weight of 115 grams:

Table (11), Figure (22) show the effect of different heat treatment time on the thickness of the samples under study at the load weight of 115 grams.

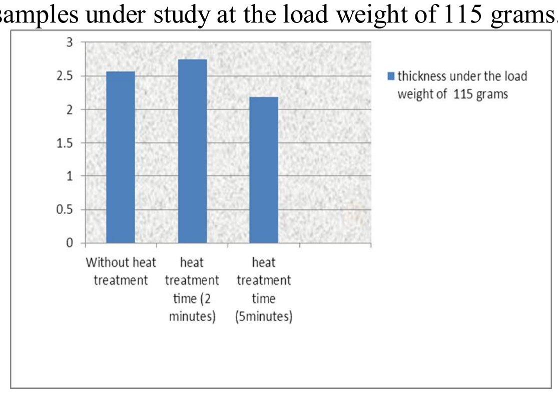


Figure (22) The effect of different heat treatment time on the thickness of the samples under study at the load weight of 115 grams

Results after statistical analysis indicated the following:

- A decrease in the thickness of the samples occurs with increasing load weight used in the experiments that have been made in this research.

- The lowest thickness under the load weight of 115 grams was for the third sample (heat treatment time 5 minutes), this is due to the increased amount of molten polypropylene fibers, which leads to decrease the thickness of the sample.

-The first sample more influenced by the load weight compared to the second sample, which led to the thickness of the first sample is less than the thickness of the second sample, this due to the free movement of fibers within the first sample due to lack of impediment prevents the movement of fiber where they are without heat treatment.

-While we find that the second sample was least affected by the load weight compared to samples other, which led to the thickness of the second sample is greater thickness, due to the occurrence of adhesion between the fiber and each other as a result of melting some of polypropylene fibers that hinder freedom of movement of fiber within the sample under the influence of the load weight.

4-3 -2 -3 The impact of different heat treatment time on the thickness at the load weight of 295 grams:

Table (11), Figure (23) show the effect of different heat treatment time on the thickness of the samples under study at the load weight of 295 grams.

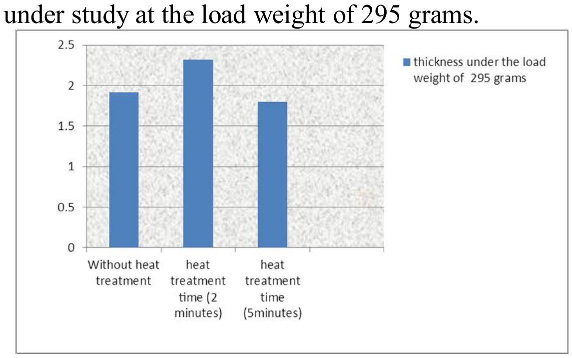


Figure (23) The effect of different heat treatment time on the thickness of the samples under study at the load weight of 295 grams

Results after statistical analysis indicated the following:

- A decrease in the thickness of the samples occurs with increasing load weight used in the experiments that have been made in this research.
- The lowest thickness under the load weight 295 grams was for the third sample (heat treatment time 5 minutes), this is due to the increased amount of molten polypropylene fibers, which leads to decrease the thickness of the sample.

-The first sample more influenced by the load weight compared to the second sample, which led to the thickness of the first sample is less than the thickness of the second sample, this due to the free movement of fibers within the first sample due to lack of impediment prevents the movement of fiber where they are without heat treatment.

-We find that the second sample was least affected by the load weight compared to samples other, which led to the thickness of the second sample is greater thickness, due to the occurrence of adhesion between the fiber and each other as a result of melting some of polypropylene fibers that hinder freedom of movement of fiber within the sample under the influence of the load weight.

4-3 -2 -4 The impact of different heat treatment time on the thickness at the load weight of 655 grams:

Table (11), Figure (24) show the effect of different heat treatment time on the thickness of the samples under study at the load weight of 655 grams.

Results after statistical analysis indicated the following:

- A decrease in the thickness of the samples occurs with increasing load weight used in the experiments that have been made in this research.
- The lowest thickness under the load weight of 655 grams was for the first sample, this is due to the lack of heat treatment for the sample, which leads to the free movement of fibers within the sample.
- Continue to increase the thickness of the second sample compared to the first sample and the third with the change in the load weight influential them.
- Relative stability in the thickness of each of the second and third sample as a result of the amount of melting polypropylene fibers, which operate on the adhesion of fiber with each other within the sample which hinders the free movement of fiber within the sample under the influence of the load weight.

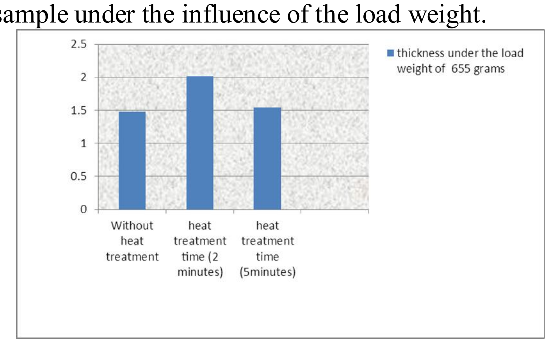


Figure (24) The effect of different heat treatment time on the thickness of the samples under study at the load weight of 655 grams

5-Conclusion:-

Using Bagasse fibers in textile field needs some of treatments to make it suitable for spinning and textile processes. It is very important to blending fibers Bagasse with other fibers, whether natural or artificial, so as to obtain textile products featuring all the properties of this fiber their constituent. For this two types of blending were used, the first: blended Bagasse fibers with other natural bast fibers (Linen, jute) to produce variation count of spinning yarns, the second: blended Bagasse fibers with man-made fibers (poly propylene) to produce nonwoven fabrics.

First: the samples of spinning yarns: the first yarn count was 20/1 made from 50% jute: 50% Bagasse, then compared it with another yarns mad from 100 % jute and 100% Linen, and the second yarn count was 40/1 made from 25% jute: Bagasse 25%: 50% linen, then compared it with another yarns mad from 100 % jute and 100% Linen, this by made the yarn tests which were (the actual count for yarn - tensile strength - elongation - number of twists / m).Results after statistical analysis indicated the following conclusions:

-Tensile strength, elongation and number of twists / m for yarn affected by material properties its constituent .

-Highest tensile strength achieved in the yarn of 100% Linen for yarn count 20/1, while less tensile strength achieved in the yarn of 50% jute: 50% Bagasse.

- Samples of different yarns count 20/1 produced under study are similar with each other in elongation.

-Highest number of twists / m achieved in the yarn blending from 100% Linen for yarn count 20/1, while less number of twists / m achieved in the yarn of 50% jute: 50% Bagasse.

-Highest tensile strength achieved in the yarn of 25% jute: Bagasse 25%: 50% linen for yarn count 40/1, while less tensile strength achieved in the yarn of 100 % jut.

-Highest percentage of elongation achieved in the yarn of 25% jute: Bagasse 25%: 50% linen for yarn count 40/1, while less percentage elongation achieved in the yarn of 100 % linen.

-Highest number of twists / m achieved in the yarn blending from 100% jut for yarn count 40/1, while less number of twists / m achieved in the yarn of 100 % linen

Second: the samples of nonwoven fabrics : we described the impact of different heat treatment time (without heat treatment- heat treatment time for 2 minutes - heat treatment time for 5 minutes), and load weight (5 grams-115 grams - 295 grams -655 grams) on the thickness of these samples, and results after statistical analysis indicated that there is a significant effect of different heat treatment time on the thickness under different load weight of grams for the samples under study.

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