ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 6, Issue 5 , May 2019

Effect of uses Polyester Microfiber on the efficiency of men socks

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ABSTRACT: The aim of this research paper is to improve the performance of knitting Men Socks by using MF(Micro Fibres Yarns), and blend them with Cotton Yarns.
From these yarns, the following knitted socks were produced socks knitting machine.
Single Jersey construction was used to make these samples.
On the other side, there were tests results on these samples, and having statistical analyses for these results, to show the influence of using MF(Micro Fibres Yarns) and combed Cotton Yarns on men socks.
The tests were performed according with standard method, analyses results using method of ANOVA test, and study these statistical analyses.
There were significant differences in samples results which produce with MF,
And improve of some properties of these samples such as (braking force, Heat Isolation, Air Permeability).

KEY WORDS: Cotton- Polyester Microfiber- Men Socks- Heat Isolation- Air Permeability

I.INTRODUCTION

Socks consider as an important part of clothes for human, which protect human feet from dust and solid bodies that harmful of human feet.
And the most important properties should be in socks is absorption ability and fastest of evaporation, also the resistance of tearing and breaking force which happened during repeated use.
In this research paper, we study how to improve the properties of men socks, by using micro fibers with different of yarn numbers, different number of fibers in the cross section of yarns, and blend these yarns with combed cotton yarn.
Make testes of the producing socks for air permeability, weight, heat isolation, water vapor %, water vapor amount, and breaking force.
And analyses the results of these testes with ANOVA test, to study the influence of change of microfiber numbers on the properties of men socks.

A. **Motives of Machine**

1) Machine kind
2) Number of needles
3) Machine diameter
4) Knitting construction.

B. The design of these experimental depend on some different in samples constructions.
- use one Cotton count yarn (20 Ne Combed Yarn) for all samples.
- use the same No. of needles at circle of knitting machine.
- The construction of knitting sock was by sequence:
(One row of cotton yarn: one row of MF yarn).

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II. SIGNIFICANCE OF THE SYSTEM

The paper mainly focuses on how socks knitting machine can produce socks with different kind of fibers, and how these fibers influence on socks efficient. The study of literature survey is presented in section III, Methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and Conclusion.

III. LITERATURE SURVEY

A.WEFT KNITTED

Weft knitted fabrics may be approximately divided into single or double jersey (double-knit) according to whether they were knitted with one or two sets of needles. Most single-jersey fabric is produced on circular machines whose latch needle cylinder and sinker ring revolve through the stationary knitting cam systems that, together with their yarn feeders, are situated at regular intervals around the circumference of the cylinder [(1-3).]
Single-jersey is the simplest and most economical weft knitted structure to produce and has the maximum covering power. It is the base structure of ladies' hosiery, fully fashioned knitwear and single-jersey fabrics [(5).].
The single-jersey is a plain stitch knitted cloth made on a circular knit machine. It is produced by the needles knitting as a single set, drawing the loops away from the technical back and towards the technical face side of the fabric. It normally has a potential recovery of 40 percent in width after stretching. The jersey knit has the least amount of shrinkage of all knit stitches [(6).]

B.COTTON

Cotton offers next-to-skin comfort and hence is a preferred fiber for undergarments. Cotton fabrics have a pleasant feel or 'handle'. They are cool in hot weather. Much of the comfort of a textile material depends upon its ability to absorb and desorbs any moisture. As we known, cotton fiber is a good conductor of heat, and draws heat away from the skin, and live it dry, making it comfortable of wear [(1).]
A garment that does not absorb any moisture at all will tend to feel clammy as perspiration condenses on it from the skin.
Cotton fiber is a good conductor of heat, and draws heat away from the skin, and live it dry, making it comfortable of wear.
Cotton fibers, however, are able to absorb appreciable amounts of moisture ,and therefore gave us feel of comfortable and cool, passing on the perspiration from the body into the surrounding air. Knit cotton T-shirts and cotton underwear are preferred for their absorbency and ease of care [(2-8).]

C.POLYESTER MICROFIBER (MF)

Polyester microfibers are now widely used in sportswear, both underwear and outerwear.
Fabrics made from polyester microfibers also combine improved handle with strength and durability [(2).]
There is a good improve of fabrics properties when we use MF in these fabrics.
That we can find improve of moisture vapor permeability, Air permeability ratio, and thermal isolation of these products [(7).]

There are many other properties of Micro Fibres such as:
- Dry faster than cotton fiber by 287% time.
- High ability of recovery
- Easy clean.
- Breathable
- High stability

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IV. METHODOLOGY

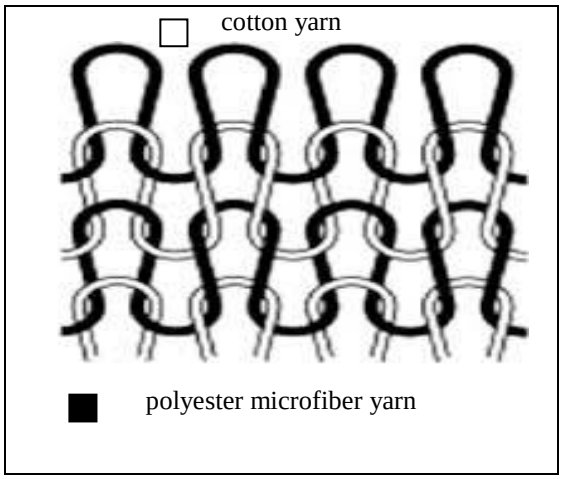
The samples were produced on socks circular knitting machine, with set of machine as shown in table 1.

Table 1. Machine properties setting

Machine properties	setting
Machine kind	socks circular knitting
Number of needles	168 needle
Machine diameter	3 ¾ inch
Knitting construction	Single jersey

- use one Cotton count yarn (20 Ne Combed Yarn) for all samples.
- use the same No. of needles at circle of knitting machine.
- The construction of knitting sock was by sequence:
  (One row of cotton yarn: one row of MF yarn).

Socks knitting machine



Single jersey knitting stitch

Fig1. Socks knitting machine specification

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International Journal of Advanced Research in Science, Engineering and Technology
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DATASET DESCRIPTION

A- use four different yarn numbers of polyester microfiber, and studied the influence of these differences on sock's properties.
Table (2) introduces yarn numbers, and blend ratio of each socks sample.

Table2. Samples Blend Ratio

Samples NO.	Blend Ratio
Sample 1	**Polyester(MF) 300/288 D/ (50%:50) Cotton**
Sample 2	**(50%:50) Cotton/ Polyester(MF) 150/288 D**
Sample 3	**(50%:50) Cotton/ Polyester(MF) 150/576 D**
Sample 4	**(50%:50) Cotton/ Polyester(MF) 300/576D**
Sample 5	**Combed Cotton (20 NE)%100**
Sample 6	**% Polyester(MF) 300/288 D100**
Sample 7	**% Polyester(MF) 150/288 D100**
Sample 8	**% Polyester(MF) 150/576 D100**
Sample 9	**% Polyester(MF) 300/576 D100**

B) System Design
Samples photos shown in fig2, which were produced with these different



Cotton%100	Polyester(MF)%100	Polyester(MF) 50%:50 Cotton

Figure2. Samples photos

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

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V. EXPERIMENTAL RESULTS

A) The knitted socks were testing to study the influence of using MF in socks, and how they change the properties of these socks.

The Breaking Force tests were performed according to standard EN ISO 13934-2: 2002. [3]

The samples were tested in standard conditions for the thermal resistance which were 20 ± 0.1 _C air temperature, 65 ± 3% R.H.

Weight samples tests According to the standard test method for ASTM D3776 D3778M-09a, Relative water vapor, and Absolute water vapor were tested According to the standard test method for ISO 11092:2014, Heat Isolation, and Air Permeability According to the standard test method for air permeability of textile fabrics (ASTM D 737). [2]

The results of these tests were shown in table (3).

Table 3. Test Samples results

Sample No.	Weight gm^2	Relative water vapor %	Absolute water vapor Pa. $m^2.w^{-1}$	Heat Isolation $mk/m^2.w^{-1}$	Air Permeability $Cm^3/cm^2/sec$	Breaking Force N
1	1.84	54.4	5.1	12.13	51.7	577
2	2	47.3	4.6	11.26	58.32	538
3	2	46.7	5	11	54.1	470
4	2.32	44.8	5.3	11.1	62.62	440
5	2.2	42.4	5.7	13.4	63.96	465
6	2.3	53.3	3.7	21.4	41.6	594
7	1.72	56.6	3.4	30.4	47.96	534
8	1.8	58.3	3.1	30.9	61.86	500
9	2.4	50.4	4.3	35.56	40.76	587

B) Values are means of three replicates, numbers in the same column followed by the same letter are not significant different at $P < 0.05$[4]

The Data were analyzed using Costat, version 3.03 for personal computers according to **Ott (1988)**. The tests used were ANOVA test and descriptive statistics test. A treatment effect was assumed to be statistically significant at $P < 0.05$[4]

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International Journal of Advanced Research in Science, Engineering and Technology

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C) Statistical Analyses:

From the previous results, we have statistical analyses for these results at table(4), and made relation between them to find the influence of Polyester MF yarns on knitting fabrics properties

Sample No.	Weight gm^2	Relative water vapor %	Absolute water vapor Pa. $m^2.w^{-1}$	Heat Isolation $mk/m^2.w^{-1}$	Air Permeability $Cm^3/cm^2/sec$	Breaking Force N
1	1.84± 0.04	45.5±0.69	5.1±0.17	12.13±0.21	52.33± 2	577±1.5
2	2.00± 0.100	47.37±0.9	4.63± 0.21	11.27± 0.21	57.2± 1	538±2
3	2.02±0.100	45.47±0.65	5± 0.1	11± 0.1	54.9±0.43	470±2,64
4	2.31±0.395	43.77± 0.95	5.3±0.2	11.1±0.36	62.77±1.67	440±3,21
5	2.20±0.105	42.4±0,85	5.67± 0.15	13.43±0.95	64.03±1.75	465±1
6	2.30±0.095	53.53± 0.15	3.7± 0.1	21.3±0.52	41.87± 1.56	594±4
7	1.72±0.10	56.57±0.32	3.4±0.0	30.4± 0.3	47.57± 0.38	534±2.08
8	1.80±0.055	58.27±0.9	3.13±0.15	30.9±0.2	60.67± 1,91	500± 4.36
9	2.41±0.110	50.43± 0.95	4.3±0.1	36.57±1.84	40.1± 0.55	587±11.5
LSD	0.270	1.3	0.25	1.27	2.46	8.03

Table4. Analyses Samples results using ANOVA test

From the previous table we can study the relationship between the different factors and their influence on the quality of socks as shown in table(5).

Sample No.	Weight gm^2	Relative water vapor %	Absolute water vapor Pa. $m^2.w^{-1}$	Heat Isolation $mk/m^2.w^{-1}$	Air Permeability $Cm^3/cm^2/sec$	Breaking Force N
1	BC	F	B	E	D	B
2	ABC	E	C	E	C	C
3	ABC	F	B	E	C	E
4	A	G	B	E	AB	F
5	AB	H	A	D	A	E
6	A	C	E	C	F	A
7	C	B	F	B	E	C
8	C	A	G	B	B	D
9	A	D	D	A	F	A

Table5. significant results between samples

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International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 5 , May 2019

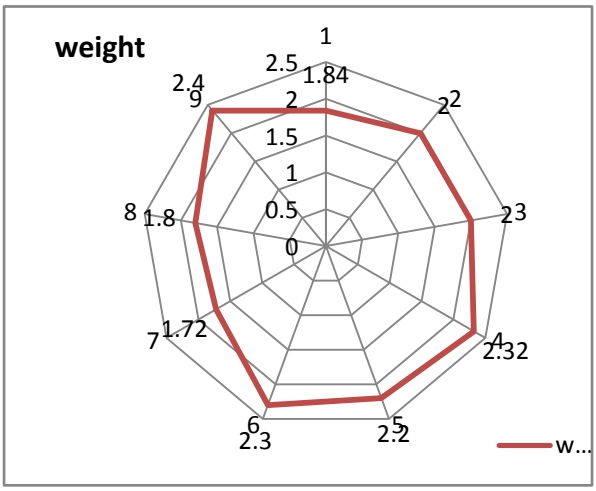

Fig3. weight of samples

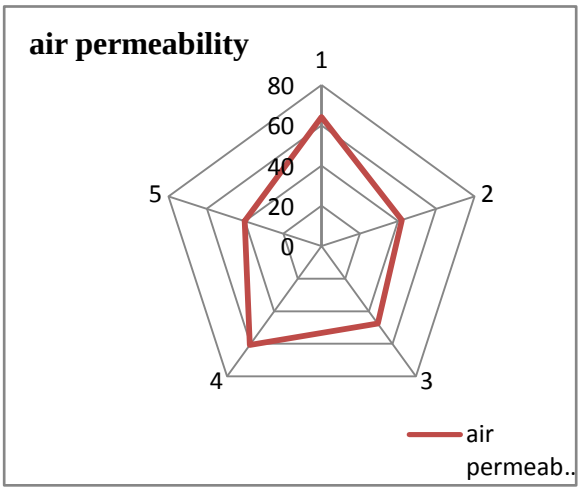

Fig4. air permeability of samples

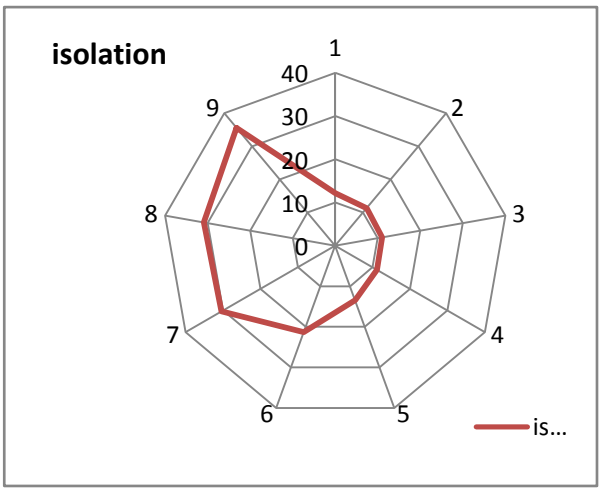

Fig5. isolation resistance of samples

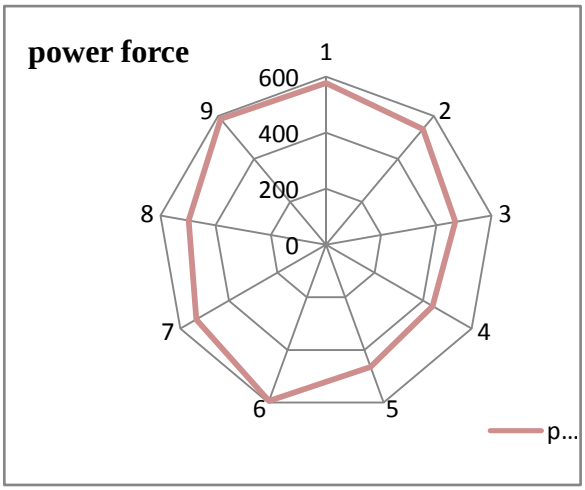

Fig6. power force of samples

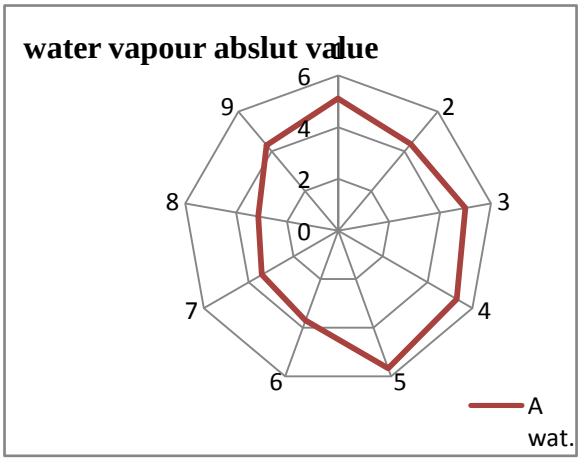

Fig7. water- vapor absolute value of samples

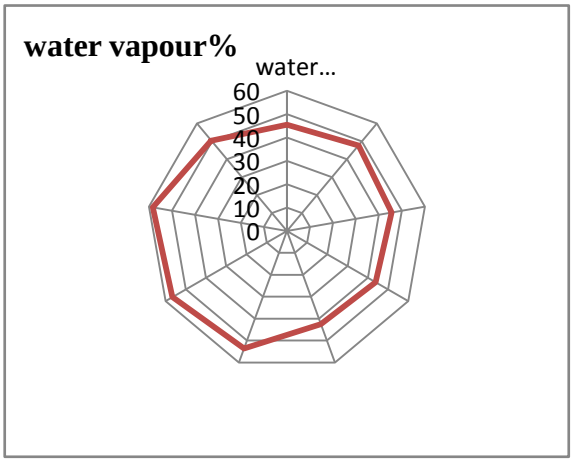

Fig8. water- vapor % of samples

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

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VI. CONCLUSION AND FUTURE WORK

- The ability of water- vapor resistance increase when the ratio of cotton fiber increases.
- The ratio of MF affected on water vapor percentage.
- The higher value of water -vapor resistance was at sample (5), where as the lower value was at sample (8).
- Resistance of power force increase with the increase of PolyesterMF ratio as shown in sample(9), while the lower value of power force was at sample(4), which has more ratio of cotton fiber.
- There are difference in samples weight, with change of yarn density and No. of fibers at MF yarns.
- The higher value of weight was at sample (9), and the lower value of weight was at sample (7).
- The sample number (5) gave the highest value of air permeability, which made from (100% combed cotton yarn).
- As we see in Fig3, the highest sample value of air permeability was in sample
- There is a positive relationship between ratio of cotton fibers and water vapor absolute value, as we can see in fig7
There is a positive relationship between ratio of cotton and Air permeability ratio, as we can see in figure (4).
- There is a positive relationship between number of fibers per yarn cross section and fabric thermal isolation. As we can see in fig5, the higher thermal isolation was at sample No (9).
- Different of sample's weight affected on the results of air permeability, water vapor resistance, and power force resistance.
- Socks offering high water vapour permeability are considered to be more comfortable[(6),] as shown at sample No(9).

In this study we used MF with different numbers, and blend these yarns with cotton yarn, with one blending ratio, and on knitting construction (single jersey).
Study some of the properties of socks we produced like(socks weight, water vapor %, water vapor absolute value, isolation, heat resistance, power force).
From the study of these properties, we had some results of these tests.
The highest value of weight was at sample (9), The highest value of water vapor % was at sample (8),), The highest value of water vapor absolute value was at sample (5),), The highest value of heat isolation was at sample (9),), The highest value of air permeability was at sample (5),), The highest value of power force was at sample (9),
From the previous results we found that, using of MF yarn gave an influence on socks behavior, and gave us more comfortable while wearing these socks.

REFERENCES

[1] Ajmerijitendra Rameshbhai, Critical Study to Improve the Water Transport Properies of Knitted Fabric, Doctor of Philosophy, March-2014.
[2] Ali Afzal, Tanveer Hussain, Statistical models for predicting the thermal resistance of polyester/cotton blended interlock knitted fabrics, International Journal of Thermal Sciences, Vol 85: 40e46, 2014.
[3] Dorin Vlada, Lucian-Ionel Ciocab, Research Regarding the Influence of Raw Material and Knitted Fabric Geometry on the Tensile Strength and Breaking Elongation, Procedia Technology ,Pp 60 – 67, 9 October 2015.
[4] **L. Ott,** An introduction to statistical methods and data analysis. 3rd ed. PWS-Kent, Boston, M.A, **(1988).**
[5] Mthokozisi Sibandaa,b, Walter Fockea,b,⁎, Bicomponent fibres for controlled release of volatile mosquito repellents, Materials Science & Engineering, Pp 754- 761, 15 June 2018
[6] Muhammad Maqsood, Gunnar Seide, Development of biobased socks from sustainable polymer and statistical modeling of their thermo-physiological properties, Journal of Cleaner Production, Vol 197: 170e177, 2018.
[7] Ola Ali Gamil**,** Improving Functional Performance of Cotton Terry Fabrics (Towels) by Using Microfibers, Master Degree unpublished thesis, Faculty of Applied Arts Spinning- Helwan University, Weaving & Knitting Department , 2017
[8] S. Cimilli, M. Özdemir, A Comparative Study of Some Comfort-related Properties of Socks of Different Fiber Types, Textile Research Journal Vol 80(10): 948–957, 2010.