

# Using Eco-friendly materials to achieve the sustainability in the clothing industry

Dr. Shaimaa Mostafa Ahmed

Lecturer of Department of Apparel -Faculty of Applied Arts-Helwan Universty

[shaimaadesign@yahoo.com](mailto:shaimaadesign@yahoo.com)

## Introduction:

The world is emerging to achieve sustainability in all areas, so caring for the environment has become an urgent necessity, where industrial progress had a negative effect on the environment of air, water and land pollution. This has caused an imbalance in the ecosystem, which has led to increased interest in environmental science and its impact on society and its economy. As well as rethinking in everything surrounding the design process, from the idea to the finished product. The concept of product design has been developed to adapt to the environment and work in a way that will not harm it such as (recycling-reuse-alternative energy-use of environmentally friendly materials-use of modern technologies that do not harm the environment). Consumers have become more aware of the need to protect the environment and themselves from the environmental effects of the materials that are being used.

## Research Problem:

The problem of this research is the negative environmental impact from the clothing industry as a result of the use of non-environmental materials, and the possibility of reducing this pollution.

## Research Importance:

The importance of research is to keep up with the progress in conservation of the environment and access to green products.

## Research Aims:

The research aims to use environmentally friendly materials to reduce environmental hazards and obtain sustainable clothing, beside that, opening new markets and increasing competitive advantage in the field of clothing industry.

## Research Methodology:

The research follows the experimental method.

## Practical Study:

Eco Tex tests were done on a product made of traditional cotton and another of organic cotton, the results were analyzed statically and proved that the product made from conventional cotton is slightly different from the product made from organic cotton in Eco-Text test, this difference in acidity (PH)and (color fastness), while the rest tests were for harmful substances, dyes, insecticides and others were not to exceed the allowed limits or not inferred during the test. the following table shows test results of ECO-Text on organic and inorganic products.

Test result of ECO-Tex on organic and inorganic products table (1)

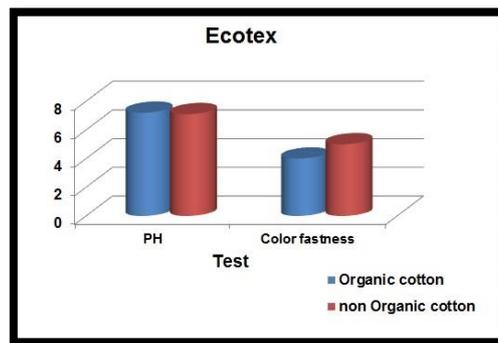
Test	Standard Method	(Organic Cotton)	(non Organic Cotton))
Formaldehyde	ISO 1484-1	ND (Nd less than 16 ppm)	ND (Nd less than 16 ppm)
PH	ISO 3071	7.2	7.1
Heavy metals	EN71-3:2014	Less than 1 ppm	Less than 1 ppm
Color fastness	DIN 53160-1:2010	4-5	5-5
Color fastness to perspiration	OKO Tex	Fast	Fast
Chlorinated phenols(ppm)	ESM7266/2011	ND	ND
Banned pesticides (ppm)	ESM7266/2011	ND	ND
Phthalates (ppm)	ESM7266/2011	ND	ND
Cleavable Aryl amines (ppm)	EN 14362-1,3	ND	ND

the following table shows the difference in color fastness test and PH between organic and inorganic product.

**The difference in color fastness test and PH, table (2)**

Material Type	PH	Color fastness
Organic cotton	7.2	4
non Organic cotton	7.1	5

the following figure shows the difference in color fastness test and PH

**The difference in color fastness test and PH, figure (1)**

Although the ECO-Tex test does not have a clear difference between the product made from organic cotton and the product made from inorganic cotton, it preserves the environment, the consumer, the farmer and all the workers who produce it from the seed to the final product. Benefits of organic cotton and the difference between it and traditional cotton.

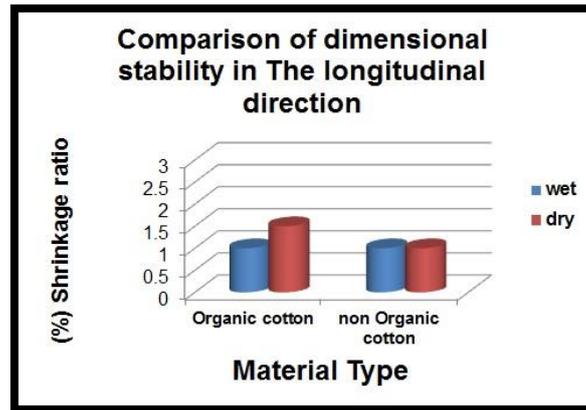
The dimensional stability test of organic and inorganic product was carried out in accordance with (ASTMD7983-17). The results showed that the longitudinal trend of inorganic cotton is lower than organic cotton, and the wet shrinkage ratio in the transverse direction of inorganic cotton is lower than organic cotton, and the dry shrinkage ratio in the transverse direction of

inorganic cotton is lower than organic cotton. the following table shows the Dimensional stability in the longitudinal direction.

### Dimensional stability in the longitudinal direction, table (3)

Material Type	Shrinkage ratio (%)	
	wet	dry
Organic cotton	1	1.5
non Organic cotton	1	1

the following figure shows the Dimensional stability in the longitudinal direction.



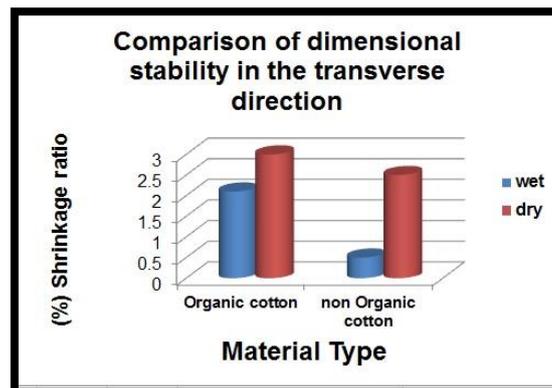
Dimensional stability in the longitudinal direction, figure (2)

the following table shows the Dimensional stability in the transverse direction.

### Dimensional stability in the transverse direction, table (4)

Material Type	Shrinkage ratio (%)	
	wet	dry
Organic cotton	2.1	3
non Organic cotton	0.5	2.5

the following figure shows the Dimensional stability in the transverse direction.



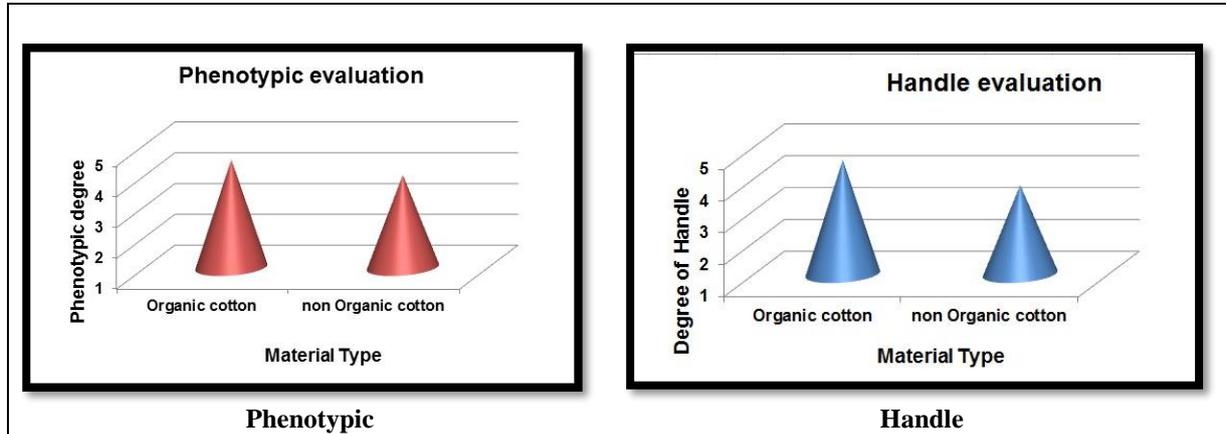
Dimensional stability in the transverse direction, figure (3)

Also, the appearance and handle of the organic and inorganic products were evaluated, by presenting the product to a group of faculty students and a group of consumers, the results proved that organic cotton is better than inorganic cotton in terms of appearance and handle. the following table shows Phenotypic and texture test results

**Phenotypic and texture test results, table (5)**

Material	Test	
	Phenotypic	Handle
Organic cotton	4.5	4.6
non Organic cotton	4	3.8

the following figure shows Phenotypic and texture test results



Organic cotton is characterized by preserving the environment and human health, so it is preferable to use environmentally friendly raw materials such as organic cotton - organic linen - natural dyes .... and other materials that do not cause harm to the environment and humans.

**Keywords:**

Environmental sustainability – Eco-friendly materials – Sustainable fashion – Organic clothing.

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