

Unusual Draping Fashionable Designs Using Anti-Odor Finishing of Dyed/Printed Synthetic Fabrics

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Abstract:

Textile materials can be exposed to contaminate with microbes during production, usage or storage. One of the results of microbial attack is unpleasant odor. Because the unpleasant odor has a negative impact on textiles and their comfort properties so, there is a need for anti-odor finishing which is classified as "novel finish". The greater use of synthetic fibers and blends in such items as shirts, hosiery, blouses, underwear, etc., has accelerated the need for bacteriostatic finishes on clothing.

The research aims to using modified viscose, viscose /polyester and polyester fabrics were draped directly onto the dress form to execute the fashionable clothes designs for women, as the drapeability of fabrics was enhanced after the Quat188 treatment. And, it adds anti-odor properties as new function designs to taken into consideration while designed these clothes. Firstly, covered the axilla, arm and legs causes these parts contained the highest concentrations of odor- causing bacteria. Secondly, the designs clothes matched with the fashion trends during period of the research, for example asymmetrical balance, one shoulder, buff sleeve, ribbon necklace, and purple; turquoise; olive acid green colors. Tie and dye, transfer printing, embroidery using hand stitches and beads were used to finish these fashionable designs.

Keywords:

- ***Draping fashionable designs***
- ***Anti-odor finishing***
- ***Synthetic fabrics,***

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1. Introduction:

As architecture is the art and science of building, so dress is the art and science of clothing. To construct and decorate a covering for the human body that shall be beautiful and healthy, is as important as to build a shelter for it when so covered that will be also both beautiful and healthy.^(1,2) Over time there have been technological innovations within textiles that have impacted on fashion.⁽¹⁾

All clothes have social, psychological and physical functions. Material (or physical functions) functions are protection, concealment, and attraction. Cultural functions (including social and psychological functions) are communication, individualistic expression, social or economic status, political or religious affiliation. Through technology the functions of clothing can be enhanced and new ones are defined.^(2,3)

Designers are aware that the markets react powerfully to innovation, and as fashion is so time sensitive, makes it all the more important to respond quickly. Recent innovations in textile production have particularly focused on fibers and finishing, in comparison the process of producing woven fabric has seen little change.⁽¹⁾

Besides the traditional concept of designing a garment with an eye for better aesthetic value for

satisfying the users, it can be thought of adding some functional value also by utilizing the new textile products and concepts developed through the emerging areas like 'smart and intelligent textiles' so as to set up a new trend growth for upcoming fashion entrepreneurs.^(4,5) Garments made from 'Smart & intelligent textiles' are a foundation for a new fashion philosophy for the 21st century.

Typically much research in this area focuses on health- and medicinally-related uses of clothing and fabrics.⁽⁶⁾

There is a broad continuum of body-centred applications including conventional and 'alternative' medicine; healthcare and therapeutic sectors; cosmetic and personal hygiene sectors.⁽⁷⁾ There are a broad range of outcomes for body-centred products that are applicable to the general consumer and fashion markets.

These include products that:

- ***have improved wearability and comfort levels;***
- ***reduce the need for washing clothes;***
- ***reduce the amount or weight of clothes we have to wear;***
- ***make us feel, psychologically, more secure;***
- ***enhance or stimulate our moods;***
- ***have a deodorant effect.***^(6,8)

Currently there are some well identified areas of

product research and a number of emergent, technological 'clusters'. These clusters may be broadly categorized as follows:

- *Performance and work related*
- *body-centred.*⁽¹⁾

So, this study is a trial to make fashionable clothes with adding some functional value which is a deodorant effect. Body odor is an embarrassment which everybody would have faced in one or the other time. The stench of sweat or dirt may put a person in discomfort, while with others. People look for clothes that smell good, and remain fresh for a longer time, thereby boosting their confidence. They expect specialized finishes that control body odor and remain fresh for a longer time. So, there is a need for anti-odor finishing.⁽⁹⁾

Anti-odor finish: The human sense of smell registers not only quality of different odors but also combines it automatically and often unconsciously with feelings ranging from agreeable to unpleasant.⁽¹⁰⁾

The unpleasant odors have a negative impact on textiles and their comfort properties. It damages the aesthetic function of the fabric.^(10,11)

One way to prevent the development of unpleasant odors that originate from the decomposition of sweat is antimicrobial finishes. They prevent the decomposition of perspiration by bacteria to bad smelling products.⁽¹⁰⁾ The use of biostats to inhibit the development of odor resulting from biological growth on textiles which exposed to perspiration has not been considered a real need until recently.⁽¹²⁾ The greater use of synthetic fibers and blends in such items as shirt, hosiery, blouses, underwear, has accelerated the need for bacteriostatic finishes on clothing.⁽¹²⁾

Draping: Draping or modeling is the manipulation of fabric on a three dimensional form or human body by a designer for the purpose of designing a garment just like a sculptor; modeling allows the fusion designer to work in 3 dimensions to obtain perfect fit and harmony between the fabrics and design of the garment and the silhouette of the individual. Working with actual materials gives a designer greater inspiration and a better indication of the flow and performance of a fabric.⁽¹³⁾

The researchers prefer to use draping methods to create their original designs. The designer can easily see the proportion, fit, balance, and style lines of a design, exactly as it will look on the bodice. So, the draping method was used in this research to execute the designs.

In draping, the original idea often changes, as modifications are introduced throughout the

design process. Or as draping proceeds and the sketch is transformed into a three dimension, modifications may be occur when proportions of design details are related to the human body and the effect of fabrics as it flows and drapes becomes apparent.^(13,14)

The research question was create new fashion trend using anti-odor treatment synthetic fabrics and enhance drapability to draping fashionable clothes.

The research aims to using modified viscose, viscose /polyester and polyester fabrics were draped directly onto the dress form to execute the fashionable clothes designs for women, as the drapeability of fabrics was enhanced after the Quat188 treatment, the antimicrobial finish was used to prevent the sweaty odor in this research.. Tie and dye, transfer printing, embroidery using hand stitches and beads were used to finish these fashionable designs.

2. Experimental work

2.1. Materials

2.1.1. Fabric: Usage treating the fabrics [Bleached 100% viscose fabric (108 g/m²) plain weave 1/1, viscose/polyester (124 g/m²) blends plain weave 1/1 (60/ 40) and 100% polyethylene terephthalate fabric (108 g/m²) were selected, taking into account availability in Egyptian market] with Quat188 by conventional finishing technique i.e. pad-dry cure.

In previews research^(15,16) **testing the treating fabrics** by Quantitative antibacterial activity of the modified fabrics was evaluated against odor-causing bacteria, Gram-negative *Staph Epidermidis* and *Corynebacterium Xerosis*. It was found that the bacterial reduction (%) of viscose fabric reached to (97.2%) and (95%) with *Staph Epidermidis* and *Corynebacterium Xerosis* respectively and the bacterial reduction (%) of viscose/polyester fabric reached to (92.2%) and (92.7%) with *Staph Epidermidis* and *Corynebacterium Xerosis* respectively but in case of polyester fabric the bacterial reduction (%) reached to (86 %) and (83%) with *Staph Epidermidis* and *Corynebacterium Xerosis* respectively. Usage ATCC 7711 & ATCC 12228 test as causing odor bacteria for evaluation the treatments effect.

In addition, The physical properties of Quat188 treated and untreated viscose, viscose / polyester and polyester fabrics, tensile strength, elongation, stiffness, drapeability and roughness properties were improved after the alkali hydrolysis of polyester fabrics and improved for the three fabric types (viscose, viscose/polyester and polyester

fabrics) after treatment with Quat188. Enhancement of drapeability is parallel to the enhancement of the stiffness. The thickness of the viscose, viscose/polyester and polyester fabrics didn't affect after treatment with Quat188.

2.1.2. Chemicals

3-chloro-2-hydroxy propyltrimethyl ammonium chloride (Quat188) (65%) is purchased from Sigma Company. Sodium hydroxide, sodium carbonate, sodium sulphate, peptone, beef extract, agar, trypticase soy broth, and yeast extract were of laboratory grade chemicals, and a non ionic detergent Hostpal[®] CVL-EL Clariant of commercial grade were used in this research.

2.1.3. Dyes and transfer printing paper

Both reactive and direct dyes were used in this study. Reactive dye kindly provided from Alwan Misr Company is Reactobond Blue 3RX.150% (C.I. Reactive Blue 195) and direct dye supplied from Ciba Company is Solophenyl Scarlet Red 200% (C.I. Direct Red 89). Unless otherwise specified.

Transfer printing paper was supplied from Alwan Misr Company. It was saturated with a mixture of two disperse red dyes. The thickener used is fast print 54.

2.2. Methods

2.2.1. Alkali treatment of polyester fabrics.

The polyester fabric was hydrolyzed using molar solution of sodium hydroxide at boiling temperature for 1 hour, and the M: L 1:50. After that the fabrics washed with 1% HCl to neutralize the fabrics, finally washing with tap water several times. The weight loss was \approx 22%.

2.2.2. Treatment of viscose, viscose/polyester and hydrolyzed polyester fabrics with 3-chloro-2-hydroxy propyltrimethyl ammonium chloride (Quat188)

The fabric were weighed and padded through two dips and two nips in the solution containing Quat188 concentrations (18 -12 - 6 g/l), NaOH in order: Quat188 molar ratio (2:1) to approximately 100% wet pick up on laboratory padder. The fabrics were (dry-cure) one step at temperature range (100 ° C for Viscose, and 120° C for viscose/polyester) for time (5 minutes). The fabrics were washed with 2 g/l non ionic detergent at 40C° for 20 minute and M: L 1:50. Finally the fabrics rinsed with hot then with tape water, and air dry.

2.2.3. Dyeing of viscose, viscose/polyester and polyester fabrics with reactive and direct dyes.

Treated viscose, viscose/polyester and polyester fabrics were dyed with reactive and direct dyes by exhaustion method. The dyeing process was

carried out according to the dyeing profiles (conventional dyeing method). After the end of dyeing, the samples were washed in an aqueous solution containing 2g/l nonionic detergent at 40°C for 20 minute. Finally the fabrics were washed with warm water, then with cold water, and dried at ambient conditions.

2.2.4. The printing of polyester fabrics

Hydrolyzed and Quat188 treated polyester fabrics were printed with transfer printing technique at temperatures (210 °C) and time (60 sec.) according the result from previews research.⁽¹³⁾

3. Designs and their draping

A Primary sketch of four designs for women's clothes was drawing. These designs were executed by draping the treated viscose, viscose / polyester and polyester fabrics directly on the dress form.

In this research the treatment with Quat188 adds anti-odor properties as new function properties to the fashionable clothes. There are two points were taken into consideration while designing these clothes;

Firstly: The designs of these clothes should cover the axilla, arm and legs as possible, because these parts contained the highest concentrations of odor-causing bacteria.⁽¹⁷⁾

Secondly: the designs of these clothes matched with the fashion trends during the period of the research. These fashion trends include:

- Asymmetrical balance as skirt in design (1), design (2),and design (4)..
- Dress with one shoulder or one sleeve as in design (4).
- Buff sleeve as in design (4).
- Ribbon necklace and multi row necklace as in design (3).
- The purple color as in design (3).
- The turquoise color as in design (3).
- The olive-acid green color as in design (4).

One of the most parameters which affected with Quat188 treatment is the drapeability of the fabrics. Drape is one of the most important properties of fabric, has played significant role in providing graceful aesthetic effects in garment. Drape is the ability of a fabric to fall under its own weight into wavy folds of different nature. Drapeability of a fabric is combined effect of several factors, finishing of the fabrics one of them because it influences on stiffness flexural rigidity, weight, thickness, stiffness, an attribute of fabric hand is one of the most important factors determining draping quality of fabric. Soft fabric drapes closer to body forming ripples whereas stiff fabric drapes away from the body.⁽¹⁸⁾

As the drapeability of fabrics which used in this

research was enhanced after the Quat188 treatment, this gave us inspiration to use draping method for executing the clothes designs.

The analysis of designs and products

So, in this research the analysis of the designs was according to the elements and principles of fashion design. This analysis was from three aspects:

- * **The structural.** It determines how the garment is constructed or how it is put together to fulfill its function. It determines the structural lines, shapes, and parts in addition to how they will relate to each other, how the garment will fit and where and how it will open and close.
- * **The functional aspects.** It deals with how something work and perform as well as determining the requirements for what the garment must or must not do functionally. As in this research, it expresses to which the designs can provide anti-odor properties to the wearer.
- * **Decorative or aesthetic view.** It deals with the appearance of the garment. It must agree with the functional and structure aspects of design.⁽¹⁹⁾

3.1. Sketch & Draping of design no. (1): as shown in figure (1a-b).



Fig.(1a) Sketch of design (1)

Fig.(1b) Drapping design (1)

***Functional aspects**

This design consists of gathering blouse with long raglan sleeve and long skirt consists of 4 parts of front and back which give a good covering so, it gives excellent anti-odor properties to all parts of women body. The width of the polyester fabric is: 150 cm.

***Structural aspects**

The structure lines in the skirt create a visual interest to this design. They are very decorative with hand stitches (herringbone) as well as structural since they are a necessary part of the garment's construction. Repeating this decoration in the raglan sleeve, neck, sleeve end and elastic waist lines of blouse is gives the desired fitting shape with comfort. The elastic in neck line and in the low waist line in skirt complete the harmony to whole design in addition to giving comfort to the wearer.

***Aesthetic aspects**

The stiff and crisp textures of polyester fabrics were reduced and convert to more smooth after the Quat188 treatment, so, it gives a good form to the garments. The use of different grain lines, lengthwise, crosswise, and diagonal wise, in this design give different view to the same fabric texture and action. Asymmetrical balance in the skirt makes the design more attraction. The pleasing interrelationship of the size of all parts can be observed in this design, by divided it into unequal parts with different shapes. Repeating the decorative hand stitches (herringbone) in blouse and skirt with different stitch size and yarn color allow the eye to move well through whole over the design. And, emphasizes the rhythm in the design as a whole.

3.2. Sketch & draping of design no. (2): as shown in figure (2a-b).



Fig.(2a) Sketch of design (2)

Fig.(2b) Drapping design (2)

***Functional aspects**

The blouse with a cap sleeve and Chinese collar in this design imparts anti-odor properties to the upper part of women body especially for axilla and neck parts. The crossover trouser without darts in this design has interesting silhouette which is fitted until the hip line and flare after can give anti-odor properties to all the lower parts of the women body as the inner and outer leg. The width of the viscose/polyester fabric is: 150 cm.

***Structural aspects**

The opening line in the trouser allows the wearer easy putting in and taking off in addition to creating a decorative effect to the design. In addition to the structural aspect of Chinese collar of blouse it completes the harmony of this design by repeating the curved lines.

***Aesthetic aspects**

A youthful spirit when you look at this design cause using the diagonal lines which imply a powerful movement, vitality. The asymmetrical balance in this design makes the design to be more interest. The decorative hand stitches (herringbone) emphasis the structural and opening lines in both blouse and skirt. The whole design has a pleasing visual unity because all the parts belong to each other.

3.3. Sketch & draping of design no. (3): as shown in figure (3a-b).



Fig.(3a) Sketch of design (3)



Fig.(3b) Drapping design (3)

Functional aspects

This is a fashionable dungaree has a long wide sleeve and pants, which impart anti-odor properties to all parts of the woman body. The fitting upper part of the dungaree allows excellent protection to the chest part as well as to the back

of the body. The width of viscose fabric is: 150 cm.

***Structural aspects**

The structural aspects resented in this design in V neck line shape, which gives easily wearing as well as freedom in addition to its attractive shape with a thin purple line. The sleeves of the dungaree attached directly to the princess lines which provide a fashionable spirit to the design. In this design, there is a corporation between the female shape and loose shape by princess line and flounce sleeve and skirt-trouser.

***Aesthetic aspects**

The different types of lines – straight in the pants and sleeve silhouettes, diagonal in V neck line shape, and curved in princess lines and lower waist line- create the optimum beauty and keep the symmetrical design from being bore. The small circles in the pants balanced the big one in sleeve. The gathering draws the attention to the lower waist line and makes pleasant emphasis, but the long purple necklace make a balance and draw the eye to move from top to down.

3.4. Sketch & draping of design no. (4): as shown in figure (4a-b).



Fig.(4a) Sketch of design (4)



Fig.(4b) Drapping design (4)

Functional aspects

This design is a dress with asymmetrical bodice. Although his dress has one sleeve by pleats at the elbow but the narrow arm hole impart the anti-odor properties to the major part in human body has odor which is axilla. As well as the high neck line, fitted bodice and the long lower part with box pleats give a protection to the rest parts. The width of the viscose fabric is: 150 cm.

***Structural aspects**

The incomplete high neck line with a decorative strip express an interest image to the dress in addition to its structural aim. It gives the wearer the opportunity to put in and take off easily. The loose empire cut allow the wearer comfort as well as the slim and tubular silhouette. The decorative strips which join the box pleats in front and back give the desired silhouette without needing to sew these box pleats.

***Aesthetic aspects**

The empire cut in this design divided it into two parts, the first one is a bodice with asymmetrical balance but the second has symmetrical balance. The buff sleeve is balanced with a high neck line and gathering in the other side. Also sleeveless arm balance the shoulderless part in the other side. The buff sleeve supports the spirits of evening celebrate. Repeating the decorative strips with beads gives a good rhythm.

4. Final of Draping Designs:

The researchers applied previews designs to create new trend in fashion design using anti-odor treatment fabrics to make functional design after it tested anti bacterial properties and physical-mechanical properties to enhance reduction in numbers of bacteria and increase in drapeability.



Fig. (5) Final of draping design (1)



Fig. (6) Final of draping design (2)

4.1. The Final of draping Design (1): as shown in figure (5).

Fabric:

* Woven treated polyester 100% treated with Quat 188

The anti-odor properties:

Reduction percent of *S. Epidermidis* 86%
Reduction percent of *C.Xerosis* 83%

Physico-mechanical properties: tensile strength (81 Kg) – elongation (41%) – stiffness (1602 mgm) – thickness (0.54 mm.) – drapeability (0.459).

Technique:

* Transfer printing using Commercial transfer paper
* Embroidery with herringbone hand stitch.

4.2. The Final of draping Design (2): as shown in figure (6).

Fabric:

* Woven viscose / polyester (60/40) treated with Quat 188.

The anti-odor properties:

Reduction percent of *S.Epidermidis* 92.2%
Reduction percent of *C.Xerosis* 92.7%

Physico-mechanical properties: tensile strength (43 Kg) – elongation (40%) – stiffness (445.8 mgm) – thickness (0.31 mm.) – drapeability (0.323) – roughness (18.87 μ m).

Technique:

* Tie and dye with circles and strips techniques.
* Embroidery with herringbone hand stitch.

Dyes:

* **Reactobond®** Red 3BX.150% (C.I. Reactive Red 195).

* **Reactobond®** Black GF (C.I. Black Mix).



Fig. (7) Final of draping design (3)



Fig. (8) Final of draping design (4)

4.3. The Final of draping design (3): as shown in figure (7).

Fabric:

* Woven 100% viscose treated with Quat188.

The anti-odor properties:

Reduction percent of *S.Epidermidis* 97.2%
The reduction percent (%) of *C.Xerosis* 95%

Physico-mechanical properties: tensile strength (38 Kg) – elongation (28%) – stiffness (1068 mgm) – thickness (0.28 mm.) – drapeability (0.389) – roughness (21-26 µm).

Technique:

* Tie and dye with circles and tied in –object techniques.

* Embroidery with ribbons.

Dyes:

* Reactobond® Red 3BX.150% (C.I. Reactive Red 195).

* Reactobond® Blue 4GXR-RL (C.I. Reactive Blue 194).

* Cibacron® Turquoise Blue GF.

4.4. The Final of draping design (4): as shown in figure (8).

Fabric:

* Woven 100% viscose treated with Quat188.

The anti-odor properties:

Reduction percent of *S.Epidermidis* 97.2%
Reduction percent of *C.Xerosis* 95%

Physico-mechanical properties:

tensile strength (38 Kg) – elongation (28%) – stiffness (1068 mgm) – thickness (0.28 mm.) – drapeability (0.389) – roughness (21-26 µm).

Technique:

* Tie and dye with circles technique.

* Embroidery with beads

Dyes:

* Reactobond® Yellow R (C.I. Reactive Yellow 105).

* Reactobond® Blue 4GXR-RL (C.I. Reactive Blue 194).

5. Conclusion:

- The modified viscose, viscose /polyester and polyester fabrics were draped directly onto the dress form to execute the fashionable clothes designs for women.
- Design unconventional clothes to cover the axilla, arm and leg to prevents unpleasant odor usage treatment fabrics to create new trend in fashion.
- The drapeability of fabrics was enhanced after the Quat188 treatment to easy drape unusual designs on dress form.
- Tie and dye, transfer printing, embroidery using hand stitches and beads were used to finish these fashionable designs to increase the value a decorative aspect in designs.

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