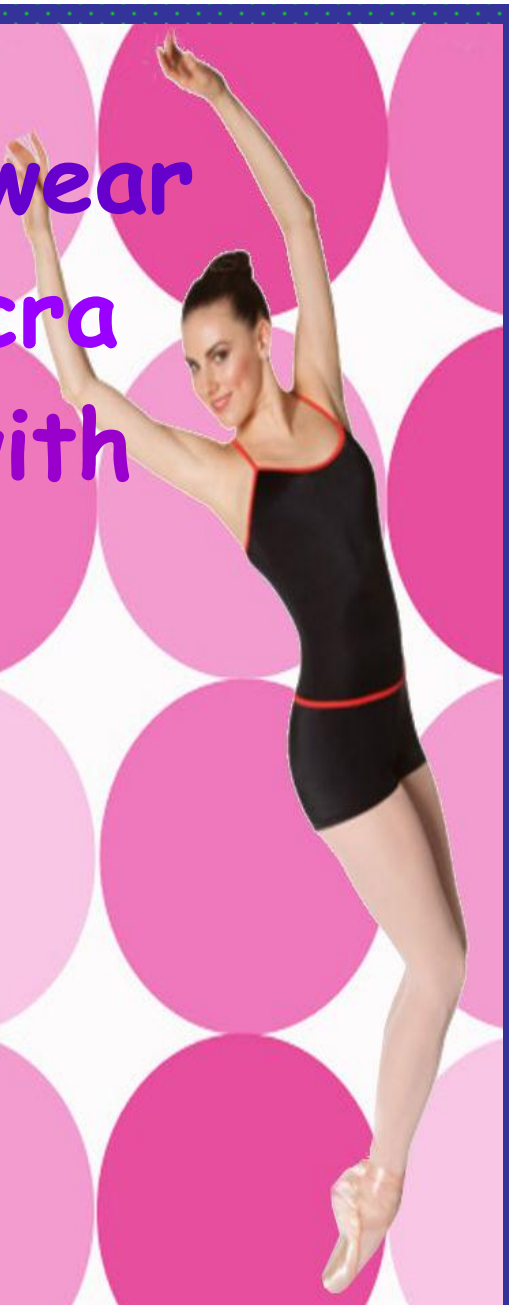
Designing Innerwear using Cotton Lycra Blend treated with Evo® Care Vital



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Abstract

Innerwear helps give proper appearance to the total outlook of the body. Innerwear made of knits is more in demand in the market today. As consumers are becoming more aware of the importance of health and hygiene and there is a growing aspiration for better quality clothing, finishing plays a very important role in the textile and garment industry due to its varied features and value. Functional finish helps alter the performance of the fabric and fulfil specific roles. Keeping in mind the demands for better living, an attempt was made to help fulfil this need. Evo Care Vital which is a wellness finish helps fulfil the needs of protecting the skin. Cotton lycra knit was used for producing innerwear for both women and men since it gives better comfort and support. A theme board 'Lines' was created. Taking into account the forecast of Spring Summer 2011, designs were created consisting of top and bottom innerwear for women and for men. Fibre and fabric tests were done to ensure that it falls within the expected performance standards with positive results obtained in most tests conducted. It is concluded that cotton lycra knit finished with Evo Care Vital has potential to be used for innerwear.

Introduction

One of the key factors to operating a successful business in the field of textiles is innovation. With improved technology in the way, new products or advanced products are coming up in the market.1 One can avoid the use of lotions and creams since finished fabrics have protective properties to guard the skin from harmful UV rays. The main purpose of finishing the fabric is to lose its unattractiveness and improve its serviceability or to fit the purpose of its end use.

Evo® Care Vital is a wellness textile finish. It is a silicon based preparation containing aloe vera, vitamin E and jojoba oil. It helps in protecting the skin against premature ageing, harmful UV radiation and pollution. Evo Care Vital gives textiles anti ageing properties and also provides a soft silk like feel. If the fabric worn next to the skin is finished with Evo Care Vital, it gives a pleasing cooling effect. Therefore this finish is suitable for textiles that comes in contact with the skin.[2]

Innerwear is normally worn next to the skin. According to Stone[3], Innerwear is worn for a variety of reasons like warmth, comfort and hygiene. According to Menezes[4], innerwear fabrics blended with lycra gives better comfort and lasting support. No special care is required. Even if repeated laundry is performed, the shape of the garment will be retained. People tend to incline towards cotton or cotton blends when it comes to innerwear. It has been widely accepted as the most comfortable fabric for innerwear.[5]

Objectives

- To understand the process of application of Aloe Vera, Vitamin E and Jojoba oil on cotton lycra blend.
- To investigate the properties of Evo Care Vital treated for cotton lycra blend
- To establish a trend in preference for innerwear (ladies and men's)

Methodology

1. **Exploratory phase-** Relevant literature was collected related to the research topic from primary and secondary sources which include journals, reference books, internet, unpublished dissertation and information from textile experts. While collecting the literature needed, trends for innerwear were also identified.

2. **Designing phase-** A theme board is essential for the designing process; therefore, according to the colour forecast of Spring Summer 2011(Plate No. 1) a theme board was created, "lines" (Plate No. 2). Using the theme board, styles, patterns and features of innerwear were designed for both women and men. Total number of designs created was 24. Refer Plate no.5-8. (Click here to view refer Plate no. 5-8)

Plate 1: Colour forecat of Spring Summer
Source: fashiontrendsetter.com/Lenzing Color Trends Summer

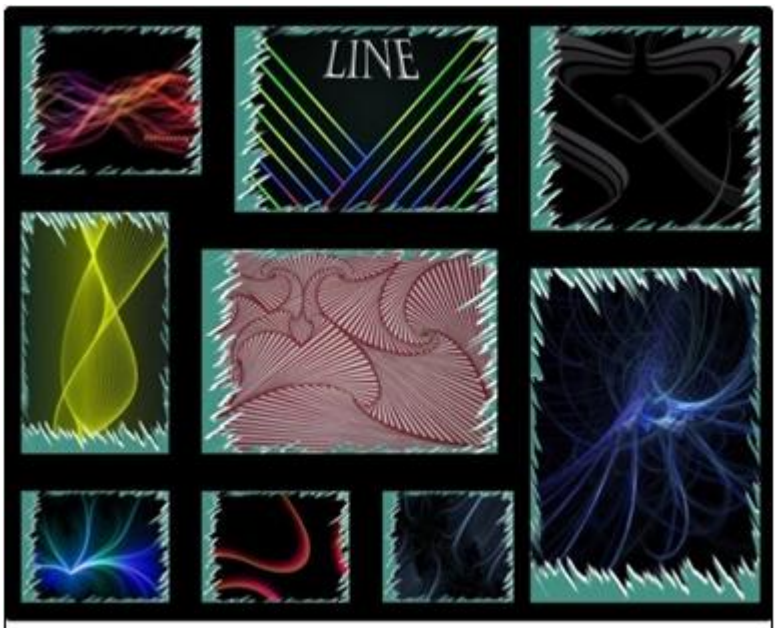


Plate no. 2 Theme board "lines"

3. **Survey-** A structured questionnaire was formulated consisting of both close ended questions and open ended questions. In close ended questions, an inquiry was made to record personal details, preference for cotton lycra knits as innerwear, preferred colour, awareness of any special property in innerwear, buying behavior and the respondents' preference for ranking the styles for women and men's innerwear. An open ended question was formulated to seek suggestions on how to improve the study further. The sampling technique used for selection of respondents was purposive sampling technique.

4. **Fibre identification testing-**

- **Qualitative analysis-** Burning test, microscopic test and solubility test were performed to identify the fibre. The chemicals used in solubility test were 70% H_2SO_4, 90% Formic acid, Cupramonium solution and N, N-dimethyl acetamide. Reactions were noted for the tests mentioned.
- **Fabric testing-** To evaluate the physical properties of the fabric, the tests conducted were- GSM (ISO 3801-1977), Fabric count, Elongation (ASTM D 5035-95 [Standard Test Method for Breaking Force and Elongation of Textile Fabrics {Strip method}]), Abrasion (ASTM D 4966-10 Test Method for Abrasion Resistance of Textile Fabrics [Martindale Abrasion Tester Method]) and Bursting strength (ASTM- 07 Standard Test Method for Bursting Strength of Textiles- Constant- Rate- of- Traverse [CRT] Ball Burst Test).
- **Fastness tests-** To evaluate the fastness properties of the fabric, the tests conducted were- laundry fastness (Standard test IS: 3361-1979), crock fastness (AATCC Test Method 8-2007 [Colorfastness to Crocking: AATCC Crockmeter

Method]), perspiration fastness (AATCC Test Method 15-2009) and light fastness (AATCC Test Method 16-2004).

5. **Product development phase-** The data collected from the survey was analyzed and interpreted. The most preferred designs were identified. Designs were created for a two colour combination according to the two most preferred colour combinations in the survey.

- **Application of the dye-**

Materials:
Fabric- Ready to dye Cotton lycra (95% and 5%respectively)
Dye- Reactive Dye (Remazol)
Other auxiliaries- Glauber salt, soda ash and non-ionic soap solution

Recipe:

Table No. 1 Recipe for Dyeing

	Fabric 3 (Black Ink)	Fabric 4 (Spring green)
Weight of the fabric	284.6 gms	572.8gms
Percent shade	7%	0.5%
Stock solution	300 ml	600 ml
MLR	1:500	1:25
Glauber salt	60 gpl	30 gpl
Soda ash	20 gpl	10 gpl
Temperature	65° C	65° C
Non-ionic soap solution	2 gpl	2 gpl
Temperature for soaping	60° C	60° C

- **Application of the finish**

Technical data:
Colour- Clear yellowish to orange liquid
pH 4-6
Ionic nature- Weakly cationic
Dilution procedure- Pour cold water onto the product to dilute
Stability- The product is sensitive to alkali.

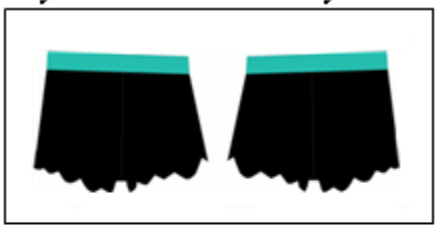
Exhaust application:
Evo care vital= 6-10%
Liquor pH= 4.5-5 (acetic acid)
Temperature time= 20-40°C
Temperature time= 10-20 mins
Dry at 80-100°C

- **Costing**
  The cost price of the most preferred garment for each category was calculated in order to check the willingness of the respondents to purchase the garment. Refer table no. 1

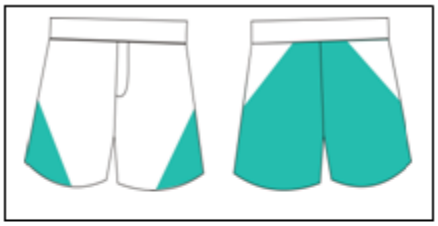
Table no. 2 Cost of innerwear in Rupees

	Style 1	Style 2	Style 3	Style 4
Fabric cost: Bright white	-	-	19	25
Black ink	13	5	-	-
Spring green	2	40	19	25
Labor cost	50	50	50	50
Elastic	1	-	3	-
Dyeing	3	5	3	5
Evo Care Vital	23	40	50	58
Total	92	140	144	163

Key: Style 1- women's boy short

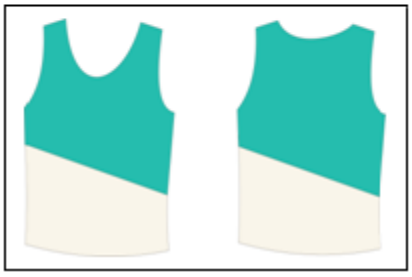


Style 3- men's boxers



Style 2- women's camisole

Style 4-men's vest



Results and discussion

Innerwear designs were produced using cotton lycra knits for this study. A survey was conducted to gather preference for the designs created. Tests were conducted to evaluate the characteristics of fibre and fabric of cotton lycra knit, qualitatively and to assess its physical and fastness properties before and after treatment with Evo Care Vital.

1. Survey results and analysis

- Preference of cotton lycra knit for innerwear

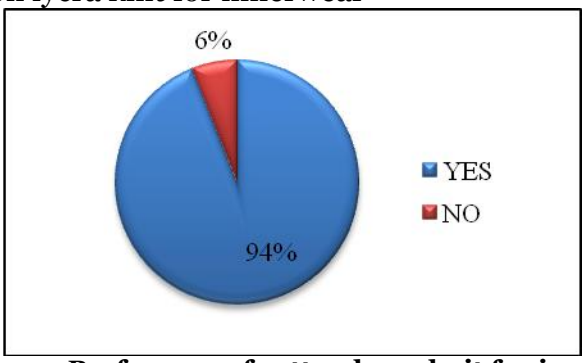
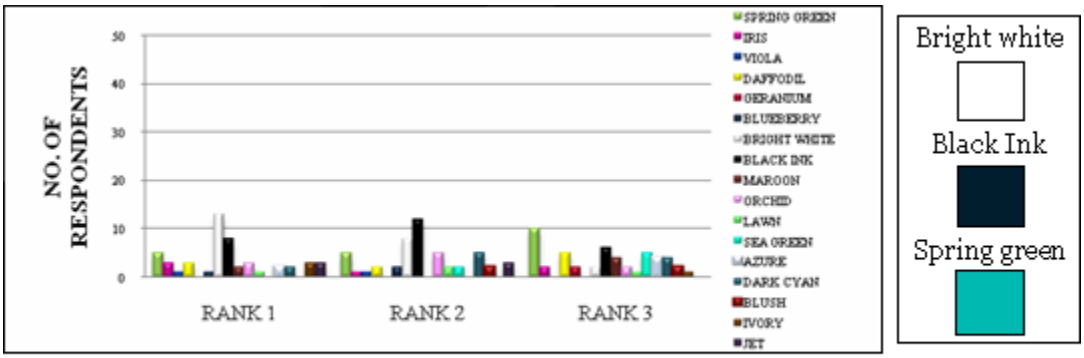


Figure no. 1 Preference of cotton lycra knit for innerwear

The given preference by the respondents as shown in Figure No.1 indicates that 94% of respondents preferred cotton lycra knits for innerwear and 4% respondents prefer 100% cotton for its comfort properties.

- Preference of colours for innerwear



*Source for colours- Spring Summer colour forecast

Figure No.2 Preference of colours for innerwear

The colour preference shown in Figure no. 2 indicates the choice of white as rank 1 followed by black, spring green and orchid with blueberry ranked as fifth.

- Preference for a two colour combination for innerwear

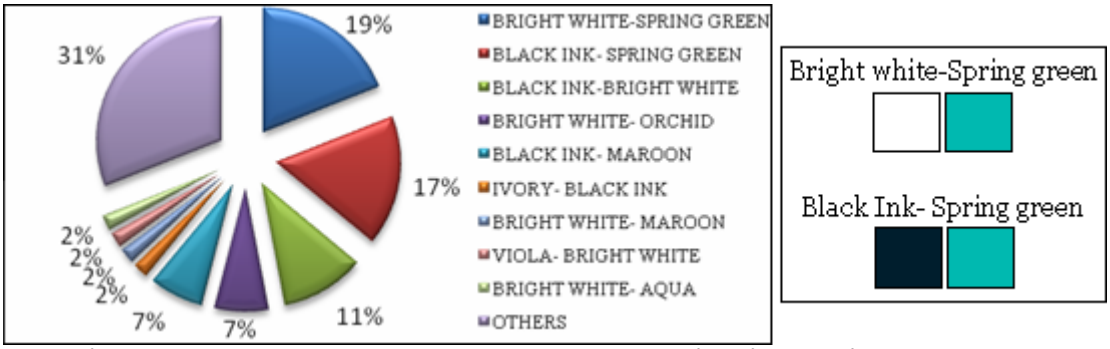


Figure No.3 Preference for a two colour combination for innerwear

The colour preference by the respondents as shown in the Figure No. 3 indicates that 19% of respondents preferred bright white and spring green combination for innerwear.

- Awareness of innerwear fabric that have special properties

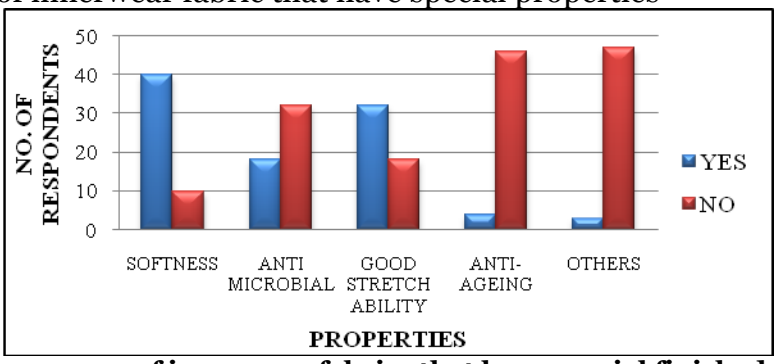
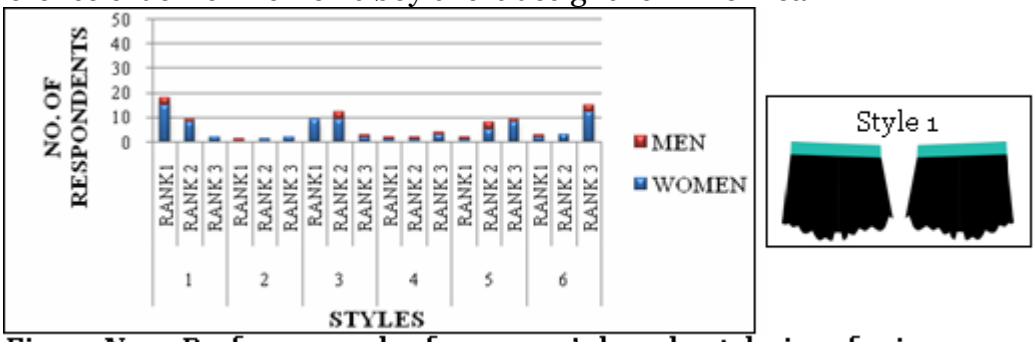


Figure No.4 Awareness of innerwear fabrics that have special finished properties

80% respondents were aware of softness finish, 36% were aware of antimicrobial finish, 64% respondents were aware of garments with high stretch ability property, 8% of the total respondents were aware of the term anti- ageing finish and only 6% respondents were aware of specialty finishes like fragrance finish.

- Preference order for women's boy short designs for innerwear



- **Figure No. 5 Preference order for women's boy short designs for innerwear**

From the data analyzed in Figure No. 5, it was found that Style 1 (plain and simple) was preferred most

- Preference order for women's camisole designs for innerwear

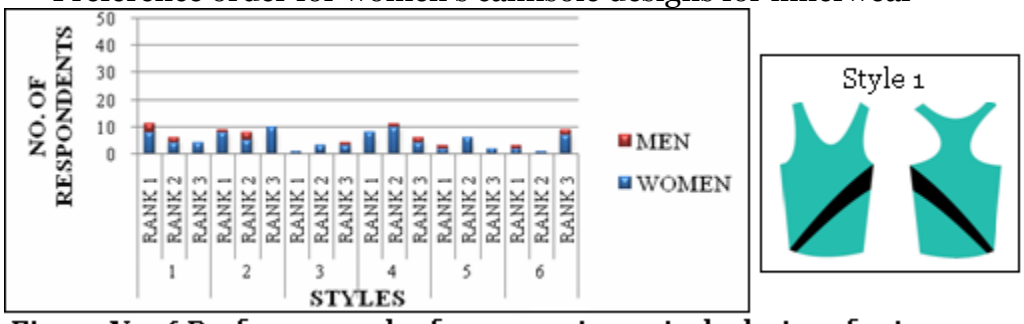


Figure No. 6 Preference order for women's camisole designs for innerwear

The data analyzed shows that respondents ranked Style1 (patch in the front and back part) as the most preferred.

- Preference order for men's boxer designs for innerwear

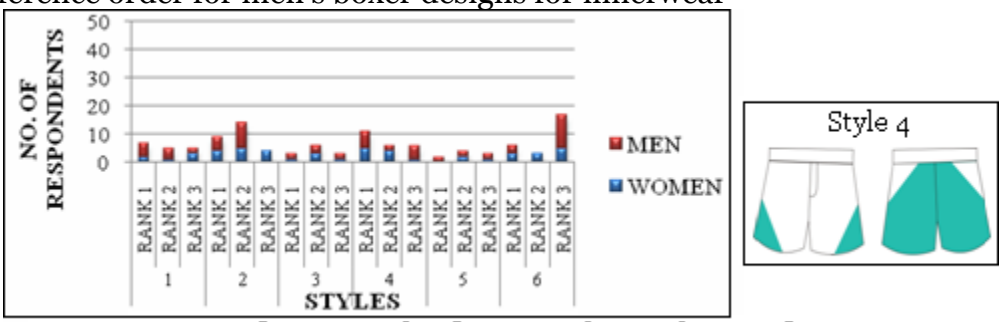


Figure No. 7 Preference order for men's boxer designs for innerwear

From the result represented graphically in Figure No. 7, it can be seen that Style 4 (slanting cut at the side) was preferred most

- Preference order for men's vest designs for innerwear

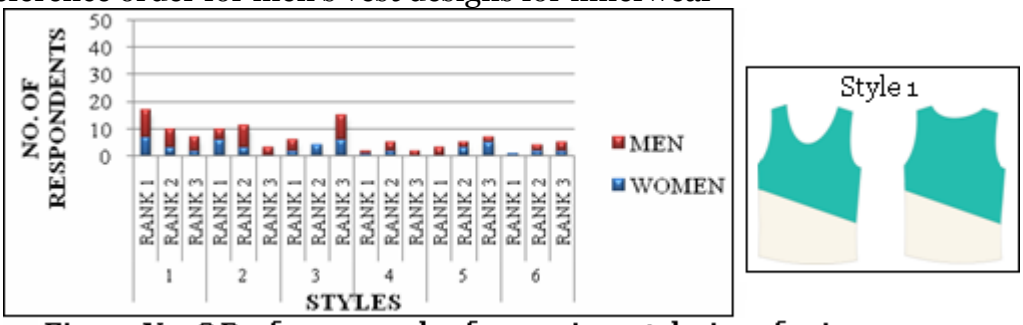


Figure No. 8 Preference order for men's vest designs for innerwear

On analysis of data for men's vest, it was revealed that Style 1 was the most preferred due to its simplicity

- Pricing for innerwear

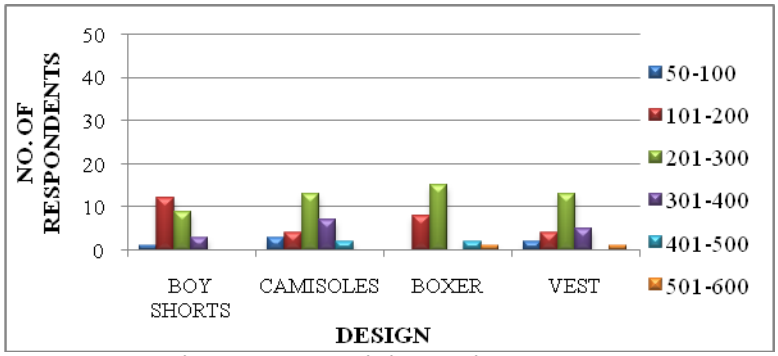


Figure No.9 Pricing of innerwear

Considering the data in Figure No. 9, the following table was made:

Table No. 2 Cost range preference for innerwear

Design	Range in Rs.	Percentage of Responses
Boy shorts	101-200	48%
Camisoles	201-300	45%
Boxer	201-300	58%
Vest	201-300	52%

- Developing the products

Plate no. 3 Designs for women's innerwear [Style no. 1 (Boy shorts) and Style no. 2 (Camisole)]

Plate no. 4 Designs for men's innerwear [Style no. 3 (Boxers) and Style no. 4 (Vest)]

2. Qualitative analysis of the fibre content

From the three different tests conducted i.e. burning test, microscopic test and solubility test, it is clear that the fabric is a blend. It is composed of cotton and lycra as stated by the fabric supplier.

3. Physical properties

The test results are as follows:

Table no. 3 Evaluation of physical properties

Tests	Average Results			
	Fabric 1 	Fabric 2 	Fabric 3 	Fabric 4 
GSM	162g	165g	165g	165g
Fabric count				

• Wales/inch • Courses/inch	45 48	45 48	45 48	45 48
Elongation • Breaking strength • Extension	 10.17kgf 226.1%	 11.74kgf 229.3%	 11.98kgf 233.7%	 11.89 231.3%
Abrasion resistance • No. of pills	 12 pills	 10 pills	 10 pills	 10 pills
Bursting strength	225 N/cm²	225N/cm²	225N/cm²	225N/cm²

Key: Fabric 1- Undyed sample, Fabric 2- Bright white, Fabric 3- Black Ink, Fabric 4- Spring green

4. Fastness tests

4.1 Laundering fastness test

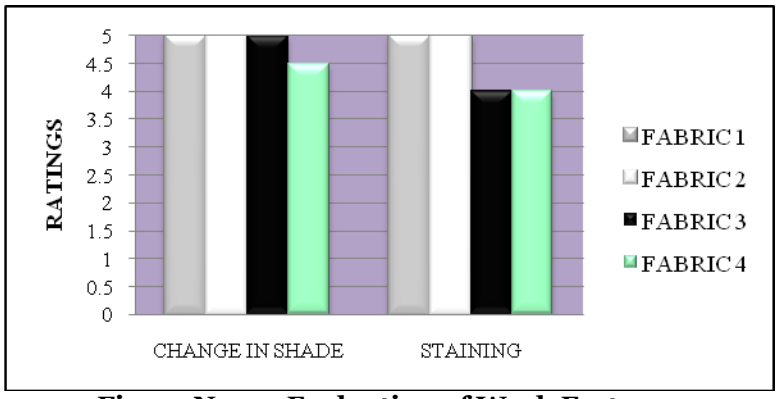


Figure No. 10 Evaluation of Wash Fastness

As seen in the data above the finished bright white cotton lycra knit has very excellent wash fastness, whereas the finished black ink and spring green fabric has little staining on the white cotton cloth.

4.2 Crock fastness test

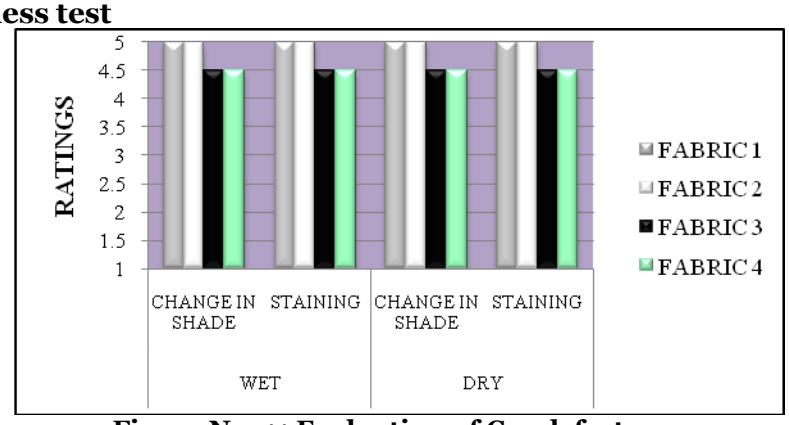


Figure No. 11 Evaluation of Crock fastness

Thus it was found that the given dyed cotton lycra knits have good crock fastness properties and therefore suitable for constructing garments

4.3 Perspiration fastness test

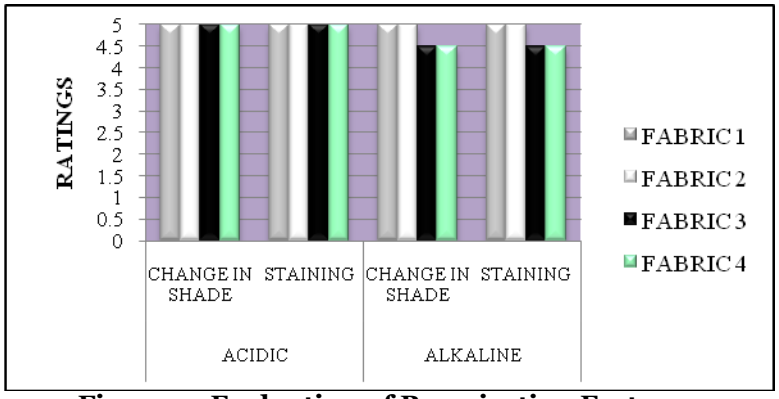


Figure 12 Evaluation of Perspiration Fastness

As shown in Figure 12, the finished cotton lycra knit has very good perspiration fastness.

4.4 Light fastness test

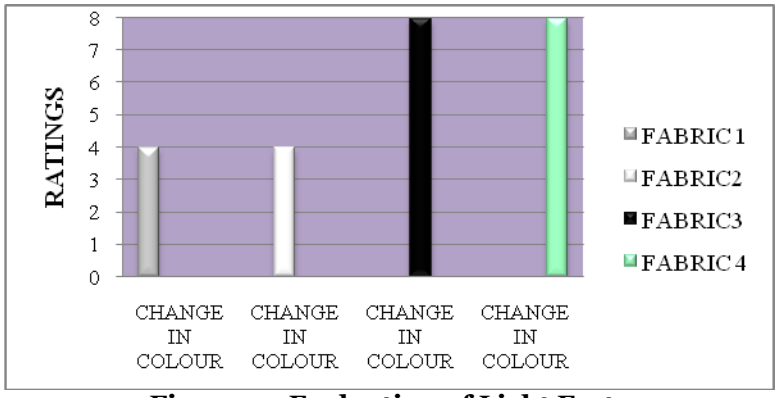


Figure 13 Evaluation of Light Fastness

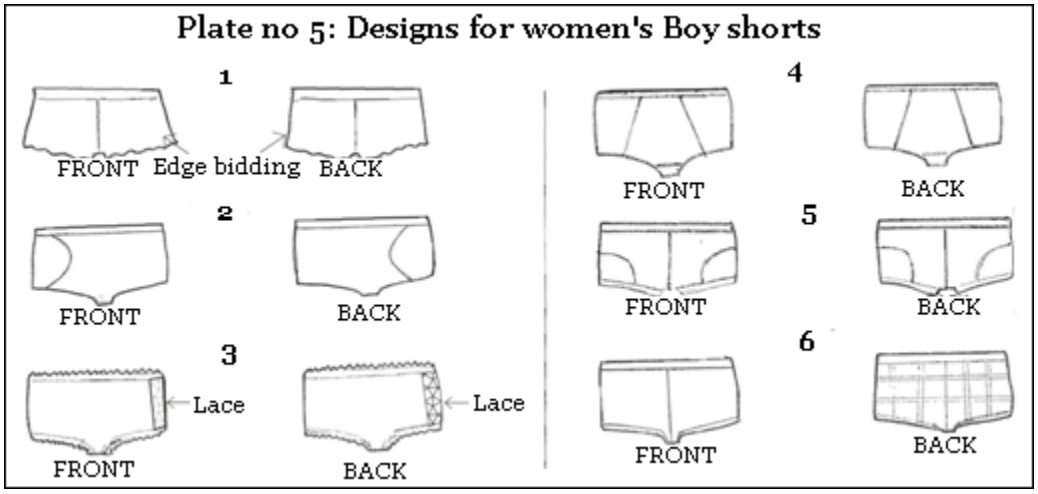
From the data above, it is seen that Fabric 3 and 4 show excellent light fastness property whereas Fabric 1 and 2 show some change in colour in terms of yellowing.

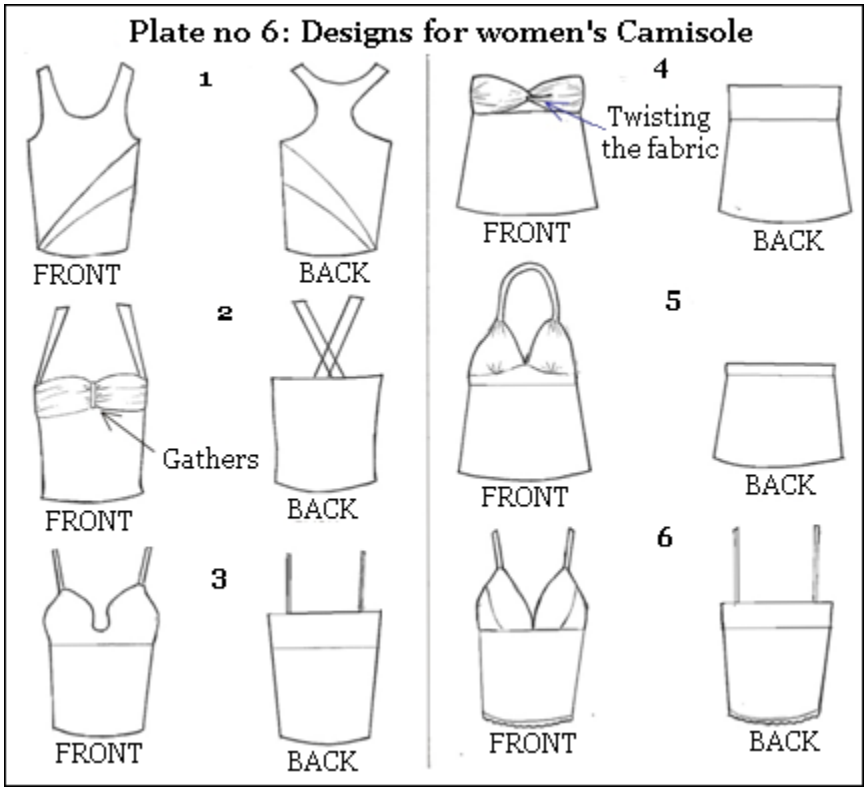
Summary and Conclusion

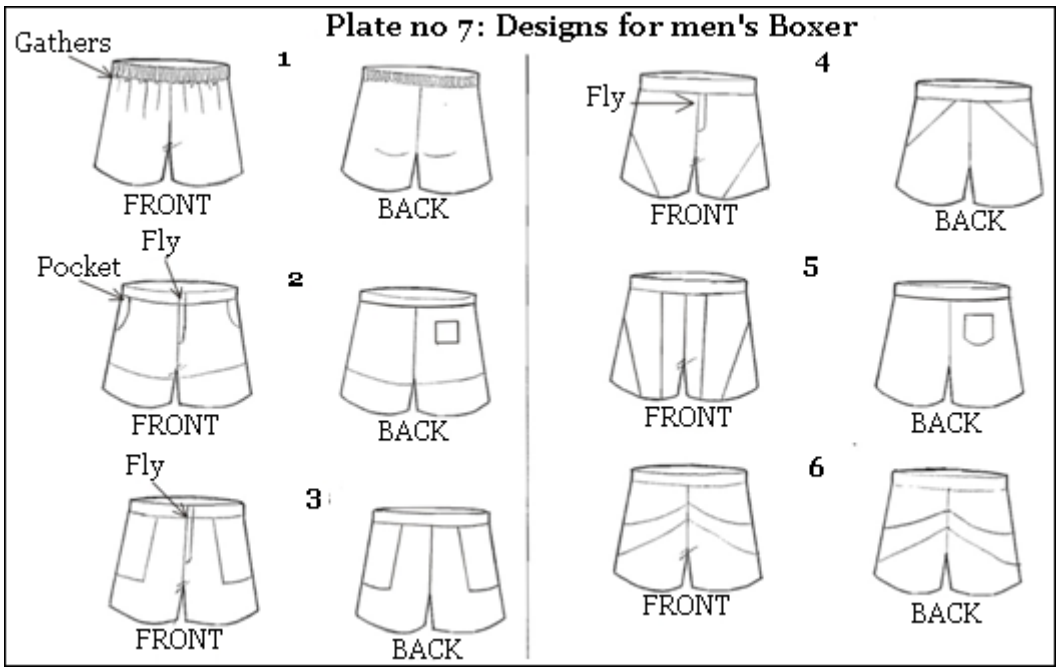
The study aimed at using cotton lycra blend treated with a functional finish Aloe vera, Vitamin E and Jojoba oil (Trademarked Evo Care Vital) for the development of innerwear. The study involved the exploratory phase, designing and developing phase, survey, fibre and fabric testing and product development phase. Conclusions drawn from the research data gathered through the survey was that respondents tend to select designs having a classic look. They did not prefer the designs which would add bulk when worn. The factors influencing the choice of selection of the designs were its comfort property when in use and overall appearance. 47% of respondents were aware of the special finishes like softness, antimicrobial, dimensional stability and anti-ageing.

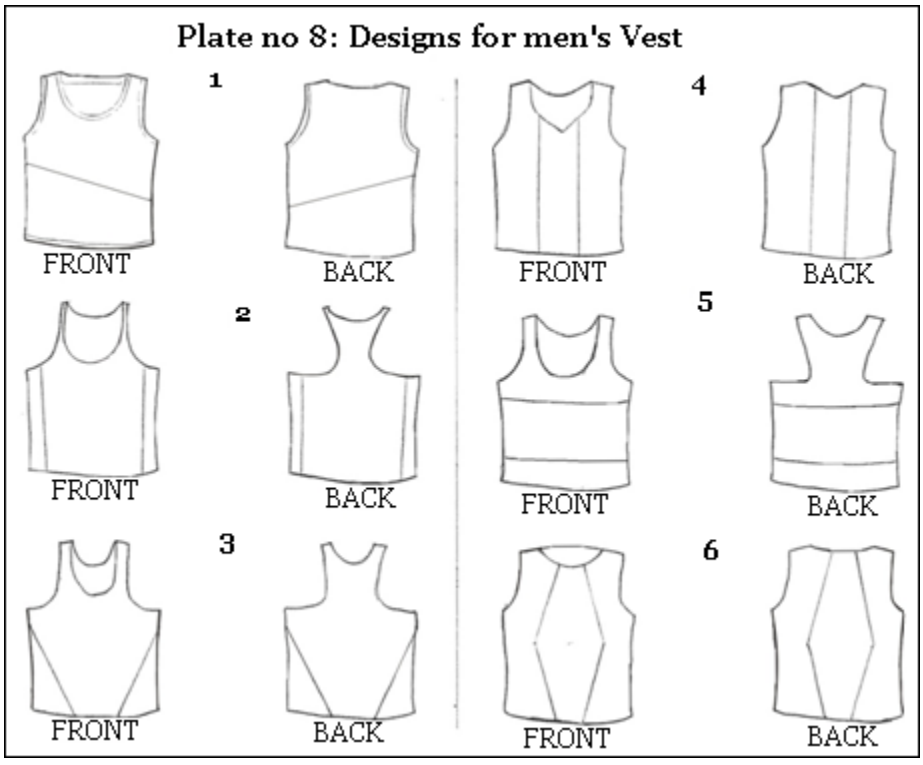
The use of cotton lycra knits for innerwear was widely accepted by respondents. The colours used for product development was according to the preference of respondents, that is spring green, black ink and bright white. The pricing was based on how much the respondent was willing to spend on particular merchandise. Overall, all the designs created were appreciated and accepted.

Conclusions drawn from fibre and fabric tests were- the dyed treated fabric showed good light fastness property in comparison to the undyed fabric that showed some yellowness as change in colour. The treated fabrics showed good perspiration, crock and wash fastness properties when compared to the untreated sample. Treated cotton lycra knit showed better abrasion resistance when compared to the untreated one. The given cotton lycra knit has good elongation property and bursting strength which was needed for innerwear.









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Acknowledgement

Our appreciation goes to the respondents, Personnel at DyStar India Pvt. Ltd., Rabale, Navi Mumbai for sponsoring the chemicals and dyes, Researchers at UICT, Matunga, for helping me conduct the tests in their lab, Krishna Knitwear Technology Ltd. Lower Parel, for supplying the fabric, libraries at various institutes, faculty of College of Home Science Nirmala Niketan and friends. All queries regarding the finish and its application may be directed to DyStar India Pvt. Ltd.

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"This article was originally presented at the 88th Textile Institute World Conference Shah Alam, Selangor, Malaysia, May, 2012".