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# Consumers' Observation on Sweat Stains and the Need for a Sustainable Solution to Control Malodour in Fabrics

R.I Sathya[1], Felicia Sunil[2],
[1]*Professor and Head of Department of Home Science, GRI University, Dindigul*
[2]*Associate Professor, Department of Home Science, Bishop Cotton Women's Christian College, Bangalore*

***Abstract:** This article empirically analyzes the consciousness the consumers have on the level of sweat on a normal day, and the intensity of malodor caused due to sweating on fabrics using the rank order rating scale. The fabric used for the study is Silk. There are four types of natural silk which are commercially known and produced in the world. Among them mulberry silk is the most important with the other three falling into the category of non-mulberry silks namely Tussar, Eri and Muga [1]. Mulberry silk comes from the silkworm, Bombyxmori which solely feeds on the leaves of mulberry plant. Eri silk is the product of the domesticated silkworm, Philosamiaricini, that feeds mainly on castor leaves. Muga silk is obtained from semi-domesticated multivoltine silkworm, Antheraeaassamensis. Mulberry silk contributes to major silk production in the world [2], [9]. Silk is the only natural protein filament that can be converted into textiles by weaving or knitting. Being a protein fiber, it is susceptible to attack by microbes found on the skin and fluid substances picked up from the surrounding environment. Warm and humid conditions still aggravate the problem.[3] When sweat comes in contact with bacteria, it causes malodor, staining, deterioration and discoloration of silk fabrics [4]. Therefore, this study is undertaken to collect information from regular users of Silk fabrics, the disadvantages caused due to sweating, furthering the cause to conduct research on Silk fabrics by coating it with eco-friendly finishes to control microbial growth.*

***Keywords:** Mulberry Silk, Bombyxmori, sweat, microbes, bacteria, malodour, eco-friendly agents.*

## I. INTRODUCTION

The demand for hygienic clothing by the consumers has resulted in increase in demand of antimicrobial products. Clothing is constantly in contact with the microbes in the environment and the skin flora. Silk is a highly hygroscopic fibre with moisture regain of 10-15% [5]. Moisture from silk attracts the microbes from the air, and tends to grow rapidly under warm and humid conditions. The microbes reacts with the sweat and not only damages the fabric by causing staining, discoloration and deterioration, but also causes malodor and harmful reactions to the skin like irritation, itchiness, rashes, eczema etc. Body odour is simply defined as the unpleasant odour given off by the body as a result of bacterial activity producing odorous compounds. Sweat itself is odourless by nature.

Bacteria that cover the surface of the skin break down sweat; and they feed on it. When the bacteria break down the sweat they form products called thioalcohols, which have scents comparable to sulfur, onions or meat [6]. To control malodour caused due to sweat, it has become imperative to apply a special finish which fights bacteria.

Several antimicrobial finishes are available in the market which is effective and controls the growth of bacteria in Textiles. Most of the antimicrobial agents are synthetic in nature. Although synthetic antimicrobial agents are very effective against a range of microbes and give a durable effect on textiles, they are a cause of concern due to the associated side effects, action on non-target microorganisms and water pollution [7].

Therefore, there is a great demand for fabrics to be treated with antimicrobial agents from natural extracts which protects the fabric as well as complies with statutory requirements imposed by regulatory agencies. Naturally available herbal agents have been in use for several centuries for its beneficial bioactive components by natural medicine. They are available locally, is inexpensive, environmental friendly, and a source of renewable raw material [8].

Fabrics susceptible to microbial attack when coated with a herbal finish, controls the growth of harmful bacteria and reduces malodour from sweat, protects the skin from microbial attack, protects the fabric from discoloration and deterioration, and gives longer durability to the fabric.

## II. MATERIALS AND METHOD

Information is collected through a questionnaire on why it is important to apply antimicrobial finish on textiles. Demographics is collected from women who wore tight-fitting clothes which is usually the upper garment of a saree called the choli or ravika; lehenga, churidar etc. This study is conducted on silk fabrics, as it is one of the most favored versatile natural textile fabric by women for its luster, softness, color, beauty, aesthetic sense, texture and rustle. A questionnaire was framed keeping in mind the population type and size. The population size was 300 women between 18-60 years most of whom were students and staff of a Women's College in Bangalore. Demographics such as Name, Age, Educational Qualification, Annual family income, Type of family, Food habits and Budget on clothing were collected.

The participants were asked if they were able to distinguish between Synthetic and Natural fibers by feel. The respondents were asked to rate their sweat on a normal day, and whether they had noticed any malodour, skin irritation or allergy due to wearing silk fabrics; or staining or fading of clothes. The respondents were asked about their awareness of different types of Silk fabrics available in the market, like Mulberry Silk, Eri Silk, Muga Silk and Tussar Silk. They were asked to give the advantages and disadvantages of choosing to wear silk on a daily basis and festive occasions. Finally, the respondents were asked to give their opinion about choosing Synthetic or Natural agents as a finish to silk fabrics, to reduce microbial growth, malodor, staining and deterioration of fabrics as well as keep the skin free from irritation and allergy.

## III. RESULTS AND DISCUSSION

The respondents belonged to the middle income group of nuclear families who were educated up to the under graduate level. About 66% of the respondents were non-vegetarians compared to 34% of vegetarians. About 80% of the respondents were able to distinguish between Synthetic and Natural fibers by physical touch. Highest percentage of about 32% who responded that they sweated lightly on a normal day were non-vegetarians, followed by 18% vegetarians, who noticed malodour, staining and fraying of silk garments due to sweat reacting with microbes. Of all the type of Silks available in the market, Mulberry Silk fabrics was the most popular followed by Tussar Silk, Muga Silk respectively, and finally Eri Silk which was the least popular. Only 43% of the respondents were aware of anti-perspiration finish in the market, compared to 57% who were not aware of such a finish. Finally, 32% of the respondents preferred to have the Textile Silk fabrics finished with anti-perspiration finish using herbs, compared to 68% who were not aware of such a finish.

TABLE I
Socio-economic Status of the Respondents

| S.No | Socio-Economic status | No of respondents | Percentage % |
|---|---|---|---|
| 1 | Type of Family<br>a) Nuclear | 243 | 81 |
| | b) Joint | 57 | 19 |
| 2 | Age group (years)<br>a) 18-25 | 69 | 23 |
| | b) 26-35 | 81 | 27 |
| | c) 36-45 | 84 | 28 |
| | d) 45-60 | 66 | 22 |
| 3 | Annual Income of family<br>a) <3 Lakhs | 90 | 30 |
| | b) 3-5 Lakhs | 84 | 28 |
| | c) 5-7 Lakhs | 72 | 24 |
| | d) 7-10 Lakhs | 54 | 18 |

TABLE II
Food Habits and Rate of sweating on a normal day

| S. No. | Food Habits (Total respondents = 300) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vegetarians | | | | | | Non-Vegetarians | | | | | |
| | No. Of Respondents | | | Percentage | | | No. Of Respondents | | | Percentage | | |
| | 102 | | | 34 | | | 198 | | | 66 | | |
| 2 | Rate of sweating on a normal day | | | | | | | | | | | |
| | L | M | H | L% | M% | H% | L | M | H | L% | M% | H% |
| | 54 | 26 | 22 | 18 | 8.6 | 7.3 | 96 | 58 | 44 | 32 | 19.4 | 14.7 |

Key: L- Light, M- Medium, H- Heavy.

TABLE III
Identification of fabrics, and awareness of Silk fabrics

| S.No. | Identification and Preference of fabrics for daily wear | | | | |
|---|---|---|---|---|---|
| 1 | Are you aware that Rayon, Acrylic and Polyester are synthetic fibers? | Yes<br>240 | Percentage %<br>80 | No<br>60 | Percentage %<br>20 |
| 2 | Do you prefer Natural or Synthetic fabrics for your garments?<br>a) Natural | 252 | | 84 | |
| | B) Synthetic | 48 | | 16 | |
| | Awareness of Silk fabrics | | | | |
| 3 | Are you aware of the following types of Silk in the market? | Yes | % | No | % |
| | a) Mulberry silk | 228 | 76 | 72 | 24 |
| | b) Eri Silk | 108 | 36 | 192 | 64 |
| | c) Muga Silk | 132 | 44 | 168 | 56 |
| | d) Tussar Silk | 168 | 52 | 132 | 44 |

IV TABLE
Customers' preference and disadvantages of wearing Silk

| S.No. | Customer's preference of Silk clothes | | |
|---|---|---|---|
| 1. | Would you wear Silk garments for the following reasons? | No. of Respondents | Percentage % |
| | a. Good durability | 126 | 42 |
| | b. Drapability | 78 | 26 |
| | c. Design and Motifs | 84 | 28 |
| | d. Colour | 132 | 44 |
| 2. | Disadvantages of wearing Silk clothes everyday | | |
| | a. Discomfort from prolonged wear | 78 | 26 |
| | b. Discoloration due to sweat | 60 | 20 |
| | c. Weakening/tearing | 60 | 20 |
| | d. Care and maintenance | 102 | 34 |
| | e. All the above | 168 | 56 |

## IV. SUMMARY AND CONCLUSION

From the questionnaire survey, we find that consumers are increasingly aware of health and hygiene in their clothing. We can also elucidate from the survey that non-vegetarians do sweat a lot compared to vegetarians coming to the conclusion that there is a relationship between eating meat and sweating [Table II].The respondents would prefer to wear fabrics made of natural filaments rather than synthetic filaments. To increase the level of comfort during wear, they prefer to have their clothes coated with an agent which is environment friendly, and also good to the skin. Presently, several studies have been conducted on antimicrobial finishes using synthetic agents on cotton fabrics. Hence it is recommended that studies be conducted on application of herbal agents on Silk filaments, of the Bombyxmori species, as it is the most produced silk in India, to control the growth of bacteria causing malodor.

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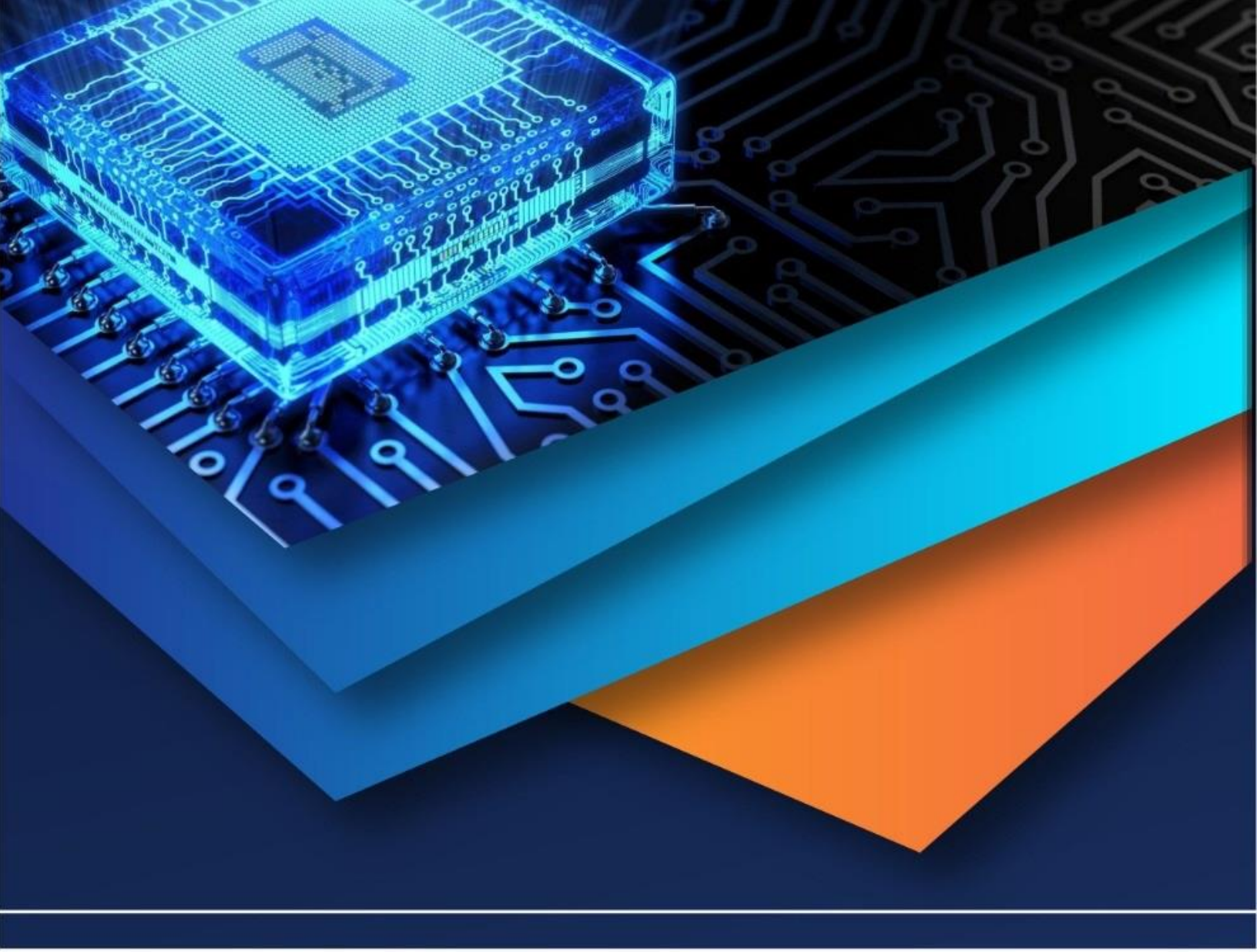

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