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A Study on Anti-Microbial Activity of Selected Medicinal Plants to Finish Non-woven for the Application of Feminine Hygiene Product

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ABSTRACT:

Sweating is a sign of healthiness, it is normal, in fact it is necessary but it can also be cause of many problems like skin infection, bad odour, feeling of wetness etc. and can also be very embarrassing in public especially for women. Excessive armpit sweating is called auxiliary hyperhidrosis. Modern women seek solution to this problem and the most common solution seems to be antiperspirant which reduces perspirations, but it comes with its own problems and the most alarming is that it contains parabens in heavy amount which prove to be one of the causes of breast cancer among women. Hygiene is crucial within the practices of aid and drugs to forestall diseases and infections and to preserve health. Thus to avoid all the problems this study is conducted to produce disposable user-friendly underarm pads which does not directly prevent sweating but it absorbs sweat and gives dry feel. The underarm pad is made from non-woven fabric treated with Thymus Vulgaris L. and Salvia Officinalis to give antimicrobial properties.

KEYWORDS: Thymus Vulgaris L., Salvia Officinalis, Anti-microbial Activity, Finishing, Underarm pads.

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1. INTRODUCTION

Hygiene plays a critical role in healthcare and medicine prevent diseases and infections and to preserve health. Due to the growing demand for snug, clean, and hygienic textile goods, an urgent need for production of antimicrobial textile goods has arisen. Having a good personal hygiene is really beneficial and useful for an individual's health, social life and professional relations[1]. Sweating isn't life-threatening can threaten the quality of life. Sweat itself is nearly in odorous to humans; it's the speedy multiplication of microorganism within the presence of sweat and what they are doing (break sweat down into acids) that eventually causes the unpleasant smell. Severe sweating in the armpits is known as auxiliary hyperhidrosis[2]. The human skin is typically huddled with innumerable microbes. In favorable conditions certain bacteria can grow from a single germ to million in a very short period of time.

Antimicrobials are used on textiles to control bacteria, fungi, mould, mildew and algae. This control reduces or eliminates the problems of deterioration, staining, odours and health concerns that they cause. *Thyme (Thymus Vulgaris L.)* is a Lamiaceae used since antiquity in traditional medicine [3]. Thyme oil with a pungent odour and medical benefit has more than 44% of phenols, which mainly consists 41% of Thymol and 3.6% karvacrol while resins, gums and tannins are concerning 100 percent of the parts of this plant. Its active constituents, thymol, is active against entrobacteria and cocci bacteria[4]. *Common Sage (Salvia Officinalis)* is an aromatic and medicinal plant well known for its pharmacological properties[5]. Phenolic acids isolated from sage have antimicrobial activities especially against *Staphylococcus aureus*[6]. Non-woven, owing to their relatively low cost of production, versatility in incorporating various mechanical properties, disposability and low lint, which reduces cross infection and enables high levels of hygiene to be maintained, made major inroads in the growing field of health care and hygiene applications[7,8].

2. MATERIALS AND METHODS

2.1. Collection of Medicinal Plant: *Thymus Vulgaris L.* and *Salvia Officinalis* were purchased from Sumadh Organics store, Bangalore. The collected plants were subjected to garbling. The plants were dried under the shade at room temperature for a week's time. The dried leaves and aerial plant were then crushed into powder using a mechanical blender.

2.2. Selection of Substrate: a light-weight non-woven of 100% Spun-bond PP fabrics as top layer, 100% Wood pulp as absorbent layer and 100% Viscose as outer layer were used for the application purpose.

2.3. Extraction of Plant material: *Thymus Vulgaris L.* and *Salvia Officinalis* (individual and combination of both) 30 g were extracted with ethanol of 200ml for 60 minutes with the temperature maintained at 60ºC using magnetic stirrer with hot plate [9]. 20 g of the selected medicinal plants were filled separately in the thimble and extracted successively with 125 ml of ethanol using soxhlet extractor for 6 hrs. After the extraction, the solution was strained using muslin cloth for removing the non-soluble portions of the plant and then filtered again using filter paper to get clear extract.

2.4. Finish Application: Herbal antimicrobial finish was applied on fabric by pad-dry-cure method. *Thyme* and *Sage* to form solution of 20gpl respectively. Three solutions were prepared as shown in table no. 1.

Table No. 1: Samples treated with different extraction techniques.

Extraction Technique	Prepared Plant Solution	Samples
Magnetic Stirrer Extraction	100% Thyme Plant Extract	A1
	100% Sage Leaves Extract	B1
	50:50% Sage and Thyme Extract	C1
Soxhlet Extraction	100% Thyme Plant Extract	A2
	100% Sage Leaves Extract	B2
	50:50% Sage and Thyme Extract	C2

2.5. Parameters for Padding: Fabric samples were dipped in solution for 30 minutes at a room temperature, M: L = 1:10 followed by padding for other 30-40 seconds at 80% expression. After the padding process the finished fabric was placed in a baking dish, then dried in the hot air oven at 100ºC for 5 minutes and then cured at 140ºC for 3 minutes.

2.6. Evaluation of antimicrobial Efficacy: Most of the antibacterial agents work under two main principles: inhibition of the growth of the cells (biostatic) and killing of the cell (biocidal) [5]. Pathogenic strains of *S. aureus* (gram positive bacteria) was used for present study. This is a Qualitative check accustomed find biological process activity on textile materials. The check methodology determines antibacterial drug activity of diffusible antimicrobial agents on treated textile materials.

2.7. Agar Diffusion Test (AATCC 147): The finished fabric samples with the diameter of 4.8+0.1 cm were taken for the analysis. Both the edges of samples were presterilized below steam flow for 15 minutes. Sterile bacteriostasis agar was dispensed in sterile petridishes. Broth cultures of the test organisms were used as inoculum. Using sterile cotton swab the test organisms'

staphylococcus aureus were swabbed over the surface of the agar plate. Presterilized samples were placed over the pre-swabbed agar surface by exploitation sterile spatula. After putting the samples all the plates were incubated at 37 ºC for 24 to 48 hours. After incubation the plates were examined. Effectiveness of the antimicrobial activity or the discharge rate of the active will be checked by size of zone of inhibition.

3. RESULTS AND DISCUSSION

3.1. Evaluation of antibacterial functional properties of the fabric samples: Here compare the growth of *S.aureus* on untreated and treated sample with different extracts of the thyme and sage. It can be seen from the Figure No.1 &2 that the growth of bacteria is more in all the samples as compared between extraction techniques. It is attributed that microorganism inhibition is because of the slow unleash of active substances from the material surface. Reduction in growth of bacteria can be seen in treated samples as compared to untreated samples. The fabric samples exhibited high antimicrobial property of soxhlet extracted due to attachment of antimicrobial agent to the substrate through bond formation on the surface. Better results has been observed in sample treated with 100% *Salvia Officinalis (sage)* soxhlet extracted. The strong antimicrobial activity has been reported in *Salvia Officinalis (sage)*, the possibility of using sage in underarm pads is better option when compared to *thyme* which also serves as a natural anti-sweating agent.

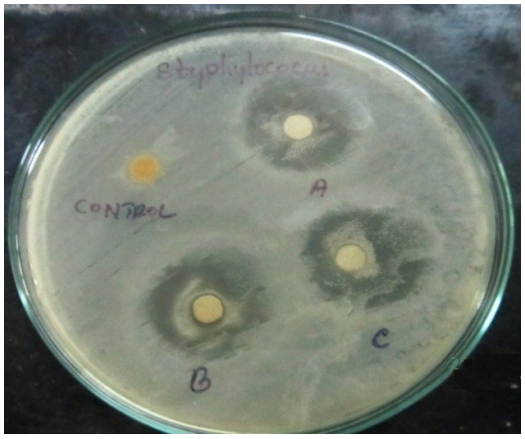

Figure No.1: Zone of Inhibition Formed by A1, B1, C1 samples along with controlled sample

Figure No. 2: Zone of inhibition formed by A2, B2, C2 samples along with Controlled samples

4. DEVELOPMENT OF UNDER-ARM PADS

Underarm pad was constructed using the three different layers such as PP Spunbond, carded wood pulp and viscose spunlace[7]. Better results of 100% *Salvia Officinalis (sage)* soxhlet extracted treated PP spunbond Non-woven fabric, Polypropylene (PP) nonwoven fabric is considered to be the best material for top sheet in personal care products due to its wicking capabilities [10] Thus the middle layer or the absorbent layer is made of wood pulp which is 100% biodegradable and made from waste.

Viscose spunlace non-woven material was selected as the bottom layer which has high absorbency, excellent softness & cleanliness compared with other natural and synthetic fibers and also eco-friendly. The layers were sandwiched and stitched along the outer edge of the product with attached elastic bad where it helps to fasten and fit. An elastic tape typically employed in hygienic pads was used on the back of the pads to fasten them.

5. CONCLUSION

Sweating could be healthy bodily activity, but the negative effects of sweating, such as wetness, unpleasant odors and stained garments, are undesirable. Anti-perspirant deodorants forestall just some of the consequences of sweating. Surgery and other methods are available, but those are not permanent solution and it is expensive [11]. Those methods are not convenient for everyone. Therefore, the target of this analysis was to style and turn out disposable easy underarm pads capable of preventing the negative effects of sweating. Low-weight plastic cloth is adequate as a high sheet for the kind of product delineated during this article. Because of their softness, light-weight spunlace cotton and viscose nonwoven fabrics was used as the absorbent middle layer. Using natural fibers within the middle layer is advantageous for makers as a result of customers like natural product.

Thyme, sage and combination of both extraction procedure has been studied successfully by magnetic stirrer and soxhlet technique [12]. These extracts were treated on to fabric by application of pad-dry-cure method using padding mangle on PP spunbond non-woven fabric as an antimicrobial finish. The soxhlet sage and sage thyme extracted finished fabric showed the very good antibacterial activity as compared to magnetic stirrer thyme, sage and sage thyme finished samples. As the extraction parameters are more consistent, its effectiveness against bacterial growth also increased. No negative effects was observed on physical properties of the treated samples after finish application. There is a huge resource of natural antimicrobial agent, which might be used for transmission helpful antimicrobial property to textile substrates.

6. ACKNOWLEDGEMENT:

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