

ABSTRACT

Medical textile is one of the most fast growing sectors in the technical textile market. In this contemporary humankind prefers to be comfortable in all aspects including medicinal treatments. The consumers are now progressively more aware of the health and hygiene lifestyle, and there is essential expectation for a broad range of textile goods finished with antibacterial properties. Now a day due to environmental pollutions and global warming there is more chance for various skin diseases among people. This has lead to the development of performance oriented textile products for human comfort and heath care.

An attempt has been made through this research work in the area of application of copper enriched medicinal herbals and their preparations, in the field of medical textiles. In this present work the copper enriched herbal extracts and microcapsules are imparted to the bleached cotton material to give a curative finish with antimicrobial effects. The research work carried out in five phases.

In this research work, investigation has been carried out on various copper enriched medicinal herbs for the development of curative fabrics / garments. The medicinal herbal extracts that are effective in the treatment of selective skin diseases like allergic dermatitis, contact dermatitis, vitiligo and Lichen Planus, eczema, detergent allergy in hands (Chemical Allergy), parthenia allergy, and psoriasis have been chosen for application on cotton fabric. The identification of medicinal herbs on the basis of presence of

copper Out of 12 medicinal herbs, 5 medicinal herbs namely *Aerva lanata*, *Aloe barbadensis* Mill, *Cumminum cyminum* Linn, *Tagetes erecta* and *Mentha piperita* were scrutinized. In order to extract the active compounds from the medicinal herbs using aqueous and solvent extraction techniques.

The coacervation technique is used to develop the microcapsules by chemical microencapsulation system. Microencapsulation was done using copper enriched medicinal herbs such as *Aerva lanata*, *Aloe barbadensis* Mill, *Cumminum cyminum* Linn, *Tagetes erecta* and *Mentha piperita* extracts as core material and gum acacia as wall material. The produced microcapsules are analysed as per the standard methods, like production yield, average particle size, microscopic appearance, cytotoxicity analysis and stability nature of the microcapsules.

The process parameter of aqueous extract of copper enriched medicinal herbs were optimized using Box and Behnken three level three variable experimental design. In this process there are three variable parameters such as concentration of extract, dipping time and of concentration of cross linking agent. The design matrixes of the variables in the actual units along with their anti microbial activity of aqueous extract of copper enriched medicinal herbal treated fabric against with *Staphylococcus aureus* and *Escherichia coli*. Analyzing the measured responses were analysed using the Design-Expert V8 software and it shows that the fit summary output indicated that the linear and quadratic polynomial models were significant for the present system.

The methanol extract and microcapsules on bleached cotton fabric using pad – dry – cure method has been adopted. Herbal extract has been applied on bleached cotton fabric with two method namely without crosslinking agent and with crosslinking agent. The application of microcapsules has been carried out with citric acid as crosslinking agent. The microcapsules produced from five medicinal herbs were applied on the bleached cotton fabric by the pad-dry-cure method. The various process parameters such as concentration of extract, concentration of cross linking agent percentage and curing temperature were considered for the optimization process using Box and Behnken design and 15 samples were produced for each selected five herbs in various combination. The effects of these parameters on the antimicrobial activity of treated cotton fabric material were investigated.

The surface morphology of the microencapsulated copper enriched medicinal herbals of *Aerva lanata*, *Aloe barbadensis* Mill, *Cumminum cyminum* Linn, *Tagetes erecta* and *Mentha piperita* treated fabric by analyzing by Scanning Electron Microscope (SEM), it shows the binding and presence of the microcapsules in the fibre assembly of the fabrics. The Fourier Transform Infrared (FTIR) pattern represents the chemical group present in the treated fabric samples. The physical properties of treated and untreated samples were assed as per standard methods. The antimicrobial efficacy were measured both in terms of zone of inhibition (qualitative analysis (SN195920)) and bacterial reduction % (quantitative analysis (AATCC 100)), herbal treated fabric samples against on *Staphylococcus*

aureus and *Escherichia coli*. The clinical trials were conformed curative performance and antimicrobial activity of the treated samples.

This research has substantiated the historical and applied use of extracts of selected copper enriched medicinal herbs by developing the curative garments for selective skin diseases. The application of copper enriched medicinal herbal extracts on the cotton fabric imparts additional functionalities like antimicrobial activity and curative ability which are added characteristics to the basic textile material. The amplification of curative garment functionality, demonstrated in this research, is a forward in the field of curative textiles.