



Antimicrobial activity of Ayurvastra Medicated with different Herbal Drugs

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INTRODUCTION:

The present study was undertaken as an exploratory endeavor to test whether Ayurvastra possesses inherent antimicrobial activity with the intention of developing protective clothing from it. Antimicrobial activity will be tested in Ayurvastra prepared with Triphala Kashaya, Manjishta, dashamula kwatha as medicated herbs, and prepared cotton cloth. Ayurvastra cloth is planned to be tested due to its total organic, sustainable, and biodegradable nature. Ayurvastra, known as the ayurvedic medicinal cloth, is made from 100 per cent pure organic cotton or silk, wool, jute, and coir products that have been prepared on handloom, processed, and dyed using various ayurvedic herbs to assimilate medicinal qualities into them. Consequently, they are free from any chemicals that may release toxins and irritants harmful to users as well as the environment (Yadav and Nath, 2010). Skin conditions such as eczema and psoriasis are addressed, and certain fabrics also encompass antibacterial and anti-inflammatory properties. Additionally, the fabric aids conditions such as rheumatism, arthritis, blood pressure, diabetes, and respiratory conditions like asthma (Bucci, 2012; Dhingra, 2014). Over years, the unrestricted utilization of natural resources and human ignorance about its effects have led to their depletion, resulting in adverse effects on our planet. Recent climate change and other prevailing environmental problems (acid rain, ozone layer depletion, air pollution, global warming, and pollution of seas and rivers) are deemed very hazardous. A study has identified the textile industry as the major consumer of chemicals, leading to severe health issues for both workers and consumers. The chemicals, in direct and prolonged contact with our skin, cause irritations, allergies, and potentially even cancer. Some chemicals may permeate our skin into the body, especially when the particles are sufficiently small, during sweating through open sweat pores. This chemical exposure has substantially reduced the protective ability of our skin. These toxins, entering our body, accumulate and pose long-term health risks. These chemicals, incompletely consumed

during textile processes, are significantly released in effluent streams, polluting water, air, land, and destroying flora and fauna. Ayurvedic fabrics, manufactured without chemical processes, are eco-friendly. Normal fabrics such as organically grown cotton, jute, silk, wool, etc., are used to create Ayurvedic, dyed with desired herbs in controlled temperature and environment. Organically grown crops enhance soil fertility, fostering the development of earthworms and above-ground arthropods. Consequently, organic fields support a greater variety of plants, animals, and microorganisms, thereby upholding biodiversity in the area (Sharma, 2014).

Triphala churna:

Triphala Kashaya, comprising *Terminalia chebula* Retz., *Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae), and *Phyllanthus emblica* L. (Phyllanthaceae), is extensively utilized for treating diverse microbial infections. Several extraction techniques were employed to extract the bioactive components of Triphala, aiming to compare their efficiency, as discussed by Omran.

Manjistha:

Rubia cordifolia, commonly known as Manjistha (Figure 1), has garnered significant clinical attention due to its considerable therapeutic potential (Peterson, C.T.). Globally, it has been employed in traditional treatments for skin problems/disorders, lymphatic flow stimulation, and blood disorders (Shan, M.). The plant's root has been a traditional remedy for ailments such as rheumatism, menstrual disorders, jaundice, urinary issues, renal stones, skin disorders, and blood detoxification. Previous research has highlighted its antioxidant properties, demonstrated by increased production of markers like superoxide dismutase, catalase, and glutathione (Shilpa, P.N./Chandrashekar, B.S.). Additionally, studies have indicated the anti-inflammatory and antimicrobial activities of Manjistha extract (MJE) (Cai, Y.).

Dasahmula:

Ayurveda, the ancient science of life, has persisted for millennia. According to Ayurveda, 'Dash' signifies ten and 'Moola' denotes roots. Dashmoola comprises ten roots from different plants, taken in equal proportions. Typically, it's considered a blend of Brihat Panchamoola and Laghu Panchamoola. Among these roots, five belong to trees, forming the Brihat Panchmoola, while the other five are from shrubs, known as Laghu Panchmoola. The Brihat Panchmoola encompasses Bilva, Gambhari, Agnimantha, Patala, and Shyonaka, whereas the Laghu Panchmoola includes Brahati, Gokharu, Kantakari, Prishniparni, and Shalaparni.

In a recent study conducted by D. H. Tambekar, Triphalachurna, Hareetaki churna, and Dashmoola churna demonstrated potent antibacterial properties against *S. epidermidis*, *P. vulgaris*, *S. aureus*, *E. coli*, *P. aeruginosa*, and *S. typhi*.

Statement of problem:

Ayurvedic medicinal cloth, is crafted from 100 per cent pure organic cotton, silk, wool, jute, and coir products. These materials are hand-loomed, processed, and dyed using various Ayurvedic herbs to infuse medicinal qualities into them. Consequently, they are devoid of any chemicals that might release toxins and irritants harmful to both users and the environment.

The current study was undertaken as an exploratory investigation to test whether Ayurvedic medicinal cloth inherently possesses antimicrobial activity, aiming to develop protective clothing from these fabrics. Ayurvedic medicinal cloth, prepared with Triphala, Kashaya, Manjishta, and Dashamula Kwatha as medicated herbs, will be assessed for its antimicrobial activity using cotton cloth as a medium.

Ayurvedic medicinal cloth - Manufacturing process

Processing refers to the sequence of operations involved in the creation of a product. In the production of Ayurvedic medicinal cloth, approximately 200 herbs are reportedly used to generate various effects and colours in the cloth. Each colour originates from a preparation that typically contains one or more primary herbs (such as turmeric in our turmeric clothing) along with 40 or more additional ones, specifically blended and carefully prepared medicinal herbs derived from plants' flowers, roots, barks, and so forth. Different procedures are employed based on whether raw woven fabric or yarn is undergoing dyeing. For handloom, the process commences with the cotton yarn and undergoes a procedure called de-sizing to eliminate loose particles and debris.

The typical processes employed in the manufacturing of Ayurvedic medicinal cloth are as follows:

(A) Bleaching: The chosen fabric or yarn is initially bleached using a solution based on cow urine. Cows graze naturally and feed on three different types of medicinal grass. Many Ayurvedic practitioners consider cow urine highly beneficial in balancing an individual's "doshas" or fundamental constituents of one's physiology and psychology, fortifying the immune systems, and as an elixir for vitality (Rangari et al., 2012). As part of the process, the fabric or yarn is also exposed to direct sunlight.

(B) Gumming: To enhance and fix colours, a proprietary gumming process is utilised before dyeing, incorporating plants like Lodhra (*Symplocos racemosa*), Kenduka (*Diospyrose ebenum*), and fruit extracts of Haritaki (*Terminalia chebula*), among others. Each colour or dye requires its unique blend of over 40 herbs/plants for gumming, as well as for synergising health and wellness benefits.

(C) Medication (Dyeing): The organic cotton yarn or fabric is subsequently immersed in a meticulously controlled blend of herbal medicine preparations known as Kashayas (meaning concoctions), depending on the health and wellness benefits desired. The term "medication" is used instead of dyeing because the medicinal plants/herbs themselves naturally impart colour to the fabrics. The temperature of the concoctions, the duration and number of medicinal soaks, the herb blend, and the equipment are all carefully managed. Ayurvastra garments can be fashioned in a spectrum of hues including red, yellow, green, blue, orange, brown, ivory, and black. Table 1 below demonstrates the colours produced by different herbs (Baid, 2014; Jain, 2010; Kumar, 2014)

Methodology:

As previously mentioned, the process of ayurvastra involves bleaching with cow's urine, gumming with aloe vera, and medicating with triphala kashaya, Dashamula, and Manjisthadi kwatha. The resulting cloth undergoes testing for antimicrobial activity as described below. The mentioned substances were sourced from the Ayurveda Interdisciplinary Research Minds Association in Mysore. The assessment of antimicrobial activity was conducted at 3 AAA Fashion Innovators Pvt Ltd in Mysore."

Antimicrobial activity testing:

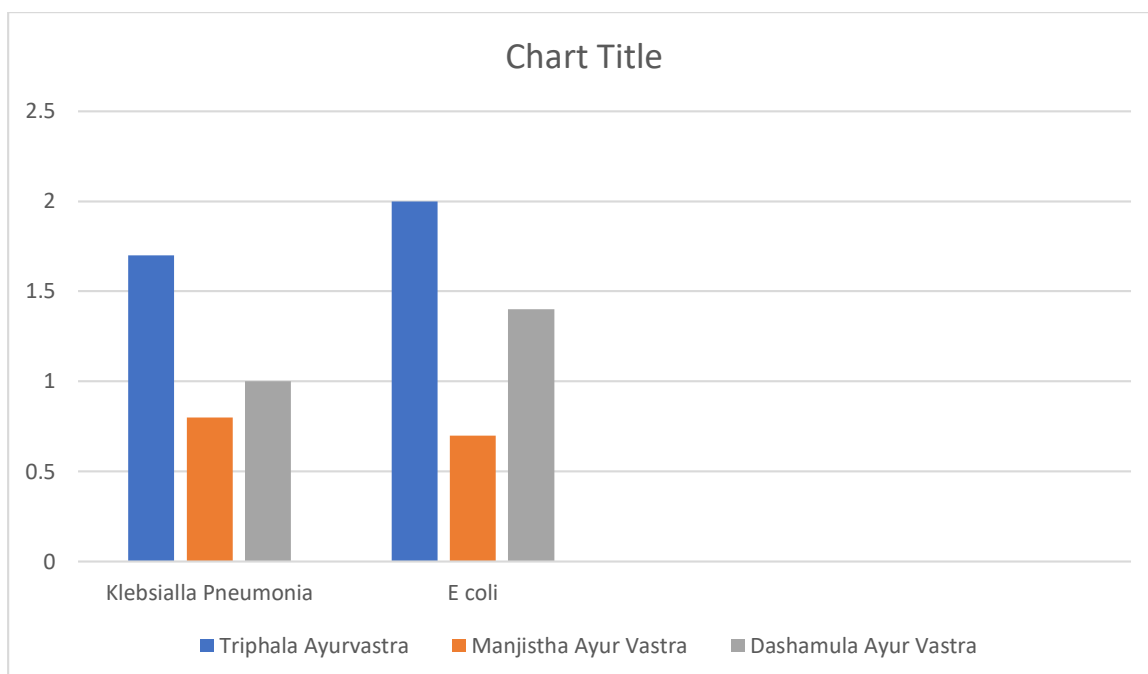
A nutrient agar medium (g/L: peptone 5.0; beef extract 1.5; yeast extract 1.5; NaCl 5.0; agar 20; pH 7.5) was prepared and autoclaved at 121 °C for 20 minutes. Sterilised petri plates were prepared with an equal thickness of nutrient agar. Test organisms were grown overnight at 37°C, 120 rpm in 10 mL nutrient broth. This broth was used for seeding the agar plates. 10 mg of each dye was impregnated onto a small disc of filter paper (diameter 5.0 mm) and placed on top of the seeded medium. After overnight incubation at 37 °C, the zones of inhibition were measured."

Results:

The Ayur Vastra underwent screening for their antimicrobial properties against specific microbes such as *Escherichia coli* and *Klebsiella pneumoniae*. The initial screening indicated that garments made from Triphala Kashaya exhibited effective antimicrobial activity compared to those made from Manjistha and Dashamula. Nevertheless, both Manjistha and Dashamula showcased antimicrobial properties, with Dashamula displaying higher activity in comparison to Manjistha.

The effect of concentration of dye on antimicrobial activity was studied further and results are summarized in Table 1. The zone of inhibition (diameter) was recorded in each case

Name	diameter	
	Klebseiall pneumonia	E.coli
Triphala cloth	1.7	2
Manjistha cloth	0.8	0.7
Dashamula cloth	1	1.4



Antimicrobial activity of textile materials dyed with *triphala churna*, *Manjishta*, *dashamula* One square inch of sterilized fabric was introduced in 100 mL sterilized nutrient broth. This was aseptically inoculated with the microbe and incubated at 37 °C for 16 h. The antimicrobial activity was calculated based on diameter.

Discussion:

The antimicrobial properties of textile materials dyed with triphala churna, Manjishta, and dashamula were examined. A piece of one square inch sterilized fabric was placed in 100 mL of sterilized nutrient broth. This setup was then inoculated with microbes under aseptic conditions and left to incubate at 37°C for 16 hours. The antimicrobial effectiveness was assessed based on the diameter of inhibition.

The natural dyes were tested for their antimicrobial effects against specific microbes (*Escherichia coli*, *Klebsiella pneumoniae*). The initial screening revealed that triphala churna and dashamula ayurvedastra demonstrated efficacy against all the microbes tested. However, before these textiles can be considered for use in the healthcare industry as antimicrobial clothing, further comprehensive studies involving various other microbes are necessary for proper standardization and marketing of the cloth.

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