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The Review Article of Medicinal Uses Reetha and Shikakai

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ABSTRACT

Historic textiles cannot be washed in a washing machine or with a commercial detergent. Washing of historic textiles in textile conservation is done after considering various factors such as the condition of the textile, age of textile, color fastness of dyes, type of fiber, and type of stain. Washing of historic textiles is done to remove unwanted materials such as dust, dirt, stains, etc, which may be damaging to the textile object. Organic surfactants have been used in India as detergents and shampoos for ages. They have been widely used in the laundry industry and researched for their medicinal properties. Moreover, organic surfactants are easily available, cheap, and eco-friendly. The aim of this study was to find out the main cleaning agent (saponin) present in reetha, shikakai (acacia concinna) by GC-MS and to find out the potential of reetha and shikakai as natural surfactants for washing historic textiles.

Keywords: Reetha, Shikakai, GC-MS, historic textiles.

INTRODUCTION

The earliest Indian textiles have been recorded in literature such as the Vedas and found in ancient sculptures. The first archaeological evidence of cotton textiles was found in the Indus Valley Civilisation. Textiles play an important role in the socio-economic role in society. They provide a platform for artistic and cultural development. They come in various materials, shapes, designs, and colors. With the development of technology, new manufacturing techniques and materials have also emerged. However, preserving and conserving these ancient textiles is a challenge. Since historic textiles are organic in nature, they are fragile and more susceptible to deterioration than inorganic materials. Thus, the conservation of historic textiles requires skilled and careful deliberations about materials used for conservation, dyes, and display techniques suitable for historic textiles. Moreover, art conservation is a multi-disciplinary field. It borrows materials, techniques, and knowledge from various fields such as fine arts, chemistry, carpentry, architecture, etc. Since it is a relatively small field, commercial materials required for conservation are not tailor-made for the purpose of conservation. Conservators conduct tests and after many trials and errors, a product is selected to be used for conservation. In textile conservation, conservators have been using use synthetic surfactants recommended by international organizations and institutions. Obtaining those conservation-grade products is a costly affair. However, organic detergents are being preferred in the world due to concern for the environment. Traditional soapnuts have been used as shampoos, detergents, and for cleaning gold and silver jewelry for centuries in India. They are cheap, easily available, and easy to use. They are organic in nature and have no harmful effects on the environment or humans. Moreover, reetha and shikakai have excellent cleansing properties. In textile conservation, there has been a search for a suitable biodegradable detergent for the wet cleaning of historic textiles. Studies have been conducted to find organic substitutes for synthetic detergents.

Surprisingly, even though reetha and shikakai are easily available in India, they are not preferred as a cleaning agent for the wet cleaning of historic textiles by textile conservators. Hence, this study was conducted as an investigation between reetha and shikakai as a potential organic surfactant for textile conservation. In discussing the environmental concerns of surfactants and their biodegradability, natural surfactants are proving to be a good alternative to synthetic surfactants (Muntaha & Khan, 2015, (Ghagi, Satpute, Chopade, & Banpurkar, 2011). Natural surfactants are biodegradable, less toxic, cost-effective, biocompatible, easily available in bulk, effective in high temperatures, pH and salinity, and environment friendly; which constitute as a 'good surfactant'.

Acacia concinna commonly known as Shikakai or Chikaikkai is a well-known plant for its shampoo-like property. This plant is common in the warm plain regions of south and central India. It's a thorny plant that is broad-based and flattened and whose leaves have caducous stipules. Flowers of Acacia concinna are pink with reduced subtending bracts. It's famous in India for its usage for hair care since ancient times. Furthermore, Acacia concinna has various applications in medical and other fields. Ayurvedic texts states Acacia concinna usage as a shampoo with anti-dandruff property. This shampoo effectively cleans dirt and grease from hair without altering its structure. This herb improves hair volume and texture. It cures leprosy and skin-related diseases such as edema. Folklore medicines state Shikakai's analgesic, antibacterial, and insect repellent and wound healing properties are very efficiently utilized. Its leaves are used in malarial fever and the decoctions of the pods are used to relieve biliousness and acts as a purgative. Traditionally Shikakai is employed as an oral rinse to cure halitosis, dental caries, mouth ulcers, and gum bleeding. It relieves leg, hip, and joint pain when applied to affected regions after a hot castor oil massage. This herb has cleansing and inflammation properties used as a tincture or infusion in a bath and washes skin infections such as accumulated pus and exudates such as skin rash. Acacia concinna has various medicinal uses such as for pain, constipation, jaundice, dandruff, age spots, gum diseases, leprosy, and psoriasis. These plant medications can be commercially available or prepared at home individually. The leaves, barks, and pods have been used as a herbal medicine for emetic, purgative and expectorant treatments. Its pharmacological properties are antioxidant, anti-coagulant, anti-platelet, anti-thrombotic, antidermatophytic, and immune adjuvant.

Saponins have been researched and used in textile conservation. Saponin is the main surface active agent responsible for foaming properties in plants belonging to the genus of Sapindaceae and family Sapindeae(Ghagi et al., 2011). A variety of saponin-rich species have been reported such as, 'soapwort (Saponariaofficinalis), Sapindustrifoliatus, soapbark (Quillajasaponaria), Sapindusemarginatus, soap root (Chlorogalumpomeridianum), soapnut (Sapindusmukurossi) or soapberry (Sapindussaponaria)' (Muntaha & Khan, 2015). In India two species of soapnuts or reetha are found; Sapindusmukurossi in the north and Sapindustrifoliatus in the south. Types of saponins found in the fruit of the soapnut are triterpenoid-type and, steroid. (Babbar-Sebens, Li, Song, & Xie, 2013). Shikakai (Acacia Concinna Linn. (Leguminosae) is a plant whose pods also contain saponins based on acacia acid (Khanpara & Harisha, 2015). Lalan, (1982) washed brocaded textiles with reetha and shikakai. Saponins are made up of glycosides and terpenoids. Based on their structure saponins are of two type triterpene and steroid aglycone (sapogenin). Since the structure of saponins contain both hydrophobic aglycone and hydrophilic sugar chain(s) (amphiphilic nature), they have excellent emulsifying, foaming and detergency properties (Netala, Ghosh, Bobbu, Anitha, & Tartte, 2015). Triterpenoidsaponin is a naturally occurring surface-active glycosides of triterpenes(Garai, 2014). Triterpenoids are classified

into three groups: acyclic, tetracyclic, and pentacyclic. The pentacyclic triterpenes are further divided into three main classes: oleanane, ursane, and lupine. The most common type of triterpene is oleanane;; oleanolic acid is the most common aglycone(Alqahtani et al., 2013). The presence of one or two carboxyl groups in the aglycone and/or sugar causes the acidic nature in many pentacyclic triterpenoids.

Phytochemical analysis:

Phytochemical composition of extracts differs based on the polarity of the solvent being used. This is due to the solubility of different compounds in various solvents. Aqueous extracts contains hydrophilic compounds, whereas ethanol extract contains both hydrophobic and hydrophilic phytochemical constituent. Alkaloids, Flavanoids, Phytosterols, Saponins and Phenolic compounds are found in all extracts of aqueous, benzene, chloroform, petroleum ether, butanol and methanol. Tannins, gums and mucilage are present in all extracts except in petroleum ether and butanol [4-5]. The powder characters include crystals of calcium oxalate and oil globules, cells containing saponins. The bark contains a high level of saponins which are foam-forming agents. These pods contain saponin with trihydroxymonocarboxylic acid that exhibits acidic activity and surfactant properties. Methanolic fraction extracts of pods of Acacia concinna enhancethe activity of Th1 and Th2 helper T cells.

Pharmacological and medicinal activities of Acacia concinna:

Acacia concinna fruits are used for washing hair, promoting hair growth, an expectorant, emetic and purgative. Methanol extract of the plant bark showed antibacterial activity against gram-positive bacteria staphylococcus aureus, Streptococcus mutans, Lactobacillus case, Lactobacillus acidophilus, and Bacillus megaterium. Acacia concinna treats infectious organ-related diseases. It's a stimulant diuretic and liver stimulant used to treat chronic cough, asthmatic obstruction, jaundice and vomiting, liver disease, lump formation in the abdomen, lice, and dandruff. This plant is implemented as a home remedy to cure various diseases such as skin itching, psoriasis, pimple, constipation, hyperpigmentation, jaundice and gum infection [10]. The fruit from this plant produces saponins that are of low pH and possess detergent action. These properties give Acacia concinna antibacterial cleansing properties. This handwash paste acts as a remedy for Pityirasiscapitis. Decoction of the leaves acts as a purgative and is used to relieve malaria. Pods of Acacia concinna are grounded to prepare an ointment used as a skin cream. Leaves of Acacia concinna are made into a paste to make hair cleanser, and prevent diabetes and skin diseases. The leaf extract is used for treating malaria. Studies have proven pod extracts have antidermatophytic properties against Trichophytonrubrum, T. mentagrophytes, T. violaceum, Microsporumnanum, and Epidermophytonfloccosum. Methanolic extracts show immunological adjuvant activity, ethanolic extractshowshepatoprotective activity, antifungal, antibacterial and acts as a contraceptive. Studies evaluate the insecticidal activity of the seed and leaves extract of A. concinna. The plant possesses surfactant type catalyst, antioxidant, and Anthelmintic and inhibits Heinz Body Induction.

METHOD

Reetha and Shikakai fruits were purchased from an export company and verified by a botanist. The samples were cleaned and the seeds were removed. The pericarp (flesh) was crushed into a fine powder and was used for extraction with methanol. The extraction was done by soaking the reethasoapnuts and shikakai pods in 1ml methanol for 24 hours each and filtered to be used as a sample for analysis with a

GC-MS instrument. The GC-MS analysis was done by GC-MS-QP-2010 Plus Ultra (Shimadzu company). Helium gas was used as a carrier gas at a constant flow of 16.3 mL/min with an injection volume of 1ml. The Column Oven Temp was at 60.0 °C and the Injection Temp was at 260.00 °C. The total GC-MS running time was 45 min. The interpretation of the mass spectrum was done using the National Institute Standard and Technology (NIST) and Wiley library database. The structure of the compounds along with their name and molecular weight were established as well.

A concinia volatile organic compounds extracted through the distillation process. GC-MS is carried out using Shimadzu QP 2000 A equipment. The bioactive compounds obtained from Acacia concinna are Furfural, 5-Methyl-2-furfural, Phenyl acetaldehyde, cis-Linslool oxide, trans-Linalool oxide, Methyl salicylate, ∝-Terpinolene (tentative), Geranyl acetone, Tetradecanoic acid, 6,10,14-Trimethyl-2-pentadecannone, Methyl palmitate, Palmitic acid, Isopropyl palmitate, Methyl linoleate and Linoleic acid (tentative). These bioactive compounds were reported by [16]. The major group of compounds found islong-chain fatty acids with esters and five members of oxygenated heterocyclic compounds. Furfural, 5-methyl-2-furfural, Linalool oxides, phenylacetaldehyde, and methyl salicylate heterocyclic compounds which originate from pyrolysis reaction, oxidation of linalool, identified in much essential oils and in foodstuffs with a sweet green odor reminiscent of hyacinth and present in ointment preparation respectively. Fatty acids and esters present in the pod's aroma are limited in their contribution towards fragrance or aroma substance. No report is available of Acacia continua against the virulence of the fungal and bacterial enzyme Candidapepsin-1. These compounds are docked at their molecular level against the enzymes considered, Candidapepsin-1. The molecular level docking will elucidate the interaction between the ligand and the active sites of the enzymes leading to novel medicinal discovery in the field of drug discovery and development. Lipinski's rule of five assesses the durability of a drug molecule. The bioactive compound analysis satisfies Lipinski's rule of five. The rule comprises of five criteria namely molecular weight.

RESULTS AND DISCUSSION

The molecular docking analysis differentiates the binding energy of each compound and itsdrug-likeness against bacterial or fungal diseases. These active compounds are screened using the Lipinski rule of five as shown in Table 1. The standard criteria for drug-likeness of each compound were molecular mass should be less than 500 daltons, Hydrogen bond donor less than 5, hydrogen bond acceptors less than 10, high lipophilicity less than 5 (LOGp), and molar refractivity between 40-130. Based on these criteria the compound that is satisfied for Lipinski's rule of five is 5-Methyl-2-furfural, Cis-Linalool oxide, Furfural, Geranyl acetone, Methyl salicylate, Phenyl acetaldehyde, Tetradecanoic acid, and Trans-linalool oxide. This study proves that essential bioactive compounds of Acacia concinna have good antifungal activity in In-vitro as well as In-silico and these compounds can also be used for various activities. As a result, the binding interactions of amino acids along with bioactive compounds.

CONCLUSION

Acacia concinna is traditionally used in ayurvedic medicine in ancient against several pathogenic diseases like anti-bacterial, antifungal, antipyrogenic, and anti-inflammatory. This study reveals the potential activity of bioactive compounds from Acacia concinna against candida species. Geranyl acetone showed better drug-reliable properties in Lipinski's rule of five and ADMET properties. The active compounds of Acacia concinna have the ability to use a drug molecule with proper dosage for

humans as well as rats as shown in ADMET properties. The geranyl acetone with a binding energy of -4.25 Kcal/mol showed better results than the control docking of pepstatin A with a binding energy of +1.4 Kcal/mol. Thus the active compounds of Acacia concinna inhibit the virulent enzymes that lead to antifungal activity with the novel discovery of a plant-based therapeutic product. The GC-MS results show that both reetha and shikakai have saponins present in them. Saponin is the main cleaning agent responsible for cleansing properties. While reetha has more types of saponins than shikakai. Since both reetha and shikakai have cleansing properties, they may be suitable for washing historic textiles. Moreover, being acidic in nature they are suitable for washing protein fibers as well. Since alkaline solutions damage protein fibers.

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