

# Wettability of Reetha and Shikakai in Textile Conservation

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## ABSTRACT

*Textile conservation is a multi-faceted field which requires knowledge about fine arts, chemistry, art history and conservation. A textile conservator conserves, preserves and takes care of a textile object by conducting thorough documentation, conservation treatment and proper display and storage methods. One of the treatments is washing with a suitable surfactant to remove harmful soiling. Commercial detergents are not used because they are very harsh for fragile textiles, unless they are tried and tested for historic textiles. The concentration of surfactants used for washing of historic textiles are kept very low to avoid redistribution of soiling. Wetting capacity of a surfactant indicates how well and fast a surfactant solution penetrates a surface. Hence, this study was conducted to find out the wetting capacity of natural surfactants of reetha and shikakai in various concentrations by measuring their contact angle.*

**Keywords:** reetha, shikakai, Contact Angle, historic textiles.

## INTRODUCTION

Cleaning is a process to remove unwanted substances from an object. It is an irreversible process of removing unwanted or undesirable substances like dust, dirt, stains, soiling, and fungus etc. Cleaning is also done in textile conservation as part of treatment. It consists of dry and wet cleaning methods. Wet cleaning is the same as washing clothes in a laundry but in textile conservation, it is more complex. One cannot wash historic textiles in a washing machine or rigorously with hands. One cannot use commercial detergents for historic textiles without proper tests and analysis about the detergent. A textile conservator decides if the historic textile object a) needs to be wet cleaned b) cleaned of what c) which stains to be removed d) if the textile is stable enough to withstand the cleaning procedure e) framing the treatment plan. Any procedure done in textile conservation is done with the aim of increasing the life of the textile, to prevent further damage and to stabilise its existing condition. An unwanted substance is that which causes damage to the textile or its aesthetics. However, not all unwanted substances may be damaging to the textile object, hence may not be removed. Since, wet cleaning may alter the physical, aesthetic, value of the textile, it greatly impacts its historic significance as well. Once, the decision of wet cleaning is made, the next step is to decide the treatment plan. Since there are no standards for wet cleaning of historic textiles in textile conservation, each textile object gets a tailored treatment plan. It includes choosing a surfactant, quality of water, duration of washing, mechanical action and rinsing. Textile conservation borrows some knowledge from the laundry industry; testing commercial products for the purpose of conservation. Finding a suitable cleaning agent for wet cleaning of historic textiles has been an on-going study in textile conservation. Various surfactants and methodologies have been researched. Synthetic, commercial and organic cleaning agents have been studied for their properties and use in the field of textile conservation. A textile object may be made up of diverse materials, like leather, metallic threads, semi-precious stones, fur, feathers, synthetic fibres, etc. Therefore, conservation of a composite textile object is a challenge. Cleaning of a textile object made up of miscellaneous materials requires skill and expertise. Finding an alternative to synthetic detergents; an organic, biodegradable, surfactant for wet cleaning of historic textiles which is easily available and cost effective was the purpose of this study.

Soapnuts are used for a variety of purposes since they have cleansing and anti-fungal properties. Reetha (*Sapindus Mukurossi*) and Shikakai (*Acacia Concinna*) are plants whose fruit contains saponins, which is the main cleaning agent responsible for the cleaning action. They are used as a natural shampoos and detergent in India. There have been various studies on reetha and shikakai regarding their properties as an anti-fungal, bio-surfactant and herbal shampoos. Moreover, Reetha solution has been used to clean the Golden Temple by experts from UK.

The concentration of surfactant used for washing of historic textiles is generally kept to a minimum. Low surfactant concentrations are used to avoid redistribution of dirt. Canadian Conservation Institute,

(1992)suggests a 5 ml/litre anionic surfactant concentration. Tímár-Balázs, (2000)notes 0.5g- 1.0 g/litre of anionic and 0.1-0.5 g/litre of nonionic surfactant concentration for washing of historic textiles.Lewis & Eastop, (2001) used Synperonic at 27% concentration in water, Synperonic A5,Berol 784 and SDS (BDH) at 100% concentration. Generally, 1- 2 g/l concentration is used for cleaning ancient textiles.The formulations for washing solutions for historic textiles must consider the fibre of the textile, nature of soiling, quality of water and foaming power of the surfactant (Hofenk-De Graaff, 1968).

To assess the wetting capacity of reetha and shikakai along with synthetic surfactant Tween20, a contact angle measurement was conducted.The smaller the contact angle the better the wetting capacity. A contact angle less than 90º indicates a good wetting capacity of a liquid with a solid. A contact angle less than 90º or 20º is considered to be hydrophilic (water loving) and a contact angle more than 90º is considered hydrophobic. A contact angle ( $\theta$  lower case theta) measures the angle formed when a liquid and a solid surface come in contact. The measurement is taken after the liquid has made contact with the solid surface.

METHOD

The surfactant recipe for reetha (*SapindusMukorossi*) and shikakai (*Acacia Concinna*) was made by boiling 50gm of pericarp without the seeds in 500ml of demineralised water for 30minutes and then simmered for 30minutes. Then strained with a muslin cloth. Four surfactant concentrations were selected i.e. 1ml/l, 2ml/l, 5ml/l and 10ml/l for both reetha, shikakai and Tween20 (synthetic surfactant).The contact angle measurement was done by LINO's fl s 95 750m contact angle instrument. Static contact angle was used to measure contact angle with the help of a goniometer. A drop of distilled water was used as a 'probe' which was placed on the surface of the samples with the help of a syringe which were analyzed using a microscope to determine the contact angle.The size of the drop was calibrated so as to have the exact amount of liquid on the solid surface. In the case of measuring different concentrations of surfactants, a thin film was prepared of the surfactant concentrations on a slide to be measured for contact angle.

RESULTS

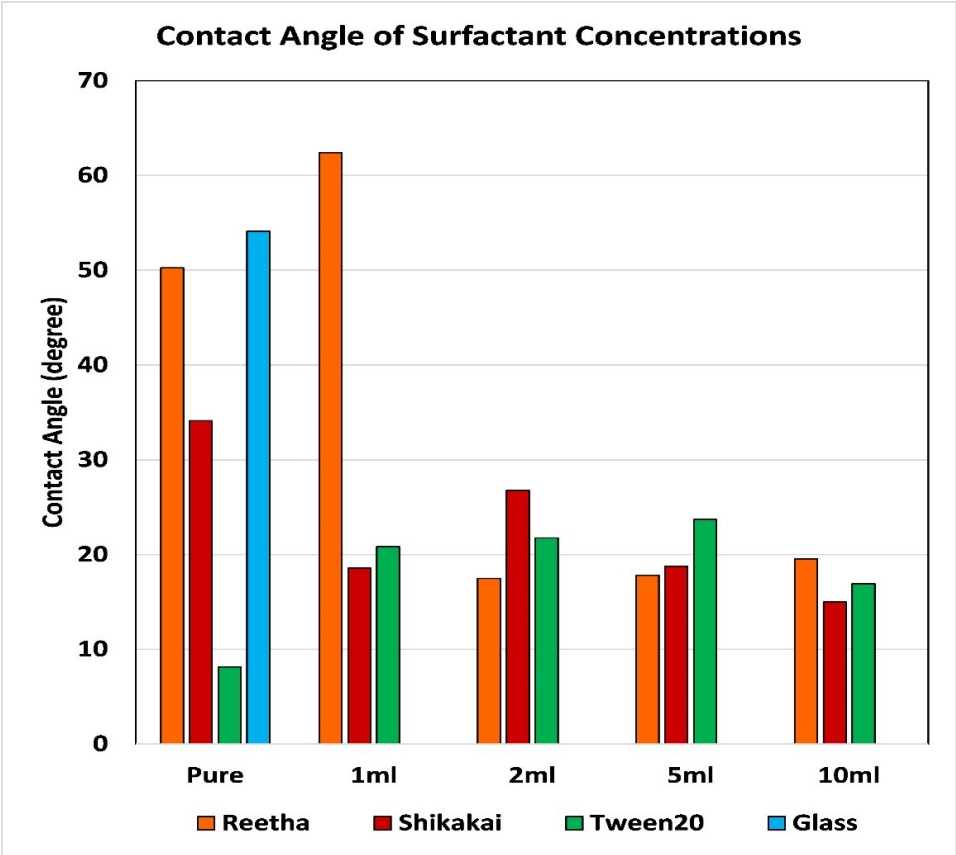


Figure-1 Contact Angle of Surfactant Concentrations

Tween20 has the smallest contact angle among the pure solutions indicates a good wetting capacity. In 1ml, shikakai has the smaller contact angle than Tween20. In 2ml concentration reetha has the smallest contact. In 5ml reetha again has the smallest contact angle. In 10ml concentration shikakai has the smallest contact than Tween20 and reetha having the largest contact angle. Contact angle of 10ml concentration for all three surfactants were less than 20 degrees. Overall, reetha and shikakai prove to have a good wetting capacity since, they have small contact angles. Contact angle of glass slide was measured to confirm 1ml concentration reetha sample to be inconclusive.

## CONCLUSION

The surfactant concentrations were kept low since the procedure was based on a textile conservation treatment. Since, Tween20 is a synthetic commercial customised surfactant, it will have low contact angles. However, the test showed that the contact angles of reetha and shikakai too were lower than 90° proving they have good wetting capacity. Having a good wetting capacity shows that reetha and shikakai may be a suitable alternative for washing historic textiles in textile conservation.

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**It's kind of fun to do the impossible.**

**~ Walt Disney**