

# Development of Degreasing Kitchen Wipes Made Up of Cotton Using Lemon and Tamarind

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## ABSTRACT

Present generation is increasingly focused on Conservative Environment, by decreasing the waste and increasing recycling and byproducts. Kitchen is the central area of working which generates more waste on disposal of cleaning products, and even harmful microbial growth in that product can potentially affect the health as well. This Project is a development of reusable kitchen wipes made up of cotton yarns for the reinforcement purpose coir is used on the other side and make this as Double sided kitchen wipes one side is Coir Fabric for Scrubbing the greasy areas and another side is with disentanglements Knitted yarns for Absorption of grease and oil dirt's. To enhance the performance of the wipes Organic acid (Citric and Tartaric Acid) is extracted from the Natural elements and used for Coating with Sodium bicarbonate. The wipes are analyzed by conducting several tests like antimicrobial test and tensile strength.

**Key Words:** Conservative Environment, Disentanglements, cotton yarns, Reinforcement, Coir and Scrubbing.

## INTRODUCTION

Textile products are classified into two different categories, Technical textile and Conventional textile. Conventional textile are designed and developed for common decoration and aesthetic application whereas technical textile is the functional application of textile, there are 12 types of technical textile: Mobitech, Indutech, Medtech, Hometech, Clothtech, Agrotech, Buildtech, Sporttech, Packtech, Geotech, Protech and Okeotech. These technical textiles exhibit properties like high strength, resistance to chemicals, enhanced performance, durability and thermal stability in extreme situations. This study comes under Hometextile, which is a reusable double-sided kitchen scrubber made up of cotton raveled yarns and coir.

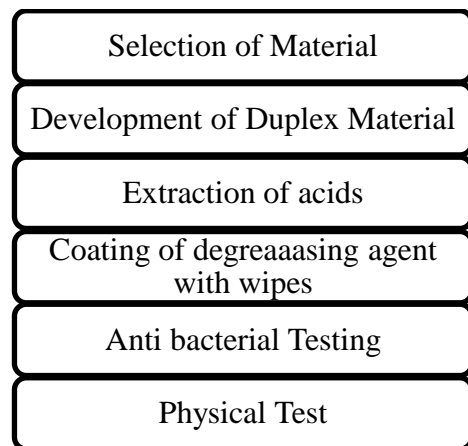
Textile Material is made from tiny fragments called fiber; they can be Natural, Man-made and Regenerated. Coir (Cocos nucifera Linn) is a Natural fiber extracted from the unripe coconut husk. Cotton (Gossypium) is the oldest natural fiber which has diverse application: Apparel, Industrial products and Hometextile. Mercerization is a pretreatment which improves absorbency. Cotton has many properties namely Fineness, Durability, Absorbency, Wickability and breathability. Raveling is the process of separating fibers of knitted fabric back to loose yarns. This happens when stitches in a knitted structure are undone for recycling of yarns. Yarns have curly or wavy structure, because of the previously knitted structure, that it has high crimp percentage hence have high absorption capacity. Since, using of raveled knitted yarns reduce waste generation it will promote sustainability.

There are different bonding techniques used in textile field, which include different types of bonding techniques are Thermal Bonding, Chemical Bonding, Adhesive Bonding, Mechanical Bonding, Lamination and Coating. The bonding technique can be varied according to the end use of the product.

Coating is the finishing process which is used to impart special properties in a textile material, the type of coating differs according to material and how long the coating should withstand like temporary, permanent or semi permanent.

To analyze the properties of the final product chemical testing, antibacterial testing and physical testing is done to analyze the strength and practicality of the product.

## METHODOLOGY



### Selection of Material

Degreasing kitchen wipes are made as duplex material that both sides of the wipes has its unique function of cleaning, Coir fabric and Raveled knitted fibers are selected for developing duplex degreasing kitchen wipes. The texture traps dirt particles, which can easily shaken or brushed off, Stain Resistance that its moderately stain resistant due to its natural sil, but stains should be addressed promptly to avoid permanent marks. Coir plays a vital role as scrub material which is used to clean the greasy and dirty area in kitchen and it also act as a support material. Coir is selected and purchased from Vel Exports, Madurai as Coir mat for several meters. Coir Mat is a continuous sheet of half inch thickness, this mat is cut into small splices.

Raveled Knitted Cotton yarns is selected for the Opposite side of the Coir fabric in duplex material, raveled knitted yarns are used to wipe out the dirt or residues which is formed due to the scrubbing of the coir material against the greasy and dirty area. Raveled yarns are purchased from the local market of Trichy, as white cotton raveled threads for several kgs. Since it is raveled yarns it has some irregular structure, but this property can also used in this wipes that the irregular structure helps in quick absorption of grease..

### Development of Duplex Material

This two different materials are bound together by using adhesives bonding technique and stitch bonding technique, and made into a single scrubber, for bonding these two material synthetic rubber adhesives is used since it use a natural polymer to make the resin it will be free from benzene. The effectiveness is based on the number of washes and number of

days it is used. Especially these organic acids are selected for cleaning greasy areas. Rubber adhesive is purchased from an online website, it is a brown coloured thick liquid coated in the coir fabric evenly and 2 or 4 strands of raveled knitted yarns is hand spun into continuous thick strands and laid above the adhesive coated side and pressed for compression, thus the duplex material is ready for coating.

### Extraction of Acids

In developing degreasing agent two acids are used such as citric acid from lemon peel and tartaric acid from tamarind and mixing these two acids with sodium bi carbonate to increase the efficiency of the solution. Acid extraction is done by calcium salt precipitation method and cold precipitation method. Citric acid is extracted from lemon peel by using calcium salt precipitation method with following steps:

1. Preparation: lemon peel is dried and make into fine powder to increase the surface area extraction.
2. Extraction: The powder is mixed with solvent like water ethanol mixture.
3. Filtration: Mixture is filter to separate the liquid containing citric acid from solid residues.
4. Purification: Impurities are removed by purification techniques like evaporation
5. Crystallization: Citric acid is obtained as crystals by evaporating the solvent.

Tartaric acid is extracted from tamarind pulp by using cold precipitation method with following steps:

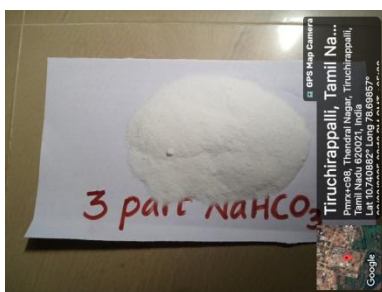
1. Preparation: Tamarind pulp, which contains a major amount of tartaric acid, is separated from seeds, fibers and other impurities.
2. Extraction: In cold extraction method, collected tamarind pulp is treated with aqueous solvent to dissolve the acid.
3. Precipitation: To separate the tartaric acid, calcium carbonate is added to the solution. It will react with tartaric acid to form calcium tartarate; This will be insoluble and precipitates out.
4. Filtration: Calcium salt is filtered from the solution.
5. Conversion: Calcium tartarate is treated with sulfuric acid, It will converts it back into tartaric acid and calcium sulfate, Then tartaric acid remains in the solution.
6. Purification: The solution is filtered to remove impurities.
7. Crystallization: water is evaporated to form the crystals of tartaric acid.



(a)



(b)



(c)

Plate 1 - (a) is the citric acid, (b) is the tartaric acid and (c) is the sodium bi carbonate

### Coating of degreasing agent with duplex wipes

Coating of the solution is done by using dip and dry method, this method involve Soaking of duplex wipes in the degreasing solution for 10hrs and drying it for 10hrs. After drying wipes are ready for usage.

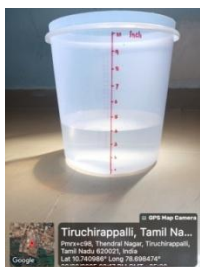
### Recipe

- Citric acid = 1 part
- Tartaric acid = 2 part
- Sodium bi carbonate = 3 part
- Water = Required amount to dissolve the solvent

Preparation involves following steps:

- Step 1 – Citric acid and Tartaric acid is taken and mixed in a dry beaker
- Step 2 – The mixer is added with required amount of water to dissolve the salts, and the solution is stirred well to make a solution with no precipitation.
- Step 3 – Sodium bi carbonate is added gradually while stirring, this will cause releasing of carbon dioxide gases and form.
- Step 4 – The solution is ready for coating.

Coating of the solution is done by using dip and dry method, this method involve Soaking of duplex wipes in the degreasing solution for 10hrs and drying it for 10hrs. After drying wipes are ready for usage.

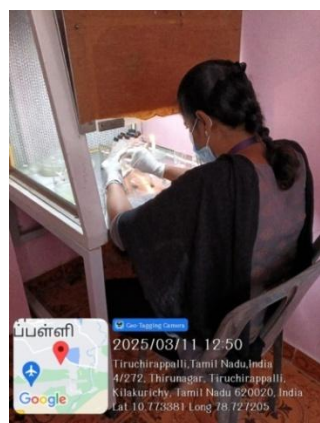




**Plate 2 – (a) diluted organic acids, (b) addition of  $NaHCO_3$ , (c) immersion of scrubber in prepared solution, (d) after 10hrs immersion of scrubber in prepared solution**

### Antimicrobial Testing

To test the microbial activity in the scrubber, antimicrobial test is undergone. For testing scrubber used for 1 to 4 days is collected. Generally kitchen scrubber has various type of pathogen, for testing most harmful bacteria is selected such as E.coli (Escherichia Coli) and Pesudomonous. E.coli is a gram-negative, rod-shaped bacterium will cause a range of diseases like Gastrointestinal infections, Urinary Tract Infections, Septicemia and Neonatal Meningitis, Pesudomonous aeruginosa cause harmful diseases like Respiratory Infections, Urinary Tract Infections, Skin and soft tissue Infections, Ear and Eye Infections and Bloodstream Infections. Test is done under stipulated condition, culture is developed with controlled medium and 4 different used scrubber, and from this the activity of the bacteria is tested.



**Plate 3 – image of undergoing antibacterial testing**

### Physical Testing

Tensile strength of the scrubber is tested using tensile strength tester, sample is prepared according to required dimensions, sample is clipped in the clamp and load weight is used to tighten the scrubber, Machine is on and the lever is lifted and sample is broken, after the breakage reading is noted. By this the tearing strength of the scrubber is analyzed. the tensile strength of the duplex material is  $\sigma = 0.332 \text{ N or } mm^2$



(a)



(b)

**Plate 4 - (a) image before breakage, (b) image after breakage**

## RESULT AND DISCUSSION

This paper focus on development of degreasing kitchen wipes made from cotton, coir, and coated with degreasing agents – citric acid (lemon) and Tartaric acid (tamarind). This study mainly focuses to create effective, chemical free and biodegradable substitute to commercially available hazards degreasing agents. Wipes is made as a duplex material using adhesive bonding and stitch bonding to ensure the durability and absorption.

### Key Findings

#### Development of Wipes

- The wipes is made as duplex material, it make the wipes more practical for kitchen cleaning. That both the side of the fabric has its specific role like scrubbing and wiping.
- Unlike commercially available scrubber it is well fitted for cleaning greasy areas in kitchen especially kitchen tiles, stoves and chimney.

#### Degreasing agent effectiveness

- Citric acid, Tartaric acid and sodium bi carbonate is used as degreasing agent this combination is most widely used cleaning agent, this is will not affect the humans health in any way that this three combination is used for medicine preparation.
- The effectiveness is based on the number of washes and number of days it is used. Especially these organic acids are selected for cleaning greasy areas.

#### Physical test

Tensile strength is the physical test undertaken to know the maximum stress that the sample can withstand this can be identified by  $\sigma = 0.332 \text{ N or mm}^2$



## Antibacterial test

The antibacterial activity of the fabric sample toward selected pathogens using disc diffusion method. Day 1 sample shows no growth of bacteria, Day 2 sample shows slow growth of bacteria, Day 3 sample shows moderate growth and Day 4 sample shows partial growth.

## CONCLUSION

The project successfully binds biodegradable materials with organic acids which will be an alternative for commercially available wipes.

The development of degreasing kitchen wipes made up of cotton and coir with organic acids is made as effective cleaning solution. Coir helped in reinforcement, and used to remove the greasy content in kitchen area, and Raveled knitted yarns helps in absorbing the dirt with this organic acids combined to be more effective, This findings recommends that it will be a alternative to chemical-based kitchen wipes, Survey feedback proves that this has a high user satisfaction and product practical usability. Future improvements will focuses on improving the acids effectiveness, coloured knitted yarns, different shapes for different uses and large-scale production practicability.

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