



## RESEARCH ARTICLE

## Phytochemical Screening of 20 Plant Sources for Textiles Finishing

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**Manuscript Info****Manuscript History:**

Received: 17 August 2015

Final Accepted: 28 September 2015

Published Online: October 2015

**Key words:**

Plant sources; phytochemical analysis; Antimicrobial property.

**\*Corresponding Author****Padma Alapati****Abstract**

Around 20 plant sources were selected to analyze presence of phytochemicals (*Alkaloids, Flavonoids, Glycosides, Steroids, Saponins, Resins, Phenols, Tannins and Terpenoids*). For the analysis of Phytochemical, sources were extracted through aqueous decoction /infusion extraction. Among the analyzed sources, *Syzygiumcumini, Datura stramonium, Perriwinkle, Cassia angustifoliavahl* and *Eucallyptus* were found to be rich in phytochemicals and ranked first followed by Ashoka, English neem, Amla (small), Tulasi and *Tecomagrandis* were ranked second; *Tamarindusindica, Castor, Amlthas, Teak* and *Amla (big)* were ranked third; and *Pipal, Pongamiapinata, Aloe vera, Radish* and *Hibiscus* as fourth. Presence of phytochemicals in these plants confers antimicrobial activity of the sources, which can be utilized as an applicant on textile material to incorporate antimicrobial property.

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**INTRODUCTION**

The phrase 'Antimicrobial' has become a most popular treatment/finish in textile materials. Antimicrobials have emerged in the textiles, to avoid infestation, to reduce bad odour and to maintain fresh feel of the textiles. Antimicrobial textile products continue to increase in popularity as demand for fresh smelling, skin friendly and high performance fabrics goes on. Modern performance fabrics are required in many specialist applications, sports textile is one example. These need to exhibit high degrees of performance in terms of longevity and durability, and by imparting antimicrobial properties to the fabric. These properties can be improved as well as increasing the comfort and hygiene factor making them more pleasant to wear. In order to obtain the greatest benefit, an ideal antimicrobial treatment of textiles should be durable by not effecting materials appearance, effective against bacterial and fungal species, as well should be non-toxic to wearer/environment. Some of these phytochemicals have more than one function. There is, however, much scope for further systematic research in screening Indian medicinal plants for these phytochemicals and assessing their potential in protecting against different types of diseases, **Lacaille and Wagner, 2000**. Phytochemical were divided as primary or secondary constituents, depending on their role in plant metabolism. Primary constituents include the common sugars, amino acids, proteins, purines and pyrimidines of nucleic acids, chlorophyll's etc. Secondary constituents are the remaining plant chemicals such as alkaloids, terpenes, flavonoids, lignans, plant steroids, curcumines, saponins, phenolics, flavonoids and glucosides, **Hanh, 1998**.

Present study was under taken, in order to assess the presence of antimicrobial activity through secondary phytochemical screening in different plant sources. Twenty plant sources were selected for phytochemical analysis. From the available review and literature on medicinal plants, 20 plant sources were selected for phytochemical screening, as shown in Table 1. In this table along with botanical name, family it belongs to, local name, parts used, uses and availability were specified.

## MATERIAL AND METHODS

20 selected plant sources were listed below:

### Selection of Plant Source

Leaves of twenty plants were collected in and around the operational villages based on the medicinal values in plants. Small description of selected plants was give as per the serial number in the Table 1.

### **Syzygiumcumini**

It is one of the most popular edible fruit of India, with immense range of properties. It's good source for calcium and a fair source of iron and good for diabetes, diarrhea, gingivitis, ulcerations, sore throats, indigestion, appetite loss, leucorrhoea, bronchitis, asthma, enema, stomach-aches and dysentery.

### **Tamarindusindica**

It is most widely used in the Indian cuisines. Almost all parts of the tree are useful. It is astringent, digestive, antiasthmatic, febrifuge, carminative, antiscorbutic, antibilious and a good source of vitamin B and C & potassium bitartrate. Used for rheumatism, dysentery, jaundice, colic, indigestion, sore throats, aphthous, sores, asthma, fever, scurvy, ulcers, boils and rashes.

### **Datura stramonium**

All parts of the plant considered poisonous and tastes bitter. It has narcotic, anodyne, and antispasmodic, anesthetic, antiasthmatic, antispasmodic, antitussive, bronchodilator, hallucinogenic, hypnotic properties. Used for rheumatism, gastric pains, asthmatic attacks, sprains, muscle pain, cramps contusions, snakebites, piles, cough, convulsions, gums during toothache and applied on dog bite wounds. Used as poultices/applicant for psoriasis, syphilitic swellings and boils, hemorrhoids, fissures, and other rectal diseases

### **Vinca major**

It has purgative, vermifuge, depurative, hemostatic, anti-cancer, antibacterial, antifungal and antiviral. It is used for diabetes, stomach cramps, menorrhagia, asthma high blood pressure, dysmenorrheal, wasp stings & bee stings, indigestion, dyspepsia, toothache and as eye wash.

### **Tecomastans**

Entire plant can be utilized in the treatment of diabetes. Roots are reported to be diuretic, tonic, anti-syphilitic and vermifuge. Decoction of flowers and bark are used for stomach pains.

### **Eucalyptus camaldulensis**

Leaves and oils of this plant are good sources of antimicrobial, antibacterial, vulnerary and antitubercular properties. It is used for lung diseases, tuberculosis, gastrointestinal disorders, sore throat, catarrh, nasal congestion, cough, bacterial infections for respiratory and urinary tracts wounds.

### **Cassia angustifoliavahl**

It is diuretic, dysenteric and ophthalmic. It is used for gynaecological diseases, uterine tonic for women immediately after delivery, stone/gravel in the bladder, externally and internally eye-diseases.

### **Saracaindica L.**

Asoka tree has got many antimicrobial properties which include astringent, uterine sedative anthelmintic, refrigerant, styptic, stomachic, constipating, febrifuge, and demulcent. It is used for menorrhagia, uterine sedative, excessive uterine bleeding, hemorrhoids, hemorrhagic dysentery and menstrual disorders, dysmenorrheal, stomachaches, cervical adenitis, biliousness, syphilis, hyperdipsia, hemorrhagic dysentery, hemorrhoids, and scabies. Asoka is also used for depression, rheumatism, skin diseases and urinary disorders.

### **Ricinuscommunis L**

It has antimicrobial, soothing, purgative, antirheumatic, antidote and antiphlogistic property. Good for gastrointestinal tract, ulcers, wounds, non-lowering of the foetus during delivery, paralysis, epilepsy, distention of the uterus, prolapsus, piles, anal fissures, skin diseases, sores, boils, burns, dog bites and headache.

**Melia azedarach linn**

It has anthelmintic, antilithic, astringent, antiperiodic, diuretic, deobstruent, stomachic, resolvent, vermifuge, laxative, stimulant, antiseptic, alterative, emmenagogue, emollient and purgative properties. It is used for fevers, malaria, thirst, nausea, dysentery, intestinal worms, urinary infections, piles, leprosy and scrofulous ulcers, boils, sores, skin diseases, hysteria, stomach aches, prickly heat and destroys head lice.

**Pongamiapennata**

Karanj has got good antiinflammatory, anti-plasmodial, anti-noniceptive, antihyperglycemic, anti-lipidoxidative, antidiarrheal, anti-ulcer, anti-hyperammonic, antioxidant, anthelminthic, antiseptic, stimulant, stomachic and chologogue properties. They are used for tympanism, dyspepsia, diarrhea, diabetes, abdominal tumours, rheumatic joints, cough, bronchitis, ulcers, bleeding piles, itches, cough, fungal skin-afflictions, scabies, sores herpes, eczema, cleaning of gums and teeth.

**Cassia Fistula**

It has antimicrobial, antitumor, inflammation, astringent, antioxidant, hypoglycemic, hepatoprotective, antibacterial, demulcent, antipyretic, abortifacient, purgative, laxative, antibilious, caminative, hypocholesterolemic and antidiabetic properties. It is used for burns, cancer, constipation, convulsion, delirium, ring worm, adenopathy, leprosy, syphilis, skin diseases; abdominal pain, constipation, heart disease, leprosy, anthrax, blood poisoning, black water fever, dysentery and malaria.

**Hibiscus rosa-sinensis**

It has emollient, emmenagogue, anodyne, expectorant, refrigerant, Anti-infectious, anthelmintic, anti-inflammatory, diuretic, antipyretic, hypotensive, antispasmodic astringent and purgative properties. Proanthocyanidins are considered antioxidant, antipyretic, analgesic and spasmolytic. It is used for gonorrhea, infusion for bronchitis, mumps, fever, sprue, paralysis and menorrhagia, sore eyes, coughs, venereal diseases, fever, antidote for poison, externally applied for swellings, tumors, abscesses, carbuncles, boils, cramps headaches and hair stimulation. Mucilage of roots is soothing on the mucous membranes of the digestive and respiratory tracts.

**Tectonagrandis**

It has diuretic, astringent, cooling laxative, sedative, expectorant, astringent, anthelmintic, anti-inflammatory, anti-bacterial, cytotoxic, anti-anemic, anti-ulcer, anti-viral, vulnerary and vermifuge properties. Used for to prevent premature births, hemoptysis, menstrual disorders, and hemorrhages, sore throat, anemia, bilious headaches, inflammatory swellings, dyspepsia, burning of stomach, eyelid swelling, eye strengthening, piles, leucoderma, dysentery, diuretic stimulant for hair growth and skin itching

**Ocimum sanctum**

It is the most sacred plant in Hindu religion. It is considered to possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, galactagogue, hepato-protective, cardio-protective, antiemetic, antispasmodic, analgesic actions. It is used for stomachic, hepatic affections, gonorrhoea, malaria, cough, bronchitis, asthma, malaria, dysentery, stress, fungal infections, diuretic, rheumatic pains, paralysis, catarrh, bronchitis, coughs, earaches, worm expulsions, croup, diarrhea and to increase milk secretion.

**Aloe barbadensis**

It is one of the major medicinal plants with aromatic, astringent, aperient, purgative, emmenagogue, emollient, cholagogue, laxative, stomachic, tonic, vulnerary, antitoxic, anticancer and antimutagenic properties. It is good for conjunctivitis, diabetes, dysentery, kidney pains sprains, stomatitis, sore throat, skin burns, scalds, scrapes, sunburns, wounds pimples, acne, cuts dandruff, hair fall and baldness.

**Emblica Officinalis (Big)**

Amla has curing for cancer, inflammation, diabetes, normalizing liver specific enzyme alanine, and transaminase activity, decreases blood glucose levels, triglyceridemic levels, age-related, renal disease and. It is used for diabetes, reduction of blood cholestrols (normal and hypercholesterolemic), renal diseases and preventing hair graying. It has high tannin content, used in polyherbal formulations, fabric dyeing as mordant, inks, shampoos and hair oils.

**Raphanussativus**

It has anthelmintic, antifungal, antibacterial, antiscorbutic, antifever, antitussive, gastric tonic, diuretic, laxative, tonic, carminative, corrective, stomachic, cholagogue, stimulant, lithotriptic, emmenagogue properties. It is good for diarrhea, dropsy, general anasarca, piles, stomach pains, fever, cough, increased urinary flow, promoting bowel movements, edema, bloated belly, pale-yellowish face, oliguria, burns, scalds, and ecchymosed/fetid/smelly feet. It's a good source iron, calcium and vitamin-B.

**Ficus religiosa**

It has antimicrobial, astringent, antidiarrhea, antidysenteric, laxative, antiasthmatic, antifungal, analgesic, anti-inflammatory, antioxidant, febrifuge and vulnerary properties. It is used for bleeding disorders, which includes hematemesis, hemoptysis, hematuria, menorrhagia, metrorrhagia, epistaxis, and bleeding hemorrhoids; gum diseases, constipation, mumps, abscesses, fevers, wounds, dysentery, bruises, boils and mumps, low back pain, stomatitis, gastric ulcers, digestive problems, skin diseases, including ringworm, athlete's foot, and other fungal infections.

**Emblica Officinalis (Small)**

It has acidic, astringent, purgative, cathartic, diaphoretic, mucilaginous and demulcent properties. It is used in gonorrhoea, urticaria, lumbago, sciatica, asthma, skin diseases like eczema, abscesses, acne, bronchial catarrh, foot psoriasis and coughs.

**Preparation & Extraction of plant sources**

Selected plant sources were washed with 5% ethanol, shade dried & powdered.

**Extraction by aqueous decoctions:**

Fresh leaves were grounded, boiled in water and filtered to extract the decoction. Extraction of the plant source can be done by using different solvents, as shown in Figure 1.

**Aqueous infusion:**

20gms of dry leaf powder of selected plant sources was boiled in 100ml distilled water for 15 minutes. The flask were then plugged and removed from heat and allowed to cool and then filtered. This filtrate was used as the aqueous decoctions, as shown in Figure 2, **Shyamalagowri and vasantha (2010)**.

**Test methods for phytochemical screening of plants**

Selected plants were tested for Phytochemical through standard test methods.

**Alkaloids [Mayer's test]**

1.36gm of mercuric chloride and 5gm of potassium iodide were dissolved in 60ml and 10ml of distilled water respectively. Two solvents were mixed and diluted to 100ml using distilled water. To 1ml of acidic aqueous solution of sample add few drops of reagent, where formation of white/pale precipitate shows presence of alkaloids.

**Flavonoids**

To 0.5ml of extract add 5 to 10 drops of diluted HCl and small amount of Zn & Mg and the solution was boiled for few minutes. Appearance of reddish pink/dirty brown colour indicates presence of flavonoids.

**Glycosides**

A small amount of alcoholic extract of samples was dissolved in 1ml water and then aqueous sodium hydroxide was added. Formation of yellow colour indicates presence of glycosides.

**Steroids [Salkowski's test]**

100mg of dried extract was dissolved in 2ml of chloroform. Sulphuric acid was carefully added to form a lower layer. Reddish brown colour at the interface was an indicative for presence of steroidal ring.

**Saponins**

To 50ml of aqueous extract add a drop of sodium bi-carbonate and keep for 3min after shake vigorously.

Formation of a honey comb like froth indicates presence of saponins.

**Resins**

To 2ml of chloroform or ethanolic extract add 5 to 10ml of acetic anhydride and dissolve gently by heating. After cooling add 0.5ml of H<sub>2</sub>SO<sub>4</sub>. Bright purple colour indicates presence of resins.

**Phenols [Ferric Chloride Test]**

To 1ml alcoholic solution of sample add 2ml of distilled/water followed by a few drops of 10% aqueous ferric chloride solution. Formation of blue/green colour indicates presence of phenols.

**Tanins**

**Lead acetate test**

To 5ml of aqueous extract add few drops of 1% solution of lead acetate. Formation of a yellow or red precipitate indicates presence of tannins.

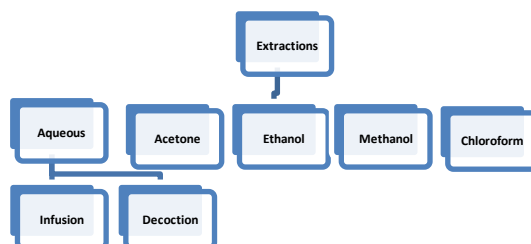
**FeCl<sub>3</sub> test**

2ml filtrate (200mg of plant material in 10ml distilled water, filtered) and 2ml of FeCl<sub>3</sub> were mixed. A blue/black precipitate indicated the presence of tannins

**Terpenoid**

2ml of chloroform, 1ml of conc. H<sub>2</sub>SO<sub>4</sub> was added to 1ml of extract, where reddish brown colour indicates the presence of terpenoid.

**RESULTS/DISCUSSION**



**Figure 1. Solvents in the extraction procedures**



**Figure 2. Process of extraction through aqueous infusion**

**Table 1. Basic information on 20 selected plant sources for phytochemical analysis.**

S. No.	Family	Common name	Parts used
1	Myrtaceae	Eugenia jambolana/plum/black plum/jaman/jambolan	Fruit/leaves/bark.
2	Cesalpiniaceae (Fabaceae)	Tamarind/Imlil/chintachettu	Leaf/-bark/flower.
3	Salanaceae	Datura/Jimson Weed/Stink Weed/Mad Apple/Thorn Apple Stramonium/Apple	Leaves

		Thorn/Datura Tatula/Datura Seeds	
4	Apocynaceae	Periwinkle/Big leaf Periwinkle/Blue Periwinkle	Whole plant
5	Bignoniaceae	Yellow trumpetbush/Piliya/Swarna/ganneru	Entire plant
6	Myrtaceae	Regum/River Red Gum	Leaves/oils
7	Caesalpinaceae	Thangedu/Indian sena/Sena/Sana	Seeds/leaves/fruit
8	Caesalpinaceae	Ashoka/Hemapushpa, Tamrapallava/PindapUshpa/Gandhapushpa	Barks/leaves/flowers
9	Euphorbiaceae	Castor oil plant	Roots/leaves/seeds
10	Meliaceae	Bead tree/Kondavepa/TurakaVepa,/Bakayan,	Fruit/leaves/bark of roots/trunk
11	Fabaceae	Kānuga/Karanj/Indian beech	Seed/root /bark/leaves
12	Caesalpinaceae	Fistula/Laburnum/Purging Fistula/Golden Shower/Amaltas	Roots/leaves/pods
13	Malvaceae	Mandaram/Red hibiscus/Gurhal	Leaves/flowers
14	Verbenaceae	Teca/Teak/Sagun	Leaves
15	Lamiaceae	Tulsi/Tulasi	Whole plant
16	Liliaceae	Aloe/Barbados aloe/Curacao aloe/Indian aloe/Ghikunvar	Leaves/pulp/sap
17	Euphorbiaceae	Gooseberry/PhyllanthusEmblica/Emblica/Indian Gooseberry/Amla	Leaves/fruit
18	Cruciferae	Radish/Muli/mullangi	Whole plant
19	Moraceae	Ravi chetu ,pepal Bargad/Banyan tree	Roots/leaves/seed/barkfruit/latex
20	Euphorbiaceae	Gooseberry/PhyllanthusEmblica/Emblica/Indian Gooseberry/Amla	Fruits

Secondary phytochemicals were analyzed in the present study, it was observed that flavonoids, saponins, phenols and tannins were present in maximum plant sources. Other phytochemicals like alkaloids, glycosides, resins and terpenoids were present in around fifty percent of the selected plant group, whereas steroids were present only in four plant sources out of twenty selected sources, as shown in Table 2.

Alkaloids are present in nine sources. Whereas, rarely obtained phytochemical, steroid was present in four plant sources, which includes *Syzygiumcumini*, *Datura stramonium*, *Cassia angustifoliavahl* and *Saracaindicalinn*. Saponins and phenols were present almost in every plant source.

Presence of Alkaloids, steroids, saponins and phenols, secondary metabolites have contributed to medicinal value as well as physiological activity to the plant. These are astringent, anti-diabetic, diuretic, anti-asthmatic, anti-cancer, anti-bacterial, etc. By utilizing the plant sources, which are having secondary metabolites, antimicrobial treatments can be given to selected plant source by undergoing proper process of textile finishing.

Steroids present in plants are good source as repellent for insects and microorganisms. This property helps to utilize the plant source in different herbal medicines and cosmetics. They can also be used in nutritional based products.

Flavonoids have been referred to as nature's biological response modifiers, because of their inherent ability to modify the body's reaction to allergies and virus and they showed their anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activities. Plant sources with flavonoids are good relief from different body allergies and stomach related problems.

Presence of tannins is considered as antiviral, antibacterial and anti-tumour activities. These properties are very important in imparting antimicrobial property to the textiles. Tannins are used in the dyestuff industry as caustics for cationic dyes (tannin dyes), and also in the production of inks (iron gallate ink). It can also be used as coagulant in rubber production, MamtaSaxena, *et al.*, 2013.

However, presence of glycosides possesses toxicity, but some of these antinutrient properties can be reduced by various processing techniques.

Saponins are known to be antimicrobial, to inhibit moulds, and to protect plants from insect attack, Lacaille and Wagner, 2000. Saponins confer antifungal, antioxidant, anti-inflammatory properties. These can be used in staining. For example, teak leaves can be used as natural dyeing source, Amla can be used as a mordant in natural dyeing or printing. In medicines, it also possesses hypercholesterolemia, hyperglycaemia, anti-inflammatory, weight loss properties.

**Table 2. Phytochemical analysis of the selected 20 plant sources**

S. No.	Plant sources	Alkaloids	Flavonoids	Glycosides	Steroids	Saponins	Resins	Phenols	Tannins	Terpenoids
1	Syzygiumcumini	-	+	-	+	+	+	+	+	+
2	Tamarindusindica	+	-	-	-	-	+	+	-	+
3	Datura stramonium	+	+	+	+	+	+	-	+	-
4	Perriwinkle	+	+	+	-	+	-	+	+	+
5	Tecomagrandis	-	+	-	-	+	+	+	+	+
6	Eucallyptus	+	+	+	-	+	-	+	+	+
7	Cassia angustifoliavahl (Thagedu)	+	-	+	+	-	+	+	+	+
8	Ashoka (Saracaindialinn)	+	-	+	+	+	-	+	+	-
9	Caster	-	+	-	-	+	-	+	+	-
10	Melia azedarach linn (English neem)	-	+	+	-	+	-	+	+	+
11	Pongamiapennata	+	-	-	-	+	-	+	-	-
12	Amalthas	-	+	-	-	+	-	+	+	-
13	Hibiscus	-	-	-	-	-	+	+	-	-
14	Teak	-	+	-	-	+	-	+	-	-
15	Tulasi	-	+	+	-	+	-	+	+	+
16	Alovera	+	-	+	-	+	-	-	-	-
17	Amla (big)	-	+	-	-	+	-	+	+	-
18	Raddish	-	-	+	-	+	-	+	-	-
19	Pepal	-	-	+	-	+	-	+	-	-
20	Amla (small)	+	+	+	-	+	-	+	+	-

Note: + Present – Absent

## CONCLUSION

From the present study it can be assumed that these leaves may serve as a potential application for treatment as antioxidant, antifungal, anti-allergic, anti-inflammatory, anti-microbial etc, and further research should be conducted in order to explore their applications.

Few of the sources are aromatic, whose extract when applied as a finish to textile material, gives fresh feel and fragrance to the finished material.

Considering the aromatics in few of the plant sources, along with antimicrobial properties, these also possess great fragrance to the finished textile product.

## Implicate of the study

Further research should be conducted in terms of, other extraction and phytochemical screening methods; Identification of best extraction method; Standardization of different application methods on textiles; Identification of best application method; Evaluation of antimicrobial properties; etc.,

## Acknowledgement

The authors would like to thank ICAR, New Delhi for providing financial assistance under All India coordinated research project on Home Science through CIWA, Bhubaneswar to carry out this project.

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