

Comparative Study On Antimicrobial Activity Of *Carica Papaya* And *Nyctanthes Arbor-tristis* Leaf Extract and Application in Cosmetics Formulation

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Abstract: To compare the antimicrobial activity of *Carica Papaya* and *Nyctanthes arbor-tristis* leaf extract on pathogenic bacteria, fungi and their application in cosmetics formulation.

Methodology: *Carica Papaya* and *Nyctanthes arbor-tristis* leaf collected and extracted by hot and cold method prepared leaf extract were tested on pathogenic microbes, such as *Pseudomonas aeruginosa*, *E.coli*, *Proteus*, *Staphylococcus aureus*, *Klebsiella*, *Aspergillus niger*, *Aspergillus flavus*, *Alternaria*, *Fusarium*, *Penicillium* by agar well diffusion method and disc diffusion method.

Result: The Antimicrobial Screening of the *Carica Papaya* and *Nyctanthes Arbor-tristis* showed that *Nyctanthes Arbor-tristis* leaf extract were found to more effective than the *Carica Papaya* leaf extract. Based on this property commercial organic products will be prepared such as oil, shampoo, handwash by using the *Nyctanthes Arbor-tristis* leaf extract. Oil and Shampoo will control the hairfall and clear the dandruff, Handwash is used to remove germs from hand and helps to prevent infection.

Keywords: Medicinal plants, *Nyctanthes Arbor-tristis* and *Carica papaya*, phytochemical test, antimicrobial activity, cosmetics formulation.

1. Introduction:

In the recent years, the use of herbal medicines has been extensively expanded all over the world. More than 80% of world population directly or indirectly depends on the traditional herbal medicines for their primary health care. In the context of Nepal, a large varieties of medicinal plants or any materials that derived from plants have been employed for the proper prevention and treatment of different kinds of diseases in all the traditional cultures. Since researchers are looking on traditional knowledge about probable consequences of exercising these plants as herbal medicines, but there is no more enough progress in the use of herbal medicine as expected. The traditional knowledge regarding of medicinal plants and their use by indigenous cultures have been passed from one generation to another. So, transfer of traditional knowledge about the herbal medicines would be supportive for the proper conservation of cultural tradition, biodiversity of medicinal herbs as well as a potential new drug development in the present and future prospect of country. The herbal medicines have drawn a great attention to all the common people as well as pharmaceutical companies because of their cost effective and eco-friendly attributes^[2].

Carica papaya belonging to family caricaceae. It is commonly known as papaya, papaw, pawpaw in English, papita in Hindi and Erandakarkali in Sanskrit^[1].

Carica papaya, one of the 22 accepted species in the genus carica of the family caricaceae. Its origin is in the tropics of the Americas, perhaps from Southern Mexico and neighboring central America. The papaya is a small, sparsely branched tree, usually with a single stem growing from 5 to 10m (16 to 33 ft) tall, with spirally arranged leaves confined to the top of the trunk. The lower trunk is conspicuously scarred where leaves and fruit were borne. The leaves are large, 50-70cm (20-28) in diameter deeply palmately lobed, with seven lobes. All parts of the plant contain latex in articulated laticifers. A natural product is a substance produced by a living organism found in nature that usually has a biological or pharmacological activity for use in drugs discovery and the drug design. Natural products are important in the treatment of life threatening conditions. Natural products may be obtained from organism or from microorganisms fermentation^[2].

Secondary metabolites are organic compounds that are not directly involved in the normal growth and reproduction of an organism. Secondary metabolites often play an important role in plant defense against herbivores. Humans use secondary metabolites as medicines, flavoring and recreational drugs^[3].

Traditionally leaves have been used for treatment of a wide range of ailments, like in treatment of a malaria, dengue, jaundice, immunomodulatory and antiviral activity. Young leaves are rich in flavonoids (kaempferol and myricetin), alkaloids (carpaine, pseudocarpaine, dehydrocarpaine 1 and 2), phenolic compounds (ferulic acid, caffeic acid, chlorogenic acid), the cynogenetic compounds (benzylglucosinolate) found in leaves. Leaf of the *Carica papaya* posses carotenoids namely β -carotene, lycopene, anthraquinones glycoside, as compared to matured leaves and hence posses medicinal properties like anti-inflammatory hypoglycaemic, anti-fertility, abortifacient, hepatoprotective, wound healing, recently its antihypertensive and antitumor activities have also been established. Leaves being an important part of several traditional formulations are undertaken for standardization for various parameters like moisture content, extractive values, ash values, swelling index, etc. The search for newer sources of antibiotics is a global challenge pre-occupying research institutions, pharmaceutical companies, and academia, since many infectious agents are becoming resistant to synthetic drugs^[1].

The plant parts are found to possess some properties like analgesic, amebicide, antibacterial, cardiotoxic, cholagogue digestive, emenagogue, febrifuge, hypotensive, laxative, pectoral, stomachic, and vermifuge. Chymenopapain and papain are the two important bioactive compounds present in *C.papaya*. Papaya leaves are made as tea for malaria. Antimalarial and antiplasmodial activity has been noted in some preparations of the plant. The leaves of the papaya plant contain chemical compounds of karpain, substance which kills microorganisms that often interfere with the digestive function. Papaya leaf extracts have phenolic compounds, such as protocatechuic acid, p-coumaric acid, 5,7-dimethoxycoumarin, caffeic acid, kaempferol, quercetin, and chlorogenic acid. During the last few decades, considerable progress has been achieved regarding the therapeutic properties of papaya^[3].

Nyctanthes arbor-tristis is commonly known as Harshinghar or Night Jasmine. It belongs to the family Oleaceae^[4].

It is a shrub or a small tree growing to 10m (33ft) tall, with flaky grey bark. The leaves are opposite, simple, 6-12cm (2.4-4.7 in) long and 2-6.5cm (0.79-2.56 in) broad, with an entire margin. The flowers are fragrant, with a five to eight lobed white corolla with an orange-red center; they are produced in clusters of two to seven together, with individual flowers opening at dusk and finishing at dawn. The fruit is a bilobed, flat brown heart shape to round capsule 2cm (0.79 in) in diameter, each lobe containing a single seed. The tree is sometimes called "tree of sorrow" because the flowers lose their brightness during daytimes; the scientific name arbor-tristis also means "sad tree". The flower is called Gangaseuli and some where jhoraa sephali in Odisha, India^[5].

Medicinal plants represent a rich source of antimicrobial agent. Wide range of different parts of medicinal plant was used for extract as raw drugs and they possess varied medicinal properties. Some of these raw drugs are collected in larger quantities and traded in markets as raw material for many herbal industries^[6].

Juice of the leaves is used as digestives, antidote to reptile venoms, mild bitter tonic, laxative, enlargement of spleen, diaphoretic diuretic and antimicrobial activities. The whole plant is used for treatment of cancer, root for fever, sciatica, anorexia; bark as expectorant, leaf for control fever, diabetes and as cholagogue, diaphoretic and anthelmintic. Various extracts of the plant is used to treat arthritis, malaria, intestinal worms tonic, laxative, antitrypanosomal, anti-inflammatory and antioxidant activity. The plants are very well known for their pharmacological properties since ancient age^[7].

With in this study, the present investigation was undertaken to predict the comparison of antimicrobial activity of *Carica papaya* and *Nyctanthes arbor-tristis* against bacteria and fungi by Antimicrobial sensitivity method, both Kirby bauer method and well diffusion method. Application for *Nyctanthes arbor-tristis* plant from leaves leaf extract preparation of Oil, Shampoo and Handwash by using organic olden days method. Oil and shampoo was used to control the hairfall and clear the dandruff. Handwash is used to remove germs from hand this helps prevent infections because people frequently touch their eyes, nose and mouth without even realizing it.

2. MATERIALS AND METHODS:

2.1 Collection of plant leaves:

Diseases free fresh, young and green *Carica papaya* and *Nyctanthes Arbor-tristis* leaves were collected from Nathampalayam, Avinashi, Tirupur, Tamil nadu, India. It was identified in Botanical Survey of India Tamil Nadu TNAU Coimbatore, Tamil Nadu, India

2.2. Preparation of Leaves Extract:

The fresh leaves were washed thoroughly 3 to 10 times in the sterile distilled water. Extract were prepared from the leaves by hot and cold method and stored for further use^[2].

2.3. Culture Collection:

Pure culture of bacteria and fungi such as *E.coli*, *Pseudomonas*, *Proteus*, *Klebsiella*, *Staphylococcus aureus*, *Alternaria*, *Aspergillus niger*, *Aspergillus flavus*, *Penicillium* were PURCHASED from microbiological laboratory, **Kovai Medical Centre and Hospital**, Avinashi Road, Coimbatore -641014, Tamil Nadu, India. The test culture was maintained in the selective media, nutrient agar slant and broth.

2.4 Phytochemical Analysis:

Phytochemical Analysis were performed according to the procedure

2.4.1. Test for Alkaloids:

1ml of the extract was taken and added 1 to 2 drops of Mayer's Reagent. It indicates the cream or white precipitate.

2.4.2. Test for Flavonoids:

2ml of the extract was taken in a test tube and added 2ml of NaOH, It indicates the yellow colour then added 2 drops of diluted acid after that the yellow colour was disappear.

2.4.3. Test for Saponins:

2ml of extract was taken in a test tube and mix vigorously, the froth was formed.

2.4.4. Test for Phenols:

5ml of the extract was taken in a test tubes and added 5% neutral ferric chloride, the solution will be change dark green colour.

2.4.5. Test for Glycosides:

2ml acetic acid and 2ml chloroform was taken in an test tube and then added 2ml of extract, cooled and add concentrated H₂SO₄, The solution will be change green colour¹.

2.4.6. Test for Protein:

3ml of extract add 3% sodium hydroxide and few drops of 1% copper sulphate. The solution turns from blue colour indicated the presence of protein.

2.4.7. Reducing Sugar:

0.5ml of extract and 1ml water and 5 to 8 drop of Fehling solution was taken in test tubes and heated in direct flame .The solution turns brick red precipitate it indicates the presence of reducing sugar.

2.4.8. Anthocyanins and Betacyanins:

1ml 2N NaOH was taken in a test tube added 1ml extract then heated in a direct flame for 5minutes at100°C. The solution will be change into Bluish green colour it indicates the presence of Anthocyanins and Betacyanins.

2.4.9. Coumarins:

1ml of extract added 1ml 10% NaOH , the solution will change yellow colour. It indicates the presence of coumarins.

2.4.10. Terpenoids:

1ml of extract added 1ml chloroform and 1ml H₂SO₄,The solution will change grey colour ,it indicates the presence of terpenoids.

2.4.11. Steroids:

2ml of chloroform and few drops of concentrated H₂SO₄ and 5ml of extract . The solution will turns red colour and low chloroform layer.

3. ANTIMICROBIAL ACTIVITY BY Kirby-bauer Method:

The (MHA) Mullen –Hinton agar plates were prepared and sterilized 0.5% MC.FARLAND standard culture of bacterial and fungal were prepared the test cultures were swabed on the MHA plate immersed in prepared leaf extract were placed , then incubated for 24 to 48 hours and zone of clearance were measured. Similarly well diffusion method^[1].

4. RESULT:

This study performed to screen the antimicrobial activity of *Carica papaya* and *Nyctanthes Arbor-tristis* leaf extract to make a nature based product formulation in future. The collected plant leaf were identified and authenticated at *carica papaya* BSI Ref.No:BSI/SRC/5/23/2020/Tech./531, *Nyctanthes Arbor-trists* BSI Ref.No:BSI/SRC/5/23/2020/Tech./532 at botanical survey of India at south zoon) Coimbatore and the wovcher specimen was deposited in the department of microbiology Dr. N. G. P. Arts And Science College(autonomous) coimbatore.100 ml of leaf extract was obtained and phytochemicals Flavonoids, Phenols, Protein, Coumarins are present in all the extract. Alkaloids are found to be absent in all extract others such as Glycosisdes, Saponins, Reducing sugar present in cold extract of *Carica Papaya* and hot extract of *Nyctanthes arbor-tristis* else are found to be absent (Table.1). The four extract showed different antibacterial and antifungal activity for the selected clinical pathogenic organisms.

Table.No.1: Phytochemical test

Test	<i>Nyctanthesis arbor-tristis</i> cold extract	<i>Carica papaya</i> Cold extract	<i>Nyctanthesis arbor-tristis</i> Hot extract	<i>Carica Papaya</i> Hot extract
Alkaloids	-	-	-	-
Flavonoids	+	+	+	+
Saponins	+	-	+	-
Phenols	+	+	+	+
Glycosisdes	+	+	-	-
Protein	+	+	+	+
Reducing Sugar	-	-	+	-
Anthocyanins and Betacyanins	-	+	-	-
Coumarins	+	+	+	+
Terpenids	-	-	-	-
Steroids	-	-	-	-

+ - present , - - absent.

Above the selected organisms *E.coli*, *Klebsiella*, *Staphylococcus aureus* found to be sensitive to the plant extract derived hot extraction method. *Pseudomonas* found to be highly sensitive to the cold extract similarly *Aspergillus niger*, *Fusarium* are sensitive to the hot extract were a *Aspergillus flavus* sensitive to the cold extract. From the the efficacy level of leaf extract was sensitive to the bacteria the the fungi of tested organisms (Fig 1to 4).



**Fig.1: Antibacterial activity
Disc diffusion method**



**Fig.2: Antibacterial activity
Well diffusion method**



**Fig.3: Antifungal activity
Disc diffusion method**



**Fig.4: Antifungal activity
Well diffusion method**

From this study efficacy of the two plant extract against tested organisms were compared and conformed that *Nyctanthes arbor-tristis* leaf extract were effective then the *Carica Papaya* leaf extract utilizing this property organic natural product such as handwash oil and shampoo was formulated and will be commercialize (Fig 5).



Fig.5. Nyctanthes Arbor-tristis leaf products

Comparison of *Nyctanthes Arbour-tristis* *Carica papaya* efficacy

Fig.6. Tested Organism Fungi

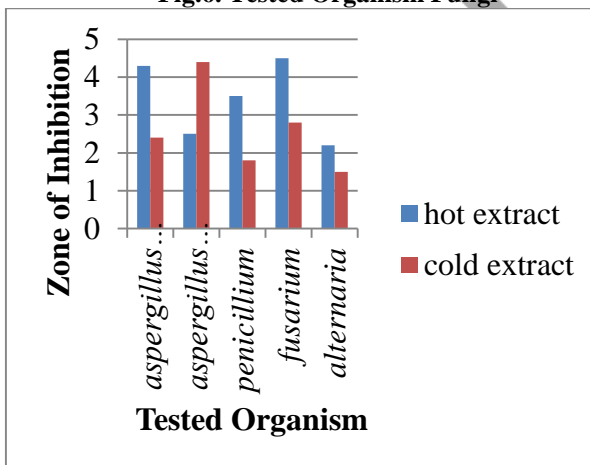


Fig.7. Tested Organism Bacteria

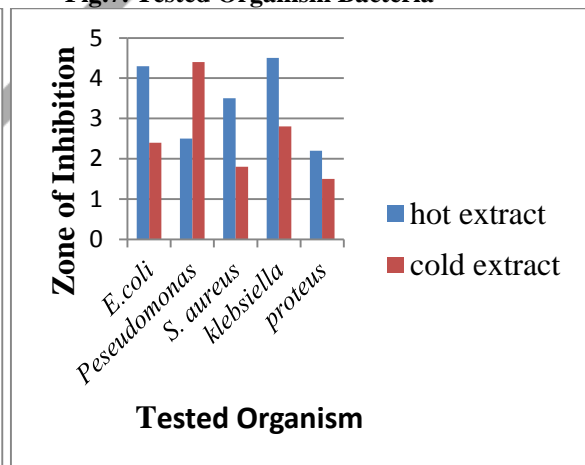
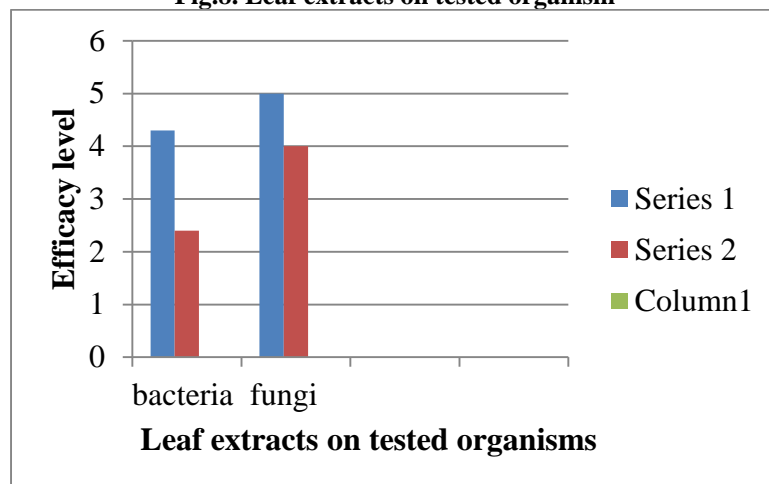


Fig.8. Leaf extracts on tested organism



5. Discussion:

From the result of this Antimicrobial Screening of *Carica Papaya* & *Nyctanthes arbor-tristis*, both showed the efficacy to fight against harmful pathogens. While comparing the two extracts, *Nyctanthes Arbor-tristis* extract were found to more effective on the test organisms than the *Carica Papaya* extract. Because of this result, I would prepared the products oil, shampoo and handwash by *Nyctanthes Arbor-tristis*.

6. Acknowledgment:

The authors are grateful to DST-FIST scheme, DBT-Star Scheme, management and principal of Dr. N. G. P. Arts And Science college (Autonomous) for their extended support of this work.

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