



Medicinal plant latex: A comparative study of the phytochemical, antioxidant and antimicrobial properties

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Abstract

Latex is a milky fluid and is present in about 10% flowering plants. Latex is in fact a compound emulsion comprising of sugars, oils, tannins, resins, gums etc. and harden up or coagulate when exposed to air. Tissue injury usually leads to exudation of latex out of the plants. Latex evolved mainly as a defense mechanism in plants against herbivores and insects. Latex is different from plant sap and have entirely different functions. Distinct plant latexes contain a variety of chemicals that have different anti-invasion properties. They protect plants from herbivores, insects, fungi, parasites, bacteria, and viruses, among other things. For millennia, mankind has used latices and their preparations for their beneficial influence on human health due to the presence of pharmacologically active chemicals. Most of these compounds have been used in traditional medicine for analgesic, wound healing, anti-pathogenic (antiviral and antibacterial), anti-parasitic, anti-diabetic, and other purposes. This study examines common latex applications and future prospects in medicine, agriculture, and industry. It is proven that plant latex comprises of several defense chemicals and proteins in high concentrations. Here, the relevance of latex in defense against bacteria, as well as its phytochemical and antioxidant properties are analyzed based on recent studies, and the unique characteristics of latex and leaf extracts of *Calotropis gigantea*, *Plumeria rubra* and *Carica papaya* are discussed. Studies concluded high rate of antioxidant, antibacterial and phytochemical activities in the latex of all the three plants studied than in leaf extracts. Effectivity was observed more in ethanol and methanol dilutions in phytochemical and antibacterial assay. Some of the chemical compositions are recorded more effective in distilled water also by phytochemical screening.

Keywords: plant latex, antioxidant, *Calotropis gigantea*, *Plumeria rubra*, *Carica papaya*

Introduction

Roughly 80% of the people in poor nations still uses traditional medicine for their primary health care. In many communities, medicinal plants are the foundation of health-care systems. The recovery of knowledge and behaviours related with these plant resources is an important strategy linked to biodiversity conservation, new medicine discovery, and improving the quality of life of poor rural populations. Ethnobotanical studies of medicinal plants have followed a variety of directions, sometimes testing assumptions about their use and understanding, and other times explaining how plants are used in specific cultural contexts. However, because indigenous knowledge of using medicinal plants to treat human problems is passed down through the generations, it is in danger of disappearing. As a result, nothing is known about the indigenous people's medicinal traditions. Researchers have been interested in the plants used traditionally for therapeutic purposes in Togo, a country in Western Africa with a border on the Atlantic Ocean in the south, in recent years. Despite these investigations, little is known about the latex plants utilized for medicinal purposes in Togolese flora.

Plant latex contains a variety of secondary compounds that impede the growth of bacteria, fungus, viruses, tumors, and cancer cell lines. It is poisonous to insects and inhibits their growth and reproduction cycles. It also has cytotoxic and anticancer properties and is frequently used as a laxative, anti-arthritic, and cosmetic conditioning agent.

Latex is a special, metabolically active cytoplasm produced by many plants. Latex yielding plants occur in fewer families than those which produces gums and resins; Apocyanaceae, Euphorbiaceae and Sapotaceae are among the important ones. Latexes are usually obtained by cutting the plant to make it bleed. Infectious diseases count number one in the total deaths worldwide and resistance to antibiotics is now a great global concern (Westh *et al.* 2004). The most feasible method to prevent antibiotic resistance is to use novel compounds that are new to the microbial world and not based on existing antimicrobial agents (Shah 2005). Plant derived phytomedicines are a great promise in the treatment of intractable infectious diseases (Idu *et al.* 2007).

Latex contains chemicals that produce allergic responses and induce hypersensitivity of the acute type. Furthermore, plant latex contains a wide range of bioactive compounds with anti-carcinogenic, anti-proliferative,

anti-inflammatory, vasodilatory, antioxidant, antibacterial, antiparasitic, and insecticidal properties. It is also employed in the manufacturing of adhesives, polymers, films, gloves, and other vital diagnostic products in the field of medical sciences. It's now a major natural supply of immunological allergens, medications, insecticides, and industrial chemicals. Plant latex may have many more applications with the introduction of modern technologies if it is employed as a basic raw material for the creation of household and immunodiagnostic goods. Plant latex has a broader ethnopharmacological purpose, since it is used by local tribal groups for wound healing, burns, joint pain, and worm control. Plant latex is used in the production of paints, elastics, swim caps, condoms, catheters, medical gloves, and balloons, as well as chewing gum. It is used as an addition in cement and offers immediate physical strength for solidification. ELISA plates and other immunodiagnostic materials are made from latex, a derivative of styrene. Plant latex comprises a complex variety of bioactive components with diverse biological properties, including proteolytic, anthelmintic, insecticidal, anti-inflammatory, antioxidant, and anticancer properties. Plant latex is used as an anticoagulant and to treat parasite illnesses. There are a few important latex-producing plants.

Only the wide range of occurrence of plant latex in the plant kingdom has been researched in many studies, but their various components, proteins, and compounds have not been fully documented. There has been a lot of advancement in this subject recently. The protective role of many plant latex proteins, such as chitin proteins and cysteine protease, has been investigated. Plant secretions contain a wide range of secondary proteins and metabolites that play an important role in defensive mechanisms. It is linked in a species-specific manner. Rubber, alkaloids, furanocoumarins, terpenoids, starch, glucosidase, phosphatase, oxidases, lectins, and other secretions are among the secondary metabolites found in abundance. For the separation of components found in plant latex, a variety of procedures have been utilised, including I fractional distillation (ii) high speed counter current chromatography (iii) fractionation by vacuum distillation (Nadeem et al., 2013). Many antifungal proteins are present in seeds of herbal plants and are employed to protect embryos against infections. These phytochemicals, such as phenolic acid, work to prevent parasites from adhering to teeth and the lining of the urine bladder, reducing the risk of urinary tract infection (UTI) and dental problems. For natural chemical analysis, GC-MS is a sophisticated and highly recommended technology. The GC-MS technique is used to determine their molecular mass as well as their ageing route. The chemical makeup of plant latex varies according to the season. *C. procera*'s white latex is used to treat coughs, loss of appetite, asthma, and is purgative. Different components in high and low concentrations make up the chemical composition of *C. procera*. Resins, tannins, and alkaloids are absent, whereas saponins and flavonoids are present in trace amounts. *Calotropis gigantea* is a species of *Calotropis* seen widely in Cambodia, Indonesia, Malaysia, Sri Lanka, India and China. It belongs to family Asclepiadaceae. *Calotropis* is commonly known as milky weed. The milky white endogenous latex, produced by the plant in appreciable amount, exhibit a variety of effect in various animal models.

Plumeria is a small tree or shrub commonly known as white champa, which is used to several traditional medicines to cure various diseases so they are also known for their medicinal importance. Their latex confers therapeutic properties to them. Latex applied to ulcers, herpes and scabies. Seeds possess hemostatic properties. Development of microbial resistance to available antibiotics led scientists to investigate the antibacterial activity of plants. For a long period of time, plants have been a valuable source of natural product for maintain human health, especially in the last decade, with more intensive studies for natural therapies. According to World Health Organization medicinal plants would be the best source to obtain variety of drugs. About 80% of individual from developed countries use traditional medicine, which has compound derived from plants. There for, such plants should be investigated to better understand their properties, safety and efficiency.

This paper aims to contribute to the knowledge of the latex plants used medicinally by the people by presenting the findings of a descriptive study of medicinal latex plants, with the goal of identifying the latex plant species used therapeutically and providing baseline data for future pharmacological, phytochemical, and toxicological studies.

Materials and methods

1. Collection of sample materials

Fresh and lively leaves of the plants *Plumeria rubra*, *Calotropis gigantea* and *Carica papaya* are collected from the different localities of Pala. The leaves are shade dried for a month. Latex of these plants are also collected as an exudate from the cut surface of severed internodes of either vegetative or matured fruit bearings. The latex was refrigerated until used.

2. Preparation of plant extract

The leaves are powdered after proper drying and kept in air tight containers. 10g powder was weighed and taken in a stoppered flask and treated with 50ml of distilled water, methanol, ethanol and acetone separately. The flask was shaken for the first six hours, kept aside and again shaken after 24 hours. After 24 hours the extract was collected and filtered and this crude extract is used for phytochemical screening, antioxidant analysis and antimicrobial screening.

3. Preparation of latex

Different dilutions of latex are prepared by adding equal volumes of distilled water, methanol and ethanol, i.e. 1ml of each.

4. Bacterial strains

Test organisms were collected from Biotechnology lab, St. Thomas College, Palai. *Staphylococcus aureus*, *Streptococcus haemolyticus*, and *Escherichia coli* were the selected candidates for antimicrobial screening. The sub cultures of bacteria was made on nutrient agar slants, incubated at 37°C for one day and stored at 4°C in the refrigerator to preserve the stock culture.

5. Preparation of nutrient broth

Peptone- 5gm

Sodium chloride – 5gm

Distilled water – 1000 ml

The above components were dissolved in water (distilled) after weighing. A pH of 7.29 (+/-) 2 was obtained. The medium was transferred to a conical flask and autoclaved at 121°C for 15 minutes. The bacteria were inoculated in nutrient broth and incubated over night at 30°C. Each were separately cultured in nutrient broth.

6. Preparation of muller-hinton agar (mha) medium

Formula and preparation:

MH agar medium was used in Disc Diffusion Sensitivity testing. Dehydrating medium obtained from Himedia laboratories Ltd, Mumbai was used. It was constituted with infusion from 300 gm beef extract, casein hydrolysate 17.5 gm, starch 1.5 gm and 17 gm (Monica 1985), per Liter. The required medium was made by dissolving the ingredients in distilled water. After boiling, pH was approximated to 7.4 and was poured into petriplates.

7. Disc diffusion method

- Nutrient medium was prepared and sterilized and poured into sterile petri plates.
- The medium was left to solidify.
- Later each pathogenic bacterial strain was swabbed in the plates using a cotton swab.
- Discs were later dipped in each of the latex samples and placed onto the center of the petri plates and kept for incubation for 24 hours at 37°C.
- Later the zone of inhibition was measured.

8. Total antioxidant activity by reducing assay

The plant extracts were screened for comparing the overall antioxidant activity using the method of Oyaizu et.al, 1986.

An extract of concentration 10 mg/50 ml were prepared by using various concentrations of ethanol and made up to 1ml. 2.5 ml phosphate buffer (0.2M, pH 6.6) was poured succeeded by 2.5 ml of potassium ferric cyanide (1%). The mixture was then incubated at 50°C for 20 minutes. After incubation, 10% trichloro acetic acid (2.5ml) was supplemented and centrifuged at 3000 rpm for 10 minutes. 2.5 ml of supernatant was moved to another test tube and was mixed together with 2.5 ml of distilled water. 0.5 ml of FeCl₃ (0.1%) was added. A blank was made using above mentioned reagents and absorbance was read at 700nm.

The increased absorbance of the reaction mixture indicates increase in reducing power.

9. Phytochemical screening

Preliminary phytochemical analysis was done to detect the presence or absence of terpenoids, flavonoids, carbohydrates, sugar, alkaloid, tannin, phenol and saponins. The various tests conducted to detect the presence of these phytochemical are follows:

Wagner's Test:

A portion of the extract is treated with 3 to 5 drops of Wagner's reagent (1.27g of iodine and 2g of potassium iodine in 100ml water) and observed for the development of reddish-brown coloring.

Molish's Test: Few drops of Molish's reagent is supplemented to 2ml portion of various extracts. This is followed by addition of 2ml con.H₂SO₄ down the sides of the test tube. The mixture is then allowed to stand 2-3 minutes. Formation of a red or dull violet color at the interphase of the two layers is a positive test.

Alkaline Reagent Test: 2ml of the extract is treated with a few drops of 20% NaOH solution. Formation of intense yellow color which becomes colorless on addition of dilute HCL indicates the presence of flavonoids.

Ferric chloride Test: A fraction of the extract is treated with aqueous 5% Ferric Chloride and observed for the formation of deep blue or black color.

Liebermann- Burchard Test: 1ml of the extract is treated with drops of chloroform, acetic anhydride and conH_2SO_4 and observe for the formation of dark pink or red color.

Braymer`s Test: 2ml of extract is treated with 10% alcoholic Ferric Chloride solution and observed for the formation of blue or greenish color.

Antimicrobial activity

Calotropis gigantea: Both the leaf extract and latex of *C.gigantea* shows antibacterial activity in bacterial strains of *E.coli*, Streptococcus and Staphylococcus. Latex extract prepared in distilled water shows highest rate zone of inhibition in *E.coli* and least rate was found in extract prepared in ethanol.in streptococcus the highest rate of zone of inhibition was found in extract prepared in distilled water and extract prepared in methanol and ethanol shows similar result.in staphylococcus the highest zone was found in extract prepared in ethanol and extract prepared in methanol shows the least result.

In leaf extract, the highest zone inhibition was found in *E.coli* is extract prepared with distilled water and extracts prepared in methanol and ethanol shows similar result. In streptococcus the highest zone of inhibition was found in extract prepared in methanol and least rate was found in extract prepared in ethanol.in staphylococcus the highest zone of inhibition was found in extract prepared in ethanol and extracts prepared in distilled water and methanol shows the similar result.

Plumeria rubra: In plumeria rubra, both the latex and leaf extracts showed antimicrobial activity on *E.coli*, Streptococcus and Staphylococcus. In *E.coli* extract of latex prepared in distilled water shows more activity than extract prepared in methanol and ethanol and least activity was found in extract with ethanol. In streptococcus, the highest zone of inhibition was found in extract prepared in distilled water and extracts prepared in methanol and ethanol shows similar result.in staphylococcus highest activity was found in extract with methanol and extract prepared in ethanol`s results the least zone of inhibition.

In leaf extract, extract prepared in distilled water shows the highest rate of zone of inhibition in *e.coli* and the least zone was found in extract prepared in ethanol.in streptococcus highest zone of inhibition was found in extract prepared in methanol and extracts in distilled water and ethanol shows similar result.in staphylococcus extract prepared in methanol`s shows more activity than extracts prepared in distilled water and ethanol.

Carica papaya: Both leaf extract and latex of *Carica papaya* also shows the antibacterial activity in *E.coli*, Streptococcus and Staphylococcus. In *E. coli*, the distilled water latex diluent showed more activity than extracts prepared in methanol and ethanol. In Streptococcus the zone was found in extract prepared in methanol and extracts prepared in distilled water. Ethanol also showed similar activity. Extract prepared in distilled water shows highest zone in Staphylococcus and extracts in methanol and ethanol showed the similar results.

Using leaf extract, in *E.coli* the rate of zone inhibition was found in extract prepared in distilled water and extract prepared in methanol and ethanol shows identical result. For Streptococcus the extracts prepared in distilled water and methanol shows highest and similar activity, extract with ethanol exhibited the least zone of inhibition. For Staphylococcus the activity was found in extract prepared in methanol and extracts with distilled water and ethanol shows greater and similar result.

Antioxidant assay

Calotropis gigantea: The increased absorbance of the sample indicated increased reducing power. In *Calotropis* there is gradual increase in absorbance value with its concentration in both latex and leaf extract. The latex has higher absorbance value than leaf extract hence it has high antioxidant property and reducing power than leaf extract.

Plumeria rubra: In *plumeria rubra* also displayed an increased absorbance in both latex and leaf extract. The absorbance value is increased with increased concentration. Latex has more antioxidant value than leaf extract. The results concluded the antioxidant efficiency of *plumeria rubra* latex is more than that of leaf extract.

Carica papaya: The absorbance value of both latex and leaf extract of *C. papaya* also increased with its concentration. The leaf extract of *C. papaya* has more absorbance value than its latex hence it has more antioxidant property in leaf extract.

Phytochemical screening

Phytochemical investigations provide with a chemical fingerprint of the herbal extract. This chemical fingerprinting can be done by qualitative analysis and further can be validated by quantitative assays too. The experiments reveals the phytochemical effects of leaf extract and latex of *C.gigantea*, *P.rubra*, and *Carica papaya*.

Calotropis gigantea

In phytochemical screening of leaf extract and latex of *C. gigantea*, it was found that it contains numerous chemical components include alkaloids, carbohydrates, flavonoids, phenols and tannins and the study is carried

out by various tests. Wagner's test carried for the confirmation of alkaloids, Molish's test for carbohydrates, alkaline reagent test for flavonoids, ferric chloride test for the presence of phenol and Braymer's test tannins. But Liebermann-Burchard test turns negative for all dilutions, which confirm the absence of sterols. The phytochemical screening of latex of *C. gigantea* shows that the presence of carbohydrate, flavonoids and sterols. But the Wagner's test and Braymer's test turns negative in all dilutions which confirms the absence of alkaloids and tannins.

Plumeria rubra

In *Plumeria rubra* it is also found that, in leaf extract and its latex are contains various chemicals which include alkaloids, carbohydrates, flavonoids, phenols and tannins. In the phytochemical screening of latex of *P. rubra*, Liebermann-Burchard test shows negative result which indicates the absence of sterols. All other test shows positive result. In leaf extract, Liebermann-Burchard test and Braymer's test was found negative, which confirms the absence of both sterols and tannins. Sterol was absent in both leaf extract latex of *P. rubra*.

Table 1: Phytochemical effects of *Plumeria rubra* on leaf extract.

<i>Plumeria rubra</i> (Leaf extract)						
	Test for Alkaloid (Wagner's Test)	Test for Carbohydrates (Molisch' Test)	Test for Flavonoids (Alkaline Reagent Test)	Test for Phenol (Ferric Chloride Test)	Test for Sterols (Liebermann-Burchard Test)	Test for Tannins (Braymer's Test)
Distilled water	+	+	-	+	-	-
Methnol	-	+	+	+	-	-
Ethnol	-	+	+	-	-	-
Acetone	-	+	+	-	-	-

Table 2: Phytochemical effects of *Plumeria rubra* on latex.

<i>Plumeria rubra</i> . (Latex)						
	Test for Alkaloid (Wagner's Test)	Test for Carbohydrates (Molisch' Test)	Test for Flavonoids (Alkaline Reagent Test)	Test for Phenol (Ferric Chloride Test)	Test for Sterols (Liebermann-Burchard Test)	Test for Tannins (Braymer's Test)
Distilled water	+	+	+	+	-	+
Methnol	+	+	+	+	-	+
Ethnol	+	+	+	+	-	+

Carica papaya

In *Carica papaya*, both latex and leaf extract contains various chemicals include alkaloids, carbohydrates, flavonoids, phenols and sterols are present except tannins because Braymer's test, test for tannins shows negative result which confirms the absence of tannins. In latex, Wagner's test, alkaline reagent test, ferric chloride test and Braymer's test shows negative results, this indicates the absence of alkaloids, flavonoids, phenols and tannins. Molish's test and Liebermann-Burchard test turns positive, this confirms the presence of carbohydrates and sterols.

Table 3: Phytochemical effects of *Carica papaya* on leaf extract.

<i>Carica papaya</i> (Leaf extract)						
	Test for alkaloid (wagner's test)	Test for carbohydrates (molisch' test)	Test for flavonoids (alkaline reagent test)	Test for phenol (ferric chloride test)	Test for sterols (liebermann-burchard test)	Test for tannins (braymer's test)
Distilled water	+	+	-	+	+	-
Methnol	+	-	-	+	-	-
Ethnol	-	+	-	-	-	-
Acetone	-	-	+	+	-	-

Table 4: Phytochemical effects of *Carica papaya* on latex.

<i>Carica papaya</i> (Latex)						
	Test for alkaloid (wagner's test)	Test for carbohydrates (molisch' test)	Test for flavonoids (alkaline reagent test)	Test for phenol (ferric chloride test)	Test for sterols (liebermann-burchard test)	Test for tannins (braymer's test)
Distilled water	+	+	+	+	-	-
Methnol	+	+	+	+	-	-
Ethnol	+	+	+	+	-	-
Acetone	+	+	+	+	-	-

Distilled water	-	+	-	-	+	-
Methanol	-	+	-	-	+	-
Ethanol	-	+	-	-	+	-

Results and Discussion

In the present study, the antibacterial activity of plant extract and latex of three plants *Calotropis gigantea*, *Plumeria rubra* and *Carica papaya* were determined by Disc Diffusion Method. Three different bacterial cultures of *Staphylococcus aureus*, *Streptococcus hemolyticus*, and *Escherichia coli* were used. The latex and plant extracts were prepared in methanol, ethanol and distilled water. Plant latex contains a variety of secondary compounds that impede the growth of bacteria, fungus, viruses, tumours, and cancer cell lines. It is poisonous to insects and inhibits their growth and reproduction cycles. It also has cytotoxic and anticancer properties and is frequently used as a laxative, anti-arthritis, and cosmetic conditioning agent. It includes a lot of hydrocarbons, which aid in the production of biodiesel. It's high in bioactive substances like flavonoids, terpenoids, and saponins, as well as glycosides, chitins, and proteases and proteinases, which provide significant protection against herbivore insects. A vast tribal population in India uses plant latex for the treatment of numerous ailments on a regular basis. Despite the fact that plant latex has a wide range of applications, its total effectiveness is yet unknown. Though plant latex has several functions, its overall ethnobotanical uses are unknown, which could be useful in the discovery of new antibiotics from plant latex. However, phytochemical analysis is required before it can be used in clinical, pharmaceutical, or industrial settings. The majority of these qualities must be investigated. Plant latex is undeniably an essential industrial material.

Slight ascites, pulmonary edema, mild bleeding in the liver, hydropericardium, flaccid heart, and ulcers on the abomasum and juxtamedullary cortex of the kidneys are all adverse effects of plant latex in animals. It has also been shown to be cardiotoxic and hepatotoxic. Latex from *C. procera* causes tachycardia and transient cardiac arrhythmias in sheep. It comprises a number of highly basic proteins with strong proteolytic, anticoagulant, and fibrinolytic activities. Latex from *C. procera* causes pathological alterations in pregnant women, such as increased levels of aspartate aminotransferase, alkaline phosphatase, creatinine, globulin, urea, and progesterone, whereas it causes vaginitis, anorexia, and loss of condition in non-pregnant women. *Lactuca virosa* is a wild lettuce plant that produces the hormones lactucopicrin and lactucin. Lactucopicrin is a sedative that inhibits cholinesterase and has a relaxing effect.

It can also help with anxiety and sleeplessness. Natural rubber latex (NRL) (*Hevea brasiliensis* (Hev-b)) causes autism in the same way. Lupeol acetate also affects neutrophil migration to the peritoneal cavity and reduces carrageenan dextran-induced paw oedemas, but *Synadenium grantii* latex is toxic and induces erythroderma in patients. Similarly, tirucallol, a tetracyclic triterpene found in latex from *Euphorbia lactea*, suppresses ear edoema in mice and affects polymorphonuclear cell influx in response to topical application of 12-O-tetradecanoylphorbol-acetate (TPA) in the mouse ear. Lipase from *Carica papaya* latex has lipolytic action, whereas papain-like protease from the same plant has proteolytic activity.

Antimicrobial Activity

According to Kareem et al., the agar well diffusion method provides for better extract diffusion into the medium, resulting in increased contact with the organisms. Paper discs may operate as a barrier between the extract and the organisms, inhibiting total diffusion of active components absorbed by the discs into the medium, which could lead to antibacterial activity. As a result, the antibacterial activity of *C.gigantea* latex extract was investigated using the agar well diffusion method in this study. Against Gram positive and Gram negative bacteria, the latex extract had varied inhibitory effects. The ethanolic extract of *C.gigantea* had the highest activity (width of zone of inhibition (27 mm) against *B.subtilis*, whereas the ethanolic extract of *C.gigantea* had the lowest activity against *S.dysenteriae*. Gram negative bacteria have a higher resistance to latex extract because of variations in cell wall construction between Gram positive and Gram-negative bacteria, with the Gram-negative bacteria outer membrane functioning as a barrier to many chemicals, including antibiotics. However, the in vitro antibacterial experiment demonstrated that the latex extract inhibited the growth of both Gram positive and Gram-negative bacteria strains by producing obvious inhibition zones. The low bioactivity of the crude latex extract could be due to either dilution of its active ingredients or bioactivity antagonism among extract constituents. Plants are a natural resource system that include a large number of biologically active compounds with a variety of therapeutic qualities and antibacterial activity. Because latexes serve a defense function in plants, they may have potent antibacterial properties, and plants may be a valuable source of antimicrobial chemicals. Finding and analysing antimicrobial chemicals has traditionally been limited to plants with a history of ethnobotanical usage, with a few research focusing on plants selected at random. The failure of chemotherapeutics and the emergence of antibiotic resistance in pathogenic microbial infectious agents has prompted the testing of numerous medicinal plants for antimicrobial activity. The antibacterial activity of aqueous fractions of plant latex of *Carica papaya*, *Plumeria rubra* and *Calotropis gigantea*, was discovered against various human pathogenic bacteria.

In *Plumeria rubra* latex prepared in distilled water was found to have greatest antibacterial activity against *E.coli* with a zone of inhibition of 10 mm, while the extracts prepared in methanol and ethanol has the zone of inhibition of 9 and 8 mm respectively. While for the bacteria, *Staphylococcus aureus*, and *Streptococcus hemolyticus*, the zone of inhibition was found to be 8, 7, 7 mm and 7, 8, 6 mm in distilled water, methanol and

ethanol respectively. Similarly leaf extract investigation resulted that more antibacterial activities in latex of *Plumeria rubra*, than leaf extracts. In *Calotropis*, the greatest zone of inhibition in *E. coli* was shown by latex extract prepared in distilled water and least zone is expressed in ethanol of about 6 mm. In other bacteria, *Staphylococcus aureus*, and *Streptococcus heamolyticus*, has the zone of inhibition was found to be 8, 7, 7 mm and 7, 6, 8 mm in distilled water, methanol and ethanol respectively. Leaf extract studies on antibacterial efficiency of *Calotropis* shows the inhibition zones of 8, 7, 7 mm; 8, 9, 7 mm; and 7, 7, 8 mm in *E.coli*, *Staphylococcus aureus*, and *Streptococcus heamolyticus* with examines on distilled water, methanol and ethanol. *Carica papaya* latex has greatest zone of inhibition in *E. coli* was shown by distilled water and least zone is expressed in ethanol. Respectively distilled water, methanol and ethanol has zone of inhibition 7, 8, 7 mm and 8, 7, 7 mm in *Staphylococcus aureus*, and *Streptococcus heamolyticus*. *Carica papaya* leaf extract has greatest zone of inhibition 9mm in *E. coli* was shown by distilled water and 8 mm in both methanol and ethanol. *Staphylococcus aureus*, and *Streptococcus heamolyticus* has inhibition zones of 8, 8, 7 mm and 7, 6, 7 mm in distilled water, methanol and ethanol respectively.

Antioxidant activity

The increase in absorbance of the reaction mixture indicates increase in reducing power. So, as per the observations on leaf extracts of, *Calotropis*, with the increase of concentration at 0.8 the absorbance is 0.439 and hence has greatest reducing power. For *Carica papaya* extract, the highest absorbance was observed in concentration of 0.8, the absorbance is 0.366. Also, like that, the highest absorbance value of 0.261 in *plumeria rubra*, was obtained in highest concentration of 0.8. For plant extract, the highest absorbance value was found in *Calotropis gigantea* and *plumeria rubra* has the least value. In latex extract, the highest optical density was found in *Calotropis* with the value of 0.704 at the concentration 0.8. The least value of optical density in plant latex was in *carica papaya* with the value of 0.08 at the concentration 0.8. In *Plumeria rubra* the highest value is obtained in concentration 0.8 as absorbance of 0.530. Phytochemical analysis was done to detect the presence or absence of terpenoids, flavonoids, carbohydrates, sugar, alkaloid, tannin, phenol and saponins. Studies are conducted in leaf extract and in latex of *Plumeria rubra*, *Carica papaya* and *Calotropis gigantea*. In *Plumeria rubra* latex only sterols are absent in three of the dilutions in distilled water, methanol, and ethanol other compounds are present. *Carica papaya* has presents of carbohydrates and sterols in all the three dilutions and others are absent. Studies on *Calotropis* latex exposed the presence of flavonoids and carbohydrates in all the dilutions. Sterols are only present in the ethanol latex dilution. Experiments on leaf extracts in four of the dilutions in distilled water, methanol, acetone and ethanol. Studies on *Calotropis* leaf extract revealed the presence of alkaloids and carbohydrates in distilled water, flavonoids and phenol in methanol, flavonoids and tannins in ethanol, and the presence of carbohydrates and tannins in acetone. Sterols are absent in all the dilutions on *Calotropis gigantea*. In *Plumeria rubra* sterols and tannins are absent in all the dilutions. Alkaloids, carbohydrates and phenols are present in distilled water; carbohydrates, flavonoids and phenol in methanol; carbohydrates and flavonoids in ethanol and in acetone. Like that of *Plumeria rubra*, sterols are absent in all the dilutions of *Carica papaya*. Alkaloids present in distilled water and methanol dilutions; flavonoids and sterols are only in acetone and distilled water respectively. Carbohydrates present in both distilled water and ethanol while phenol only absent in ethanol dilutions. The results gained from the current study suggest that latex and leaf extracts of *Calotropis gigantea*, *Plumeria rubra* and *Carica papaya* possesses significant activity in phytochemical analysis, antioxidants and antibacterial activity. The rates of actions varying with dilutions.

Conclusion

Herbal medicines, phytonutrients, and nutraceuticals have seen a large increase in demand in both developing and developed countries during the previous few decades. They now account for a significant share of the worldwide medication market. Furthermore, at least four million individuals are thought to rely on herbal medications as their primary source of healthcare. As a result, the need for innovative medicines, as well as plant-derived pharmaceuticals with a long history of medical usage (such as morphine), continues to rise. Bioactive substances (secondary metabolites and proteins) are abundant in laticiferous plant species, although their therapeutic value is only partially understood. The development of new high-throughput sequencing technologies, as well as CRISPR/Cas9, a quick and efficient genome editing method, has provided the research community with the tools it needs to achieve its goals. Inadequate genomic knowledge is one of the most significant barriers to dealing with latex-producing plants. Exploration of a plant's genome allows for precision alteration and the avoidance of off-target mutations. Nonetheless, the use of CRISPR/Cas9 technology gives fresh light on the function of particular genes in laticiferous plant species and points the way toward improving agronomically essential features. Furthermore, it provides a modern foundation for further latex compound discovery and pharmaceutical use. In addition to its common use as chewing gum, rubber components for vehicles, machineries, and other consumer products such as footwear, toys, and gloves, India's flora has a rich latex generating plant diversity, which offers the potential to produce medications to cure bacterial and fungal diseases. Latex can be used in the cosmetics sector for skin care, as well as as an anti-insecticide. This collection of data on 30 latex-producing species could prove to be a helpful resource for researchers working on new medications and industrial items. The Euphorbiaceae family has the most species that produce latex. Plant latex will undoubtedly be a future raw material for a variety of bioengineering and biotechnological companies. The importance of latex in plant defense against bacteria, as well as in the phytochemical and antioxidant properties,

are reviewed in this study, and the unique characteristics of latex and leaf extracts on *Calotropis gigantea*, *Plumeria rubra* and *Carica papaya* are conferred. It was concluded that plant latex and leaf extracts are efficient in antibacterial, phytochemical and antioxidant activity in highly concentrated forms. Antibacterial assay reveals the effect of plant extracts of three of the plants in dilution of distilled water, methanol and ethanol. Leaf extract and latex of *Calotropis gigantea* shows more antibacterial effect against *E.coli* in dilutions of distilled water, effect on *Streptococcus* on methanol and in distilled water dilutions by leaf extract and latex respectively. And activity against *Staphylococcus* on ethanol dilutions of both latex and leaf extract. In *Plumeria rubra* latex has more effect against *E.coli* in distilled water. Least effect in ethanol dilution against *Staphylococcus*. Leaf extract shows the highest rate of zone of inhibition in distilled water and methanol dilutions against and *E.coli* and *Staphylococcus* respectively. In *Carica papaya* both latex and leaf extract has more effect against *E.coli* in distilled water. And least effect in methanol dilutions on *Staphylococcus*. The phytochemical analysis on three plant extracts concluded *Calotropis gigantea* has presence of alkaloids, carbohydrates, flavonoids, phenols and tannins in plant extract and absence of alkaloid, phenol and tannins in latex. In *Plumeria rubra* sterols and tannins are absent in leaf extract and in latex all the chemical components are present except sterols. Comparative studies on three of the plants *Carica papaya* latex has negligible amount of chemical components, include carbohydrates and sterols only. In plant extract only the tannins are absent. *Calotropis gigantea* has highest optical density in both latex and leaf extract when compared with other samples. In case of *Plumeria rubra* least optical density on antioxidant assay by leaf extract, in case of latex it's in *Carica papaya*.

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