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Research Article

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Antibacterial and anti acne activity of *Caesalpinia sappan* L. and *Cinnamomum verum* J. Presl – A comparison

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Abstract

This study describes the comparison of antibacterial and anti acne activity in heartwood of *Caesalpinia sappan* and bark of *Cinnamomum verum* profusely described as traditional medicine and food additive. Both these species were consumed daily in the form of food and water. *C.sappan* is used in ayuervedic medicine for the treatment of jaundice, cough, wound, purifying blood and quenching thirst and *C.verum* has the properties of improving flavor and have storage stability. Antibacterial and anti acne activity was analyzed with methanolic extract of *C.sappan* and *C.verum* by using disc diffusion method against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pseudomonas aeroginosa*, *Propionibacterium acne* and *Staphylococcus epidermidis.* The result showed that when compared to *C.verum*, *C.sappan* have more zone of inhibition in all the bacteria used.

Keywords: *Caesalpinia sappan*, *Cinnamomum verum*, antibacterial and anti acne activity

Introduction

According to World Health Organization (WHO) more than 80% of the world's population relies on traditional medicine for their primary healthcare needs. Use of herbal medicines in Asia represents a long history of human interactions with the environment. Plants used in traditional medicine contain a wide range of ingredients that can be used to treat chronic as well as infectious diseases. Several screening studies have been carried out in different parts of the world. Antimicrobial activity was reported for different herbal extracts in different regions of the world. Microorganisms build many side effects against antibiotics so to overcome this problem bioactive compounds which are isolated from plant species in herbal medicine were used now a days.

Different types of infectious disease are there such as hepatitis, common cold, skin infections etc. When compared to all other infections skin infections are very easily communicable. Skin is the largest organ of the body. Its function is to protect the body from infection. Skin infection can be caused by germs and symptoms can vary from mild to serious. Mild infection can be treatable with over the-counter medications and home remedies, whereas other infections may require medical attention.

Human skin is called as outer covering of the body. It also constitute the first line of defense. Skin contains many specialized cells and structures. It is divided into three different layers viz., epidermis, dermis and hypodermis. Each layer provides distinct role in functioning of the skin.

Skin disease is a common ailment and it affects all ages in number of ways. There are more than thousand conditions that may affect skin but most skin diseases are categorized into nine common types viz., rashes, viral infection, bacterial infection, fungal infections, parasitic infection, pigmentation disorder, tumor and cancer, trauma and other conditions such as wrinkles, rosacea, spider vein, and varicose vein.

Acne is an inflammatory disease of sebaceous follicles of skin. Acne vulgaris is a common skin disorder affecting more than 85% population of the world, specifically teenagers. Acne is a disease of pilosebaceous glands. Many factors are responsible for pathogenesis of acne. They are sebum, abnormal follicular differentiation, hormones, *Propionibacterium acne* infection, inflammation and nutrition. It is an inflammatory disease of sebaceous follicles of skin marked by comedones, papules, pustules, presence of bacterias viz; *Propionibacterium acne*, *Staphylococcus epidermidis* and *Malassezia furfur* in follicular canal.

Caesalpinia sappan Linn. (Leguminosae) a small thorny tree, 6-9 m high is found in India, Peru, Malaya etc. It is being used traditionally for large number of ailments and reported to have a wide variety of medicinal properties like anticonvulsant, anti-inflammatory, anti-proliferative, antimicrobial, anticoagulant, antiviral, immunostimulant and antioxidant activities of this plant have been reported. According to Ayurveda, the heartwood of *C.sappan* is useful in many conditions of Pitta, burning sensation, wounds, ulcers, leprosy, skin diseases, diarrhea, dysentery, diabetes etc. A decoction of the heartwood is commonly used in Kerala in their day to day life, for its antithirst, blood purifying, antidiabetic properties and also this plant is one of the ingredients in many traditional Ayuervedic formulations in India.

Cinnamomum has a long history both as a spice and as a medicine. *Cinnamomum verum* (Family: Lauraceae) is well known since ancient time for its fragrance and medicinal value. Its bark is commercially traded as cinnamon. *C. verum* is mostly found in Sri Lanka and is also found in south India and is cultivated in Malaysia too. *Cinnamomum verum*, called true cinnamon tree or Ceylon cinnamon tree is a small evergreen tree. *Cinnamon* trees are 10- 15 meters tall. The leaves are ovate-oblonge in shape and 3-7 inches long. *Cinnamomum* bark is commonly used as food additive all over the world. In medicine it is used for the cure of cold. It has also been used to cure diarrhoea and other digestive system problems. *Cinnamomum* is high in antioxidant activity. The essential oil of *Cinnamomum* is used as preservative in foods and have antimicrobial activity. It also have pharmacological effects in the treatment of type II diabetes. It has also been used in the treatment of toothache and bad breath.

Materials and Methods

Collection of Plant materials

The two plants used in the present study were *Caesalpinia sappan* L. (heartwood) and *Cinnamon verum* (bark) collected from Parunthumpara, Idukki Disrtrict, Kerala State. The collected plant samples were washed thoroughly in running tap water to remove the surface microflora and other adherents, shade dried and grind into fine powder and stored in airtight bottle for the use.

Extract Preparation

Soxhlet extraction method was used. Twenty grams of plant powder (*C.sappan* and *C.verum*) was packed in Whatmann No. 1 filter paper and placed in extraction chamber which was suspended below in the round bottom flask containing the solvent (200 ml of Methanol). The samples were extracted at 64.7^{o}C for 24 hours. Collected extracts from soxhlet apparatus were stored at 4^{O} C for further studies.

Collection of bacterial strains

Five bacterial strains were used in the present study encompassed of four gram positive bacterias (*Streptcoccus pyogens, Staphylococcus aureus, Staphylococcus epidermidis, Propionibacterium acne*) and one gram negative bacteria (*Pseudomonas aeruginosa*). Bacterial cultures were collected from Department of Biotechnology, Dr.N.G.P Arts and Science college, Coimbatore.

Anti bacterial activity

The method suggested by Bauer *et al*., (1996) is widely used for the antibacterial susceptibility testing . The *in vitro* antibacterial activity of the plant extract were evaluated by disc diffusion method using Muller Hinton Agar (MHA). Whatmann No 1 filter paper disc of 5mm diameter were prepared and sterilized. The discs were impregnated with 5mg/ml and they were placed on previously inoculated MH agar plates.

Plates were incubated at 37^{o} C for 24 hours. Streptomycin disc was used as the positive control and methanol itself is used as the negative control.

Anti acne activity

The Anti acne activity was tested by disc diffusion method. *Propionibacterium acne* and *Staphylococcus epidermidis* were used. *P. acne* was inoculated in Brain Heart Infusion agar where as *S. epidermidis* was inoculated in Mullen Hinton Agar. Sterile disc impregnated with 5mg/ml plant extracts were kept in inoculated plates and kept for incubation. Clindamycin discs were used as positive control and methanol was used as negative control.

Results and Discussion

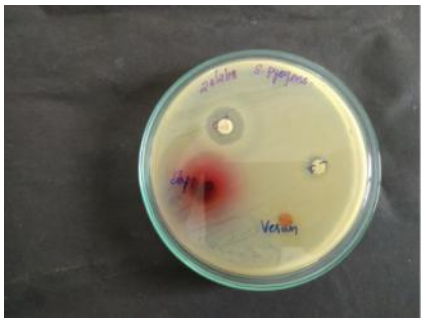
Antibacterial and anti acne activity

Antibacterial and anti acne activity of methanolic extract of *C.sappan* (heartwood) and *C. verum* (bark) were assayed by using agar disc diffusion method against five bacterial strains was shown in figure 1 & 2 and Table 1 & 2. Among five bacterial strains tested, *S. epidermidis* was most susceptible with inhibition zone of 20mm and *S.aureus* was least susceptible organism with inhibition zone of 15mm. further, methanolic extract of *C.sappan* was found to be most effective than *C.verum*.

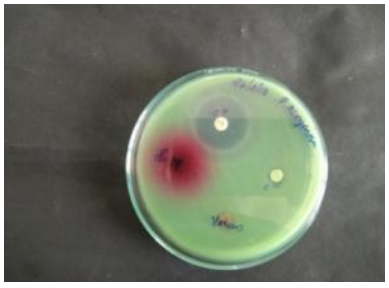
Many similar studies were performed and shows that methanolic extract of plants was most effective in extracting secondary metabolites which are resposible for the antibacterial property than any other solvents. The *C.sappan* extract shows the presence of tannins and phenolic compounds where as *C.verum* only shows trace amount which possess high antimicrobial activity. Arunkumar Bukke et al[1] , investigated the antibacterial activity of leaves, bark, heartwood and seed extract of *C.sappan* and reported that methanolic extract of heartwood shows high inhibition activity and Rania Mohamed and Abdelgadir Elfadil[18], performed the antibacterial activity and phytochemical consitutents of *Cinnamomum verum* and *Matricaria chamomilla* from Sudan, reported that *Cinnamomum verum* has less antibacterial activity than *Matricaria chamomilla* and also trace amount of phenloic compounds and tannins.

Figure 1. Antibacterial activity of methanolic extract of *C. sappan* and *C. verum*

Staphylococcus aureus



Streptococcus pyogenes



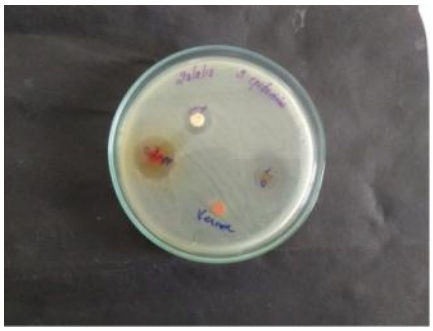
Pseudomonas aeruginosa

Table 1.*In vitro* antibacterial activity of methanolic extract of *Caesalpinia sappan* and *Cinnamomum verum*

Microorganisms	Zone of inhibition		
	Streptomycin	*C.sappan*. Linn	*C.verum*. J. Presl
Staphylococcus aureus	23mm	15mm	No inhibition
Streptococcus pyogenes	16mm	17mm	10mm
Pseudomonas aerogonsa	21mm	18mm	No inhibition

Figure 2 : Antiacne activity of methanolic extract of *C.sappan* and *C.verum*

Propionibacterium acne



Staphylococcus epidermidis

Table2 .*In vitro* anti acne activity of methanolic extract of *Caesalpinia sappan* and *Cinnamon verum*

Microorganisms	Zone of inhibition		
	Clindamycin	*C.Sappan*. Linn	*C.verum*. J. Presl
Propionibacterium acne	16mm	19mm	13mm
Staphylococcus epidermidis	16mm	20mm	No inhibition

Conclusion

The study indicates that methanolic extract of *C. sappan* is more active against common bacteria as well as acne inducing bacteria which can be used as a promising alternative source instead of synthetic antibiotics.

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