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RESEARCH ARTICLE

ANTIMICROBIAL ACTIVITY OF SELECTED ETHNOMEDICINAL PLANTS USED IN SKIN DISEASES BY PALIYAR TRIBE OF SOUTHERN WESTERN GHATS, PULIANGUDI, TIRUNELVELI DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

The medicinal plants used in skin diseases by *Paliyar* tribe were selected for the screening of its antimicrobial potential. The antimicrobial activities of the ethanolic extract of *Alseodaphne semicarpifolia* and *Indigofera aspalathoides* were tested against three bacterial pathogens causing skin infections viz., *Streptococcus pyogenes*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* as well as three fungal pathogens of skin infections namely *Candida albicans*, *Trichophyton rubrum* and *Trichophyton mentagraphytes* by disc diffusion method. The extracts at a concentration of 100µg/ml exhibited a higher antimicrobial activity whereas lesser inhibition zone was observed at the concentration of 50µg/ml. The ethanolic extract of whole plant *Indigofera aspalathoides* exhibited good antimicrobial activity over the bacterial pathogens at varying levels. The ethanolic bark extract of *Alseodaphne semicarpifolia* showed good antimicrobial activity over the test bacterial pathogens and also on the fungal pathogens by performing the higher inhibition zone. Among the two ethnomedicinal plants tested, *Alseodaphne semicarpifolia* has exhibited significant antimicrobial activity in all the bacterial and fungal skin pathogens tested.

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INTRODUCTION

Plants used in traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases. The traditional medicinal methods still play an important role to cover the basic needs in the developing countries. The use of medicinal plants as traditional medicine is well known in rural areas of many developing countries. Antibiotics are some time associated with adverse effects on the host which included hypersensitivity, immune suppressant and allergic reactions. With the continuous use of antibiotics, microorganisms have become resistant. This has created some clinical problems in the treatment of infectious diseases. Therefore, there is an urgent need to develop alternative antimicrobial drugs for the treatment of infectious diseases. Infectious skin problems are of common occurrence in rural settings and in the forest dwelling tribal people. The common skin problems include skin abuses, acne, burns, minor wounds, dermatitis and rosacea.

Immuno suppressed / Immuno compromised individuals are frequently found suffering from skin infections that are difficult to cure. Ultra Violet light exposure and pollutants are also added to the skin problems (Dhaliwal and Kaur, 2005). Identification of traditional medicines for the treatment of skin diseases is an important activity for the preservation of traditional knowledge and for the search of novel antimicrobial treatments against skin diseases. *Paliyar* tribe inhabit in the Puliangudi forest range, Tirunelveli district, a part of Southern Western Ghats of Tamilnadu. They possess very good knowledge on medicinal plants for the treatment of skin diseases which are available in their forest locality. Many plants have been studied for their antimicrobial properties (Kaushik, 1998, Babu et al., 2002, Patil and Ramajah, 2004) and some of them resulted in development of new drugs.

MATERIALS AND METHODS

Plant Materials

Two plant drugs, bark of *Alseodaphne semicarpifolia* Nees and whole plant of *Indigofera aspalathoides* Vahl. ex DC were selected based on the usage of the *Paliyar* tribe to treat skin

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diseases and the plants were screened to ascertain antimicrobial activity. Plants were collected from the Puliangudi forest range of Southern Western Ghats, Tirunelveli District during October 2016. Plants were identified taxonomically with the standard floras (Gamble, 1956; Mathew, 1983; and Henry *et al.*, 1987). The voucher specimens were deposited in the herbarium of Tamil University, Thanjavur for further reference.

Plant extracts

The bark of *Alseodaphne semicarpifolia* and whole plant of *Indigofera aspalathoides* were collected from the source plant. They were washed 2-3 times with tap water and then with distilled water. This was followed by ethanol wash and then allowed to dry at 50°C for overnight and finally pulverised to a coarse powder. 100 gm of the powdered materials were Soxhlet extracted with solvent ethanol. The extracts were evaporated in vacuum under reduced pressure and stored in a refrigerator. The qualitative phytochemical analysis was carried out on the extracts to determine the presence or absence of alkaloids, saponins, flavonoids, tannins, polyphenol, glycosides, carbohydrate and protein (Trease and Evans, 1996).

Microorganisms

The bacterial and fungal pathogens causing skin infections in human were selected on the basis of literatures. The fungal strains, *Candida albicans*, *Trichophyton rubrum* and *Trichophyton mentagraphytes* were isolated from samples obtained from the skin infected patients of Out Patient Unit, Department of Siddha Medicine, Tamil University, Thanjavur.

Agar and Sabouraud's Dextrose Agar (purchased from Hi-Media, Mumbai) were used to perform the antimicrobial assay for the bacterial and fungal strains respectively. Discs were made from Whatmann No.1 filter paper. 15 ml of sterilized molten agar medium was poured aseptically into sterilized petriplates. The plates were allowed to solidify for 5 minutes and inoculum suspension of both the group of microorganisms were swabbed uniformly and the inoculum was allowed to dry for 5 minutes. The paper discs impregnated with the plant extracts (50, 75, 100 mg/disc) were placed on the test organism seeded medium. The plates were pre incubated for 1 hr at room temperature and then incubated at 37± 2° C for 24 hrs and 28± 2° C at 48 hrs respectively for the anti bacterial and anti fungal growth response. Ciprofloxacin (5µg/disc) and Fluconazole (10 µg/disc) were involved as reference standard for bacteria and fungi respectively. All the test microorganisms were tested in triplicates. Antimicrobial growth was qualitatively evaluated by measuring the inhibition zone. After the incubation period, the no microbial growth area in the culture plate was recorded by measuring the diameter in mm.

RESULTS AND DISCUSSIONS

The two ethnomedicinal plants predominantly used in skin diseases by the *Paliyar* tribe in Puliangudi, Southern Western Ghats, Tirunelveli District, Tamil Nadu were studied. The ethnobotanical data including botanical name, family name, local name, part used, habit, location and medicinal uses were summarised in Table 1. Among the 58 ethnomedicinal plants surveyed by Shanmugam *et al.*, (2009) in the *Paliyar* tribe of Shenbagathope, Virudhunagar District, Tamil Nadu, these two study plants *Alseodaphne semicarpifolia* and *Indigofera*

Table 1. Ethnobotanical data for the selected ethnomedicinal plants used in skin diseases by *Paliyar* tribals

Botanical name & Family	Local name (Tamil)	Habit	Part used	Area	Medicinal uses
<i>Alseodaphne semicarpifolia</i> Nees (Lauraceae)	Vandukadippattai	Tree	Bark	Thalaiyanai	<i>Eczema</i> , Insect bites
<i>Indigofera aspalathoides</i> Vahl.ex DC (Fabaceae)	Sivanar Vembu	Herb	Whole plant	Thalaiyanai	Skin diseases, leprosy, Syphilis

Table 2. Preliminary phytochemical screening of the selected ethnomedicinal plants used in skin diseases by *Paliyar* tribe

S.No	Phyto chemicals	<i>Alseodaphne semicarpifolia</i>	<i>Indigofera aspalathoides</i>
1.	Alkaloids	+	-
2.	Saponins	+	+
3.	Flavonoids	+	+
4.	Tannins & Phenol	+	+
5.	Glycosides	+	-
6.	Carbohydrates	+	+
7.	Protein	-	+

The bacterial strains *Streptococcus pyogenes*, *Staphylococcus aureus* (Gram positive) and *Pseudomonas aeruginosa* (Gram negative) used in this investigation were obtained from the Doctors' Diagnostic Laboratory, Tiruchirappalli. The microorganisms were repeatedly sub cultured on sterile nutrient agar medium and Sabouraud's Dextrose Agar (SDA) medium in order to maintain pure cultures. Bacterial and fungal cultures were maintained in slant tubes with nutrient agar and SDA culture media respectively. These were sub cultured for further use.

Antimicrobial activity

Antimicrobial potential of the plant drugs were evaluated by *in vitro* disc diffusion assay (Bauer *et al.*, 1966). Mueller Hinton

aspalathoides were not reported so far. The preliminary phytochemical analysis was carried out on the bark extract *Alseodaphne semicarpifolia* and whole plant extract *Indigofera aspalathoides* of showed the presence of some bioactive compounds (Table 2). The bark extract of *Alseodaphne semicarpifolia* contains alkaloids, flavonoids, saponins, tannin and phenols, glycosides and protein. The whole plant extract of *Indigofera aspalathoides* also contain flavonoids, saponins, tannin, phenols, carbohydrate and protein while alkaloid and glycosides were absent. This was also supported by Sabitha *et al.* (2016). The phytochemical constituents such as alkaloid, flavonoids tannin and phenolic compound have been reported to be important compounds in many other medicinal plants (Sani *et al.*, 2009).

Table 3. Antimicrobial activity of ethanolic bark extract of *Alseodaphne semicarpifolia* on skin infectious microorganisms

Sl. No.	Microorganisms	(50mg /disc)	(75mg /disc)	(100mg /disc)	Ciproflaxacin (5µg/disc)
1.	<i>Streptococcus pyogenes</i>	9 mm	14 mm	16 mm	21 mm
2.	<i>Staphylococcus aureus</i>	10 mm	16 mm	18 mm	23 mm
3.	<i>Pseudomonas aeruginosa</i>	9 mm	12 mm	13 mm	18 mm
Sl. No.	Fungi	(50 mg/disc)	(75 mg/disc)	(100 mg/disc)	Fluconazole (10µg/disc)
4.	<i>Candida albicans</i>	8 mm	12 mm	15 mm	20 mm
5.	<i>Trichophyton rubrum</i>	9 mm	14 mm	16 mm	21 mm
6.	<i>Trichophyton mentagraphytes</i>	9 mm	10 mm	14 mm	19 mm

Table 4. Antimicrobial activity of ethanolic whole plant extract of *Indigofera aspalathoides* on skin infectious microorganisms

Sl. No	Microorganisms	(50mg/disc)	(75mg/disc)	(100mg/disc)	Fluconazole (10µg/disc)
1.	<i>Streptococcus pyogenes</i>	9 mm	13 mm	16 mm	20 mm
2.	<i>Staphylococcus aureus</i>	12 mm	14 mm	16 mm	21 mm
3.	<i>Pseudomonasaeruginosa</i>	8 mm	11 mm	12 mm	16 mm
Sl. No	Fungi	(50 mg/disc)	(75 mg/disc)	(1050 mg/disc)	Fluconazole (10µg/disc)
4.	<i>Candida albicans</i>	6 mm	8 mm	11 mm	15 mm
5.	<i>Trichophyton rubrum</i>	7 mm	8 mm	10 mm	14 mm
6.	<i>Trichophyton mentagraphytes</i>	6 mm	9 mm	10 mm	14 mm

The presence of tannins in the study plant drugs inhibits the pathogenic fungi and improves the antimicrobial activity. Saponin causes the leakage of proteins and degradation of cell wall enzymes from the cell (Zablutowicz *et al.*, 1996). The presence of alkaloids in the test plants might be cured skin diseases. This was also supported by Miean and Mohamed (2001). The essential oils and extracts of certain plants have been shown to have antimicrobial effects, as well as imparting flavour to foods (Burt, 2004). The presence of these phytochemicals in the investigated plant parts of *Alseodaphne semicarpifolia* and *Indigofera aspalathoides* would be responsible for the antimicrobial activity of the extracts. Antimicrobial potential of the study plant drugs were qualitatively evaluated by *in vitro* agar disc diffusion method. The inhibition zone of microbial growth in the culture plates were recorded in mm (Table 3&4). An effective antimicrobial activity was exhibited by the selected medicinal plants extract with clear, good inhibition zones at all the concentrations of test drugs against the both bacterial and fungal organisms tested.

The results showed that *Alseodaphne semicarpifolia* has potential inhibitory action against both bacterial and fungal strains tested. Similar type of findings were noticed by Veeramuthu Duraipandian *et al* (2006) that 11 ethno medicinal plants tested against 9 bacterial and one fungal strain exhibited significant antimicrobial activity. The whole plant extract of the medicinal plant *Indigofera aspalathoides* at a concentration of 75 mg/disc showed good antimicrobial activity against the bacterial pathogens *Streptococcus pyogenes* and *Pseudomonas aeruginosa* and the fungal pathogen *Trichophyton rubrum*. The plant extract was effective on the bacterial pathogen *Staphylococcus aureus* even at 75 mg/disc. The variations in the inhibition zones reported in the test plants might be due to differences in its phytochemical composition and sensitivity of the microorganisms tested (Bhardwaj and Laura, 2009). It is anticipated that phytochemicals with adequate antimicrobial efficacy are used for the treatment of microbial infections. Ethno medicinal informations of the *Paliyar* tribe suggested that the selected medicinal plants to be used to treat skin diseases. Literature review in Siddha Medicine also revealed that it could also be used in skin diseases. In conclusion, the results of this study have shown that the plant extracts of *Alseodaphne semicarpifolia* and *Indigofera aspalathoides* have great potential to control the skin infectious bacteria and fungi as antimicrobial agents.

The ethno medicinal plant sources should be scientifically evaluated for other biological action which leads to new drug discovery.

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