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Phytochemicals, Antioxidants and Antimicrobials Components in Leaf Extracts of *Curcuma Caesia Roxb* with Reference to Location

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Abstract

Medicinal plants are reported to possess various activities. The present study was designed to compare the antimicrobial and antioxidant potency of Curcuma caesia Roxb, Himalayan variety, and native Kerala variety. Methanol extracts of both varieties of *Curcuma caesia Roxb* were investigated for the comparison of antimicrobial activity by the disk diffusion agar plate method. The activity index was calculated with was more than 0.5. Himalayan variety exhibited more antimicrobial activity towards gram-positive and the Indian variety exhibited more activity in the gram-negative microorganism. We also investigated the antioxidant activity of *Curcuma caesia Roxb*, Himalayan variety, and native Kerala variety by FRAP method. The maximum percentage of inhibition by the Himalayan variety was found to be 98.76 ± 0.2% and that of Indian variety was found to be 81.81 ± 0.32%. IC50 values were found to be 28.1 µg/ml, 29.9 µg/ml, and 39.9 µg/ml for ascorbic acid, Himalayan variety, and Indian variety respectively. The study has provided a basis to explore the chemical constituents in *Curcuma caesia Roxb*.

Keywords: *Curcuma caesia roxb*; FRAP method; Disk diffusion agar plate method; Antimicrobial and antioxidant potency

Introduction

Medicinal plans rich sources of bioactive components and impart enormous biological activities. Novel bioactive components for several diseases have now been discovered from different medicinal plants. The major problem faced by antibiotic drugs is toxicity, lower potency, development of resistant bacterial strains, high cost of new generation antibiotics. Herbal medicine is having greater need and demands, all over the world. A natural antioxidant biomolecule is available in many dietary foods and medicinal plants. Major plants show antioxidant properties due to the presents of polyphenols and carotenoids. Hence those drugs with significant antioxidant properties are used for the treatment of including anti-inflammatory, anti-aging, anti-atherosclerosis, and anticancer therapy. Curcuma species are well known for their antimicrobial activity and they are also been used as antioxidant drugs traditionally, shown health improvement and immunity achievement [1]. *Curcuma caesia roxb* is commonly known as kali haldi and it belongs to the Family Zingiberaceae. Fresh and dried rhizome and leaves of *Curcuma caesia roxb*. are used in treating leucoderma, asthma, tumors, pile, bronchitis. The various medicinal activities of *Curcuma caesia roxb* such as antimicrobial, antioxidant, rice seed germination, and anthelminthic activities of *Curcuma caesia* were already investigated. The objective of this study was to perform the comparison of antimicrobial and antioxidant activities of two varieties of *Curcuma caesia roxb*, native and Himalayan varieties.

Materials and Methods

Collection and identification of plant

The varieties of *Curcuma caesia* were collected from Kottayam district. Kerala and was identified authentically by the Department of Botany, Nirmala College, Muvattupuzha. The leaves were collected in the month of September-October.

Extraction and preliminary phytochemical screening

The leaves were dried and 50 gms of powdered leaves were subjected to soxhlet extraction using methanol as solvent. The percentage yield was calculated and recorded. The residue extract was stored in a refrigerator for further studies. The extracts of plant materials were subjected to phytochemical analysis using the methods mentioned [2].

Assessment of antibacterial activity

The antibacterial activity of the extracts was determined by Agar well diffusion method. Petri plates containing 20 ml Muller Hinton Agar Medium were seeded with the bacterial culture of *Klebsiella Pneumoniae* and *Staphylococcus aureus* (growth of culture adjusted according to McFarland Standard, 0.5%). Wells of approximately 10 mm was bored using a well cutter and different concentrations of the sample such as 50 mg/mL and 100 mg/mL were added. The plates were then incubated at 37°C for 24 hours. The antibacterial activity of the methanol extract of the leaves was assayed by measuring the diameter of the inhibition zone formed. Streptomycin and penicillin

were used as a positive control and methanol were also kept as vehicle control.

Assessment of antioxidant activity

The antioxidant activity of the two varieties was determined by FRAP((Ferric Reducing Antioxidant Power Assay) method. The reagent was freshly prepared in the lab. Different concentrations (10-50 µg/mL) of the methanolic extract (2.5 ml each) were taken and added to 2.5 mL of 0.2 M sodium phosphate buffer (pH 6.6) and 2.5 mL of 1% potassium ferricyanide solution. The resulting mixture was vortexed well and then incubated for 20 min at 50°C. At the end of the incubation, 2.5 mL of 10% trichloroacetic acid was added to the mixture and centrifuged at 3,000 rpm for 10 min. The supernatant (2.5 mL) was mixed with 2.5 mL of deionized water and 0.5 mL of 0.1% ferric chloride. The colored solution was read at 700 nm against the blank using UV Spectrophotometer. Here, ascorbic acid was used as a reference standard the reducing power of the samples was compared with the reference standard [3].

Results

The methanol extract of the Native variety and Himalayan variety of *Curcuma caesia roxb* were investigated and compared for antimicrobial and antioxidant activities. The percentage yield of the extract of the Native variety and Himalayan variety of *Curcuma caesia roxb* are shown in Table 1.

Extract	Percentage yield
Himalayan variety	15.5% w/w
Native variety	14.6% w/w

Table 1: Percentage yield of extract.

Phytochemical screening of the samples

The phytochemical analysis of both the extracts was performed to evaluate the presents of various constituents in *Curcuma caesia roxb*. The results of the phytochemical screening are shown in Table 2. The phytochemical analysis confirmed the presence of alkaloids, flavonoids, tannins, and phenolic compounds.

Sl No	Chemical constituents	Himalayan variety	Native variety
1	Alkaloids	+	+
2	Carbohydrates	-	-
3	Flavonoids	+	+
4	Tannins and phenolic test	+	+
5	Glycoside	-	-
6	Saponins	-	-
7	Protein and amino acids	-	-

Table 2: Phytochemical screening curcuma caesia roxb native variety and himalayan variety.

Assessment of antimicrobial activity

In the evaluation of the antimicrobial activity of the Himalayan variety and native variety of Curcuma Caesia, both gram-positive and gram-negative bacteria were used and results were compared. The antibacterial activity of both extracts was more promising for gram-positive organisms. Himalayan variety exhibited more significant antimicrobial activity in gram-positive bacteria than the Native variety. The activity of the extracts on the gram-negative organism was also evaluated. The Activity index was calculated using Penicillin and Streptomycin as standards for gram-positive and gram-negative organisms respectively. Activity index more than 0.5 indicates that both varieties have a potential antibacterial effect on both gram-positive and gram-negative organisms [4].

Assessment of antioxidant activity

Antioxidant activity was measured using FRAP (Ferric Reducing Antioxidant Power Assay) method. Ascorbic acid was used as the Standard. FRAP assay is based on measuring the reducing ability of an antioxidant component.

In this Assay Ferric tripyridyltriazine, complex react with antioxidant and converted to colored ferrous tripyridyltriazine. The absorbance of the resulting colored solution is used to calculate the activity (Figure 1).

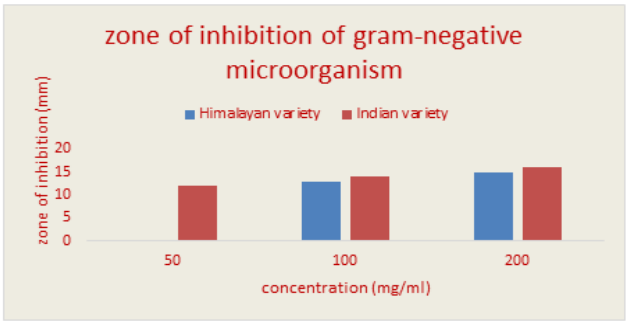

Figure 1: Zone of inhibition produced by the extracts on gram-negative microorganism.

The antioxidant activity of the methanolic extracts of leaves of the Himalayan and native variety of *Curcuma Caesia* was found to be increased with an increase in the concentration of active components. It was observed that a significant correlation exists between the concentration of the extract and % inhibition. (Correlation coefficient R2: Standard ascorbic acid -0.997, Himalayan variety-0.992 and Native variety-0.996) respectively. IC 50 values were calculated to establish a relationship between the antioxidant activities of both extracts (Figure 2).

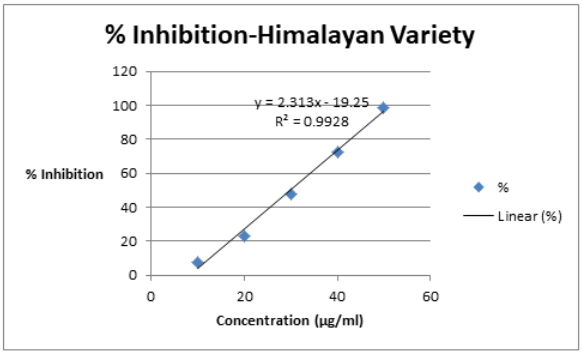

Figure 2: FRAP determination of *Curcuma Caesia* (Himalayan variety).

Discussion

The present study was carried out to compare the antimicrobial and antioxidant activity of *Curcuma Caesia* Himalayan Variety and native variety. The preliminary phytochemical analysis confirmed the presence of alkaloids, flavonoids, tannins, and phenolic compounds in both the varieties. The *in-vitro* antimicrobial activity study was carried out with different concentrations of methanol extract of leaves of the Himalayan variety and Indian variety of *Curcuma caesia Robx* and Himalayan variety exhibit more significant antimicrobial activity in gram-positive and the Indian variety exhibit more significant activity in the gram-negative microorganism [5]. The *in-vitro* antioxidant activity were carried out with different concentrations of extract for the Himalayan variety and Indian variety of *Curcuma caesia Robx* using the FRAP method and IC 50 values indicate that the Himalayan variety has more antioxidant potency (IC50-29.9(µg/ml)) when compared to Native variety (IC50-39.9(µg/ml). It is concluded that both the Himalayan variety and Native variety of *Curcuma caesia Robx* are good sources of antimicrobial and antioxidant constituents. Further research is needed to identify and characterize the active principles of *Curcuma caesia Robx*.

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