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Anti-Microbial Activities of Turmeric and Ginger on Bacterial Isolates of Normal Skin Flora

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Authors' contributions

This work was carried out in collaboration between both authors. Author BSP designed the study, supervised the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author SCB managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The antimicrobial activity of *Zingiber officinale* (Ginger) and *Curcuma longa* (Turmeric) was evaluated using the agar well diffusion method. Different bacterial genera (*Staphylococcus Epidermis* and *Bacillus* Sp) which were isolated from the human skin were used as the test isolates. Ginger and turmeric extracted in two different solvents, ethanol and water. Different concentrations of the extracts were prepared and directly applied against bacterial genera to reveal their antimicrobial activity. Ethanol extracts of ginger and turmeric showed greater inhibitory effect against selected *Staphylococcus epidermis* and *Bacillus* sp followed by the water extract which had the least inhibitory property. Among the two extracts, ethanol extract of ginger made higher zone of inhibition than turmeric. The overuse of this herbs should be discouraged as they could reduce the microflora of the skin thereby exposing the skin to colonization by pathogens.

Keywords: Antimicrobial activity; Different bacterial genera; cattle's ailment; prehistoric times; zero side effects; antimicrobial plant extracts; microorganisms disease.

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1. INTRODUCTION

Plants are used as medicines to cure many human and cattle's ailment since prehistoric times. Plants are given more importance in medicinal field due to their easy availability, very cheap cost and effectiveness with zero side effects. Plants are mostly used by herbalists in rural and less developed areas [1]. Plants were known to show antimicrobial properties from long time being [2]. Due to production of many secondary metabolites (i.e. phenol, alkaloid, terpenoids, glycosides, etc.) many plants show bactericidal, fungicidal and pesticide activities. Plant is still backbone for making traditional medicines and drugs [3]. Because of increasing resistance in bacteria against currently available antibiotics and couple of other reason there is deadly need of antimicrobial plant extracts for survival of human against microorganisms disease [4].

Two plants *Zingiber officinal* (Ginger) and *Curcuma longa* (turmeric) belongs to the family zingiberaceae. Zingiberaceae family is known to produce novel phytochemicals which have vast antimicrobial potentials. Curcuminoids are important antibacterial phytochemicals found to be produced by *Zingiber officinal* (Ginger) and *Curcuma longa* (turmeric) known to retard bacterial growth [5]. Both plants are used in pharmacology due to their antimicrobial activities [6]. Ginger and turmeric are herbs. The rhizome power of turmeric (underground stem) is used as spice and also as powerful antimicrobial agent. Ginger rhizome in powder form is used as spice, flavor and also and also as a medicine, in Asia, India, Jamaica, Nigeria and China since 2000 [7]. Ginger and turmeric are used worldwide as herbal medicine for curing bacterial ailment known to have antimicrobial and antioxidant properties [8,9] antiprotozoal activity, anti-microbial activity, anti-venom activity having a hepatoprotective effect [10,11]. Many studies have proved that ginger is endowed with strong antioxidant, antigenotoxic, antimagnetic and anticarcinogenic properties [12]. Both In-vitro and in-vivo studies. Powdered ginger rhizome contains 3.6% fatty oil, 9% protein, 60- 70% carbohydrates, 3.8% crude fibre, 8% ash, 9- 12% water and other terpenes and terpenoids. Fish ginger contains 80.9% moisture, 23% proteins, 0.9% fat, 1.2% minerals, 2.4% fibre and 12.3% carbohydrate. Ginger and turmeric extracts are found to show antibacterial activity against methicillin resistant *Staphylococcus aureus*. This study is aimed at evaluating the antimicrobial activity of ginger and turmeric extracts on bacterial isolates of skin flora.

2. MATERIALS AND METHODS

2.1 Sample Collection

Turmeric and ginger root were bought from Bori market and was taken to the microbiology laboratory, Kenule Beeson Saro-Wiwa Polytechnic, Bori, Rivers State for further analysis. The root of turmeric and ginger that was bought were washed and dried before it was blended into a powder form.

2.2 Extraction of Turmeric and Ginger

The turmeric and ginger which have been blended were extracted as described using previous method [13]. In this method, 20g of the powdered ginger and turmeric were immersed in four 250ml beaker containing 200ml of ethanol and water which were labelled accordingly. The set up was homogenized by swirling and was allowed to stand for forty-eight hours (48 hours). After extraction, the leave extracts were filtered with sterile filter paper (Whatman no1 filter paper) into sterile 250ml beakers. The filtrate was evaporated to dryness in the hot air oven at 45□. The resulting oily residue was weighed and stored in sterile containers which were preserved in the refrigerator for further analysis.

2.3 Identification of Bacterial Isolates

Bacterial isolates were cultured from normal skin flora using the method of Cheesbrough [14]. Pure cultures of the isolates were obtained by streaking representative isolates on freshly prepared nutrient agar and incubated at 37□ for 24hours in the incubator. After incubation, identification was done using the gram staining technique and some biochemical test such as Oxidase, Citrate, Indole, Catalase, sugar fermentation tests and Methyl Red Test.

2.4 Antimicrobial Sensitivity Test

The agar well diffusion method as described by previous studies [13,15] was used in the sensitivity test. Bacteria suspension that was prepared to match 0.5% MC Farland standard was inoculated on the surface of prepared nutrient agar plates and distributed evenly by means of glass spreaders. A cork borer of 6mm was used to bore wells in the medium and about

Table 1. Inhibition zones of ginger and Turmeric extracts on normal skin flora

Bacterial Isolates	Concentration (%)	Inhibition zone of ginger and turmeric (mm)				
		GW (mm)	GE (mm)	TW (mm)	TE (mm)	Control (mm)
Staphylococcus	100	0	11	0	0	
Epidermis	50	0	0	0	0	25
Bacillus	100	0	11	0	9	
Sp	50	0	0	0	7	30

GW = Aqueous extract of ginger, GE = Ethanolic extract of ginger, TW = Aqueous extract of turmeric, TE = Ethanolic extract of turmeric, Control = 25 mg/ml Tetracycline

0.1ml of 100 and 50% of the extract concentrations were introduced separately into the well of each plate and labeled according to the concentrations. Tetracycline (25mg/ml) served as the control. All sensitivity tests were carried out in duplicate and the Petri-dishes were incubated in an incubator for 24 hours at 37℃.

3. RESULTS AND DISCUSSION

Two bacterial isolates belonging to *Staphylococcus epidermidis* and *Bacillus* sp were identified from skin flora. The result showing the zones of inhibition (mm) of the ethanol and aqueous extracts at 100 and 50 % concentrations against *S. epidermidis* and *Bacillus* sp is presented in Table 1.

From the Table above, under *Staphylococcus epidermis*, it was observed that the aqueous extract of ginger did not inhibit any growth of bacteria both in 100 and 50% concentrations while the ethanolic extract of ginger inhibited and a zone diameter of 11mm was recorded both for *S. epidermidis* and *Bacillus* sp. at the 100% concentration. The aqueous extract of turmeric and ethanolic extract of turmeric did not inhibit any bacteria growth both in 100 and 50 % concentrations. The ethanolic extract of turmeric showed antibacterial activity against *Bacillus* sp. both at the 100 and 50% concentrations with observed zone diameter of 9mm and 7mm, respectively. The result also showed that the higher concentrations had higher antimicrobial activity against the bacterial isolates. This is agreed with work done by Robinson and Patrick [13] who reported that higher concentrations exhibited higher zones of inhibition on the tested bacterial isolate whereas at low concentrations, the zone diameter reduced. Ginger extracts have been extensively studied for a broad range of biological activities including antibacterial, anticonvulsant, analgesic, antiulcer, anti-secretory, antifungal and other beneficial activities [13]. Ginger has been shown to be effective against the growth of both gram-positive and gram-negative bacteria including *Escherichia coli, Proteus vulgaris, Salmonella typhi, Staphylococcus aureus* and *Staphylococcus coli* [16]. The antibacterial activity of ginger and turmeric extracts has been demonstrated by Kim et al. [17] against methicillin resistant *Staphylococcus aureus*. Polosa et al. [18] also has reported in-vivo antimutagenic effect of turmeric on bacterial isolates. The active particle, curcumin is known for its inhibitory effect on microorganisms [19]. The zone diameter of ethanolic extract of ginger against *S. epidermidis* and *Bacillus* sp at 100% concentration are lower than the 12.52mm zone of inhibition on *S. aureus* and *Bacillus* sp reported by Ponmurugan et al. [20].

4. CONCLUSION

From this study, it was drawn that the bioactive components present in the roots of ginger and turmeric extract with ethanol possess a good antimicrobial activity against some normal skin flora bacteria than those extracted with water. More so, the overuse of these herbs on skin could pose serious health dangers especially if the normal skin flora is replaced by pathogens due to the inhibitory effect of these herbs on skin flora.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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