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Short Communication

Comparative antimicrobial activities of *aloe vera* gel and leaf

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The comparative antimicrobial activities of the gel and leaf of *Aloe vera* were tested against *Staphylococcus aureus, Pseudomonas aeruginosa*, *Trichophyton mentagraphytes, T. schoeleinii, Microsporium canis* and *Candida albicans*. Ethanol was used for the extraction of the leaf after obtaining the gel from it. Antimicrobial effect was measured by the appearance of zones of inhibition. Antimicrobial susceptibility test showed that both the gel and the leaf inhibited the growth of *S. aureus* (18.0 and 4.0 mm, respectively). Only the gel inhibited the growth of *T. mentagrophytes* (20.0 mm), while the leaf possesses inhibitory effects on both *P. aeruginosa* and *C. albicans.* The results of this study tend to give credence to the popular use of both *Aloe vera* gel and leaf.

Key words: Antimicrobial, *Aloe vera* gel, *Aloe vera* leaf.

INTRODUCTION

Aloe vera Linne or *Aloe barbadensis* Miller is a succulent from the Aloe family (400 different species) with its origin in African continent. Its thick leaves contain the water supply for the plant to survive long periods of drought (Foster, 1999). The leaves have a high capacity of retaining water also in very warm dry climates and therefore this plant can survive very harsh circumstances where most other vegetation disappears. When a leaf is cut, an orange-yellow sap drips from the open end. When the green skin of a leaf is removed a clear mucilaginous substance appears that contains fibres, water and the ingredient to retain the water in the leaf. This is called the gel. *A. Vera* gel consists of 99.3% water. The remaining 0.7% is made up of solids with glucose and mannose constituting for a large part. These sugars together with the enzymes and amino acids in the gel give the special properties as a skin care product.

The gel stimulates cell growth and as such enhances the restoration of damaged skin. It moisturizes the skin because it has a water holding capacity. This moist on the skin and also has a cooling effect. As a drink it protects the mucous membrane of the stomach especially when irritated or damaged. *A. vera* juice is considered helpful for relieving many types of gastrointestinal irritation and juice products are widely available (Foster, 1999). In Germany, concentrated extracts of dried *Aloe leaves* are used as laxative preceeding rectal surgery and as a hemorrhoid treatment. *Aloe* gel is perhaps the most widely recognized herbal remedy in the United State today; it is used to relieve thermal burn, sunburn and promote wound healing (Foster, 1999). In addition, research suggests that *Aloe* gel can help stimulate the body's immune system (Davis, 1997).

Although a lot of works have been carried out on the medicinal uses of *A. vera* gel, there is still little information on the uses of the leaf. This work therefore provides information on the comparative antimicrobial activities of both the gel and the leaf of *A. vera*.

MATERIALS AND METHODS

Test organisms

Pure cultures of the bacterial and fungal isolates (*Staphylococcus aureus*, *Pseudomonas aeruginosa, Trichophyton mentagrophytes, T. schoeleinii, Microsporum canis* and *Candida albicans*) were collected from the Microbiology Laboratory of the Federal University

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of Technology, Akure. The organisms were maintained on agar slants stocks and were subsequently subcultured into newly prepared nutrient agar slants. The fungal isolates were maintained on malt extract agar, while *Candida albicans* was maintained on Sabouraud dextrose agar.

A. vera gel and extracts

A. vera leaves were purchased from Akure Township in Ondo State of Nigeria. The gel were gotten from the leaves into a clean container and used as such. While the leaves from which the gel have been drained were air dried, ground and soaked in ethanol for 4 days. This was later filtered and the filtrates evaporated to dryness using a rotary evaporator. The extracts were dissolved in sterile water and used for the antimicrobial susceptibility testing.

Antimicrobial susceptibility testing

Sterile agar (at 45°C) was poured into sterile petri dishes, which had been inoculated with the test organisms. The plates were allowed to gel for an hour. Wells (10 mm diameter) were made with the aid of flamed cork borer on the surface of the agar plates. About 0.1 ml of each of the gel and the leaf extracts were delivered into each of the wells. These were incubated at 37°C for 24 h. Sabouraud dextrose agar plates were used for *C. albicans.* They were incubated at 25°C for 5 days. The presence of zones of inhibition was regarded as the presence of antimicrobial action. From the inhibition zones seen, antimicrobial activity was expressed in terms of average diameter of the zones of inhibition measured.

Table 1. Antimicrobial activities of A. vera gel and leaf extract (25 mg/ml).

Organisms	Zone of inhibitory mm	
	Gel	leaf
Staphylococcus aureus	18.0	4.0
Pseudomonas aeruginosa	0.0	4.0
Trichophyton mentagrophytes	20.0	0.0
Trichophyton schoeleini	0.0	0.0
Microsporum canins	0.0	0.0
Candida albicans	0.0	3.0

RESULTS AND DISCUSSION

The results showed that both the gel and the leaf have inhibitory effect on S*. aureus* with zone of inhibition 18.0 and 4.0 mm, respectively. Among the bacteria and fungi tested, *A. vera* gel possesses greatest inhibitory effect on the *S. aureus.* This result could be responsible for the popular use of *A. vera* gel and leaf to relieve many types of gastrointestinal irritations (Foster, 1999; Grindlay and Reynolds, 1986) since *S. aureus* form part of the normal microbial flora of the skin, upper respiratory tract and intestinal tract (Cheesbrough, 1984). Also the gel is also said to promote wound healing due to the presence of some components like anthraquinones and homones (Davis, 1997), which posses antibacterial antifungal and antiviral activities. However, most of the constituents are found in the gel and not in the leaf; hence the gel is likely to be more active than the leaf.

The gel also inhibited the growth of *T. mentagrophytes* (zone of inhibition: 20.0 mm) while the leaf has no effect on the organism. This result indicates that gel and the leaf are made up of different constituents, which is manifested in antimicrobial activities. However, the leaf possesses inhibitory effect on *P. aeruginosa* (zone of inhibition: 4.0 mm) while the gel had no effect. *P. aeruginosa* is known to cause skin infection especially at burns sites, wounds, pressure sores and ulcers. The inhibitory effect of the leaf of *A. Vera* on the growth of *P. aeruginosa* gives an explanation of its reputation as a healing plant for burns.

The growth of *C. albicans* was also inhibited by *A. vera* leaf but was not affected by the gel. Many different clinical forms of candidiasis are known involving primarily the mucosa surface (thrush gastrointestinal or urogenital tract) and deep-seated infections such as candidaemia or meningitis. Candida vaginitis is a common infection during pregnancy. Candida infection of the mouth and esophagus are common in those with HIV disease (Cheeshrough, 1984). Davis (1997) in his experiment challenged the medical views of the relationship between AIDS and HIV infections and *A. vera*. He sees a promising role for this natural brood spectrum healing plant because of its immunodulatory properties can also act as an immune stimulant. The results of inhibitions effect on *C. albicans* also established that the *A. vera* gel and leaf, though share certain components, are distinct from one another (Foster 1999).

In conclusion, more work should also be carried out on the leaf to reveal some of its potentials. This investigation shows that both the gel and the leaf are useful and that they can complement one another in their medicinal capabilities.

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