

Influence of Geographical Locations on the Antibacterial Activities of *Aloe vera* Accessions

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Abstract: This study evaluated the influence of geographical locations on the antibacterial activities of *Aloe vera* accessions using standard techniques. Results obtained following representation of the antibacterial activities on a dendrogram indicated that higher level of percentage truncation of the constructed dendrogram was found to be associated with low level of antibacterial disparities even though the activities of the studied *Aloe vera* accessions varies to different degrees of efficacies as 20, 40 and 60% level of truncation classified the 30 *Aloe vera* accessions into 5, 3 and 2 clusters respectively. It can thus be concluded based on our research findings that geographical locations have little effect on the antibacterial studies.

Key words: Geographical Locations • *Aloe vera* • Antibacterial

INTRODUCTION

Bacterial infections are a leading cause of morbidity and mortality worldwide and bacteria can cause infections in nearly all host tissues [1]. Furthermore, some of these infections including health care-associated urinary tract infections, pneumonia, skin and soft tissue infections, invasive bloodstream infections and surgical-wound infections are increasingly common [2, 3]. The usual method of treating bacterial infections is by local or systemic administration of broad-spectrum antibiotics. Excessive use of antibiotics is, however, common practice in many countries and is a leading cause of the rise of multidrug-resistant pathogenic bacterial strains [4].

The discovery of these antibiotics in the early 20th century fundamentally transformed human and veterinary medicine and have now save millions of lives each year in the United States and around the world. The rise of antibiotic-resistant bacterial strains, however, represents a serious threat to public health and the economy. The CDC estimates that annually at least two million illnesses and 23,000 deaths are caused by antibiotic-resistant bacteria in the United

States alone [5]. They further buttressed that as more strains of bacteria become resistant to an ever-larger number of antibiotics, our drug choices will become increasingly limited and expensive and, in some cases, nonexistent.

Hence, the need to search for new antimicrobial agents from natural products of plants to combat the problems associated with drug resistant strains of microorganisms [6]. The plant *Aloe vera* L. Burm. f. (family Liliaceae) which is an ancient semi tropical medicinal plant indigenous to Africa, Madagascar and Arabia [7], is one of the approximately 420 species of the genus *Aloe* [8] that has been reported to exhibit a wide range of biological characteristics such as antimicrobial, antifungal, anti-inflammatory, immune stimulant, antiseptic, wound and burn healing, antiulcer, antitumor and antidiabetic activities [9] among other functions. However, there seem to be paucity of information regarding the influence of geographical locations on the antibacterial activities of the *Aloe vera* accessions using standard reference strains of bacteria. This study was therefore aimed at evaluating the likely effect of geographical locations on the antibacterial activities of *Aloe vera* accessions.

MATERIALS AND METHODS

Plant Materials: Specimens of *Aloe vera* were collected from Professor Afolabi Oluwadun Garden in Sagamu and some selected places in Abeokuta and Ilorin both in Ogun State and Kwara State respectively. The identification was done by Mr T.K.Odewo of the Department of Botany, University of Lagos, Akoka, Lagos, Nigeria. In this study, the gel of the *Aloe vera* leaves were scraped with sterilized knife and blended in a pre sterilized electric blender. The blended sample was double fold serially diluted.

Preparation of Concentrations of *Aloe Vera* Juices:

Ten sterile tubes were arranged in the rack and 1ml of nutrient broth was added to tubes 2 to 10 (except tubes 1 and 9) and 2.0ml of *Aloe vera* juice were put into tube 1. Then, 1.0ml of *Aloe vera* juice was transferred from tube 1 to tube 2. Serial doubling dilution was made from tubes 2 to 8 by transferring 1.0ml of the homogeneous tube 2 content to tube 3 and from 3 to 4 and so on to 8 and the remaining 1ml was discarded. Then, 1ml of the *Aloe vera* juice was added to tube 9 (negative control) and 1ml of nutrient broth was added to tube 10 (positive control).

Test Microorganisms: Authentic pure cultures of standard test bacteria like *Proteus mirabilis* ATCC 25933, *Staphylococcus aureus* ATCC 25923, *Pseudomonas aeruginosa* ATCC 27853, *Klebsiella pneumoniae* ATCC 23357 and *Enterococcus faecalis* 19433 were obtained from Department of Veterinary Microbiology and Parasitology, Federal University of Agriculture, Abeokuta, Nigeria. These isolates were further confirmed using standard microbiological techniques [10].

Determination of Minimum Inhibitory Dilution (MID) of *Aloe Vera* Juice:

1.0 ml each of 0.5 Mcfarland turbidity standard of the bacterial suspension was added to the contents of all the tubes and incubated at 37°C 24hrs. The highest dilutions showing no turbidity were observed as the MID.

Determination of Minimum Bactericidal Dilution (MBD) of *Aloe Vera* Juice:

Minimum bactericidal dilutions of the *Aloe vera* juices were determined by plating each MID on the Nutrient agar plate and incubated at room temperature for 7days. Lack of growth indicated bactericidal activity of the juices while growth indicated bacteriostatic activity.

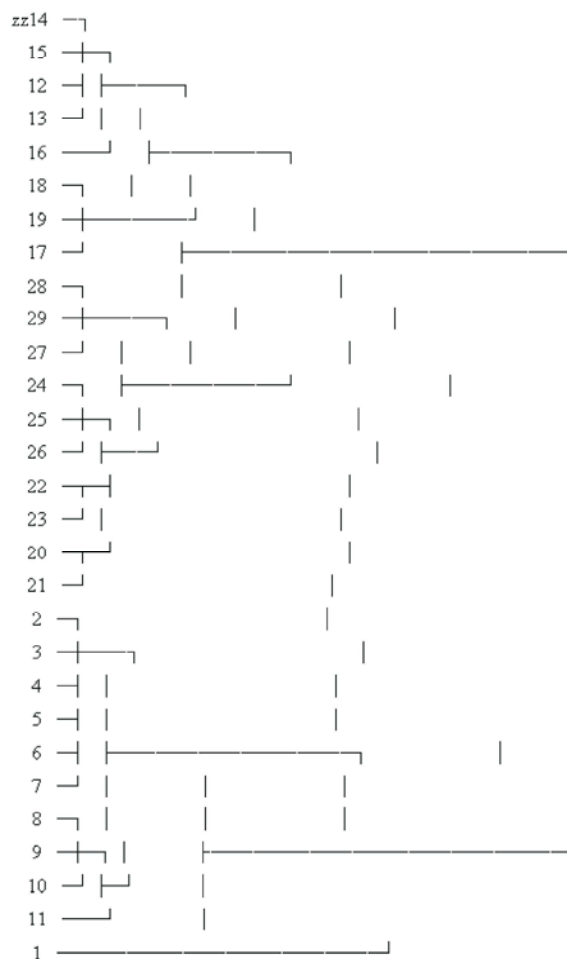


Fig. 1: Dendrogram showing the antibacterial activities of *Aloe vera* from different geographical zones

RESULTS

The phytochemical analysis as summarized in Table 1 showed that all the *Aloe vera* accessions investigated revealed the presence of tannins, flavonoids, alkaloids, saponins, anthraquinones, steroids and terpenoids.

The figure one below depicts the influence of geographical locations on the antibacterial activities of the studied *Aloe vera* accessions. As shown in the figure, higher level of percentage truncation was found to be associated with low level of antibacterial disparities even though the activities of the studied *Aloe vera* accessions varies to different degrees of efficacies. At 20, 40 and 60% level of dendrogram truncation, the 30 *Aloe vera* accessions were classified into 5, 3 and 2 clusters respectively.

Table 1: Phytochemical attributes of *Aloe vera* from different geographical locations

S/N	Tannin	Saponin	Anthraquinone	Alkaloids	Steroids	Terpenoids	Flavonoids
1	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+
3	+	+	+	+	+	+	+
4	+	+	+	+	+	+	+
5	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+
7	+	+	+	+	+	+	+
8	+	+	+	+	+	+	+
9	+	+	+	+	+	+	+
10	+	+	+	+	+	+	+
11	+	+	+	+	+	+	+
12	+	+	+	+	+	+	+
13	+	+	+	+	+	+	+
14	+	+	+	+	+	+	+
15	+	+	+	+	+	+	+
16	+	+	+	+	+	+	+
17	+	+	+	+	+	+	+
18	+	+	+	+	+	+	+
19	+	+	+	+	+	+	+
20	+	+	+	+	+	+	+
21	+	+	+	+	+	+	+
22	+	+	+	+	+	+	+
23	+	+	+	+	+	+	+
24	+	+	+	+	+	+	+
25	+	+	+	+	+	+	+
26	+	+	+	+	+	+	+
27	+	+	+	+	+	+	+
28	+	+	+	+	+	+	+
29	+	+	+	+	+	+	+
30	+	+	+	+	+	+	+

DISCUSSION AND CONCLUSION

Results of the phytochemical analysis as summarized in Table 1 showed that all the *Aloe vera* accessions investigated revealed the presence of tannins, flavonoids, alkaloids, saponins, anthraquinones, steroids and terpenoids. Majority of the phytochemical constituents present have been known to possess antibacterial activities [11-13]. The fact that all the tested *Aloe vera* accessions shows the same qualitative presence of the tested phytochemicals is an indication that these *Aloe vera* accessions are phytochemically indistinct. The antibacterial activities of the tested plants demonstrated activities against the tested organisms to varying degrees suggesting that geographical location can influence the antibacterial activity of the plant. The report of Ermel *et al.* [14] showed that the concentration of insecticidal principle in seed kernels of *Azadirachta indica* A. Juss. varied with humidity, geographical location, individuality of trees among other factors. Olafimihan [15] also reported the influence of season on the antibacterial activity of stem bark of

A. indica. The fact that there are varying degree of inhibition by juice obtained from different location also reveals that differences in geographical location may influence the antibacterial activity of the plant. It may well be that genetic constitution of individual plant tested influence the antibacterial studies. Further work could also be done to reveal the link between genetic constitution of *Aloe vera* accessions and their antibacterial activities.

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