

Full Length Research Paper

Traditional information and antibacterial activity of four *Bulbine* species (Wolf)

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Ethnobotanical survey of *Bulbine* Wolf, (Asphodelaceae) used for various treatment, such as, diarrhea, burns, rashes, blisters and insect bites, was carried out in the Eastern Cape Province of South Africa. Information on the parts used and the methods of preparation was collected through questionnaire which was administered to the herbalists, traditional healers and rural dwellers which indicated the extensive use of *Bulbine* species. Most uses of *Bulbine* species closely resemble that of *Aloe*. Dried leaf bases and leaf sap are the commonest parts of the plants used. Preparations were in the form of decoctions and infusions. *Bulbine frutescens* was the most frequently and commonly used of the species collected for the treatment of diarrhoea, burns, rashes, blisters, insect bites, cracked lips and mouth ulcers. The leaf, root and rhizome extracts of *B. frutescens*, *Bulbine natalensis*, *Bulbine latifolia* and *Bulbine narcissifolia* were screened for antibacterial activities to verify their use by traditional healers.

Key words: Herbal medicine, diarrhea, medicinal plants, *Bulbine* species, antibacterial activity.

INTRODUCTION

Many traditionally used plants are currently being investigated for various medicinal ailments such as treatment to cure stomach ailments, boding, headaches and many more aspects including new and progressive viruses that are developing in the entire world. Members of the family Liliaceae as well as asphodelaceae are well known for their medicinal value (Acocks, 1975). *Aloe vera* is a well-known example that is currently marketed throughout the world. Antimicrobial activities have validated the use of species as traditional remedies and some have been patented successfully (Akerle, 1988; Cunningham, 1998; Farnsworth, 1994; Klos et al., 2009).

In South Africa, it is estimated that 70% of the black population consults traditional healers for health hazard problems and utilize traditional medicines, most of which is derived from plant species indigenous to the region (Jager et al., 1996). These may be obtained on prescription from traditional healers, purchased from herb sellers or gathered in the wild for personal medication (Coopoosamy and Magwa, 2007; Jager et al., 1996). Medicinal ingredients have been obtained from plants for a very long time. The natural products obtained serves as a source of drugs (Balandrin et al., 1993). Dependence on plants as the source of medicine is prevalent in

developing countries where traditional medicine plays a major role in health care (Farnsworth, 1994; Srivastava et al., 1996).

The medicinal implications of the *Bulbine* species have been well known for centuries and were used as early as the eighteenth century. The British and Dutch settlers of Southern Africa utilized the species for various medicinal ailments (Coopoosamy et al., 2000). The indigenous knowledge was crucial at that time. They made their knowledge available to the settlers who suffered diseases such as diarrhea; other treatments that the family of plants were used for was for sores, burns, etc. With the recent advancement of research, in the field of medicinal plants and their treatments, it has become apparent that many of the species utilized by indigenous people as well as the knowledge of the traditional healers has began to make its mark on society as a possible avenue for cure to diseases. The effective remedies obtained for traditional healers have proved successful.

MATERIALS AND METHODS

Information given in this paper was collected from herbalists, traditional healers and rural dwellers in the Eastern Cape Province

Table 1. Localities of *Bulbine* species.

Plant species	Lat	Long
<i>B. latifolia</i>	-32.82297	26.91189
<i>B. longifolia</i>	-32.84280	26.94101
<i>B. frutescens</i>	-32.79700	26.87082
<i>B. natalensis</i>	-33.2858	26.6233

Table 2. Various treatments in which *Bulbine* species are used.

Species	Treatment	Part used
<i>B. latifolia</i>	Stomach ailments, rheumatism	Dried bases
<i>B. longifolia</i>	Stomach ailments, burns, sunburn	Dried bases and leaf sap
<i>B. narcissifolia</i>	Burns, wounds, rashes	Leaf sap/extracts
<i>B. natalensis</i>	Diarrhoea, burns, rashes, sunburn, corns, warts	Leaf sap/extracts
<i>B. frutescens</i>	Diarrhoea, burns, rashes, blisters, insect bites, cracked lips, mouth ulcers	Dried bases, leaf sap/extracts

of South Africa. Adopting the method of Jovel et al. (1996), information was compiled through scientifically guided questionnaires, interviews with local indigenous people, herbalists and traditional healers. The plants were initially identified by their vernacular names through consultations with the local people. Scientific identification of the plants and their uses in other communities were collected from literature (van Wyk and Gericke, 2000). Furthermore, verbal communication with indigenous people as to the use of various *Bulbine* species was conducted and plants species were collected as shown in Table 1.

Traditional method of extraction and administration

Bases of various *Bulbine* species comprising roots, rhizomes and leaves were collected by traditional healers or indigenous people and allowed to dry in the sun until sufficiently dried (approximately 2 days). Once dried, the bases were boiled to extract the necessary ingredients required to form a decoction for treatment. The amount of plant material used in this process varies from individual to individual, but in most cases an amount approximate to one kilogram of dried bases, rhizome, roots and leaves, were used. After thirty minutes of boiling in water, the fluid portion was separated from the pulp of the bases. The fluid with the extract was referred to as a "tea". This tea was allowed to cool after which it was administered orally three times a day for a period of three to five days. During this time, the patient recovers and he/she is advised to drink a lot of water to compensate for loss due to dehydration.

Antibacterial assay

One kilogram of dried material of each (leaf, root and rhizome) was crushed and placed in a 2 l conical flask containing one of three mediums, that is, water, ethyl acetate and acetone, for extraction, based on varying polarity of solvents. The media were left for 72 h in an orbital shaker at 20 shakes per minute. After 72 h, the extracts were filtered and used for further tests.

The plant extract was then tested for antibacterial properties against three strains of gram-positive (*Bacillus subtilis*, *Micrococcus kristinae*, and *Staphylococcus aureus*) and three strains of gram-negative bacteria (*Escherichia coli*, *Proteus vulgaris* and *Enterobacter aerogenes*) for antibacterial activity using the cup-plate method. Each organism was prepared by diluting in 24 h old broth

cultures with sterile nutrient broth. The cultures were then diluted 100 fold to give approximately 10^6 bacteria ml^{-1} . Cultures were incubated over 72 h at 60°C. Each treatment was done in triplicate.

RESULTS AND DISCUSSION

Observation of antibacterial test on extracts of all tested species indicates that, the acetone and ethyl acetate extracts were more active as compared to water extracts. During the experimental procedures, solvent traces were removed before treatment with cultures. The results are outlined in Tables 2 to 5. The different species of the genus *Bulbine* exhibit varying medicinal importance with respect to different uses amongst the indigenous people of Africa. Today, the plant is often seen in gardens throughout Southern Africa as an ornamental species (Acocks, 1975). The most popular species within this family is *Bulbine frutescens* Wild. And *Bulbine natalensis* Baker. *Bulbine latifolia* Spreng, *Bulbine longifolia* A. Rich. and *Bulbine narcissifolia* Salm-Dyck are less popular compared to the two species mentioned earlier.

Bulbine species has many common names used by traditional healers and indigenous people. In English *Bulbine* is referred to as snake flower, cat's tail or jelly plant; among the Afrikaans, it is referred to as Balsem kopieva, Copaiba and Geelkatstert, while in Sotho, it is referred to as Khomo-ya-Ntsuammele, Sehlare-sapekane, Sehlare and in Xhosa and Zulu, it is referred to as Intelezi, Ishaladi lenyoka. The different names are adopted from the appearance of the plant in the wild. Due to the wide use of this genus, it is undoubtedly well known among all nationalities in South Africa (van Wyk, 2000, 2008).

Bulbine species have fleshy leaves and is relatively quite distinct on the field. The fleshy leaves and roots of most species of this genus are used in many traditional treatments. Traditional healers and indigenous people

utilize mainly the leaf sap of this genus widely for use in the treatment of wounds, burns, rashes, itches, cracked lips and cracked skin. Stems and roots of *Bulbine* species contain antraquinones such as chrysophanol and knipholone (Jager et al., 1996). These compounds could be of minor importance in the healing process, which is most likely due to glycoproteins such as aloctin found in the leaf gels of *Aloe arborescence* and *Aloe excelsa* (Cooposamy and Magwa, 2007; Jager et al., 1996). Fresh leaf sap is used to treat or heal cracked lips and the crushed leaves are used as a dressing for burns and cuts. It is believed that women drink the concoction to cure venereal diseases (Bajinath, 1977).

Due to its broad leaves, an infusion from the broad dried leaves and bases of *B. latifolia* is prepared and administered orally for various treatments. Some of the probable diseases that this infusion can cure are listed in Table 2. *B. narcissifolia* has a rather tougher leaf than any of the other *Bulbine* species under study. The indigenous people used a concoction from the roots and leaves to remove corn and warts (Bajinath, 1977). Almost all the indigenous people questioned on the medicinal use of *B. natalensis* had indicated the use to be that of curing diarrhea. The species is less used for treatment of sores, wounds, rashes and sunburn. The exudates are spread over the surface of a sun burnt victim over a period of three to five days, during this time the sap cools down the body and helps in the bodies natural defenses to block out the burning sensation on the skin.

B. frutescens often termed intelezi by the indigenous people, because of its sticky sap is the most frequent of the *Bulbine* species used by traditional healers and indigenous people for treating burns, rashes, mouth blisters, insect bites, cold sores and cracked skin. The leaf sap is applied directly to the infected area and treatment occurs almost instantly. According to indigenous people and traditional healers, the most frequent *Bulbine* species used in treatment of diarrhea are *B. latifolia* and *B. frutescens*. The most frequent *Bulbine* species used in treatment of burns is *B. natalensis*, *B. latifolia* and *B. narcissifolia*.

The antibacterial testing provided some valuable results in validating the use of *Bulbine* species in traditional treatments. Gram positive bacteria most often cause human diseases, prominent in patients who have diarrhea, wounds and sores (Booolootian and Stiles, 1981). These bacteria are also found in the large intestine of such patients. Subsequently, the patient would have frequent stools and suffer extreme loss of water. If not treated in appropriate time, the patient will suffer dehydration and subsequent death might result.

Leaf extracts of the four *Bulbine* species tends to inhibit gram positive bacterial growth for both acetone and ethyl acetate extracts (Tables 4 and 5). Such antibacterial activities were noted on the following gram positive bacteria such as *Bacillus subtilis*, *Micrococcus kristinae* and *Staphylococcus aureus*. The rhizome extract of *B.*

narcissifolia exhibited antibacterial activity for *Escherichia coli* at a relatively low minimum inhibitory concentration (MIC). However, there was no inhibition of this *E. coli* in both the roots and leaves. Surprisingly, no inhibitory effect has been noted for all water extracts as water is the only medium which is available to the traditional healers (Table 3). However, the survey indicated that traditional healers boil their plant part to extract the necessary ingredients in water. Due to both ethyl-acetate and acetone being polar more than that of water, these solvents would extract more of the compounds embedded within the plant cells. More polar solvents are difficult for traditional healers to obtain.

These results are in line with those from previous screenings of medicinal plants for antibacterial activity, where most of the active plants showed activity against gram positive strains only (Cooposamy and Magwa, 2000; 2007, Cooposamy et al., 2010; Kelmanson et al, 2000; Rabe and van Staden, 1997; Vlietinck et al., 1995). The minimum inhibitory concentration values are relatively high, but active compounds in the extract may be present in low concentrations. This could be justified by investigations using bioassay-guided fractionation.

Conclusion

Traditional information obtained from traditional healers has indicated the use of *Bulbines* in their treatments. These ailments included sun-burns, sore, gastro-intestinal infections, etc. The antibacterial result validates the use of *Bulbine* species by traditional healers. Isolation of active ingredients would have to be pursued to ascertain any economic benefit that could be obtained from these species.

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