

Phytochemical Analysis of *Asparagus africanus* Root Extracts

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Abstract: Phytochemicals are the reliable source for the treatment of health complications in Africa and specifically South Africa, which brought forward for the screening of *Asparagus africanus* root extracts, though this result indicated several bioactive constituents presents, such as alkaloids, carbohydrate, cardiac glycosides, protein, flavonoids, tannins, steroids, terpenoids and saponins contained in *A. africanus* roots.

Key words: Medicinal plant, phytochemical screenings, *Asparagus africanus*.

1. Introduction

Plants have been in existence for a long time. Over 250,000 species of flowering plants are known and estimated 155,000 species can be found in the tropics [1]. South Africa is recognised as one of the countries in the world with the richest biodiversity (<http://www.gcis.gov.za>). Apart from fuel, fibre and food, plants have always been known to be a traditional source of medicines, since they contain secondary metabolites of high chemical diversity. Chemical diversity is one among several important factors that has given rise to continuing interest in research into natural [1]. Most medicinal plants contain some organic compounds that cause a definite physiological action in the human body, as a result of the presence of bioactive substances, such as tannins, alkaloids, carbohydrate, terpenoids, steroids and flavonoids [2]. These substances are also reported to be present in the roots of *Asparagus* species [3]. In view of the reports on bioactive substances in natural plants, phytochemical screening of plants has become more important. Phytochemical analyses are conducted on medicinal plants to ascertain the

presence of constituents that are known to exhibit medicinal factors, as well as physiological activities [4]. Furthermore, recent studies have shown that phytochemicals present in leaves and roots have received a great deal of attention, mainly for their role in preventing diseases caused by oxidative stress, which releases reactive oxygen species. Considering the importance of these substances, which fight against various illnesses and are good for human consumption, checking for their presence in any medicinal plant is a necessity. In addition, there is a need to validate the presence of these bioactive constituents through an organised infrastructure (phytochemical screening) if they are to be used as an effective therapeutic means in novel drug discovery [5]. Therefore, in this study knowledge of the chemical constituents of *A. africanus* is desired and this will be obtained through qualitative phytochemical screening.

2. Materials and Methods

2.1 Preparation of Plant Material and Extracts

A. africanus was purchased and authenticated at the National Botanical Gardens in Bloemfontein, South Africa. The collected plant roots were oven-dried at 40 °C and stored in a cool and dry place. A voucher

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specimen, CUT01/11/2012, was kept in the laboratory at the Central University of Technology.

The dried roots of *A. africanus* (10 g of the dried roots) were weighed, pulverised and soaked separately in 100 mL of methanol and distilled water and then mixed on an orbital shaker for 72 hours. The extracts were filtered using Whatman No. 1 filter paper disc and the solvent (methanol) was removed completely under vacuum by a rotary evaporator (at 40 °C) and stored in a refrigerator until use. The water extract was dried to a powder using lyophilisation.

2.2 Phytochemical Screening of *Asparagus africanus*

All the chemical tests were carried out on the methanolic and water extracts, using the standard procedure to identify the chemical constituents by colour changes [4, 6, 7].

2.2.1 Test for Saponins

Amounts of about 0.7 g of the extracts were dissolved in 3 mL of distilled water and shaken vigorously. The formation of emulsion was observed. The test was performed in triplicate.

2.2.2 Test for Carbohydrates

Benedict's test was performed using 0.2 g of the extract dissolved in 2 mL of methanol; 1,000 μ L of the sample was put into a test tube and the same proportion of Benedict's solution was added. The test was carried out in triplicate.

2.2.3 Test for Protein

The test for protein was carried out measuring out 0.2 g of the extract dissolved in 2 mL of methanol; a few drops of 1% CuSO_4 and 4% NaOH were used; these are also Biuret reagents. The test was performed in triplicate.

2.2.4 Test for Flavonoids

Three methods were used to determine the presence of flavonoids in the plant sample [4, 8]. Five (5) mL of dilute ammonia solution was added to both the methanol and distilled water extracts, followed by the addition of concentrated H_2SO_4 . Yellow colouration observed in each extract indicated the presence of

flavonoids. The test was done in triplicate.

2.2.5 Test for Tannins

Amounts of about 0.7 g of the extracts were dissolved in 2 mL methanol and distilled water, then three drops of 0.1% ferric chloride solution were added. The formation of precipitates in the solution was observed; there was a blue-black or brownish green precipitate, which indicated the presence of tannins.

2.2.6 Test for Steroids and Terpenoids (Salkowski Test)

About 2 g of each extract was dissolved in 2 mL of both methanol and distilled water. Both extracts were premixed with 1 mL of chloroform and afterwards concentrated sulphuric acid (H_2SO_4) was added to the sample. A layer was then formed. These experiments resulted in a reddish brown colour precipitate at the border or interface of chloroform and H_2SO_4 , which confirmed the presence of steroids and terpenoids.

2.2.7 Test for Cardiac Glycosides (Keller-Killani Test)

About 0.7 g of each extract was dissolved in 2 mL of methanol and distilled water, and then the extracts were both treated with 2 mL of glacial acetic acid containing one drop of ferric chloride solution. This was underlaid with 1 mL of concentrated sulphuric acid. A brown ring at the interface indicated the deoxysugar characteristic of cardenolides. A violet ring appeared below the brown ring, while in the acetic acid layer, a greenish ring formed gradually throughout thin layer.

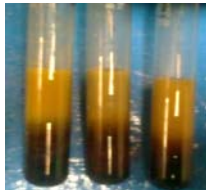
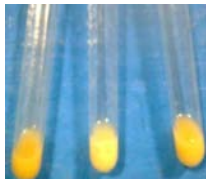



2.2.8 Test for Alkaloids (Meyer's Test)

Amounts of about 1 g of each extract were dissolved in 3 mL of methanol and distilled water; 1 mL of the Meyer's solution (potassium mercuric iodide solution) was added to 200 μ L of the respective samples. The methanol extracts became creamish in colour, while the water extracts turned orange brownish in colour.

2.2.9 Test for Alkaloids (Dragendorff's Test)

About 1 g of each extract was dissolved in 3 mL of

Table 1 Phytochemicals screening (*A. africanus*).

Phytochemical	Methanol	Water	Image
Alkaloids (Meyer's test)	Cream colour(+)	Orange brownish(+)	
Alkaloids (Dragendorff's test)	Reddish brown(+)	Reddish brown(+)	
Carbohydrate (Benedict's test)	Reddish brown(+)	Brick reddish(+)	
Cardiac glycosides (Keller-Killani test)	Brown ring(+)	Purple (+)	
Protein (Biuret test)	Pale blue(+)	Pale blue(+)	
Flavonoids	Yellow precipitate(+)	Yellow precipitate(+)	
Tannins (ferric chloride test)	Brownish green(+)	Brownish green(+)	
Saponins (froth test)	Formation of emulsion(+)	Formation of emulsion(+)	
Steroids	Blue green(+)	Blue green(+)	
Terpenoids (Salkoski test)	Reddish brown(+)	Reddish brown(+)	

Positive (+) Negative (-).

methanol and distilled water and 1 mL of the Dragendorff's solution (potassium Bismuth iodide solution) was added to 200 μ L of the respective samples. Both the methanol and distilled water turned reddish brown in colour. This test was carried out in triplicate.

3. Results and Discussion

Preliminary phytochemical screening revealed the

presence of alkaloids, flavonoids, glycosides, tannins and steroids in crude root extracts of *A. africanus* was shown in Table 1. These results revealed that the plant has quite a number of chemical constituents, which may be responsible for the many pharmacological actions. Reports have shown that most active compound constituents in plants are alkaloids, phenolics, tannins and saponins [9]. Alkaloids are very important in medicine and constitute most of the

valuable drugs [10]. Phenolic is considered potentially toxic to the growth and development of pathogens, while tannins are fairly potent bioactive compounds used for therapeutic purposes [11, 12]. All of these chemical constituents play a role in plants' resistance to disease. Further work should also be done to investigate the specific phytoconstituents responsible for these activities. Phytochemicals can serve as a valuable source of information and provide appropriate standards to establish the quality of this plant root material in future study or application.

The phytochemical constituents, such as flavonoids and other plant phenolic and phytoconstituents of *Asparagus laricinus* are reported by Mashele et al. [3]. Flavonoids are the most extensively studied phenolic and antioxidant compounds, which play more intensive roles in ethno-pharmacology.

4. Conclusions

The results above indicate that all three solvents of *A. africanus* root crude extracts have a notable chemical constituent and phenolic content. *A. africanus* root crude extracts revealed the presence of alkaloids, flavonoids, tannins, terpenoids, cardiac glycosides, saponins and steroids by positive reaction with the respective test reagents.

These results indicate that *A. africanus* root crude extract is rich in phenolic, with low antioxidant and reducing activities. The findings of this study suggest that this plant root could be a potential source of natural antioxidants that could have great importance as therapeutic agents in preventing or slowing down the progress of ageing-associated oxidative stress related to degenerative diseases such as diabetes, cancer and cardiovascular diseases caused by lack of antioxidant capacity. Further studies of this plant should be carried out to determine the bioactive compounds and *in vivo* studies of its medicinal

properties should be done in order to prepare natural pharmaceutical products of high value.

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