

Preliminary Studies on *Vernonia ambigua*: Phytochemical and Antimicrobial Screening of the Whole Plant

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Abstract

A dry, whole plant of *Vernonia ambigua* Kotschy and Peyr was collected from Suleja, Niger State, Nigeria and qualitatively screened for the presence of secondary metabolites using standard methods. Some proximate compositions were also determined. The result showed the presence of alkaloid, tannin, saponin, flavonoid and carbohydrate while terpene, sterol, anthraquinone, phlobatannin, resin, cardiac glycoside, balsam, phenols and volatile oil were not detected. The result of proximate analysis which includes ash value, acid-insoluble ash value, water and alcohol extractive values are reported. Crude extracts of the plant were screened for activity against selected microorganisms. The result is also reported. This work is aimed at providing some scientific data for this plant since there is limited scientific report on it in literature.

Key words: *Vernonia ambigua*, proximate analysis, biological screening,

Introduction

Vernonia ambigua is an annual shrub belonging to the family Asteraceae/Compositae. The shrub is erect, coarse and bushy in nature, growing up to 600 mm high. The stem is erect, woody and ribbed as well as hairy and leafy especially at flowering time. The leaves are simple and alternate oblanceolate with a dimension of 20-60 mm long and 6-10 mm wide. The upper leaves have serrated margins and are coarsely hairy. The floescence consists of cluster of flower heads 10-15 mm in diameter with pail bluish or mauve floret usually at the end of leafy branches (Akobundu and Agyakwa, 1998).

The plant is easily propagated through seeds and stem cutting. The plant is widely distributed in areas like Angola, Sudan, Tanzania, Uganda and tropical West Africa. It occurs throughout the drier part of

these regions and also widely dispersed in similar parts of tropical/Africa (Akobundu and Agyakwa, 1998).

The plant is called Orungo in Yoruba and Tab-tabá/Tattaba in Hausa. In Suleja, Nigeria, the root is chewed raw or taken as a decoction as an expectorant for cough and fever or to regulate body temperature. Despite the wide local use of *V. ambigua* for the management of cough and fever, no information on this and other uses of the plant could be obtained in literature. This work which is the beginning of a series of research work to be carried out on the plant is aimed at evaluating the phytochemical and proximate composition of *V. ambigua* with a view to bringing it to the vista of scientific research.

Materials and Methods

Plant Material: A plant of this species was collected in February 2007 from Rafin Sanyi, Suleja, Niger State, Nigeria and identified by the Ethnobotanist in the Department of Medicinal Plant Research and Traditional Medicine of the National Institute for Pharmaceutical Research and Development (NIPRD) Abuja, Nigeria. A voucher specimen with number NIPRD/H/6302 was deposited at the herbarium for reference. The whole plant was pulverized fresh using mortar and pestle.

Phytochemical screening: The pulverized sample was dried for two weeks and was used for phytochemical analysis to determine the secondary metabolites present using standard methods (Sofowora 2008; Evans 2002). Proximate analysis was also carried out to determine the moisture content, total ash value, acid insoluble ash value, alcohol and water soluble extractive values.

Results and Discussion

The phytochemical screening of *V. ambigua* whole plant (Table 1) reveals the presence of tannins, saponins, flavonoids and alkaloids. The plant did not show the presence of steroids, anthraquinones, resins, volatile oils, terpenes, steroids, cardiac glycosides and phlobatannins. The presence of these secondary metabolites suggests that the plant might be of medicinal and industrial importance. Preliminary antimicrobial screening of the water, methanol, ethylacetate and hexane extracts against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella sp.* (clinical) at a test concentration of 2mg/ml showed no activity.

The secondary metabolites are relevant in various areas for different purposes and some of these include:

Saponin is used as mild detergents and in intracellular histochemistry staining to allow antibody access

to intracellular proteins. In medicine, it is used in hypercholesterolaemia, hyperglycaemia, antioxidant, anti-cancer, anti-inflammatory and weight loss etc (Ngbede *et al.*, 2008).

Table 1. Result of the phytochemical screening.

Phytochemical constituents	Results
Cardiac glycosides	-
Terpenes	-
Steroids	-
Saponins	+
Tannins	+
Anthraquinones	-
Balsams	-
Resins	-
Alkaloid	+
Phlobatannin	-
Flavonoids	+
Volatile oil	-

Key: + = Present; - = Absent

Table 2. Result of the proximate analysis.

Parameter	Values
Moisture content	8.20%

Total ash value	13.9%
Acid-insoluble ash value	2.35%
Water-soluble extractive value	20.60%
Alcohol-soluble extractive value	5.49%

It has also been reported to have anti-fungal properties (Sodipo *et al.*, 1991). Saponin inhibits $\text{Na}^+/\text{Ca}^{2+}$ antipoter producing elevated cytosolic Ca^{2+} which strengthens the contractions of heart muscle and thereby reducing congestive heart failure (Oloyede, 2005). Seigler (1998), also reported that saponnins have anti-carcinogens' properties, immune modulatory activity and cholesterol lowering activity.

Tannins were reported to exhibit antiviral, antibacterial and anti-tumor activities. It was also reported that certain tannins are able to inhibit HIV replication selectively and is also used as diuretic. Plant tannins have been widely recognized for their pharmacological properties and are known to make trees and shrubs a difficult meal for many caterpillars (Haslem 1989).

Alkaloids are metabolites known to be produced by plants and animals and over 800 have been isolated. They are of considerable pharmaceutical importance since they are used as drugs for the treatment of several disease conditions known to man. Example is quinine, hyoscyamine, nicotine, cocaine, etc, most of which have pharmacological activity in man and animals as well as microorganisms (Evans 2002).

Flavonoids suggest that the leaves might have an anti-oxidant, anti- inflammatory, anti-cancer, anti-microbial and anti-allergic activity. Plants flavonoid has been referred to as nature's biological response modifiers because of strong experimental evidence of their inherent ability to modify the body's reaction to allergen, virus and carcinogens. They show anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activities (Cook *et al.*, 1996). Many of these alleged effects of flavonoids are reported to be linked to their strong antioxidants, free radical scavenging and metal chelating properties (Jimoh and Oladiji 2005).

Table 2 shows the moisture content of 8.20%. The moisture content is within acceptable range thus implying that the plant can be stored for a long period and would not easily be attacked by microbes. Total ash value of 13.90%, which is low, implies that the plant has a good organic content and fairly low inorganic component. Alcohol-soluble extractive value of 5.49% which is less than water-soluble

extractive value of 20.60% implies that water is a better solvent of extraction of the plant than ethanol. Acid-insoluble ash value of 2.35% shows that a very small amount of the inorganic component is insoluble in acid and hence this may affect amount of the component absorbed in the gastrointestinal canal when taken orally.

In conclusion, *V. ambigua* is a plant that is yet to be thoroughly explored and reported in the literature. The presence of alkaloid and flavonoid tends to suggest potentials for pharmacological and other biological relevance in drug discovery. Work is ongoing in our laboratories on its use in other disease conditions.

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