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PROXIMATE AND MINERAL COMPOSITION OF AFRICAN MISTLETOE (*Tapinanthus bangwensis*) LEAVES

O. O. Egbewande

Department of Animal Science, Ibrahim Badamasi Babangida University, Lapai, Nigeria

ABSTACT

Proximate, mineral and phytochemical analyses were carried out on the leaves of the African mistletoe. Results from the proximate analysis showed that the crude protein, crude fibre, ether extract, ash and metabolisable energy values were 13.99%, 10.94%, 11.49%, 14.96% and 3183.52 kcal/kg, respectively. Mineral compositions (mg/kg) of the mistletoe were: 35000, 4400, 42300, 44350, 1500, 30, 450 and 40 for Calcium, Magnesium, Potassium, Sodium, Phosphorus, Manganese, Iron and Zinc, respectively. Phytochemical analysis showed that the leaves contained alkaloids, tannins, flavonoids, saponins, anthraquinones and cardiac glycosides. Therefore, if the leaves can be harnessed, the plant can be of immense nutritional benefit to livestock.

Key words: *African mistletoe* leaves; Proximate; Mineral; Phytochemicals.

INTRODUCTION

Parasitic plants, such as mistletoes, have been the subject of much curiosity since ancient times, due to their nutritional modes that differ from what is typically perceived to be normal for green plants that is, photosynthetic and motionless (Nickrent, 2002). Mistletoes (Hemiparasites) make up about 50% of all parasitic angiosperms, and represent the largest and most diverse group of aerial parasites. Most grow in the tropics and subtropics, though there are many species in northern and southern temperate zones (Calvin *et al*., 1999).

African Mistletoes belong to the *Loranthaceae* and *Viscaceae* families. The African *Loranthaceae mistletoes* are more prominent with long colourful flowers, grow all year round along the branches of the host trees (never touching the ground) and remain green even during the dry season (Polhill and Wiens, 1998). Being unusual semi-parasitic plants, they can manufacture food by photosynthesis, but depend on the hosts for water and mineral salt. African mistletoes green branches grow largely on deciduous trees; leaves are opposite, simple, oblong and leathery (Walter *et al*., 1977).

The medicinal values of plants have assumed a more important dimension in the past decades owing largely to the discovery that extracts from plants contain not only minerals and primary metabolites but also a diverse array of secondary metabolites with antioxidant potential (Akinmoladun *et al*., 2007). Mistletoes have been used in the treatment and

management of many diseases for many years, both in traditional and complementary medicine in some part of Africa (Ademiluyi and Oboh, 2008).

Many medicinal uses have been ascribed to the leaves of mistletoes: Bown (1995) reports that *Viscum album* of Loranthaceae family has ability to lower blood pressure, slow heart beat and stimulate the immune system. Tea prepared from the dried leaves has anti-diabetic properties (Swanston-Flatt *et al.*, 1989; Gray and Flatt, 1997; Obatomi *et al*., 1994). Kafaru (1994) reports that consumption of aqueous extract (infusion) prepared from the fresh leaves of mistletoe could serve as a remedy for hypertension and metabolic disorders. Treben (1986) believed that extrac from mistletoe leaves is a corrective medication for barrenness in women. A number of biological effects, such as anticancer, antimycobacterial, antiviral and immunomodulatory activities have been reported for mistletoes (Onay-Ucar *et al*., 2006).

From the afore-mentioned sources it could be observed that lots of work had been carried out on the medicinal value of mistletoe, but there is dearth of knowledge on the nutritive potentials of the plant. Having seen ruminants relishing the twigs and leaves of the plant without any reported side effects, it is possible however, that the leaves of this plant may be rich nutritionally. Therefore, it was the objective of this study to evaluate the proximate, mineral and phytochemical compositions of the leaf of the African mistletoe so as to know if it may be possible to include it in livestock feeding program.

MATERIALS AND METHODS

Sampling and Sample Treatment

Mistletoe leaves were harvested from Neem trees (*Azadirachta indica*), within Federal Government College, Sokoto. The leaves were painstakingly separated from the flowers, twigs and branches, air-dried, milled to pass through 1mm sieve and stored in sealed container prior to analyses.

Proximate Analysis

Proximate analysis: moisture, ash, crude protein (%Nitrogen x 6.25), crude fibre and lipid of the processed leaves of mistletoe were determined by the methods of A.O.A.C. (2000), while nitrogen free extract (NFE) was calculated by subtracting the sum of all other proximate contents from 100%. The metabolisable energy (ME) was calculated using Pauzenga (1985) formula as follows:

$$ME\ (kcal/\ kgDM) = (37 \times \%CP) + (81.8 \times \%fat) + (35.5 \times \%\ NFE)$$

Mineral Analysis

Potassium and Sodium were determined using flame photometer (Corning 400 Model), while other minerals except phosphorus were determined after a wet-ashing with a mixture of 60% Perchloric Acid and 70% Trioxonitrate (V) acid in ratio 1:4, and 20ml Sulphuric acid. Phosphorus was determined by Vanadomolybdate method, while Calcium, Magnesium, Manganese, Iron and Zinc were determined using Atomic Absorption Spectrophotometer. Phytochemical analysis was carried out on the extract and the following constituents were tested for: alkaloids, tannins, flavonoids, saponins, anthraquinones and cardiac glycosides.

Phytochemical Analysis

About three grams of mistletoe leaves was soxhlet extracted with methanol for eight hours.

Alkaloids

In testing for alkaloids, 1ml of the extract was added to 1ml of Wagner solution and brown turbid precipitate was formed. Also 1ml Dragendorff's solution was added unto 1ml of the extract and yellow turbid precipitate was formed. The above showed the presence of alkaloids.

Tannins

In testing for tannins 2ml of Iron (III) Chloride was added to 2ml of the extract and greenish black precipitate was formed. Also 2ml of Bromine was added to 2ml of the extract and yellowish brown precipitate was formed. The two tests confirmed the presence of tannins.

Flavonoids

To test for flavonoids, 1ml of the extract was added in to 1ml of 10% lead acetate, and wooly-brownish precipitate was obtained. Also, 1 ml of extract was added into 1ml of 10% iron (III) chloride solution and dirty brownish precipitate formed. In to 1ml of dilute Sodium hydroxide was added 1ml of extract and golden yellow precipitate formed. These confirmed the presence of flavonoids.

Saponins

Emulsion test was carried out in which 2ml of the extract was added to 2ml of Acachis oil and shaken vigorously. A stable emulsion was formed. Frothing test was carried out in which 2 ml of the extract in 5 ml of water and shaken together vigorously. Foaming persisted after 15 minutes. These confirmed saponins in the leaves.

Anthraquinones

2 ml of extract was shaken with Benzene, filtered, and to the filtrate was added 2ml of 10% ammonium solution. The mixture was shaken together and reddish-brown precipitate was formed. This confirmed the presence of anthraquinones.

Cardiac Glycosides

2 ml of Chloroform was added to 2ml of the extract and 1ml of concentrated H_2SO_4 was carefully added to the mixture to form a lower layer. Yellow colouration was obtained with ring forming at the interface.

RESULTS AND DISCUSSION

Results of the proximate and mineral analysis of mistletoe are shown in Table 1. The values obtained for moisture, dry matter and organic matter of mistletoe leaves were 6.22%, 93.78% and 85.04%, respectively. The crude protein value obtained (13.99%) compared to what was obtained for *Leucaena leucocephala* by Hill (1971). It also compared favourably

well with those of oil palm leaves (Esonu *et al*., 2008) and fresh leaves of water hyacinth (Anigbogu *et al*., 2003).

Table 1: Proximate and mineral compositions of mistletoe leaves.

Proximate	Composition (%)
Moisture	6.22
Dry Matter	93.78
Organic Matter	85.04
Crude Protein	13.99
Crude Fibre	10.94
Ether Extract	11.49
Ash	14.96
Nitrogen Free Extract (NFE)	48.62
Metabolisable Energy (kcal/kgDM)	3183.52
Mineral	**Composition (mg/kg)**
Calcium	35000
Magnesium	4400
Potassium	42300
Sodium	44350
Phosphorus	1500
Manganese	30
Iron	450
Zinc	40

Values of crude fibre, ether extract and ash are comparable to the reports for cassava leaf meal (Adeyemo *et al*., 2008), and water hyacinth leaves (Anigbogu *et al*., 2003). The results showed the metabolisable energy of the leaves to be 3183.52kcal/kg. Values for minerals compared with those of water hyacinth leaves. If mistletoe leaves can compare favourably well with the above mentioned leaves (processed) which were fed to livestock in different studies without any adverse effects then, the test material may be of immense benefit in livestock nutrition.

Tests on the extract were positive for alkaloids, tannins, flavonoids, saponins, anthraquinones and cardiac glycosides (Table 2). Alkaloids are secondary metabolites of amino acids and constitute the largest and most diverse group of natural products of vegetable origin (Tedder *et al*., 1979). This however suggested the presence of alkaloids in mistletoe leaves. Tannins are polyphenols which are widely used in disinfection (Tedder *et al*., 1979), Therefore, the presence of tannins in the leaves of mistletoe can be used as disinfectant. Also, the availability of cardiac glycosides in mistletoe leaves may be of immense use in preventing cardiac failure or any other heart disease in livestock fed with the leaves.

Table 2: Summary of the results of phytochemical screenings.

Anti-nutritive factor:	Tannins	Anthraquinones	Flavonoids	Saponins	Cardiac glycosides
Inference:	++	++	++	++	++

++ = Present

CONCLUSION

The proximate and mineral compositions of the mistletoe leaves compared favourably with the leaves of *Leucaena leucocephala*, water hyacinth and oil palm, which had been used in feeding livestock. Therefore, if the anti-nutritive factors could be reduced or eliminated, mistletoe leaves may be of nutritive as energy or protein sources in livestock nutrition. Therefore, instead of allowing mistletoe to be flourishing at the expense of its hosts, it is recommended that the leaves be harnessed as supplements in livestock feed.

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