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Original Research Article

Characterization of Mistletoe Leaves Growing on Fig Plant Found in NISLT, Samonda, Ibadan Premises

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Abstract: This study investigates the chemical composition of mistletoe leaves growing on fig tree. The mistletoe leaves and the fig leaves used for this research were harvested from Fig plant. Proximate analyses, phytochemical screening, Elemental and antioxidant analysis were done on both leaves. This study has provided a scientific justification that both the Fig leaves and Mistletoe leaves contained relevant phyto constituents such as alkaloids, saponins, flavonoid, and steroids; whereas antraquinones, tannins, phenols, resins and terpenoids were completely absent. Nutritionally relevant inorganic minerals like, Calcium, magnesium and potassium were the most abundant element in both plants. Proximate constituents like carbohydrates, lipids and proteins were present in varied amounts in both leaves. Result of inhibition of free radicals in fig leave extract increases with increase in concentration of the extract. The inhibition is closely comparable with that of the standard (Vitamin C) at the same concentration. The inhibition by the extracts of mistletoe grown on fig tree is low when compared with that of Fig and that of standard. This suggests that some of the chemical characteristics of mistletoe are conferred to them by their host trees.

Keywords: Phytoconstituents, Trees, Mistletoe, Phyto-chemicals, Vitamins, Minerals.

INTRODUCTION

The fig plant is a bush or small tree, from 1 meter (3 feet) to 10 to 12 meters (33 to 39 feet) high, with broad, rough, deciduous leaves that are deeply lobed or sometimes nearly entire. The leaves and stems exude white latex when broken. The common wild fig, *Ficus thonningii*, is one of the many fruit-bearing trees that have traditionally been used for treating diseases in Africa and beyond. Despite its widespread use in ethno medicinal systems, *F. thonningii* is a well-known ornamental tree that is also used in improving agro-forestic systems. Its leaves are used as fodder and its bark is used for making bark cloth. Like many woody trees, *F. thonningii* is commonly used in homesteads for fencing, firewood and construction (Orwa *et al*., 2009) *F. thonningii* is a flowering tree that is pollinated by wasps which enjoy a symbiotic relationship and live in the syconium of its fruit and it can easily be propagated using seeds and cuttings (Agroforestry tree Database, 2011).

Kernzehola *et al*., (1997) stated that african mistletoes (*Loranthusmicranthus*) have tough, oblong, green leaves, attractive flowers and waxy, translucent white berries with a viscous mesocarp. Mistletoes are considered as parasitic plants growing wild on the branches or trunks of economic trees in the tropics resulting in drastic reduction in their aesthetic, economic and medicinal values. Mistletoe takes water and minerals from its host, but not carbohydrates which it can produce by photosynthesis (Hostanska *et al*., 1995; Solar *et al*., 1998). Several studies have revealed that mistletoe has considerably antioxidant potential, justifying its therapeutic use in herbal medicine (Deeni and Sadiq, 2002). Aqueous extract of mistletoe has been reported to normalize blood sugar and cholesterol levels in rat (Iheanacho *et al*., 2008). It contains lectins which are protein that could bind sugars and possibly reduce the blood sugar level (Hostanska *et al*., 1995). It was reported by Hostanska *et al*., (1995) that few rural subsistent farmers use the leaves to feed their goats that have newly given birth to kids. The amount of chemical compounds may vary in mistletoe leaves depending on

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the source of the leaves. The objective of this study is to compare the chemical composition of mistletoe leaves and its host plant (fig plant) found in NISLT premises.

MATERIALS AND METHOD

Plant Sample Collection and analysis

The mistletoe plant and its host tree (Fig leaves) were harvested in early September from NISLT premises. The plant leaves, and its accompanying host were dried at room temperature and milled under aseptic condition into powder form and preserved in a well labeled air tight container for proximate composition, phytochemicals, oxidative activity and elemental analysis.

Proximate analyses were carried out according to the procedure of Association of Official Analytical Chemist (A.O.A.C., 1990). Quantitative and qualitative Phytochemical screening was done by the method of Odebiyi and Sofowora, (1978), and the minerals was determined using the Atomic Absorption Spectrophotometer (AAS) after acid digestion of the samples; however magnesium and calcium was determined by complexometric titration using the method of Black and Goring, (1953). The free radical scavenging activity was measured in terms of hydrogen donating or radical scavenging ability using the stable radical DPPH (Sharna *et al*., 2016).

RESULT AND DISCUSSION

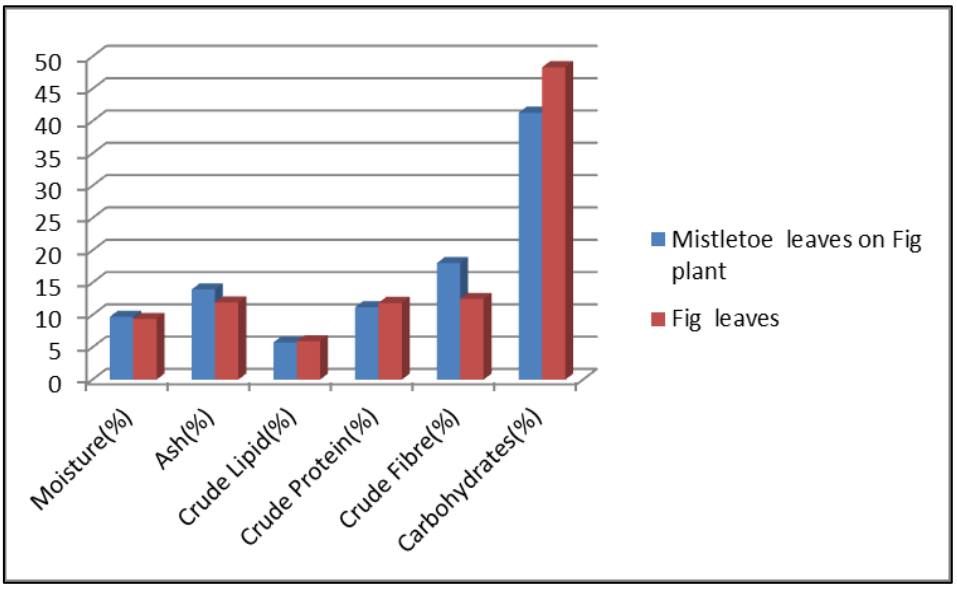

Fig 1: Proximate analysis of the mistletoe leaves and the fig plant

Table 1: Phytochemicals Screening (Quantification)

S/NO	Parameters	Mistletoe leaves on Fig plant	Fig leaves
1	Alkaloids (mg/g)	0.486	1.856
2	Saponins(mg/g)	0.686	2.586
3	Flavonoids(mg/g)	0.198	0.244
4	Tannins(mg/g)	Nil	Nil
5	Phenols(mg/g)	Nil	Nil

Table 2: Phytochemicals Screening (Qualitative)

S/NO	Parameters	Mistletoe leaves on Fig plant	Fig leaves
1	Alkaloids	+	+
2	Saponins	+	+
3	Tanins	-	-
4	Phenols	-	-
5	Flavonoids	+	+
6	Cardiacglycoside	-	+
7	Antraquinones	-	-
8	Cardenolides	+	+
9	Resins	-	-
10	Terpenoids	-	-
11	Steroids	+	+

Table 3: Elemental Analysis

S/N	Parameters	Mistletoe on fig leave Concentration(Mg/Kg)	Fig leaves Concentration(Mg/Kg)
1	Manganese(Mn)	34.15	139.125
2	Potassium(K)	1215.48	1311.585
3	Sodium(Na)	ND	17.54
4	Iron(Fe)	88.23	303.3
5	Zinc (Zn)	20.395	85.875
6	Copper(Cu)	ND	ND
7	Magnesium(Mg)	837.605	4474.53
8	Calcium(Ca)	1951.58	6057.18
9	Chromium(Cr)	ND	ND

Table 4: Free Radical Scavenging Activity

S/NO	Concentration (mg/ml)	Mistletoe leaves on Fig plant	Fig leaves	Vitamin C %inhibition
1	0.5	42.32	84.44	93.29
2	0.25	32.98	54.47	93.07
3	0.125	15.86	31.23	92.51
4	0.0625	13.91	13.81	85.99
5	0.03125	8.75	7.98	56.32

DISCUSSION

The result of proximate analysis (Fig 1) showed that the mistletoe leaves and the fig leaves share almost the same moisture content (9.74%: 9.40%), crude lipid (5.75%:5.95%) and crude protein (11.22%:11.88%) respectively. The mistletoe leaves have a higher ash content (13.95%) and crude fiber content (18.04%) in relation to that of the fig leave .Carbohydrate was detected in highest amount compared to other proximate. The high carbohydrate and caloric value of the fig and mistletoe makes them good sources of energy for humans and livestock compared to some vegetables such as pumpkin leaves, mushrooms and tomatoes leaves (FAO, 2006). The ash content of both leaves (13.96% and 11.95%), is moderately low, compared to some of the leafy vegetables commonly consumed in Nigeria such as *Talinum triangulare* (20.05%), indicating that they have good mineral retaining capacity.

The crude fiber contents (18.04%, 12.48%) of both leaves are relatively high when compared to *Talinum triangulare* (6.20%), *Piper guineeses* (6.40%), *Corchorus olitorius* (7.0%), bitter leaves (*Vernonia amygdalina*), 6.5% (Akindahunsi and Salawu, 2005). The leaves could be used in the management of some metabolic disorders such as diabetes, obesity and gastrointestinal disorders due to their fiber contents (Saldanha, 1995).

The moisture content of Mistletoe leaves and Fig leaves is low when compared to those of some medicinal plants. This indicates that the two leaves have a good shelf life and cannot be easily degraded by microorganism (Adejumo and Awosanya, 2005).

It was observed from the results of quantitative and qualitative phytochemical analysis (Table 1 and 2) that alkaloids, saponin, flavonoid, and steroids were present whereas antraquinones, tannins, phenols, resins and terpenoids were completely absent in both leaves. These agree partially with the works of Osadebe and Uzochukwu (2006) who reported that the dried leaves of Mistletoe leaves contained alkaloids, saponin, flavonoids and tannins

The level of flavonoid present in the mistletoe of fig is 0.198 mg/kg while that of fig 0.244mg/kg. The presence of flavonoids in the two leaves that have antibacterial, anti-inflammatory, antiallergic, antimutagenic, antiviral, antineoplastic, antithrombotic and vasodilatory activity (Ekam and Ebong, 2007). The presence of flavonoids gives the plant their ability to scavenge hydroxyl radicals, superoxide anions and lipid peroxy radicals may be their most important function (Allan and Miller, 1996).

Saponin content in the fig leaves is high with 2.586mg/kg while the saponin content of the mistletoe is low with 0.686 mg/kg. Saponin is one of the secondary metabolites that is capable of neutralizing some enzymes in the intestine that can become harmful, building the immune system and promoting wound healing. It also prevent excessive absorption of cholesterol and reduce the risk of cardiovascular diseases (Akinpelu and Onakoya, 2006; Olaleye, 2007); strengthen the contractions of cardiac muscles (Aja *et al*., 2010; Schneider and Woliling, 2004); exhibit cytotoxic effects and growth inhibition against a variety of cells making them have anti-inflammatory and anticancer properties (Akinmoladun *et al*., 2010).

Cardiacglycoside was only present in the fig leaves and absent in the mistletoe leaves. Cardiac glycosides are important in medicine because of their action on the heart and are used in cardiac insufficiency. Thus cardiac glycosides are drugs that can be used in the treatment of congestive heart failure and cardiac arrhythmia. They work by inhibiting the Na^+ /k^+ pump resulting in an increase in the levels of sodium ions in the myocytes, which then leads to a rise in the level of calcium ions. This inhibition increases the amount of Ca^{2+} ions available for contraction of the heart muscle, improves cardiac output and reduces distention of the heart (Zhang *et al*., 2012).

The elemental content of plants play crucial roles in enhancing the activities of plants against different diseases due to a definite correlation between mineral content in the human body with some disease conditions (Ceyik *et al*., 2003). These inorganic elements play an important role in physiological processes involved in human health.

Calcium, magnesium and potassium were the most abundant element in the fig leaves and mistletoeleaves. Calcium as an essential mineral was high in the leaves of Fig. This suggests that this leaf can produce a significant proportion of calcium and other essential minerals if consumed appropriately. Calcium is important to humans because of its contribution in blood clotting, muscle contraction, bone and teeth formation/repairs and in some enzymatic metabolic processes (National Research Council, (NRC), 1989). These elements act as inorganic cofactors in metabolic processes hence their absence can lead to impaired metabolism (Iheanacho and Udebuani, 2009) Since calcium helps in bone formation and blood coagulation, calcium and phosphorus deficiency may contribute to bone loss and other symptoms associated with rickets such as bowl and knock knees, curvature of the spine, pelvic and thoracic deformities. Magnesium is also known to prevent cardiomyopathy, muscle degeneration, growth retardation, alopecia, dermatitis, immunologic dysfunction, gonadal dystrophy, impaired spermatogenesis, congenital malformations and bleeding disorders (Akinmoladun *et al*., 2010).

Zinc, iron and manganese were present in a relatively moderate concentration in both the fig leaves and mistletoe. Iron as an essential trace element/metal plays numerous biochemical roles in the body including oxygen binding in haemoglobin and acting as important catalytic center in many enzymes (Udoessien and Ifon, 1984). Fig leaves can therefore be recommended for inclusion in the diets of patients with iron deficiency anaemia. The mineral composition values obtained in this study probably reflects the physiological state of the leaves when they were harvested (Udoessien and Ifon, 1984).

Result of inhibition of free radicals in fig leave extract increases with increase in concentration of the extract. The inhibition is closely comparable with that of the standard (Vitamin C) at the same concentration. This supports the claim by Okwu and Josiah 2004 that fig leave is a good source of antioxidants that can prevent the body from oxidative stress by scavenging free radicals of reactive oxygen species (ROS) in the human system. The inhibition by the extracts of mistletoe grown on fig tree is low when compared with that of Fig and that of standard. This suggests that some of the chemical characteristics of mistletoe are conferred to them by their host trees.

CONCLUSION

This study has provided a scientific justification that the Fig leaves contained phyto-constituents such as flavonoids, carotenoids, steroids and saponin, as well as nutritionally relevant minerals compare to the Mistletoe leaves. The fig leaves is rich in antioxidants thus can be very effective in management of oxidative stress and inflammatory reactions. It can also be used in the management of heart disorders due to the presence of rare medicinally important secondary metabolite-cardiaglycoside in the leaves. It will also be necessary to standardize, formulate and commercialize these phyto medicines to health care providers and consumers in order to maximize the economical, medicinal and industrial values of these plants.

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