GEROLD RAHMANN, VICTOR OLOWE, TIMOTHY OLABIYI, KHALID AZIM, OLUGBENGA ADEOLUWA (Eds.) (2018) Scientific Track Proceedings of the 4TH African Organic Conference. "*Ecological and Organic Agriculture Strategies for Viable Continental and National Development in the Context of the African Union's Agenda 2063".* November 5-8, 2018. Saly Portudal, Senegal

Comparative Assessment of Phytochemical Properties of Ethanolic Extracts of Barks of Two Herbal Trees

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Keywords:
Phytochemicals, herbs, extracts and antibiotics

Abstract

This study serves to explore the chemical constituents of Azadirachtaindica and Mangiferaindica as a possible alternative sources of conventional antibiotics. Ethanolic extracts of Azadirachtaindica and Mangiferaindica stem bark were analysed for their chemical constituents. Phytochemical values for (Tannins, Oxalate, Phytate, Terpenoids, Trypsin inhibitor, Total Phenol, Total Carotenoids, Total Carotene Carotenes, Xanthophyll, Flavonoids, Alkaloids, Saponins and Antioxidant (DPPH Scanvenger) were revealed. The result were subjected to Studentized T-test as contained in SAS (1999). The result showed that all secondary metabolites analyzed were present in the bark of the two plant species studied but at different concentrations. The concentration of Tannin (1510.00 mg/kg), Oxalate (139.20 mg/kg), Phytate (15.55 mg/kg), Trypsin inhibitor (730.00 mg/kg), Flavonoids (78.50) and Saponins (17.71%) contents of Mango stem bark were found to be more than in Azadirachtaindica. However, Azadirachtaindica contained the highest Terpenoids (43.85mg/kg), Total Phenol (34.00mg/kg), Total Carotenoids (89.59 g/kg), Total Carotene Carotenes (69.88 g/kg), Xanthophyll (19.71 g/kg), Alkaloids (19.50%) and Antioxidant (68.65%) than the of M.I stembark respectively. It can therefore be concluded that stem bark extracts, besides serving as good source of pharmacologically active phytochemicals may also be useful as supplements in human and animal nutrition particularly that the components are biodegradable compared to synthetic antibiotics.

Introduction

Medicinal plants are part and parcel of human society to combat diseases, from the dawn of civilization. Any part of the plant may contain active components (Parekh *et al*.,2006).

Plant derived substances have recently become of great interest owing to their versatile applications. Medical plant are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, pharmaceuticals, food supplements, flock medicines, pharmaceutical intermediates and chemical entities (Ncube *et al*., 2008). *Azadirachtaindica* A. Juss (Neem) is well known in India and its neighbouring countries for more than 2000 years as one of the most versatile medicinal plants having a wide spectrum of biological activity.

Shankarnarayana *et al*.(1979) stated that *Mangiferaindica* is another beneficial herb containing different chemicals, especially the polyphenolics, flavonoids, triterpenoids. Mangiferin which confers its bioactivities.

This study attempted to assess the phytochemical properties of *Azadirachtaindica* and *Mangiferaindica (MI)* stem bark for possible use in the treatment of diseases in poultry.

Materials and Methods

Site of Experiment

The research was carried out at three different locations; proximate analysis was carried out at Chemistry laboratory, College of Biochemistry, Federal University of Agriculture, Abeokuta, phytochemical screening was carried out at Gaagee laboratory in Ibadan, Oyo state.

Sources and Collection of Plant Materials

The plants materials; *Mangiferaindica (MI)* and *Azadirachtaindica* bark were sourced from school premises of Federal University of Agriculture Abeokuta (FUNAAB). Fresh bark pieces were collected from both *Mangiferaindica* tree and *Azadirachtaindica* tree at school farm of Federal University of Agriculture Abeokuta (FUNAAB). The samples were air dried under the shade at room temperature for two weeks. The dried samples were chopped into smaller pieces in preparation for extraction.

Extraction of Plant Materials

The extraction was done mechanically by crushing and soaking the crushed stem bark in 70% ethanol for 3 days in a sealed container at a room temperature. 1kg of the stem bark were used against 2kg of 70% ethanol. The mixture were turned twice daily to ensure proper mixing, on the fourth day the extract were separated from the shaft with a strainer (cheesecloth). The solvent was removed at a temperature of 40°C in a water bath and the extracts were stored in a freezer at -20°C.

Phytochemical Screening of *Mangiferaindica (MI) and Azadirachtaindica (AI)* extracts

Phytochemical test of the ethanolic extract was carried out using standard procedures as described by (Harborne, 1973) and enunciated by Sofowora (1993) to determine Saponin, terpenoid, alkaloid, phenol, carotenoid, phytate and oxalate content.

Statistical Analysis

Data obtained from the analysis were subjected to studentized T-test using SAS (2005).

Results

The phytochemical screening of the stem bark extracts of *Azadirachtaindica* and *Mangiferaindica*

Table 1 shows the result obtained fromphyto chemical screening of ethanol bark extract of *Azadirachtaindica* (A.I) and *Mangiferaindica* (M.I). All the values of phytochemicals were significantly ($p<0.05$) different between the two extracts. *Mangiferaindica* (M.I) bark extract had significantly ($p<0.05$) higher tannin (1510.00mg/kg), oxalate (139.20mg/kg), phytate (15.55mg/kg), trypsin inhibitor (730mg/kg), flavonoids (78.50g/kg) and saponins (17.71%) than extract of *Azadirachtaindica* (A.I). However, terpenoids (43.85mg/kg), total phenol (34.00mg/kg), total carotenoids (89.59g/kg), Total Carotene Carotenes (69.88g/kg), xanthophyl (19.71g/kg), alkaloids (19.50%) and antioxidant (DPPH scanvenger) (68.65%) were significantly ($p<0.05$) higher in extract of *Azadirachtaindica* (A.I) than *Mangiferaindica* (M.I).

Table 1. **Phytochemical screening of *Azadirachtaindica* (*AI*) and *Mangiferaindica* (*M.I*) ethanolic stem bark extract**

Parameter	Herbs Bark Extracts		SEM
	Azadirachtaindica	*Mangiferaindica*	
Tannin (mg/kg)	1495.50□	1510.00[a]	0.29
Oxalate (mg/kg)	128.68□	139.20[a]	0.14
Phytate (mg/kg)	13.90□	15.55[a]	0.28
Terpenoids(mg/kg)	43.85[a]	13.54□	1.01
Trypsin inhibitor (mg/kg)	494.71□	730.00[a]	0.21
Total phenol (mg/kg)	34.00[a]	30.60□	0.29
Total Carotenoids (g/kg)	89.59[a]	54.17□	0.14
Total Carotene Carotenes (g/kg)	69.88[a]	42.26□	2.10
Xanthophyll (g/kg)	19.71[a]	11.92□	0.28
Flavonoids (g/kg)	13.68□	78.50[a]	1.29
Alkaloids (%)	19.50[a]	5.61□	1.43
Saponins (%)	8.02□	17.71[a]	1.03
Antioxidant (DPPH Scanvenger) (%)	68.65[a]	58.48□	4.21

[ab] Means with different superscript differs significantly ($p<0.05$)

Discussion

The phytochemical screening of the stem bark extracts of *Azadirachtaindica* and *Mangiferaindica* revealed the presence of tannin, oxalate, phytate, terpenoids, trypsin-inhibitor, total phenol, total carotenoids, total carotene carotenes, xanthophyll, flavonoids, alkaloids, saponin and antioxidant. These phytochemicals exhibit various pharmacological and biochemical actions when ingested by animals. Plants used in the treatment of diseases are said to contain bioactive principles with biological activity some of which are responsible for the characteristic odour, pungencies and colour of plant, while others give the particular plant its culinary, medicinal or poisonous virtue (Evans, 2002).

Saponins are known bioactive substances that can reduce the uptake of cholesterol and glucose at the gut through intra-lumenal physiochemical interaction (Price *et al*., 1987). Saponins as a class of natural products are also involved in complexation with cholesterol to form pores in cell membrane bilayers (Francis *et al*., 2002) as such may be used as anticholesterol agents or cholesterol lowering agent. Alkaloids are beneficial chemicals to plants serving as repellant to predators and parasites. This probably endows these group of agents its antimicrobial activity. However, when ingested by animals, they affect glucagon, thyroid stimulating hormones and inhibit certain enzymatic activities (Okaka *et al*., 1992). Flavonoids were also determined in the two extracts and they in general serve as flavouring ingredients in plants. Besides their role as flavouring agents they are also expressed in plants in response to microbial infection suggesting their antimicrobial activity (Kujumgiere *et al.,* 1999).

Flavoniods have also been implicated as antioxidants both in physiological and disease states. For instance tea flavonoids have been reported to reduce the oxidation of low-density lipoprotein, lower the blood level of cholesterol and triglycerides (Erdman, 2007). Tannins in this study were indicated to be present but in low concentration in both plant parts. This bioactive compound is known to have potential anti-viral activity (Cheng *et al*., 2003) as well as potential prophylactic and therapeutic effect against

cancer cells, but via different mechanisms (Narayanan *et al*., 1999).

Phytic acid and Oxalate are present in low concentration in all the samples studied and this also makes them safe for consumption. Oxalate should be consumed in small quantity because oxalic acid binds with other mineral such as calcium to form oxalate salt which has been postulated to be the cause of kidney stone according to (Bridget, 2010). However, in comparison to report by Harry-Asobara*et al*.(2014) concentrations revealed as regards the presence of Alkaloid (1.22%), Flavonoid (0.36 0%), Saponin (0.32 %), Phenols (0.18 %), Phytate (0.15 %) and Tannin (0.26%) in dry ash extraction method of *Azadiracthaindica* stem bark contradicts the percentage concentration of recent studied. Also the results reported by Adetuyi*et al.*(2013) on *Mangiferaindica* stem bark was contradictory with the recent results, his studies revealed the presence of active secondary metabolites including tannins, saponins, flavonoids and alkaloids. However, carotenoids, xanthophyll, terpenoids, oxalate and phytate were reported to be absent. Also he reported percentage composition of tannins, Saponins, flavonoids and nonflavonoids to be (0.35mg/g, 9.78mg/g, 12.9mg/g and 8.60mg/g) which were low in concentration compared to Tannins, Saponins, Flavonoids and Alkaloids (1495.50mg/kg, 8.02%, 13.68g/kg and 19.50%, respectively) of recent study.

The broad distribution of phytochemicals in the extracts studied support, as well as provide a basic rationale for its use as an antimicrobial, antiviral, anticholesteremic, antioxidants and some other health related uses in livestocks especially in poultry.

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