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PHYTOCHEMICAL SCREENING AND PROXIMATE COMPOSITION OF SOME MEDICINAL PLANTS AS POTENTIAL FEED INGREDIENTS AND PROTECTIVE MECHANISMS FOR AQUATIC ANIMALS

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ABSTRACT

Medicinal plant with several parts such as the leaves, bark, roots, fruits and seeds are used as natural remedies for a variety of illnesses, as food additives, components of functional foods, and preventing animal diseases. The phytochemical screening and proximate composition of some medicinal plants such as tiger nut (Cyperus esculentus), cinnamon bark (Cinnamomum zeylanicum), nutmeg (Myristica fragrans), thyme (Thymus vulgaris), thorn apple (Datura stramonium) seed, thorn apple (Datura stramonium) leaves, cattle stick (Carpolobia lutea) root and cattle stick (Carpolobia lutea) leaves were determined using standard methods. The results of phytochemical screening of these plants showed the presence of saponins, alkaloids, tannins, phenol, glycosides, flavonoids, steroids and protein. Phenol was absent in thyme, thorn apple seed, thorn apple leaves and cattle stick leaves. Glycosides were absent in thyme and nutmeg while tannins were absent in cinnamon bark. The results of the present study show that the crude protein and ash were highly distributed in thorn apple seed (15.45±0.02; 4.39±0.02) and nutmeg (11.95±0.01; 4.52±0.02) than cinnamon bark which recorded the least values of crude protein (3.45±0.03) and ash (2.35±0.01). The results indicate that these plants are potentials source of fish feed ingredients and could be used to fulfil the growing demand for plant-based food with immunomodulatory and antioxidant properties.

Keywords: Medicinal plants, Phytochemical, Proximate composition, Aquatic animals, Feed ingredients

INTRODUCTION

Plants as a source of medicinal compounds have continued to play a dominant role in the maintenance of human health since ancient times. Over 50% of all modern clinical drugs are of natural product origin (Kirbag *et al.,* 2009). They are known to have versatile immunomodulatory activity by stimulating both non-specific and specific immunity (Pandey and Chowdhry, 2006). Phytochemical studies have attracted the attention of plant scientists due to the development of new and sophisticated techniques. These techniques played a significant role in the search for additional resources of raw material for the pharmaceutical industry (Shakeri *et al*., 2012). The variation in phytochemical compounds in different species of plants gives us the ability to use this material in different application, like industrial, economic and medical application (Al-Saadi *et al*., 2012). The use of plant extracts and phytochemical, both with known antimicrobial properties can be of great significance in treatments. Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant (Nascimento *et al*., 2000). This study attempt to investigate the phytochemical and proximate composition of some natural plant products as potential feed ingredients in aquaculture to enhance animals productivity.

MATERIALS AND METHODS

Plant collection, Identification and Treatment: Six plants such as*C. esculentus*, *C. zeylanicum*, *M. fragrans*, *T. vulgaris*, *D. stramonium* seed and leaves and *C. lutea* root and leaves were used for the study. *Cinnamomum zeylanicum*, *M. fragrans*, and *T. vulgaris* were purchased from Darasimi ventures, Ondo city, Nigeria while *D. stramonium* seed and leaves, and *Carpolobia lutea* root and leaves were obtained from a farm in Ilutitun – Osoro,

Ondo state, Nigeria and were identified at the Department of Biological Sciences (Botany Programme), Olusegun Agagu University of Science and Technology, Okitipupa. The fresh plants (thorn apple seed, thorn apple leaves and cattle stick leaves) were washed with sterile distilled water, air-dried for 4 weeks, ground with hammer mill and store at 25°C until required.

Proximate Composition:Ten grams (10g) of each plant was taken in triplicates and analyzed for their proximate composition using the methods of Association of Official Analytical Chemists (AOAC, 2005) to determine the moisture, crude protein, crude fat, crude fibre, ash, and carbohydrate,

***Determination of Phytochemical Screening*:** Phytochemical constituents such as saponins, phenols, tannins, flavonoids, glucosinolates, triterpenes and steroids and proteins were done as described by Olusola *et al*., (2017)

***Statistical Analysis*:** Data that resulted from the experiments were subjected to a one-way analysis of variance (ANOVA) using SPSS (Statistical Package for Social Science 2006 version 20.0). Duncan multiple range tests were used to compare differences among individual means at P = 0.05

RESULTS

Determination of Phytochemical Screening

The phytochemical screening of tiger nut, cinnamon bark, nutmeg, thyme, thorn apple seed, thorn apple leaves,cattle stick leaves and cattle stick root for metabolites revealed the presence of saponins, flavonoids, alkaloid, phenol, glycosides, tannins, steroid and protein were detected in these plants. However, Phenol was absent in thyme, thorn apple seed and thorn apple leaves. Glycosides were absent in thyme and nutmeg while tannins were absent in cinnamon bark. Protein was detected in cinnamon bark, thorn apple seed and leaves while protein was absent in thyme, cattle stick leaves, and cattle stick root. The value of these metabolites was in low (+), moderate (++) and large quantity (+++) as shown in Table 1.

Table 1: Phytochemical screening of some medicinal plants

	Thyme	**Cinnamon bark**	**Thorn apple leaves**	**Thorn apple seed**	**Cattle stick leaves**	**Cattle stick root**	**Tiger nut**	**Nutmeg**
Saponins	++	+	+	++	++	++	+	++
Flavonoids	+++	+++	+	++	++	++	+	++
Alkaloids	+++	+++	++	++	+	++	+	+
Phenol	-	+	-	-	+	+	++	++
Glycosides	-	+	+	++	+	+	+	-
Steroid	+++	++	+	++	++	+	+	+
Tannins	++	-	+	+	+	++	+	+
Protein	-	+	+	+	-	-	ND	ND

Keys: low (+), moderate (++) and large quantity (+++), ND = Not determined

Table 2: Proximate composition of some medicinal plants (per cent of dry matter)

	MOISTURE	CRUDE PROTEIN	CRUDE FAT	CRUDE FIBRE	ASH	NITROGEN FREE EXTRACT
Tiger Nut	7.18±0.01^{b}	7.23±0.04^{c}	21.99±0.02^{h}	15.35±0.01^{d}	3.91±0.03^{e}	44.34±0.05^{b}
Cinnamon Bark	5.50±0.02^{a}	3.45±0.03^{a}	4.05±0.01^{c}	32.78±0.05^{g}	2.35±0.00^{a}	51.87±0.08^{d}
Nutmeg	14.10±0.0^{g}	11.95±0.01^{g}	16.05±0.02^{e}	19.01±0.00^{f}	4.52±0.01^{h}	34.37±0.04^{a}
Thyme	10.85±0.00^{f}	9.75±0.01^{e}	6.25±0.02^{d}	18.21±0.05^{e}	4.02±0.01^{f}	50.92±0.07^{c}
TAS	5.41±0.01^{a}	15.45±0.04^{h}	16.19±0.06^{f}	14.15±0.01^{b}	4.39±0.00^{g}	44.41±0.06^{b}
TAL	7.61±0.03^{c}	9.95±0.01^{f}	16.79±0.06^{g}	14.25±0.01^{c}	2.42±0.02^{b}	51.02±0.06^{c}
CSL	8.53±0.02^{d}	8.35±0.03^{d}	1.82±0.01^{b}	1.05±0.00^{a}	3.55±0.02^{d}	76.70±0.01^{e}
CSR	9.45±0.01^{e}	6.65±0.02^{b}	1.75±0.02^{a}	1.02±0.01^{a}	3.39±0.03^{c}	77.74±0.01^{f}

Keys: TAS =Thorn Apple Seed, TAL= Thorn Apple Leaves, CSL= Cattle Stick Leaves, CSR= Cattle Stick Root. Mean of duplicate data, mean value in each column with similar superscripts are not significantly different (P > 0.05)

Proximate Composition of Some Medicinal Plants: The results of proximate composition of theseplants showed that percentage moisture, crude protein, crude at, crude fibre, ash, and carbohydrate ranged from 5.50-14.10 %, 3.45-15.45 %, 1.75-21.99 %, 1.02-32.78 %, 2.35- 4.52 % and 34.37-77.74 % respectively (Table 2).

DISCUSSION

The phytochemical analysis is very useful in the evaluation of some active biological component of some vegetables and plants (Aja *et al*., 2010). The qualitative analysis of phytochemical screening of these plantsshowed the presence of saponins, alkaloids, tannins, phenol, glycosides, flavonoids, steroids and protein. The result of this study was in agreement with the work of Jackson *et al.,*(2011), Aremu *et al*., (2015), Ibiam *et al*., (2017) and Olayinka *et al*., (2019), who reported the presence of these metabolites such as saponins, alkaloids, tannins, phenol, glycosides, flavonoids, steroids and protein.. The presence of flavonoids in these plants was in line with the fact that these plants can act as primary antioxidants and its antibacterial properties, and as a growth enhancer on juvenile *Clarias gariepinus* (Olusola and Nwokike, 2018), and *Catla catla* (Kaleeswaran *et al.,* 2011). Presence of phenol in cinnamon was in line with Citarasu, (2010); Chakraborty and Hancz, (2014) who reported that medicinal plants enhance various physiological statuses like anti-stress, growth, appetite, tonic, and immunity. Alkaloid has the biological ability of inhibiting micro-organism and also reduces the risk of fungal infection. Alkaloids also have neuropharmacological agents and anti oxidating characteristics (Harbone, 1999). Saponins are known to be anti-microbial, inhibit the growth of mould and prevent attack by bacteria (George *et al*., 2012). The results of the proximate composition of these plants revealed that carbohydrate recorded maximum values among these parameters while moisture, ash, crude protein, crude fat, and crude fibre showed variation among these plants. The moisture contents of these plants could be considered to be low except nutmeg and this would hinder the growth of microorganisms and extend the shelf life during the store period. These results agree with the work of Adeyeye and Ayejuyo, (1994) who reported that low moisture content would reduce microbial growth and increase the shelf life ofmedicinal plants. The protein content was found to be higher in thorn apple seed (15.45±0.04), followed by nutmeg (11.95±0.01) and the least in cinnamon barks (3.45±0.03). Also, higher ash content was recorded in nutmeg (4.52±0.01), followed by thorn apple seed (4.39±0.00) and the least in Cinnamon bark (2.35±0.00). The results of the study were in aligned with the report of Gambo and Da'u (2014), Aremu *et al*., (2015), Ibiam *et al*., (2017), Olayinka *et al*., (2019) and Abid-Shad and Bashir (2019) who recorded higher

values in crude protein and an ash content of tiger nut, thorn apple seed and leaves, castle stick root and leaves, and cinnamon bark respectively. The ash content is used as a reflection of the mineral elements present in any food materials (Iniaghe *et al*., 2009).

CONCLUSION

The present study showed that variation exists in the values of both proximate and phytochemical components of the medicinal plants analyzed. The results indicated that the plants contained high nutritive and medicinal values and this could be explored in aquaculture as feed ingredients for aquatic animals.

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