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A Comparative Analysis of Proximate, Phytochemical, and Physico-Chemical Constituents of Fresh, Air-Dried, and Sun-Dried Samples of *Momoedica Dioica* Leaf

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***Abstract**: The present study was undertaken to explore and compare the proximate phytochemicals and physicochemical constituents of fresh, air-dried, and sun-dried samples of Momordica dioica leaves. The proximate analysis revealed varying compositions of the proximate contents in the samples. The results showed that the fresh sample had the highest values of moisture (72.48%), fat (11.0%), and ash (6.00%); the air-dried sample excelled in dry matter (94.50%) and carbohydrate (65.38%), whereas the sun-dried sample superseded in crude protein (7.87%) and crude fiber (32.0%). The results of the phytochemical screening indicated the presence of saponins, glycosides, reducing sugar, and anthraquinone in all the samples. Other secondary metabolites analyzed showed alternate appearances in the samples. The physical parameters determined indicated that all the samples are alkaline, with the fresh sample having the highest pH value of 8.317, while the samples maintained their green coloration after treatment. The air-dried sample presented the highest conductivity value (6600 µs/cm), followed by water-insoluble ash, WIA (13.33%), and sulfated ash, SA (2.85%). The sun-dried sample had the highest turbidity (1550 FTU) and acid-insoluble ash (AIA) (6.76%). The results of the essential elements showed that the fresh and sun-dried samples were equivalent in Mn concentration (0.70 mg/kg). The air-dried sample contained the highest concentrations of Ca (0.34 mg/kg) and Zn (0.93 mg/kg). The sun-dried sample contained the highest concentrations of Na (0.18 mg/kg) and Ni (0.022 mg/kg). The overall results of this research revealed some medicinal properties of Momordica dioica.*

Keywords: *Phytochemical, Physico-chemical, essential element, Metabolite, Medicinal.*

Introduction

Momordica dioica Roxb belongs to the family Cucurbitaceae (Chopra *et al.,* 1996). Cucurbitaceae is a plant family commonly known as melons, gourds or cucurbits and includes crops like cucumbers, squashes (including pumpkins), luffas, and melons (including watermelons) (Sivasudha *et al.,* 2012). The family is predominantly distributed around the tropics, where those with edible fruits were amongst the earliest cultivated plants in both the old and new world. Other members from the same genus include *Momordica charantia* Linn, *Momordica balsamina* Linn, *Momordica cochinchinensis* Spreng, *Momordica tuberosa Cogn* and *Momordica umbellata* Roxb (CSIR, 1992). This work was undertaken to ascertain the presence of some proximate and active antioxidants that gave *Momordica dioica* leaf health benefit as acclaimed by many cultural groups consuming it which is also reported by some researchers (Sharmila *et al.,* 2017; Shaktisinh and Jadeja, 2016).

Materials and Methods

Sample Collection and Identification and Preparation

The fresh sample of *Momordica dioica* leaf was collected at the Botanical Garden of the Agricultural Technology Department, Ramat Polytechnic, Maiduguri, and was identified by a taxonomist in the department. The sample was divided into three (3) portions; two portions were air-dried and sun-dried under a shed and in the sun for 120 hours, respectively, and pulverized into coarse pending further preparation.

Determination of Proximate Contents

The three samples (fresh, air-dried, and sun-dried) were analyzed for proximate contents according to the AOAC (2000) method.

Extraction of Sample for Phytochemical analysis

300 g of each of the samples (fresh and air-dried) was extracted exhaustively with distilled water using reflux apparatus as described by Usman and Osuji (2007). The extracts were separated from the marc using Whatman filter paper. The resulting filtrates were kept airtight under aseptic conditions until use.

Phytochemical Screening

The aqueous extract of the plants was subjected to qualitative phytochemical screening for the identification of secondary metabolites. The methods of Trease and Evans (1997), Brain and Turner (1975), Sofowora (1993), Silva *et al. (1998),* Markham (1982), and Sofowora (1984) as harmonized were adopted.

Physico-chemical Analysis

The Metler Toledo (pH meter) model 8603 was used to determine pH, conductivity, and turbidity, while the Smart Spectrophotometer model 2000 was used for the elemental analysis.

Table1: shows the results of the proximate analysis of fresh, air-dried and sun-dried *aqueous* extract of *momordica dioica* leaf

S/No	Proximate Composition (%)	Fresh Sample	Air Dried Sample	Sun Dried Sample
1.	Dry matter	27.82	94.50	93.20
2.	Moisture content	72.18	5.50	6.80
3.	Crude protein	4.98	5.12	7.87
4.	Crude fibre	23.00	19.00	32.00
5.	Fat	11.00	1.00	1.00
6.	Ash	6.00	5.00	3.00
7.	Carbohydrate	–	65.38	50.33

Table 2: shows the results of the phytochemical analysis of fresh, air-dried and sun-dried extract of *momordica dioica* leaf

S/No	Phytochemicals	Fresh Sample	Air Dried Sample	Sun Dried Sample
1	Tannins	-	+	-
2	Alkaloids	+	+	-
3	Saponins	+	+	+
4	Glycosides	+	+	+
5	Steroids	+	-	-
6	Flavonoids	-	-	-
7	Phlobatannins	-	+	+
8	Free reducing sugar	+	+	+
9	Anthraquinones	+	+	+

Where: + = present, − = absent

Table 3: shows the results of the physical characteristics of fresh, air-dried and sun-dried *aqueous* extract of *momordica dioica* leaf

S/No	Physical Parameters	Fresh Sample	Air Dried Sample	Sun Dried Sample
1	pH (Ambient)	9.397	8.317	8.805
2	Conductivity (µs/cm)	1000	6600	5110
3	Turbidity (FTU)	840	1440	1550
4	Colour	Green (Brilliant)	Green	Green
5	Moisture (%)	77.66	12.28	10.72
6	Ash (%)	5.71	19.04	18.84
7	WIA (%)	4.08	13.33	13.04
8	AIA (%)	2.86	6.19	6.76
9	SA (%)	1.63	2.85	2.42
10	Loss of Drying (%)	77.66	–	–

WIA = Water insoluble ash, **AIA =** Acid insoluble ash, **SA=** Sulphated ash,

Table 4: shows the results of some essential elements in fresh, air-dried and sun-dried extract of *momordica dioica* leaf

S/No	Essential Elements (Mg/Kg)	Fresh Sample	Air Dried Sample	Sun Dried Sample
1	Na	0.06	0.05	0.18
2	Ca	0.20	0.34	0.09
3	Mn	0.70	0.60	0.70
4	Ni	0.010	0.015	0.022
5	Zn	1.30	0.93	1.30

Discussion

Table 1 above shows the results of the proximate analysis of *fresh, air-dried, and sun-dried aqueous* extracts of *Momordica dioica* leaf expressed in percentages. The results show that the fresh sample extract is high in moisture content (72.18%), fat (11.0%), and ash (6.00%) as compared to the low values exhibited by the dry sample extract (5.50%, 1.00%, and 5.00%) and the sun-dried sample (6.80%, 1.00%, and 3.00%), respectively. The air-dried sample extract exceeds in dry matter (94.50%) and carbohydrate (65.38%), whereas the sun-dried sample exceeds in crude protein (7.87%) and crude fiber (32.0%). Dry matter is the material remaining after the removal of water, and the moisture content reflects the amount of water present in the samples. The result shows that the dried sample has a low moisture content compared to the fresh sample. The low moisture content helps to prevent the leaves from spoilage by microorganisms (Ayeni *et al.,* 2015), which is an advantage for larger storage. This shows that the fresh sample is vulnerable to attack by microorganisms due to its high moisture content. The crude protein in the dried sample is a little greater than that of the fresh sample, which could be due to the high moisture content, which might have degenerated the protein through hydrolysis. Proteins are one of the macromolecules that are considered an alternate energy source when other energy sources are in short supply. They are the building blocks of the body, and the food protein unit is needed to make vital hormones, important brain chemicals, antibodies, digestive enzymes, and necessary elements for the manufacture of DNA (Usunobun *et al.,* 2015). The samples analyzed contained an appreciable amount of crude fiber (23.00%, 19.00%, and 32.00%) for fresh, air-dried, and sun-dried samples, respectively. Plants are natural sources of fiber. A wide range of plants are used to produce plant fiber, as many fiber plants are grown as field crops to make paper, cloth, and rope. The crude fiber quantity in these samples is desirable because adequate consumption of dietary fiber may aid digestion. Fiber softens stools and therefore prevents constipation (Ayoola and Adeyeye, 2010). Dietary fiber is also important for lowering serum cholesterol levels and reducing the risk of diseases such as coronary heart disease, hypertension, diabetes, and breast cancer (Ishida *et al.,* 2000). The fresh sample contains more fat (11%) than the air-dried and sun-dried samples (1% each); this could be attributed to the moisture content of the samples. Based on this, the fresh sample has more energy than the dried one. Dietary fat increases the palatability of food by absorbing and retaining flavors (Antia *et al.,* 2006). The ash contents of the samples are almost the same for the fresh (6%) and the air-dried (5%); the sun-dried sample contained the least value (3%). These values are relatively low compared to the values obtained by Usunobun *et al. (*2015) in some plant samples. Ash content is a reflection of the mineral contents preserved in the plant leaf (Usunobun *et al.,* 2015).

Table 2 shows the results of the phytochemical screening of the aqueous extract of the samples. The result indicated that saponins, glycosides, free reducing sugar, and anthraquinones were present in all the samples, while flavonoids were absent in all the samples. Tannins were absent in the fresh and sun-dried samples but present in the air-dried sample. Alkaloids were present in the fresh and air-dried samples but absent in the sun-dried sample. Steroids were present in the fresh sample but absent in the air-dried and sun-dried samples. Phlobatannins was absent in the fresh sample but present in the air-dried and sun-dried samples. The phytochemicals found in this plant have been reported to influence physiological activities of the body and implicated to have much medicinal importance (Tijjani *et al.,* 2012). The absence of tannins and phlobatannins in the fresh leaf extract might be attributed to the high moisture content of the fresh leaf sample, which might have reduced the concentration of those metabolites and couldn't be picked up by the test agent. Tannins, which were present in both extracts, are polyphenols that are obtained from various parts of different plants (Gajendiran and Mahadevan, 1990). In addition to their use in the leather industry, tannins have shown potential antiviral and antibacterial activities (Lim *et al.,* 2004; Akiyama *et al.,* 2001; Yang *et al.,* 2000).

Table 3 shows the results of the physical characteristics of the three samples of *Momordica dioica* leaf. The results showed that all three samples were alkaline and retained their green coloration after treatment. Other physical parameters determined differ in their values for the three samples. The results indicated that the fresh sample has the highest values of moisture (77.66%), the air-dried sample was found to be high in conductivity (6600 µs/cm), ash (19.04%), WIA (13.33%), and SA (2.85%), whereas the sun-dried sample was higher in turbidity (1550 FTU) and AIA (6.76%). The moisture content of the two dried samples is 12.28% and 10.72%, which are within the recommended range of 8–14% (Jemilat *et al.,* 2012) for vegetable drugs, and this is an indication that the plant can be stored for a long period with less probability of microbial attack (Jemilat *et al.,* 2012). The ash content of the fresh sample was low, indicating a low presence of inorganic components (Jemilat *et al.,* 2012). Since all traces of organic matter were removed (Setia and Goyal, 2010),

Table 4 shows the concentrations of some essential elements in the three samples. The elements analyzed are Na, Ca, Mn, Ni, and Zn. The results show that the fresh sample and sun-dried samples are equal in their concentrations of Mn (0.70 mg/kg) and Zn (0.70 mg/kg), while the sun-dried sample is high in Na (0.18 mg/kg) and Ni (0.022 mg/kg). Whereas the air-dried sample was found to contain a high amount of Ca (0.34 mg/kg).

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