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Assessment of Phytochemical and Antinutritional contents of some medicinal plants use for the management of diabetic mellitus in Jalingo, Taraba state, Nigeria

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Abstract: *Diabetes mellitus is a disease that is associated with metabolic disorder, treatment with medicinal plant products can be an effective alternative in treating diabetes mellitus. This study aims at Evaluation of Qualitative and Quantitative Phytochemical and Antinutritional contents of Zingiber officinale, leptadenia hastate, Moringa Oleifera, Vitex doniana, and Guiera senegalensis with antidiabetic effects used in jalingo. The plants extracts were prepared using cold aqueous maceration method, the Qualitative phytochemicals screening was done using standard procedure while the Quantitative phytochemicals and anti-nutritional content was determined using Ultraviolent Visible Spectroscopy. The qualitative phytochemical shows the presence of Alkaloid, Tannins and flavonoid across all the five selected medicinal plants, while for Antinutritional contents, the value of Phytate determined ranged from 26.2 mg/kg (M. oleifera) to 57.2 mg/kg (G. Senegalensis), Hydrocyanide levels range from 15.9 mg/kg (L. hestata) to 55.116 mg/kg (M. oleifera), The value of Trysin inhibitors range from 20.6 mg/kg (L. hestata) to 50.0 mg/kg (M. oleifera), Tannins values determine range from 1.879 mg/kg, (Z. officinale) to 5.830 mg/kg (M. oleifera), The level of Cyonogenic glycosides analyzed range from 0.268 mg/kg (Z. officinale) to 0.734 mg/kg (L. hestata). while oxalate content analyzed range from 28.825 mg/kg (M. oleifera) to 78.554 mg/kg (L. hestata).*

Keywords: *Hypoglycemic, Antinutritional, Phytochemicals, Medicinal plants.*

1.0 INTRODUCTION

Medicinal plants are in great demands in the developed as well as in the developing countries for primary health care because of their wide biological activities and lesser costs. Diabetes mellitus is defined as a group of metabolic diseases characterized by high levels of blood glucose, polydipsia, polyuria and polyphagia, muscle weakness and weight loss (Mohajan and Mohajan, 2023). While Hypoglycemia is the condition in which the plasma or blood glucose concentration falls below normal levels (Paluchamy, 2019). Although safety of medicinal plants consumption has become one of the global problems, there is a rekindled interest in the use of natural products for improved health in Nigeria due to a positive correlation between certain diets, specific foods, and disease expression. (Muyideen *et al*., 2024). therefore, the need to

investigate and create awareness of the roles of antinutritional values in medicinal plants as means of controlling the progress of some diseases, so also the phytochemical content of the medicinal plant is important in order to obtain a complete picture of the plant constituents which may likely be responsible for their activities. *Guiera senegalensis* is a small shrub abundant in semi-desert areas of the Sudano-Sahelian zone, it is widely used in African traditional medicine as a tonic and for the treatment of many complications such as respiratory and gastrointestinal disorders. (Dirar *et al*., 2021). *Leptadenia hastata* is a wild plant used as medicine and vegetable due to its nutritive and therapeutic properties, it is a climber plant with pale white, soft, groved stem, few drops of yellow liquid exude from cut stem. (Abubakar *et al.,* 2014). *Vitex doniana* is known by the local names: Hausa (dinyar), Fulani (galbihi), Yoruba (ori nla), Ibo (ucha koro) and several literatures have reported its uses in traditional medicine while *Moringa oleifera* is the most widely cultivated species of the family, a native of the sub-Himalayans but has naturalized in the tropics, popularly called horseradish tree, its high nutritive contents have been advocated. (Muyideen *et al*., 2024). *Zingiber officinale* is a medicinal herb belonging to the family of Zingiberaceae, it is mainly found in tropical regions, including India, China, Indonesia, and Nigeria. (Han *et al.,*2024). Although according to literature, a lot of studies on *Zingiber officinale*, *leptadenia hastate, Moringa Oleifera, Vitex doniana,* and *Guiera senegalensis* have been conducted, but to the best of our knowledge, their Phytochemicals and Antinutritional contents have not been documented nor reported in the study area. Hence, the need to assess these gaps.

2.0 MATERIALS AND METHOD

2.1 Sampling and Sample Preparation

Fresh leaves of *Zingiber officinale*, *leptadenia hastate, Moringa Oleifera, Vitex doniana,* and *Guiera senegalensis* were collected from Jalingo town, Taraba state. Each of the plant sample was carefully cleaned to remove dirt and wrapped separately with a polythene bag and was transported to the laboratory for identification and authentication by a botanist as outline by Kifle *et al.,* (2020). The drying was carried out under the shade away from the sun to avoid losing some qualities of the secondary metabolites for few weeks until the plant become brittle and were size reduce using wooden mortar and pestle. (Vishnu *et al.,* 2019). Extraction of the size reduce samples were done in accordance with method outlined by Muyideen *et al*., (2024). In which maceration extraction method was carried out by weighing 250 g of plant samples and immersing in 1500 ml of distilled water for 72 hours. The mixture was agitated intermittently to facilitate the extraction of bioactive compounds from the plant samples, after filtration, the residue was macerated for another 72 hours. This process was repeated three times using the same volume of distilled water to exhaustively extract the plant material. The solvent-to-sample ratio and extraction time were optimized to ensure maximum extraction efficiency. The final extract was concentrated on a rotatory vacuum evaporator at 45°C and under reduced pressure. The dried extract was kept in a refrigerator at −4°C for used in the experiment.

2.2 Qualitative Phytochemical Screening of the Extract

Preliminary phytochemical screening of the plants under study was conducted in accordance with the method of Vishnu et al., (2019). The plant extracts were screened for the presence and/or absence of anthraquinones, alkaloids, glycosides, cardiac glycosides, phenol,

tannins, flavonoids, phytosterols, phlobatannins, saponins and steroids

2.3 Quantitative Phytochemical Screening of the Extract

Quantative phytochemical screening of the plants under study was conducted in accordance with the method of Kasolo et al., (2018). The Content of anthraquinones, alkaloids, glycosides, cardiac glycosides, phenol, tannins, flavonoids, phytosterols, phlobatannins, saponins and steroids were determined as outline by Kasolo et al., (2018).

2.4 Antinutritional content Determination

2.4.1 Sample Preparation for UV Spectrophotometer

The sample was dissolved in a chosen solvent, ensure complete dissolution to obtain homogeneous solution, a blank solution was prepared using chosen solvent. which serve as a reference for baseline correction and was place in a cuvette identical to the one used for the sample. A high quality transparent cuvette was used that is compatible with the wavelength range of UV spectrophotometer. A blank solution cuvette was insert and adjust the spectrophotometer to zero absorbance. The blank cuvette was replaced with cuvette containing sample solution. Measure the absorbance of the sample at the chosen wavelength. (Hassan *et al.,*2018). The plants extracts were screen for the determination of Phytate, Hydro cyanides, Tannin, Oxalate and Cyanogenic Glycoside according to the procedure outline by Hassan *et al*., (2018).

3.0 RESULTS AND DISCUSSION

3.1 Qualitative phytochemicals

The five plants samples, *V. doniana, Z. officinale, L. hestata, G. Senegalensis* and *M. oleifera* were analyzed for Anthraquinone, Alkaloids, Cardiac glycosides, Glycoside, phenol, Tannins, Flavonoids, Phytosterols, Phlobatannins, Saponin and Steroids. (Table 1). Anthraquinone was present *in Z. offinale* and *M. oleifera* while absent in *V. doniana, L. hestata and G. senegalensis*, Alkaloids, Tanin and Flavonoid were present in all the five selected medicinal plant*,* Glycoside *and* Cardiac glycosides were present in *V. doniana, Z. officinale, G. Senegalensis* and *M. oleifera, w*hile absent in *L. Hestata,* Phenol was present in *V. doniana, Z. officinale, L. Hestata* and *M. oleifera* while absent in *G. Senegalensis,* Phytosterol and Steroids were absent in *Z. Officinale,* and *L. Hestata* while present in *V. doniana, G. Senegalensis* and *M. Oleifera*, Phlobatannins is Absent in *M. oleifera* and *Z. offinale* while present in *V. doniana, L. Hestata* and *G. Senegalensis.* Saponins is Absent in *V. doniana,* while present in *Z. officinale, L. hestata, G. Senegalensis* and *M. oleifera.* this result was similar with another studies reported by Alkali *et al*., 2024 and Sharma and Modi, 2023.

Table 1: Qualitative Phytochemical Properties of Five Different Selected Plant

Parameters	Samples				
	V. doniana	*Z. officinale*	*L. hestata*	*G. senegalensis*	*M. oleifera*
Anthraquinone	-	+	-	-	+
Alkaloids	+	+	+	+	+
Cardiac glycoside	+	+	-	+	+
Glycosides	++	+	-	+	+
Phenol	+	+	++	-	++
Tanins	++	+	+	+	+
Flavonoids	+	+	+	++	+
Phytosterols	+	-	-	+	+
Phlobatannins	+	-	+	+	-
Saponins	-	+	+	+	+
Steroids	+	-	-	+	+

Values are mean ± standard deviation (n=3)

3.2 Quantitative phytochemicals

Table 2 shows the quantitative phytochemicals for the five selected medicinal plant from which Anthraquinone concentration was recorded as 0.346 mg/kg *in Z. offinale* and 0.473 mg/kg in *M. oleifera* while recorded zero for *V. doniana, L. hestata and G. senegalensis*, the average value of Anthraquinone recorded from this study was found to be below the average value of 1.335 mg/ kg anthraquinone reported by Okareh *et al.,* (2018), Alkaloids concentration was recorded for all the five medicinal plant samples as 1.046 mg/kg, 0.841 mg/kg, 0.534 mg/kg, 1.361 mg/kg and 1.114 mg/kg for *V. doniana, Z. officinale, L. hestata, G. Senegalensis* and *M. oleifera* respectively, Cardiac glycosides concentration was recorded as 0.214 mg/kg, 0.304 mg/kg, 0.329 mg/kg and 0.191 mg/kg for *V. doniana, Z. officinale, G. Senegalensis* and *M. oleifera.* respectively while recorded zero for *L. Hestata.* The value of the concentration of cardiac glycosides recorded in this study across the five medicinal plant was found to be below the concentration of cardiac glycosides reported by Muhammad and Abubakar, (2016), the concentration of Glycoside was recorded zero for L. *Hestata* while *V. doniana, Z. officinale, G. Senegalensis* and *M. oleifera*, was recorded as 0.864 mg/kg, 0.581 mg/kg, 0.246 mg/kg and 0.316 mg/kg respectively, the concentration of Phenol was recorded as 4.04 mg/kg, 3.417 mg/kg, 7.08 mg/kg and 6.01 mg/kg for *V. doniana*, *Z. officinale, L. Hestata* and *M. oleifera* respectively while recorded zero for *G. Senegalensis*, the concentration of tannin was recorded

for all the five medicinal plant extract as 8.118 mg/kg, 1.834 mg/kg, 2.091 mg/kg, 4.0961 mg/kg and 3.061 mg/kg for *V. doniana, Z. officinale, L. hestata, G. Senegalensis* and *M. oleifera,* respectively. The concentration of flavonoids in the five medicinal plant sample investigated recorded 0.946 mg/kg, 1.567 mg/kg, 2.733 mg/kg, 4.268 mg/kg and 0.881 mg/kg for *V. doniana, Z. officinale, L. hestata, G. Senegalensis* and *M. oleifera* respectively. The concentration of Phytosterol was recorded as zero for *M. oleifera* and *L. Hestata* while for *V. doniana, Z. officinale,* and *G. Senegalensis,* it was recorded as 0.516 mg/kg, 0.596 mg/kg and 0.344 mg/kg respectively, the concentration of Phlobatannins analyzed was recorded as zero for *M. oleifera* and *Z. offinale* while for *V. doniana, L. Hestata and G. Senegalensis*. It was recorded as 0.163 mg/kg, 0.207mg/kg and 0.157 mg/kg respectively, the concentration of Saponin in the medicinal plants analyzed recorded zero for *V. doniana,* while recorded 5.278 mg/kg, 6.814 mg/kg, 2.831 mg/kg and 3.067 mg/kg for *Z. officinale, L. hestata, G. Senegalensis* and *M. oleifera.* respectively, the concentration of steroids analyzed was recorded zero for *L. Hestata and Z. offinale* while for *V. doniana, M. oleifera* and *G. Senegalensis* it was recorded as 1.041 mg/kg, 0.641 mg/kg and 0.834 mg/kg repectively, the value of steroids obtained from this study for *V. doniana* was found to be above the reported value of 0.91 mg/kg reported by Ogboru *et al.,* (2015).

Table 2: Quantitative Phytochemical Properties (mg/kg) of Five Different Selected Plant

Parameters (mg/kg)	Samples				
	V. doniana	*Z. officinale*	*L. hestata*	*G. senegalensis*	*M. oleifera*
Anthraquinone		0.346 ± 0.017			0.473 ± 0.011
Alkaloids	1.046 ± 0.044	0.841 ± 0.020	0.534 ± 0.007	1.361 ± 0.056	1.114 ± 0.100
Cardiac glycoside	0.214 ± 0.042	0.304 ± 0.012		0.329 ± 0.009	0.191 ± 0.034
Glycosides	0.804 ± 0.087	0.581 ± 0.075		0.246 ± 0.015	0.316 ± 0.072
Phenol	4.040 ± 0.142	3.417 ± 0.086	7.080 ± 0.065		6.010 ± 0.024
Tanins	8.118 ± 0.009	1.834 ± 0.114	2.091 ± 0.091	4.961 ± 0.317	3.061 ± 0.053
Flavonoids	0.946 ± 0.088	1.567 ± 0.062	2.733 ± 0.106	4.268 ± 0.238	0.881 ± 0.085
Phytosterols	0.516 ± 0.007			0.596 ± 0.018	0.344 ± 0.027
Phlobatanins	0.163 ± 0.013		0.207 ± 0.076	0.157 ± 0.011	
Saponins		5.278 ± 0.449	6.814 ± 0.301	2.831 ± 0.134	3.067 ± 0.098
Steroids	1.041 ± 0.056			0.640 ± 0.049	0.834 ± 0.064

Values are mean ± standard deviation (n=3)

3.3 Anti-Nutritive composition

Figure 1 shows the antinutritional content of the selected medicinal plant. The experimental level of Phytate determined range from 26.2 mg/kg (*M. oleifera*) to 57.2 mg/kg (*G. Senegalensis*). while other values were observed as 32.5 mg/kg, 37.4 mg/kg, 51.0 mg/kg for *L. hestata, Z. officinale and V. doniana* respectively, the levels of Hydrocyanide analyzed were recorded as 24.6 mg/kg, 38.4 mg/kg, 15.9 mg/kg, 45.3 mg/kg and 55.116 mg/kg for *V. doniana, Z. officinale, L. hestata, G. senegalensis and M. oleifera* respectively, the value of Trysin inhibitors was recorded as 33.2 mg/kg, 42.4 mg/kg, 20.6 mg/kg, 26.1 mg/kg and 50.0 mg/kg for *V. doniana, Z. officinale, L. hestata, G. senegalensis,* and *M. oleifera* respectively, the observed values for Tannins determine from the five medicinal samples analyzed was recorded as 2.580 mg/kg, 1.879 mg/kg, 5.26 mg/kg, 4.966 mg/kg and 5.830 mg/kg for *V. doniana, Z. officinale, L. hestata, G. senegalensis,* and *M. oleifera* respectively, the level of Cyonogenic glycosides analyzed was recorded as 0.381 mg/kg for *V. doniana*, 0.268 mg/kg for *Z. officinale,* 0.734 mg/kg for *L. hestata,* 0.506 mg/kg for *G. Senegalensis* and 0.457 mg/kg for *M. oleifera*, Oxalate content analyzed was recorded as 67.106 mg/kg, 34.090 mg/kg, 78.554 mg/kg, 48.354 mg/kg and 28.825 mg/kg for *V. doniana, Z. officinale, L. hestata, G. senegalensis,* and *M. oleifera* respectively. A lesser value of oxalate (7.57 mg/kg) was observed from another report while tannin value was observed to be between the values of tannins from this study. (Shaba *et al.,* 2015).

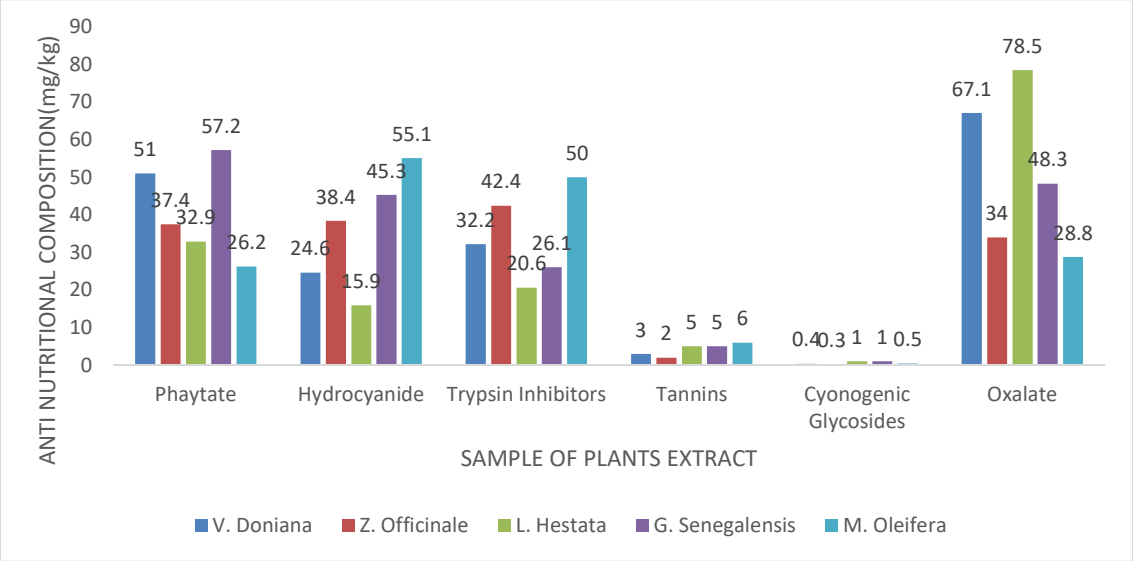

Figure 1: Mean Anti –Nutritional composition (mg/kg) from plant samples extract

4.0 Conclusion

The qualitative phytochemical screening shows the presence of alkaloid, tannins and flavonoid at varied concentration across the five selected medicinal plants which could be responsible for the antidiabetic properties of the selected plant. Even though these selected medicinal plants contain some reasonable amount of antinutritional content which may be usefull as an antioxidant, but need to be aware that antinutritional content reduce nutrient intake, digestion

and utilization and also has the potentials to produce adverse effects.

4.1 Recommendations

I. Further studies need to be carried out to Isolate the principal compound that may be responsible for the antidiabetic activities of the five selected medicinal plants.

II. Cautions should be taken with respect to other disease condition such as hypertension while considering the use of this selected medicinal plants for the management of diabetic mellitus.

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