

COMPARATIVE STUDY OF THE PHYTOCHEMICAL, PROXIMATE AND MINERAL CONSTITUENTS OF AIR-DRIED LEAVES OF *HIBISCUS ASPER* AND *HIBISCUS SABDARIFFA*

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ABSTRACT

This study was conducted on the basis of radiant hope in medicinal plants' efficacy to solve health and nutritional problems in livestock production. Standard procedures were adopted in the determination of phytochemicals, proximate and mineral constituents of *Hibiscus asper* and *Hibiscus sabdariffa*. Saponins, tannins, flavonoids, terpenoids and steroids were present in both plants. These are indispensable for the body systems and physical well being. The quantitative phytochemicals were found to be more in *H. asper* than *H. sabdariffa*. Proximate values for moisture (12.163 ± 0.060), ash (11.709 ± 0.042), fat (9.579 ± 0.090), crude protein (13.903 ± 0.086) and crude fibre (1.418 ± 0.065) in *H. asper* were higher than that of *H. sabdariffa*. The metabolizable energy in *H. asper* was 3109 Kcal/Kg while that of *H. sabdariffa* was found to be 3107 Kcal/Kg; making the plants to a veritable source of energy. *H. asper* had higher values of Sodium (27.400), Potassium (72.500), Magnesium (10.480), Iron (0.670), Copper (0.280), Zinc (1.027), Phosphorus (3.130), compared to *H. sabdariffa*. Insignificant quantity of Lead (0.010 ppm) was detected in *H. asper* and none in *H. sabdariffa*, showing that the two plants are safe from lead poisoning. It was concluded that *H. asper* and *H. sabdariffa* are medicinal plants that can be of inestimable value in livestock production if the leaves can be exploited for drug and feed formulation.

Key words: Phytochemical, proximate composition, minerals, medicinal plants, livestock

INTRODUCTION

The universe offers plethora of plants with medicinal and nutritional properties. This has given radiant hope to the scientists all over the world that medicinal plants have the potentials to solve disease and nutritional challenges in animal production. The incessant problem of antibiotic resistance in livestock production can also be mitigated through administration of medicinal plants in drinking water or incorporation into their feed. The usage of leaf meal in broiler diets was reported by Oloruntola *et al.* (2016). It was reported by Ukorebi *et al.* (2019) that 10% dietary level of *Gongronema latifolia* (Utasi) leaf meal supported normal health by enhancing the blood building capacity and performance of broiler chickens. Wumnokol *et al.* (2019) reported the inclusion of Acha (*Digitaria exilis* Staph) grains in the diet of broiler chickens as beneficial on the haematological parameters. Despite the inexhaustible well of medicinal plants, innumerable species of them are yet to be exploited satisfactorily. *Hibiscus asper* and *Hibiscus sabdariffa* are two medicinal plants of high pharmacological and nutritional value that are yet to be meaningfully tapped. They belong to the genus Linnaeus of the family Malvaceae. It was reported that the plants from this family are good source of fibres, medicine, tea and oil (Ayanbadejo *et al.*, 2012). Although, many researchers have worked on the seeds and calyxes from the plants in poultry nutrition but there is a great dearth of information on the use of the leaves (leaf meal) for drug formulation or nutritional purpose in livestock production in Nigeria. Hence, the essence of studying the phytochemical, proximate and mineral constituents of air-dried leaves of these two medicinal plants.

MATERIALS AND METHODS

Plant samples collection and preparation

Fresh leaves of *Hibiscus asper* and *Hibiscus sabdariffa* were harvested from Goshen Community, off Aule Road Akure, Ondo State Nigeria in September, 2019. The plants were properly identified taxonomically at the Department of Forestry and Wood Technology of the Federal University of Technology, Akure. The leaves were gently rinsed in distilled water to get rid of dirt and thereafter air-dried for fourteen days until constant weight was achieved. Air-dried leaves were ground in Thomas Willey machine® to fine powder and stored in air tight containers prior the time of the analyses at 4°C.

Phytochemicals, proximate and minerals analyses

The phytochemicals and proximate analyses of the plant extracts were carried out at the Chemistry Department Laboratory, School of Sciences of the Federal University of Technology, Akure (Trease and Evans, 2005; AOAC, 2006). The results were obtained in duplicates and expressed as means $\pm$ SD using IBM SPSS Statistics version 23. Metabolizable energy was determined using the Janssen formula (Janssen, 1989). The minerals analysis was done in a reputable commercial Laboratory in Akure, Ondo State with the usage of AAS Buck Scientific 210 VGP & FP 902 Laboratory instrument.

Results and Discussion

The results of the phytochemical constituents, proximate and mineral composition of the two plants are shown in Table 1, 2 and 3. As seen in Table 1, *H. asper* and *H. sabdariffa* contained saponins, tannins, flavonoids, terpenoids and steroids. Glycosides were present in *H. asper* but absent in *H. sabdariffa*. Phlobatannins, alkaloids and anthraquinones were absent in the two plants. This agrees with the reports of Sulaiman *et al.* (2014) and Gbadamosi *et al.* (2018), that *H. sabdariffa* contained tannins, saponins, terpenoids and steroids while *H. asper* is very rich in flavonoids, tannins, saponins and cardiac glycosides respectively. The qualitative analysis of the phytochemicals showed that *H. asper* had higher values than *H. sabdariffa* in all the phytochemicals present in them. The phytochemicals in plants give them their medicinal value that has been tapped into by man and animals over the ages. According to the report of Osuntokun and Olajubu (2014), phytochemicals have the ability to prevent diseases in man and animals. They have the potential to alleviate the possibility of urinary tract infections (Bongoni *et al.*, 2013).

Table 1: Phytochemical constituents of air-dried leaves of *H. asper* and *H. sabdariffa*

Phytochemicals	<i>H. asper</i>	<i>H. sabdariffa</i>	<i>H. asper</i>	<i>H. sabdariffa</i>
Saponins	+	+	8.000 $\pm$ 0.257	6.727 $\pm$ 0.257
Tannins	+	+	3.845 $\pm$ 0.000	3.153 $\pm$ 0.008
Flavonoids	+	+	2.619 $\pm$ 0.005	1.550 $\pm$ 0.005
Terpenoids	+	+	39.415 $\pm$ 0.038	25.053 $\pm$ 0.038
Steroids	+	+	8.042 $\pm$ 0.018	4.371 $\pm$ 0.018
Glycosides	+	-	12.476 $\pm$ 0.046	ND
Phlobatannins	-	-	ND	ND
Alkaloids	-	-	ND	ND
Anthraquinones	-	-	ND	ND

Where (+) = present, (-) = absent and ND = not detected. Values are expressed as means $\pm$ SD.

Table 2: Proximate analysis of air-dried leaves of *H. asper* and *H. sabdariffa*

Parameters (%)	<i>Hibiscus asper</i>	<i>Hibiscus sabdariffa</i>
Moisture	12.163 ± 0.060	9.166 ± 0.234
Ash	11.709 ± 0.042	10.594 ± 0.532
Fat	9.579 ± 0.090	8.439 ± 0.243
Crude protein	13.903 ± 0.086	8.965 ± 0.355
Crude fibre	1.418 ± 0.065	0.885 ± 0.123
Carbohydrate	51.192 ± 0.274	62.309 ± 0.333
ME (Kcal/Kg)	3109	3107

Values are expressed as means ± SD of duplicate determination. ME = Metabolizable energy

Table 3: Mineral composition of air-dried leaves of *H. asper* and *H. sabdariffa*

Minerals (ppm)	<i>Hibiscus asper</i>	<i>Hibiscus sabdariffa</i>
Sodium (Na)	27.400	24.900
Potassium (K)	72.500	58.200
Calcium (Ca)	12.940	17.100
Magnesium (Mg)	10.480	10.130
Iron (Fe)	0.670	0.420
Copper (Cu)	0.280	0.250
Manganese (Mn)	0.074	0.095
Lead (Pb)	0.010	ND
Zinc (Zn)	1.027	0.780
Phosphorus (P)	3.130	2.420

Where ppm = part per million and ND = Not detected

The proximate analysis (Table 2) revealed *H. asper* values for moisture (12.163 ± 0.060), ash (11.709 ± 0.042), fat (9.579 ± 0.090), crude protein (13.903 ± 0.086) and crude fibre (1.418 ± 0.065) to be higher than that of *H. sabdariffa*. However, *H. sabdariffa* value for carbohydrate (51.192 ± 0.274) was higher than that of *H. asper*. Metabolizable energy in *H. asper* and *H. sabdariffa* were 3109 and 3107 Kcal/Kg respectively. This is even higher than the metabolizable energy in some of the commercial feed ingredients. The ash value for *H. asper* (11.709 ± 0.042) in this study was higher (3.27 ± 0.06) than that reported by Gbadamosi *et al.* (2018) and conversely for the crude protein and crude fibre (lower). This may be attributed to the effect of geographical location. The low crude fibre obtained from *H. asper* (1.418 ± 0.065) and *H. sabdariffa* (0.885 ± 0.123) is a factor for effective digestibility of the leaves from these plants if incorporated as leaf meal into livestock diets. Consequently, it was observed from Table 3 that *H. asper* had higher values of Sodium (27.400 ppm), Potassium (72.500 ppm), Magnesium (10.480 ppm), Iron (0.670 ppm), Copper (0.280 ppm), Zinc (1.027 ppm), Phosphorus (3.130 ppm), compared to *H. sabdariffa*. Generally the two plants are rich sources of minerals because they are found in appreciable quantities. Lead (Pb) that was found in the plants in trace amount is required by the body in little or less quantity (lead is poisonous). According to Okwu and Okwu (2004), elevated level of lead (Pb) in the body is hazardous to the body systems. This justifies one of the reasons medicinal plants are used for various purposes all over the world.

CONCLUSION

Based on the results obtained from this study (phytochemicals, proximate and mineral composition) *H. asper* and *H. sabdariffa* are medicinal plants whose potentials can be explored by phytopharmaceutical industries and animal nutritionist for drug and feed formulation respectively. The ability of the leaves of these plants' to re-grow quickly after plucking is a credited plus to them.

Recommendations

Further studies: antimicrobial and antifungal properties are to be determined *in-vitro*. Analysis of the amino-acid profile of the plants, isolation of bioactive compounds (GC-MS) and *in-vivo* experiments with animals are also very important to be carried out.

REFERENCES

- AOAC (Association of Official Analytical Chemists), (2006). Official Methods of Analysis of the AOAC. In: Horwitz, W. (Ed.). 18th Edition. Association of Official Analytical Chemists, Washington D.C., USA.
- Ayanbadejo, A., Ogundipe, O. T. and Olowokudejo, J. D. (2012). Taxonomic significance of the epicalyx in the genus *Hibiscus* (Malvaceae). *Phytologia Balcanica* 18(2): 135 – 140.
- Bongoni, R., Steenbekkers, L. P. A., Verkerk, R., Van Boekel, M. A. J. S and Dekker, M. (2013). Studying consumer behaviour related to the quality of food: A case on vegetable preparation affecting sensory and health attributes. *Trends in Food Science & Technology* 33(2): 139 – 145.
- Gbadamosi, I. T., Abiade, A. A. and Agbatutu, A. (2018). An assessment of the Nutritional, Phytochemical and Antioxidant Properties of *Hibiscus asper* Hook. F. (Malvaceae). *Afr. J. Biomed. Res.* 21(3): 331 – 338
- Janssen, W. M. M. A (1989). *European tables of energy values for poultry feedstuffs*. 3rd Ed. Beekbergen Netherlands (Spelderholt Centre for Poultry Research and Information Services) pp 84.
- Okwu, D. E and Okwu, M. E. (2004). Chemical composition of *Spondias mombin* Linn. Plant parts. *J. sustain. Agric Environ* 6(2): 140 – 147.

- Oloruntola, O. D., Ayodele, S. O., Agbede, J. O. and Oloruntola, D. A. (2016). Effect of feeding broiler chickens with diets containing *Alchornea cordifolia* leaf meal and enzyme supplementation. *Archivos de Zootecnia* **65**: 489 – 498.
- Osuntokun, O. T. and Olajubu, F. A. (2014). Comparative Study of Phytochemical and Proximate Analysis of Seven Nigerian Medicinal Plants. *App. Sci. Res. J.* **2**(1): 10 - 26.
- Sulaiman, F. A, Kazeem, M. O., Waheed, A. M, Temowo, S. O., Azeez, I. O., Zubair, F. I., Adeyemi, T. A., Nyang, A and Adeyemi, O. S. (2014). Antimicrobial and toxic potential of aqueous extracts of *Allium sativum*, *Hibiscus sabdariffa* and *Zingiber officinale* in Wistar rats. *Journal of Taibah University for Science* **8**(4): 315-322.
- Trease, G. E. and Evans, W. C. (2005). Pharmacognosy, 11th Edition. Brailliar Tinidel Can. Macmillian Publishers.
- Ukorebi, B. A., Akpet, S. O and Gbose, P. N. (2019). Haematology, serum biochemistry and organ histopathology of broiler chickens fed graded levels of *Gongronema latifolia* (Utasi). *Nig. J. Anim. Prod.* 2019, **46**(2): 164 – 175.
- Wumnokol, D. P., Guluwa, L. Y and Latu, M. Y. (2019). Performance and Haematology of broiler starter fed Acha (*Digitaria exilis* staph) grains as replacement for maize. *Nig. J. Anim. Prod.* 2019, **46**(2): 87 – 91.