



Short Communication

Qualitative and Quantitative Phytochemical Analysis and
Medicinal uses of *Hibiscus sabdariffa* (Zobo) and
Hyphaene thebaica (Goriba)

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ABSTRACT

Hibiscus sabdariffa and *Hyphaene thebaica* commonly refers to as Zobo and Goriba respectively are edible plants commonly used in making beverages in Nigeria. These two plants have been linked with salutary effects when consumed and are considered to be of great public health importance. This study aims to conduct qualitative and quantitative phytochemical analysis of *Hibiscus sabdariffa* and *Hyphaene thebaica*. Phytochemical compounds were extracted from the plants by the soxhlet hot percolation method using methanol as a solvent. Qualitative phytochemical analysis was conducted for alkaloids, cardiac glycosides, flavonoids, glycosides, phenols, resins, saponins, steroids, tannins and reducing sugar. Quantitative phytochemical analysis was done for alkaloids, total phenolics, total flavonoids, tannins, saponins and glycosides following standard procedures. The phytochemical analysis of both plant species exhibited the presence of alkaloids, phenolics, flavonoids, tannins, saponins and total glycosides in considerable quantity. The result *Hibiscus sabdariffa* leaves extract contains phytochemicals in considerable quantity with negative results for reducing sugar, resin and phenol while *Hyphaene thebaica* leaves extract contains phytochemicals in considerable quantity with negative results for steroids. Hence these plants have a potential for anti-oxidants and antihypertensive activities.

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INTRODUCTION

Different parts of commonly available plants such as flowers, stems, seeds, fruits, leaves and bark have provided medicinal benefits from time immemorial (Mohamed *et al.*, 2010). These plants provide medicinal values through their phytochemical and antioxidant compounds which have considerable physiological effects that can protect cellular systems from oxidative damage and lower the risk of chronic diseases (Luvonga, 2012; Exarchou *et al.*, 2002; Mohamed *et al.*, 2010). Some of the important phytochemical components are alkaloids, tannins, flavonoids and phenolic compounds (Shariff, 2001). Common plants with such constituents include *Hibiscus sabdariffa* L. commonly called Zobo and *HyphaeneThebaica* also referred to as Goriba in Nigeria and both plants are used in making beverages (Aliyu *et al.*, 2000).

Generally, *Hibiscus sabdariffa* L. and *Hyphaene thebaica* have been linked to being effective in the treatment of most non-communicable diseases especially high blood pressure in ancient times. Ethnobotanical studies have also revealed the importance of these medicinal plants in treating infectious diseases, Ramamurthy (2017). The plants contain antimicrobial compounds such as polyphenols, phenolic, terpenoids, essential oils, lectins and alkaloids, (Okereke *et al.*, 2015). These compounds act on the bacteria through a different mechanism: phenolic compounds modify the permeability of cell membrane, tannins inactive the metabolism by binding the enzymes and phenolic acid disrupts the membrane integrity and leakage of essential intracellular constituents, Flavonoids also may act by inhibiting both energy metabolism and DNA synthesis thus affecting protein and RNA syntheses (Adam & Ngwu, 2015). Secondary metabolites isolated from medicinal plants have anti-

cancerous, antibacterial, analgesic, anti-inflammatory, antihypertensive, antitumor, antiviral and many other activities, Singh (2017).

Hibiscus sabdariffa is a species of hibiscus, native to the old world tropics and is commonly available in Nigeria (Okereke *et al.*, 2015). The plant species belongs to the family Malvaceae also known as Roselle or Sorrel or Zobo plant is native to Asia (India to Malaysia) or tropical Africa. The plant is widely distributed in India, Caribbean Africa, Central America, Brazil etc. Though the calyx is a commonly used part of the plant, the seeds and leaves are used for nutritional benefits (UNICEF, 2006). The leaves are deeply lobed and arranged alternatively on the stems (Adegunloye *et al.*, 1996). The flowers are white to pale yellow with a dark red spot at the base of each petal, 8-10 cm in diameter, and have a fleshy calyx at the base 1-2 cm wide, enlarging to 3-3.5 cm, fleshy and bright red as the fruit matures (Brunold *et al.*, 2004). The calyx of this plant is used in making a beverage commonly called Zobo drink in Nigeria. However, depending on the hygienic conditions and degree of temperature used in its preparation, the drink may be contaminated by a micro-organism which can cause infect the consumers (Rimm, Salmah, Suhaila, & Pau, 2002).

Hyphaene thebaica (Family- Arecaceae) are widely used as medicinal plants either by themselves or in combination with other herbs (Mohamed *et al.*, 2010). *Hyphaene thebaica*, with common names doum palm and gingerbread tree (also mistakenly doom palm), is a type of palm tree with edible oval fruit. It is native to the Arabian Peninsula and also to the northern half and western part of Africa where it is widely distributed and tends to grow in places where groundwater is present (Dosumu *et al.*, 2006). The doum palm is dioecious and grows up to 17 m (56 ft) high.

The trunk, which can have a girth of up to 90 cm (35 in), branches dichotomously and has tufts of large leaves at the ends of the branches. The bark is fairly smooth, and dark grey and bears the scars of fallen leaves. Female trees produce large woody fruits, each containing a single seed that remain on the tree for a long period. The doum palm flourishes in hot dry regions where little else grows and the tree is appreciated for the shade it provides. All parts of the tree are useful, but the leaves are considered the most important product (Amir *et al.*, 2020). A study conducted on the fruit pulp of *H. thebaica* revealed that it contains nutritional trace minerals, proteins and fatty acids, in particular the nutritionally essential linoleic acid (Kamis *et al.*, 2003).

These plants were found to contain antioxidants that are involved in the prevention of cellular damage, which is a common pathway for cancer, ageing and a variety of diseases Santhi (2016). The scientific community has begun to be interested in the identification, recovery and enhanced performance of natural antioxidant principles from plant sources (Iqbal *et al.*, 2015). The purpose of this study is to validate the existence of phytochemicals and antioxidants in *Hibiscus sabdariffa* and *Hyphaene thebaica* with a view of examining the antihypertensive effects of the two plants.

MATERIALS AND METHODS

Identification and Collection of plant materials

The plants were collected from Kano, North-Western Nigeria. The authenticity of the plants was confirmed in the Department of Plant Biology, Bayero University Kano, The voucher number of the specimen is Bayero University, Kano, Herbarium Accession Number BUKHAN0040 and BUKHAN0380 for *Hibiscus sabdariffa* and *Hyphaene thebaica* respectively. The fresh leaf parts of this species were washed under running tap

water, shade dried at room temperature and powdered.

Preparation of extracts

The leaves were washed under tap running water and rinsed with distilled water and dried in a shaded area and then powdered by using pestle and mortar, the powder is packed in the Soxhlet apparatus to continuous hot percolation using methanol as a solvent. The extract was concentrated and dried and the powdered sample stored in refrigerator at 4°C (Cowan, 1999).

Preliminary Phytochemical Screening:

The methanol extract of the leaves were used for the preliminary phytochemical screening procedure for the presence of bioactive ingredients such as tannins, alkaloids, flavonoids, saponins, and steroids (Kumar *et al.*, 2019).

Phytochemical analysis:

The methanolic extraction of leaves sample was tested for qualitative phytochemical compounds;

Hibiscus sabdariffa: Alkaloids 0.81g, Flavonoids 0.72g, Glycosides 0.68g, Saponins 0.60g, Tannin 0.52g, Steroids 0.42g.

While *Hyphaene thebaica*: Alkaloids 0.54g, Flavonoids 0.68g, Glycosides 0.51g, Reducing sugar 0.44g, Saponins 0.73g, Steroids 0.0g, Tannin 0.84g, Resin 0.38g, Phenol 0.64g

Innovations and breakthroughs

The selected plants have varieties of phytochemicals but *Hibiscus sabdariffa* showed negative results in reducing sugar, resin and phenols, while *Hyphaene thebaica* showed negative results only in steroids.

Applications

The selected plants have varieties of phytochemicals such as phenolics, flavonoids and tannins, glycosides, steroids and possess various activities. Therefore, this plant species may be attempted to derive the drugs of antioxidant properties and medicinal use

RESULTS AND DISCUSSION

Table 1 showed the result of the phytochemical screening of methanolic extracts of *Hibiscus sabdariffa* L. (Roselle) and *Hyphaene thebaica*. It revealed the presence of alkaloids, flavonoids, glycosides, saponins, steroids and tannins for *Hibiscus sabdariffa*. While alkaloids, flavonoids, glycosides, reducing sugar, saponins, tannins, resins and phenolics were present in methanolic extracts of *Hyphaene thebaica*. The Table further revealed that *Hibiscus sabdariffa* was negative for reducing sugar, resins and phenolics while *Hyphaene thebaica* was negative for steroids. This is similar to the results of the phytochemical screening and antibacterial activities of *Hibiscus sabdariffa* was conducted by Adamu & Ngwu (2015) which revealed the presence of saponins, steroids, flavonoids and tannins. The antibacterial activity of methanolic extract of *Hibiscus sabdariffa* L. The result of our phytochemical analysis was however different

from that of a study conducted by (Okereke *et al.*, 2015) which revealed that *Hibiscus sabdariffa* was negative for tannins, saponins and steroids. This difference may be related to the part of the plant used. The extraction in this study was from the concentrated, dried and powered sample while in a study by Okereke *et al.* (2015), the extraction was from calyces of the plant using 20g of the ground calyces sample in soxhlet.

Table 2 showed that *Hibiscus sabdariffa* or Roselle leaves show a positive result for alkaloids, flavonoids, glycosides, saponins, steroids and tannins. The test was however negative for reducing sugar, resins and phenolics. The negative result of reducing sugar seen in the quantitative phytochemical analysis was the only difference reported when compared to findings from the qualitative analysis. The Table further revealed that *Hyphaene thebaica* was negative for steroids which are the same as the result reported in the qualitative analysis.

Table 1: Qualitative Phytochemical Analysis of *Hibiscus sabdariffa* and *Hyphaene thebaica* extracts

Extracts	Alkaloid s	Flavanoid s	Glycoside s	Reducin g Sugar	Saponin s	Steroid s	Tannin s	Resin s	Phenoli c
<i>Hibiscus sabdariffa</i> (Zobo)	+	+	+	-	+	+	+	-	-
<i>Hyphaene thebaica</i> (Goruba)	+	+	+	+	+	-	+	+	+

Key: - Absent in plant extract, + present in the plant extract

Table 2: Quantitative Phytochemical Analysis of *Hibiscus sabdariffa* and *Hyphaene thebaica* extracts

Extracts	Alkaloids	Flavanoid s	Glycosid es	Reducing Sugar	Saponin s	Steroid s	Tannin s	Resin s	Phenoli c
<i>Hibiscus sabdariffa</i> (Zobo)	0.81g	0.72g	0.68g	0.00g	0.60g	0.42g	0.51g	0.00g	0.00g
<i>Hyphaene thebaica</i> (Goruba)	0.54g	0.68g	0.51g	0.44g	0.73g	0.00g	0.84g	0.38g	0.64g

CONCLUSION:

The result of *Hibiscus sabdariffa* leaves extract contain phytochemical in considerable

quantity with the negative results for reducing sugar, resin and phenol while *Hyphaene thebaica* leaves extract contain phytochemical

with considerable quantity with the negative results for steroids. Therefore, these plants have a potential for anti-oxidants and antihypertensive activities. *Hibiscus sabdariffa* and *Hyphaene thebaica* contain bioactive components, potential source of drugs in herbal medicine so, it can be used as therapeutic compounds and it has antimicrobial properties so can be used in pharmaceutical industry for controlling infectious diseases.

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CONFLICT OF INTEREST STATEMENT:

All authors declare no conflict of interest.

REFERENCES:

- Adamu, H. & Ngwu, R. O. (2015). Phytochemical Screening and Antibacterial Activities of *Hibiscus sabdariffa* L. Leaf Extracts. *Nigerian Journal of Chemical Research*, 20
- Adegunloye, B. J., Omoniyi, J. O. & Ajabonna, O. P. (1996). Mechanism of blood pressure lowering effects of the calyx extract of *Hibiscus sabdariffa* in rats. *Journal of science*, 235- 238.
- Aliyu, M. S., Salih, W. M., Mohammed, A. H. & Homeida, A. M. (2000). Investigation on the antispasmodic potentials of *Hibiscus sabdariffa* calyces. *Ethnopharmacology*; 31:249-257.
- Brunold, C., Deters, A., Knoepfel-sidler, F., Hafner, J. M. & Hensel, A. (2004) Poly-saccharides from *Hibiscus sabdariffa* flowers stimulate proliferation of Human Keratinocytes plants. *Medical plants*; 70(4):370-373.
- Cowan, M. M. (1999). Plant products as antimicrobial agents. *Clin Microbiol Rev.* 12(4):564-82. PMID: 10515903; PMCID: PMC88925.
- Dosumu, O. O., Nwosu, F. O. & Nwogu, C. J. (2006). Phytochemical screening and anti-microbial studies of extracts of *Hyphaenethebaicalinn* (Mart) Palmae. *International Journal of Tropical Medicine* 1(4), 186-189
- Exarchou, V., Nenadis, N., Tsimidou, M., Gerothanassis, I. P., Troganis, A. & Boskou, D. (2002). Antioxidant activities and phenolic composition of extracts from Greek oregano, Greek sage and summer savory. *Journal of Agricultural and Food Chemistry* 50 (19), 5294-5299.
- Iqbal, E., Salim, K. A & Lim, L. B. L. (2015) Phytochemical screening, total phenolic and antioxidant activities of bark and leaf extracts of *Goniothalamus velutinus* (Airy Shaw), *Journal of King Saud University - Science*, 27 (3): 224 – 232
- Kamis, A. B., Modu, S., Zanna, H., Oniyangi, T. A. (2003). Preliminary biochemical and haematological effects of aqueous suspension of pulp of *hyphaenethebaica* (l) mart in rats. *Biokemistri* 13: 1-7
- Kumar, S & Sheba, A. (2019). A Study on Phytochemicals, Antimicrobial, and Synergistic Antimicrobial Activities of *Hibiscus sabdariffa*, *International Journal of Research in Pharmaceutical Sciences*, 9: 984-989
- Luvonga, A. W. (2012). Nutritional & Phytochemical Composition, Functional Properties of Roselle (*Hibiscus sabdariffa*) and Sensory Evaluation of Some Beverages made from Roselle Calyces. (A Master of Science Dissertation at the Jomo Kenyatta University of Agriculture and Technology)
- Mohamed, A. A., Khalil, A. A. & El-Beltagi, H. E. S. (2010) Antioxidant and antimicrobial properties of kaffaryam (*Anastaticahierochuntica*) and doum palm (*Hyphaenethebaica*), *Grasas Y Aceites*, 61 (1), DOI: 10.3989/gya.064509
- Okereke, C. N., Iroka, F. C., Chukwuma, M. O. (2015). Phytochemical analysis and

- medicinal uses of *Hibiscus sabdariffa*. *International Journal of Herbal Medicine*, 2 (6): 16-19
- Ramamurthy, V. & Sathiyadevi, M. (2017) Preliminary Phytochemical Screening of Methanol Extract of *Indigofera tinctoria* Linn. *J Plant Biochem Physiol* 5: 184.
- Rimm, L.T., Salmah, Y., Suhaila, L. & Pau, M. (2002). Antioxidant properties of roselle (*Hibiscus sabdariffa*) in linoleic acid, *model system* 2002; 1:17-20.
- Salah, A. M, Gathumbi, J., Verling, W. (2002) 'Inhibition of Intestinal motility by methanolic extracts of *Hibiscus sabdariffa* in rats'. *Phytochemical Resources*, 16:283-285.
- Shariff, Z. U. (2001). Modern Herbal Therapy for Common Ailments. Nature Pharmacy Series Vol.1, Spectrum Books Ltd., Ibadan, Nigeria in Association with Safari Books (Export) Ltd. UK, pp. 9-84.
- Singh, P., Khan, M. & Hailemariam, H. (2017). Nutritional and health importance of *Hibiscus sabdariffa* : a review and indication for research needs. *J Nutr Health Food Eng*; 6(5):125-128. DOI: 10.15406/jnhfe.2017.06.00212
- United Nations Children Fund UNICEF (2006). Changes in the quality of zobo beverages produced from the plant food, *Hibiscus sabdariffa* and the effects on human immune system. *Nigeria National Science Journal*; 5:1-10.