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Phytochemicals and antioxidant properties of some selected medicinal plants

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Abstract
Phytochemicals are bioactive compounds that provide plants colour, flavour and odour while antioxidants are compounds that aid in inhibiting free radicals that can damage the cells of an organism. This study was aimed at determining the phytochemical and antioxidant (enzymes) content of *Sorghum vulgare* leaf-sheath, *Eremomastax polysperma* and *Brillantaisia owariensis* leaves. The phytochemicals were quantified using gas chromatography while antioxidant (enzymes) properties were quantified using spectrophotometric method. The results from the study revealed the presence of saponins, alkaloids, flavonoids and phenols. The concentration of ribalinidine (an alkaloid) was the highest in the three plants, with *Sorghum vulgare* (85.74 µg/g) having a higher concentration than *Eremomastax polysperma* (42.49 µg/g) and *Brillantaisia owariensis* (19.06µg/g). *Sorghum vulgare* also had a higher saponins concentration (13.29µg/g) than *Eremomastax polysperma* (9.08 µg/g) and *Brillantaisia owariensis (*6.99 µg/g) while the phenols concentration of *Brillantaisia owariensis* (12.33 µg/g) was higher than *Sorghum vulgare* (3.93µg/g) and *Eremomastax polysperma* (3.28 µg/g). For the antioxidant contents, *Sorghum vulgare* had the highest catalase activity (6.97µmol/ml) while *Brillantaisia owariensis* had the highest superoxide dismutase (3.58 µmol/ml) and glutathione peroxidase (7.56 µmol/ml) activities. In conclusion, from the results obtained, these plants have phytochemicals and antioxidant properties that could help in fighting diseases.

Keywords: Antioxidants, phytochemicals, medicinal plants

1. Introduction
Medicinal plants are of importance due to their beneficial healing and curing effect of human diseases. This healing ability is due to the presence of phytochemicals present in the plants (Wadood *et al.*, 2013) [15]. Phytochemicals are bioactive naturally occurring chemical compounds that protects plants from disease and damage, contributes to the plants' colour, aroma and flavour (Saxena *et al.*, 2013) [11]. Phytochemicals include alkaloids, flavonoids, tannins, glycosides, saponins, phenolics and terpenoids. Phenolic compounds are phytochemicals with one or more aromatic rings with at least one hydroxyl group and they have antioxidant properties. Flavonoids are polyphenols with low molecular weight which have Antihyperglycemic effect, anticancer function and have free radical scavenging activity. Tannins are polyphenols with antidiabetic activity. Terpenoids have anticancer and anti-inflammatory properties. Alkaloids contains nitrogen and have antidiabetic, anti-arrhythmic, antihypertensive, anticancer and antimalarial activities. Saponins have hypocholesterolemic, hypoglycemic and anti carcinogenic properties. Cardaic glycosides contains a glycoside unit and acts on contractile action of the cardiac muscle. They are used for the treatment of cardiac arrhythmias and congestive heart failure (Nyamai *et al.*, 2016) [9].
Antioxidant enzymes are enzymes that are capable of reducing free radicals produced during normal metabolism or gotten from the environment. Superoxide dismutase reduces superoxide ion to hydrogen peroxide, catalase reduces hydrogen peroxide to water and oxygen (Krishnamurthy and Wadhwani, 2012) [6], and Glutathione reductase uses NADPH to convert oxidized glutathione to the reduced form.
Sorghum vulgare is of the poaceae family. The extracts of sorghum have a strong chemo protective potential, anti-inflammatory properties, hepatoprotective and hematopoietic effects (Benson *et al.*, 2013) [1]. *Eremomastax polysperma* and *Brillantaisia owariensis* belongs to the acanthaceae family. *E. polysperma* is common in Southern Nigeria (Uyoh *et al.*, 2014) [13] and used to treat anaemia and internal heat (Mboso *et al.*, 2014) [3]. *B. patula* a synonym of *B. owariensis* is a shrubby herbs, found in Nigeria, Toga, west Cameroon and across Uganda and Angola. The leaves are used for rheumatism treatment, the decoction is taken to ease child birth, menstrual pain and stomach ache (Faparusi *et al.*, 2012) [2]. Hence the objective of this study was to determine the phytochemical and antioxidant properties of some selected plants: *Sorghum vulgare* leaf-sheath, *Eremomastax polysperma* and *Brillantaisia owariensis.*

2. Methodology

2.1 Collection of Plant sample

The plants; *Sorghum vulgare* leaf sheath was bought from mile 3 market while *Eremomastax polysperma* and *Brillantaisia owariensis* were gotten from a farm at Rumokoro (Lat 4.88999; long 6.96922) all in Port Harcourt, Nigeria. The plants were identified with voucher numbers: UPH/V/1325(*Brillantaisia owariensis*) and UPH/V/1326 (*Sorghum vulgare*, synomyms *sorghum bicolr*) and UPH/V/1346 (*Erempmastax polysperma*). They were dried and ground into fine powder with a blender and stored in an air tight container.

2.2 Phytochemical analysis

Phytochemical Analysis was according to Kelly and Nelson (2014) method, using a Gas chromatography.

2.3 Antioxidants in the plants

Glutathione reductase (GR) activity was determined by measuring the amount of NADPH utilized at 340nm using a spectrophotometer (NADPH is one of the substrate of GR: catalyses the conversion of oxidized glutathione to reduced glutathione employing NADPH as substrate).

Peroxidase activity was determined according to Reddy *et al*. (1995) [10] method and absorbance read at 430nm in a spectrophotometer. Catalase activity was assayed following the method of Luck (1974) [8] and absorbance read at 240nm in a spectrophotometer. Superoxide dismutase activity (SOD) was assayed according to the method of Kakkar *et al.* (1984) [4] and absorbance read at 560nm in a spectrophotometer.

3. Results

Table 1: Phytochemical analyses of *Sorrghum vulgare, Brillantaisia owariensis* and *Eremomastax polysperma*

S: N	Components	Concentration (µg/g)		
		S. vulgare	***E. polysperma***	***B. owariensis***
1.	Spartein	0.00	3.37	4.38
2.	Anthocyanin	1.42	0.57	0.37
3.	Oxalate	2.63	-	8.21
4.	Tannin	10.53	-	-
5.	Phenol	3.93	3.28	12.23
6.	Epicatechin	1.87	12.15	0.25
7.	Lunamarin	2.09	3.92	1.48
8.	Saponin	13.29	9.07	6.99
9.	Ribalinidine	85.74	42.49	29.06
10.	Phytate	0.29	0.37	1.15
11.	Rutin	11.41	2.96	4.37
12.	Kaempferol	9.60	5.34	7.35
13.	Catechin	7.08	-	17.32
14.	Sapogenin	-	6.69	11.13

Table 2: Antioxidant Content of *Sorghum vulgare* Leaf Sheath, *Eremomastax polysperma* and *Brillantaisia owariensis*

Antioxidants	***Sorghum vulgare***	***Brillantaisia owariensis***	***Eremomastax polysperma***
Peroxidase(µmol/ml)	2.37	1.73	2.74
Glutathione Reductase (µmol/ml)	0.85	0.84	0.38
Catalase (µmol/ml)	4.73	3.63	3.73
Superoxide Dismutase (µmol/ml)	2.58	3.58	1.78
Glutathione Peroxidase (µmol/ml)	6.97	7.56	4.89

4. Discussion

Phytochemicals are chemical compounds produced by plants that help the plants protect themselves from harmful agents such as bacteria. They include alkaloids, flavonoids, phenols, tannins and saponins. Flavonoids have antioxidant activity such as radical scavenging and cytotoxic activity (Kumar and Pandey, 2013) [7]. Saponins have functions such as permeabilization of the cell membrane, lowering of serum cholesterol levels, stimulation of luteinizing hormone release leading to abortifacient properties and cytotoxic effects on malignant tumour cells (Thakur *et al.*, 2011) [12]. Tannins (Tannic acid) are potential anticancer agent. Alkaloids provokes DNA damage, inducing apoptosis, and acting as anti-proliferative agents.

The results of the phytochemical analysis of *Sorghum vulgare*, *Eremomastax polysperma* and *B. owariensis* is shown on Table 1. Ribalinidine an alkaloid had the highest concentration in all the three plants, with *Sorghum vulgare* leaf-sheath (85.74µg/g) having a higher concentration than *B. owariensis* (19.07 µg/g) and *Eremomastax polysperma* (42.49 µg/g) Saponin's and rutin concentration of *Sorghum vulgare* leaf-sheath (13.29µg/g; 11.41µg/g) was higher than *B. owariensis* (6.99 µg/g; 4.38 µg/g) and *Eremomastax polysperma* (9.08µg/g; 2.96 µg/g). These results implies that these plants might have phytochemicals sufficient to improve health conditions.

Antioxidants are substance that inhibit oxidation. Antioxidants such as glutathione reductase, glutathione peroxidase, catalase, superoxide dismutase and peroxidases [involved in scavenging reactive oxygen species (Vicuna, 2005) [14] were determined in these plants. The Antioxidant content of *Sorghum vulgare* leaf sheath, *Eremomastax polysperma* and *Brillantaisia owariensis* is shown on Table 2. Catalase activity of *Sorghum vulgare* leaf sheath (4.73 µmol/ml) was higher than *Eremomastax polysperma* (3.63 µmol/ml) and *Brillantaisia owariensis* (3.73 µmol/ml). Superoxide dismutase and glutathione peroxidase activities of Brillantaisia *owariensis* (3.58 µmol/ml; 7.56 µmol/ml) was higher than *Eremomastax polysperma* (1.78 µmol/ml; 6.97 µmol/ml) and *Sorghum vulgare* leaf sheath (2.58 µmol/ml; 6.97 µmol/ml). The result suggests the plants had antioxidants which might help to scavenge free radicals generated in the body system.

5. Conclusion

In conclusion, these plants have phytochemicals and antioxidant properties that could help improve health conditions.

6. Reference

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