

## Preliminary Phytochemical Analysis of N-Hexane Extract of *Zingiber officinale* (Ginger) Rhizome

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### ABSTRACT

Phytochemical screening of the *n*-hexane extract of *Zingiber officinale* rhizome was carried out in this study using the methods. Results of this study revealed that *Zingiber officinale* contains alkaloid, saponin, tannin, glycoside, flavonoid and terpenoid while carotenoid was absent. Further quantification of these phytochemicals present indicated their compositions to be: alkaloid  $1.15 \pm 0.070$  mg/g, flavonoid  $1.19 \pm 0.040$  mg/g, saponin  $0.88 \pm 0.070$  mg/g, steroid  $1.95 \pm 0.021$  mg/g, tannins  $1.44 \pm 0.114$  mg/g, glycosides  $0.57 \pm 0.057$  mg/g, terpenoid  $0.88 \pm 0.060$  mg/g, and phenol  $0.54 \pm 0.10$  mg/g. It can be concluded from this study that *Zingiber officinale* is a potential medicinal rhizome and can be exploited as a medicinal and therapeutic agent.

Keywords: Phytochemicals, *Zingiber officinale*, ginger, herbs, rhizomes.

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### INTRODUCTION

Ginger, with the scientific name of *Zingiber officinale* is an herbaceous perennial plant belonging to the order Scitamineae and the family *Zingiberaceae*. It is a perennial reed - like plant with annual leafy stems about a meter (3 - 4 feet) tall [1,2,3]. It is a root crop and a typical herb extensively grown across the world for its pungent aromatic underground stem or rhizome which makes it an important export commodity in world trade [4]. Ginger root is the rhizome of the plant *Zingiber officinale*, consumed as a delicacy, medicine or spice. It is from the family *Zingiberaceae* [5]. Ginger cultivation began in South Asia and has since spread to East Africa and the Caribbean. Ginger was introduced to Europe by Arab traders from India the first century AD. The Arabs also took the plant from India to East Africa in the

thirteenth century while the Portuguese took it to West Africa and other part of the tropics in the sixteenth century. Ginger was introduced to Nigeria in 1927 [6,7,8,9]. The plant is now cultivated in different parts of Nigeria, though the major producing areas include Kaduna, Nasarawa, Sokoto, Zamfara, Akwa Ibom Oyo, Abia and Lagos states although southern Kaduna still remain the largest producers of fresh ginger in Nigeria in Kachia, Jabba, Jama'a and Kagarko Local Government Areas [10]. The quality of Nigeria Ginger being the best in the world has contributed to and is an indicator of the increased demand for Ginger. *Zingiber officinale* is commonly known in English as ginger, *atale* or *aje* by Yorubas, *jinja* by Efiks/Ibibios of Cross River and Akwa Ibom States [11]. It is known in Hausa as *cither*.

### AIM OF STUDY

This study aims at the phytochemical screening of the crude *n*-hexane extract of ginger (*Zingiber officinale*).

### OBJECTIVE OF STUDY

The objective of this study is to:

To investigate the phytochemicals present in *n*-hexane extract *Zingiber officinale*.

To furthermore quantify those phytochemicals present.

**MATERIAL AND METHODS****Plant Source**

The gingers used in this study were bought from Ogbete Main Market, Enugu North, Enugu State, Nigeria. The plant materials were identified and authenticated by Prof. Ezeh in Applied Biology and Biotechnology of Enugu State University of Science and Technology,

Enugu state, Nigeria. The identified fruit were separated and fresh ones obtained. Sample collection, preparation and analysis were done in the Biochemistry Laboratory of Applied Biochemistry Department, Enugu State University of Science and Technology, Enugu, Nigeria.

**Preparation Of Crude Extract**

The ginger rhizome was washed and air dried for one week. Then it was grinded using an electric grinder. The grounded ginger was weighed. 250g was weighed into a glass bottle and soaked with

1000ml of *n*-hexane for 24hrs. It was then filtered and concentrated with rotator evaporator at 55° C to get the crude extract.

**METHODOLOGY****Qualitative Phytochemical Analysis**

The concentrated crude extract of *Zingiber officinale* rhizome was subjected to qualitative test for the identification of

its various phytochemical constituent as per standard procedure.

**Quantitative Phytochemical Analysis**

The concentrated crude *n*-hexane extract of *Zingiber officinale* was subjected to quantitative test for the identification of

the quantity of its various phytochemical constituent as per standard procedure.

**RESULTS**

**TABLE 1:** Results of the qualitative phytochemical analysis of *n*-hexane extract of *Zingiber officinale*. The results obtained revealed the presence of

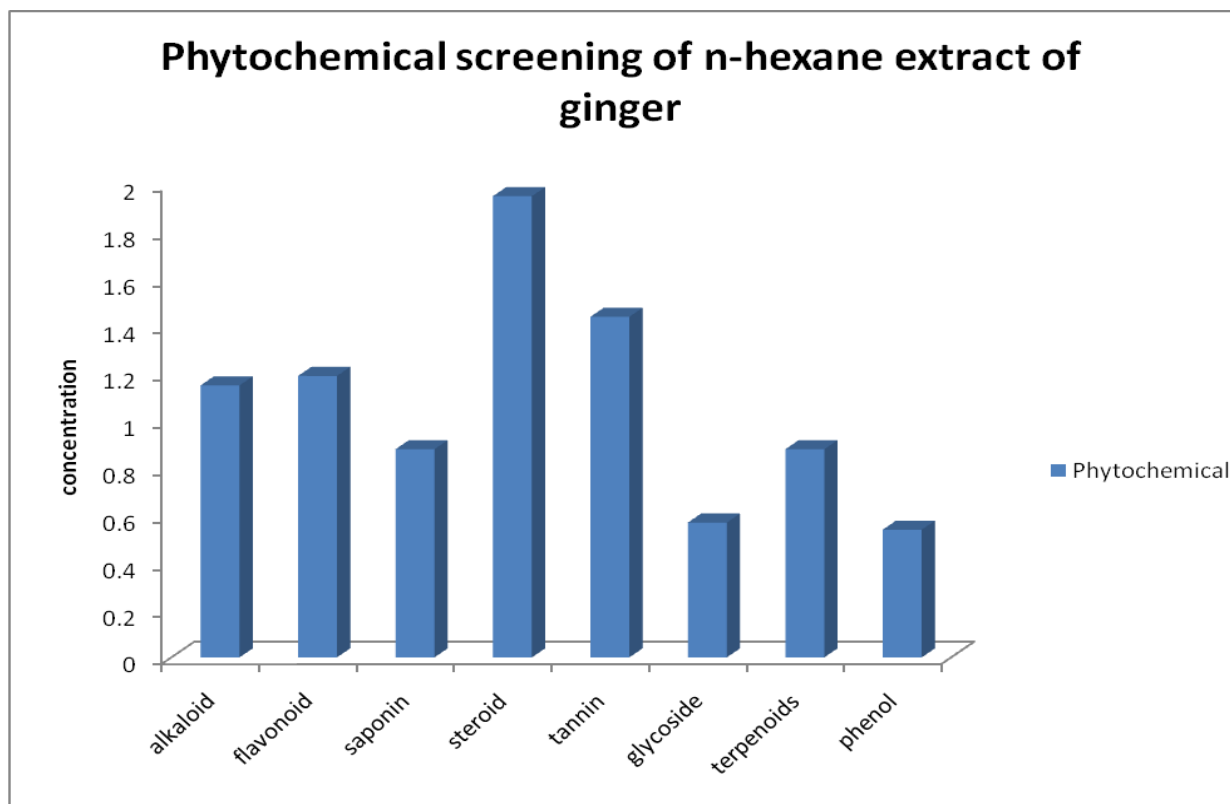
alkaloids, flavonoids, saponins, steroid, tannin, glycoside terpenoid and phenol, while carotenoid was absent.

Phytochemicals	Result
Alkaloid	++
Flavonoid	++
Saponin	+
Steroid	+++
Tannin	+++
Glycoside	+
Terpenoid	++
Carotenoid	-
Phenol	+

**Key = +++ abundantly present, + fairly present, ++ moderately present, – absent**

**TABLE 2:** Results showing the quantitative analysis of *n*-hexane extract of *Zingiber officinale*

Phytochemicals	Concentration (mg/g)
Alkaloid	1.15±0.070
Flavonoid	1.19±0.040
Saponin	0.88±0.070
Steroid	1.95±0.021
Tannin	1.44±0.114
Glycoside	0.57±0.057
Terpenoids	0.88±0.060
Phenol	0.54±0.10



**Figure 1:** Bar Chart Representation of the Phytochemical Screening of *N*-Hexane Extract of Ginger.

#### DISCUSSION

The phytochemical screening of the crude n-hexane extract showed the presence of alkaloids, flavonoids, saponins, steroid, tannin, glycoside terpenoid, and phenol (Table 1). Further quantification of these phytochemicals showed steroid to be the most abundant phytochemical present. Plant steroids (or steroid glycosides) also referred to as “Cardiac glycosides” are one of the most naturally occurring plant phytoconstituents that have found therapeutic application as arrow poisons or cardiac drugs [7]. Therapeutically, steroids contribute cardiotonics vitamin D precursors, anti inflammatory agents (corticosteroid) and anabolic agent’s androgen. Tannin was the second most abundant Recently the tannins have attracted scientific interest, especially due to the increased incidence of deadly illnesses such as AIDS and various cancers [8]. The search for new

lead compounds for the development of novel pharmaceuticals has become increasingly important, especially as the biological action oftannin-containing plant extracts has been well Documented [9].

Alkaloid and flavonoid were also abundantly present. [10], also reported similar results in aqueous extract of *Zingiber officinale*. Alkaloids have diverse and important physiological effects on humans and other animals. The medicinal properties of alkaloids are quite enormous for instance morphine and alkaloids is a powerful narcotic used for the relief of pains [12]. Flavonoids possess antioxidant properties and ensure healthy circulation of blood. It helps to strengthen capillaries wall. The compound is sometimes referred to as phytoestrogens. Phytoestrogens are associated with relief of menopausal

systems, reduction of osteoporosis, improvement of blood cholesterol levels, and lowering the risk of certain hormone-related cancers and coronary heart disease [13].

The phytochemical screening of *Zingiber officinale* rhizome also revealed the presence of phenols this results compared favourable well with the one reported by Osabor [14] for *Cola lepidotaseeds*. Phenols have been implicated in medical circle to protect person against ageing and can inhibit cancer growth [15].

The results of Phytochemicalscreening of *Zingiber officinale* extract revealed the presence of saponins in n-hexane extract of *Zingiber officinale* rhizome. The physiological role of saponins in plants is not yet fully understood. While there is a number of a publication describing their identification plants, and their multiple effects in animal cells and on fungi and bacteria, only a few have addressed their function in plant cells. Many saponins are known to be antimicrobial, to inhibit mould, and to protect plants from insect

The Phytochemicalscreening revealed that *Zingiber officinale* has good secondary plants metabolites which justify its therapeutic utility. As a rich source of phytochemicals *Zingiber officinale* can be considered a potential source of medicinal herb. It can be concluded that ginger is a good source of antioxidants

attack. Saponins may be considered a part of plants' defence systems, and as such have been included in a large group of protective molecules found in plants named phytoanticipins or phytoprotectants [16]. Saponin mixtures present in plants and plant products possess diverse biological effects when present in the animal body. Extensive research has been carried out into the membrane-permeabilising, immunostimulant, hypocholesterolaemic and anticarcinogenic properties of saponins and they have also been found to significantly affect growth, feed intake and reproduction in animals. These structurally diverse compounds have also been observed to kill protozoans and molluscs, to be antioxidants, to impair the digestion of protein and the uptake of vitamins and minerals in the gut, to cause hypoglycaemia, and to act as antifungal and antiviral [17,18]. Saponins are heterogeneous groups of natural products with a marked hormonal activity, strong expectorant and aid in the absorption of nutrients [19].

#### CONCLUSION

that are beneficial to health and enhances resistance to infectious diseases by increasing non-specific and specific immune mechanisms. Hence, apart from its medicinal properties, ginger can also be used as an antioxidant supplement.

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