Phytochemical Screening of Aqueous Extract of Garlic(*Alliumsativum)* bulbs.

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Abstract: The present study investigates the qualitative and quantitative analysis of the major bioactive constituents of medicinally important plant *Allium sativum* (garlic) in its aqueous of bulb. The phytochemical tests were conducted using standard methods of analysis. The result of the phytochemical screening showed the presence of flavonoids, alkaloids, saponins, tannins and cardiac glycosides. Quantitative analysis showed the highest yield of tannins (2.52 g/100g) and lowest yield of flavonoid (0.05 g/100g). Saponin was 0.24 g/100g and C. glycoside 1.88 g/100g. The presence of these phytochemicals confirmed the pharmacological activities of aqueous extract of *Allium sativum*bulb.

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1. Introduction

Plants that possess therapeutic properties or exert beneficial pharmacological effects in the animal body are generally termed as "medicinal plant". And It is now been established that the plants which naturally synthesize and accumulate some secondary metabolites and vitamins, possess medicinal properties (Sofowora, 1993). Medicinal plants constitute an important natural wealth of a country. They play a significant role in providing primary health care services to rural people. They also serve as therapeutic agents as well as important raw materials for the manufacture of traditional and modern medicine. Substantial amount of foreign exchange can be earned by exporting medicinal plants to other countries. In this way indigenous medicinal plants play significant role in the economy of a country (Sofowora, 1993).

Garlic is commonly known as *Allium sativum*. In Hausa it is called Tafarnuwa, in Yaruba it is called Ayu and in Igbo it is called Ayu-Ishi (Aliyu, 2006), and also it is a species in the onion genus "*Allium*". Its close relatives include the onion, shallot, leek, chive and rakkyo (Block, 2010). The plant is a member of the *Liliaceae* family and one of the most popular herbs used worldwide to reduce various risk factors associated with several diseases (Thomson *et al*., 2007). Also, it is a bulbous perennial food plant of the family *Alliaceae* which give it a botanical name known as *Allium Sativum* and the common name Garlic (which comes from old English genlac meaning "spear lack").When crushed, *Allium sativum* yield allicin, an antibiotic and antifungal compound (phytoncide). It has been claimed that it can be used as home remedy to help speed recovery from strep throat or other minor ailments because of its antibiotic properties (Wikipedia, 2010). It also contains the sulphur containing compounds allinin, ajoene, diallylsulfide, enzymes, B-vitamins, proteins, minerals, saponins, flavonoids and maillard reaction products, which are not sulphur containing compounds. Actually garlic contain variety of effective compound that exhibit anticoagulant (antithrombotic) (Anwar, 2003), antioxidant (Douglas, 2003), antibiotics (Thomson *et al*., 2007), hypocholesterolaemic and hypoglycemic as well as hypotensive activities (Benergee and Maulik, 2002).

Phytochemicals are bioactive compounds found in plants that work with nutrients and dietary fibersto protect human against diseases. They are non-nutritive compounds (secondary metabolites) that contribute to flavour and colour. Many phytochemicals have antioxidant activity and reduce the risk of many diseases, for example, alkyl sulfide (found in onions and garlic), carotenoids (from carrots), and flavonoids (present in fruits and vegetables) (Craig, 1999). Reactive oxygen-free radicals (ROS) have been implicated in many diseases and in aging process. These free radicals, which cause tissue damage via oxidative stress, are usually generated by aerobic respiration, inflammation, and lipid peroxidation. Antioxidant systems minimize or prevent deleterious effects of the ROS (Valko *et al*., 2007). Due to its medicinal values, it is important to determine some of the phytochemicals presents.

2.0 Materials and Methods

2.1 Plant material

Fresh Allium sativum were purchased from the Kofa Market in Bebeji, Kano State, Nigeria and authenticated at the Herbarium of the Department of Plant Biology, Bayero University Kano, Kano, Nigeria,

where a voucher specimen was deposited at the Herbarium of the Institute.

2.2 Preparation of aqueous extract of *Allium sativum*bulb

The raw *Allium sativum* was sliced, crushed, dried in air and then pulverized to powder. The extraction was performed by soaking 100g of the pulverized garlic in 600ml of distilled water for 24 hours, the residue and the filtrate were obtained by filtering the soaked garlic (*Allium sativum*) using Whatman No. 1 filter paper. The residue was dried on a cardboard paper and the filtrate was obtained as extract. The volume of the extract is 380ml and the concentration of the extract was obtained by specific gravity method.

2.3 Phytochemical screening (Qualitative)

The presence of alkaloids was determined according to the method described by Harborne (1973) while the method described by Odebiyi and Sofowora (1978) was used for flavonoids and tannins while Cardiac glycosides and saponins were determined by the methods of Sofowora (1993) and Wall *et al*. (1954) respectively.

2.4 Phytochemical screening (Quantitative)

Alkaloid, Saponins, Flavonoids Anthraquinones, tannins, steroids, phenols and cardiac glycoside were quantitatively determined by adopting the procedure described by Harborne, (1980), Obadoni and Ochuko (2002), Allen *et al.* (1973), Schanderl, (1970) and Harborne, (1980) respectively.

3.0 Results

Table 1 shows the phytochemical present in the aqueous extract of *Allium sativum* bulb. Alkaloids, tannin, flavonoids, saponin and cardiac glycosides were detected as shown in Table 1.

Table 2 shows the quantitative phytochemical screening of aqueous extract of *Allium sativum* bulb. The quantitative phytochemical screening revealed that the plant contain 0.05 g/100g flavonoids, 0.24 g/100g saponin, 0.12 g/100g alkaloids, 2.52 g/100g tannins and 1.88 g/100g cardiac glycoside (Table 2). Furthermore, the results shows that the concentration of tannins in the plant is the highest while flavonoids present in the plant is the lowest.

Table 1: Qualitative phytochemical screening of aqueous extract of *Allium sativum*bulb

Phytochemicals	Status
Tannins	+
Saponins	+
Cardiac glycosides	+
Alkaloids	+
Flavonoids	+

Key= + present; - absent.

Table 2: Quantitative phytochemical screening of aqueous extract of *Allium sativum*bulb

Phytochemicals	Percentage composition (g/100g)
Saponins	0.24 ± 0.04
Tannins	2.52 ± 0.12
Cardiac glycosides	1.88 ± 0.26
Flavonoids	0.05 ± 0.03
Alkaloids	0.12 ± 0.02

Values are expressed as Mean ± SEM (n = 3)

4.0 Discussion

A medicinal plant is any plant in which, one or more of its organs, contains substances that can be used for therapeutic purpose of which are precursors for the synthesis of useful drugs. The crude extracts or purified form of plant has been used as medicines and cosmetics (Sofowora, 1993). The medicinal value of these plants lies in bioactive phytochemical constituents that produce definite physiological action on the human body (Akinmoladun *et al.,* 2007). In our present study of *Allium sativum* bulbs, the phytochemical investigation indicates the presence of alkaloids (0.12 g/100g), flavonoids (0.05 g/100g), saponin (0.24 g/100g), tannins (2.52 g/100g) and cardiac glycosides (1.88 g/100g). This is in agreement with the work done by Idowu *et al.,* (2008). These classes of compounds especially alkaloids, saponins, tannins and flavonoids are known to have curative activity against several pathogens (Usman *et al.,* 2009).

Saponins are steroid or triterpenoid glycosides characterised by their bitter or astringent taste, foaming properties and their haemolytic effect on red blood cells. Saponins possess both beneficial (cholesterol-lowering) and deleterious (cytotoxic permeabilization of the intestine) properties and also exhibit structure dependent biological activities (Osagie and Eka, 1998). Saponins cause a reduction of blood cholesterol by preventing its reabsorption (Prohp and Onoagbe, 2012). Also, it has also been documented that saponins have antitumor and anti-mutagenic activities and can lower the risk of human cancers, by preventing cancer cells from growing. Saponins are believed to react with the cholesterol rich membranes of cancer cells, thereby limiting their growth and viability (Roa *et al.,* 1995). Plants produce saponins to fight infections by parasites and in humans saponins help the immune system and also protect against viruses and bacteria. The non-sugar part of saponins has a direct antioxidant activity which may result in reduced risk of cancer and heart diseases (Prohp and Onoagbe, 2012).

Flavonoids are water soluble polyphenolic molecules and therefore belong to the polyphenol family. Together with carotenes, flavonoids are also responsible for the coloring of fruits, vegetables and

herbs (http://www.phytochemicals.info/phytochemicals/flavonoids.php). Flavonoids have antioxidant activities as well as much health promoting effects viz., anti-allergic, anti-cancer, anti-oxidant, antiinflammatory, anti-thrombotic, vasoprotective, tumour inhibitory and anti-viral effects. These effects have been associated with the influence of flavonoids on arachidonic acid metabolism. Some flavonoid containing plants are diuretics (e.g. buchu), antispasmodic (e.g. liquorice) and others have antimicrobial properties (Trease and Evans, 2002). Epidemiological studies have shown that heart diseases are inversely related to flavonoid intake and that flavonoids prevent the oxidation of LDL therefore reducing the risk for the development of atherosclerosis (Prohp and Onoagbe, 2012). The presence of flavonoids in the leaves of *Cissampelos mucronata* (*Menispermaceae*) which have hypoglycaemic and anti-diabetic properties have also been documented (Tanko *et al.,* 2007). Effects of flavonoids, quercetin and ferulic acid on pancreatic β-cells leading to their proliferation and secretion of more insulin have been proposed by Mahesh and Menon (2004) and Sri-Balasubashini *et al.,* (2004) as the mechanism of their hypoglycaemic activity in streptozotocin-induced diabetic rats. These are justifications for the use of the extracts of *Allium Sativum*in the treatment of diabetes mellitus.

Tannins may decrease protein quality by decreasing digestibility, and palatability. Other nutritional effects which have been attributed to tannins include damage to the intestinal tract, toxicity of tannins absorbed from the gut, and interference with the absorption of iron, and a possible carcinogenic effect (Osagie and Eka, 1998). In addition, tannin has astringent properties, hastens the healing of wounds and inflamed mucous membrane. Plants with tannins are used for healing of wounds, varicose ulcers, hemorrhoids, frost- bite and burns (Igboko, 1983; Maiduyi, 1983).

The presence of alkaloids in *Allium Sativum*aqueous bulb extract in this study shows the potential of the extract to have an analgesic, anti-inflammatory and adaptogenic effects, which help the host (man and animal) to develop resistance against disease and endurance against stress (Gupta, 1994). Flavonoids detected in *Allium Sativum*bulbs could be used in the treatment of various disease conditions like edema, toothache, fever, common cold, diarrhea and dental caries. These could be possible as the root extracts contains some antibacterial activities. The flavonoids are acting on bacteria by inhibiting its protein synthesis (Hong-xi and Song, 2001).

5.0 Conclusion

This study shows that aqueous extract of *Allium Sativum* bulb contain important and active phytochemical compounds which justify the various therapeutic uses attributed to it in folklore medicine.

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