IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 7 Issue 9, September 2020
ISSN (Online) 2348 – 7968 | Impact Factor (2020) – 6.72
www.ijiset.com

Comparative Study on the Phytochemical and Mineral Composition Cucumis Sativus L. AND Cucumis Anguria L. (CUCUMBERS) From UBA.

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Abstract

The study was carried out to investigate and compare the phytochemicals and mineral composition of two species of cucumber: Cucumis sativus L. and Cucumis anguria L. The qualitative test of the phytochemicals was done using chemical method and the mineral composition was determined using atomic absorption spectrophotometer. The result revealed that both the spieces (C. sativus L. and C.angureia L.) contains tannins, saponins, alkaloids, flavonoids, glycosides, terpenoids and steroids. Tannins were found to be slightly positive in both the species, saponins, alkaloids and flavonoids were found to be moderately positive in C. sativus, while in C. anguria saponins and flavonoids were highly positive and alkaloids was slightly positive. Glycoside, tapinoids and steroids were observed to be highly positive in C. sativus , while in C. anguria were found to be slightly positive. This indicated that cucumber contain some major phytochemicals that inhibits the growth of microorganism thereby providing very effective source of drugs. This means cucumber could be used for the treatment of dysentery, diarrhea, typhoid, fever and hypertension. The result of the mineral composition showed that both the species contain the following minerals Fe, Zn, Ca, Mg, Na, Mn, Cu, K and P. All the minerals were found to be higher in C.sativus than C.anguria. This indicates that cucumber could also be a source of minerals in diet as well as drugs in pharmaceutical industries.

Key words: Cucumber, phytochemicals, Mineral, composition, investigation, Comparison, Diet, Drugs

Introduction

Medicinal plants are those plants which show antimicrobial, antifungal, antiviral or insecticidal activities. Medicinal plants have been used in traditional medicine practice since time immemorial. The plants are often cheaper, locally available and easily consumable raw as medicine (Rwarinda et al., 2016). The therapeutic efficiency of the drug used in this system are greatly depends on the use

of the proper and genuine raw materials. The screening of medicinal plant extracts and plant product for antimicrobial and antioxidant properties show that many of such plants are primary sources of antibiotic (Williams et al .,2019a).

The cucumber plant is a coarse prostrate annual creeping vine that grows up trellises or any other supporting frames, wrapping round ribbing with thin, spirally tendrils. The plant has large prickly, hairy triangular leaves that form a canopy over the fruit and yellow flowers which are mostly either male or female. The female flowers are recognized by the swollen ovary at the base which will become edible fruit (Cumber and Gherkins technical report, 2015).

Cumber is used as salad, pickle and also as cooked vegetables because of it low calorie content. Tender leaves are also used as vegetables. Fruits help in the cure of constipation, jaundice and indigestion. Seeds have a number of ayurvedic uses. The fruits and seeds possess cooling properties, hence used as astringent and anti-pyretic (Germplasm Resources Information Network, 2004).

They are widely used for various skin problems including swelling under the eyes and sunburn. It is believed that they promote refreshing, cooling, healing, soothing, and emollient and anti- itching effect to irritated skin. In Chinese folk medicine, leaves, stem and roots are generally used as anti-diarrheal, detoxicant and anti-gonorrheal agents (Willams et al., 2019a, 2019b)

Several phacological activities including the anti oxdant, anti-wrinkle, anti-microbial, antidiabetic and hypolipidemic potentials have reported with this plant. Anti hyaluronidase and anti-elastiase activities have proved for its cosmetic (Nema et al., 2011). Few bioactive compounds have been derived from this plant belonging to different chemical groups. (Aburjai and Natsheh , 2003).

Cucumber is an important agricultural crop not only because of its economic importance but also for the nutritional value of its vegetables, mainly due to the fact that they are an excellent sources of nutrient and phytochemicals. Cucumber is increasingly becoming important in health because of its micronutrients and phytochemical .It has an additional advantage of being low in calories which is very important in weight management. Therefore it is becoming a food of choice for many people.

Since the phytochemicals and mineral composition of plants varies not only with species but also with environmental condition in which they grow, it important to determine the phytochemicals and mineral composition of locally grown plants.

The purpose of this study is to determine the phytochemicals and mineral composition of cucumis Sativus L.and Cucumis anguria L. obtained in Uba Hong Local Government Area of Adamawa State.

Materials and methods

Sample collection

The fruits of cucumis Sativus L. and cucumis Anguria L. were collected from Uba Hong Local Government area of Adamawa State. The plants were identified and authenticated by a staff in the department of crop production, Adamawa State University Mubi.

Chemicals and reagents

All Chemical and reagents used were of analytical grade.

Sample preparation

The samples of cucumis Sativus L. and cucumis anguria L. collected were washed with ordinary water to remove dirt , dust and other contaminants. Furthermore the plant fruit were cut into pieces and allowed to dry. The plants samples were air dry in shade at room temperature (22 – 25^{o}C). The dried plant fruits were crushed and grinded in to powder and homogenized using laboratory blender. The powdered samples were sieved using 90 micron sieve and were kept in polyethylene bag separately for further processing (Hossen, 2003).

Sample extraction

Twenty gram each of the powdered samples was dissolved in 200 cm^{3} ethanol and water. It was allowed to stand for 24 hours and filtered. The filtrate was concentrated in oven at 80 ^{o}C (Hossen, 2003).

Qualitative determination of phytochemical composition

The extracts of C. Sativus L. and C.anguria L. were tested for the presence of phytochemicals such as alkaloids, flavonoids, terpenoid, steroids saponins, tannins and glycoside following the method adopted by Selvam (2007).

Determination of mineral Composition

The dried samples were weighed into crucible and placed in muffle furnace at room temperature and the temperature raise to 550^0C for 3 hours to complete ash. The ash was then dissolved in hot 10 % HNO_3, filtered and diluted to required volume in a standard flask with deionized water. This was used to determine the elemental composition using atomic absorption spectrophotometer (AAS) following the standard method of AOAC (2000).

Statistical Analysis

All determinations were replicated three times and results were reported in mean (±) standard deviation

Results and Discussion

The results of the phytochemical screening of chemical constituents of C. sativus L. and C.anguria L. were presented in table 1.While table2 shows the mineral composition of C. sativus L. and C.angureia L.

Table 1 qualitative phytochemical screening of C. sativus L. and C.angureia L.

Phytochemical	C. sativus	C.angureia
Tannins	+	+
Saponins	+ +	+ + +
Alkaloids	+ +	+
Flavonoids	+ +	+ + +
Glycocids	+ + +	+
Terpenoids	+ + +	+
Steroids	+ + +	+

+ = slightly positive, + + = moderately positive, + + + = highly positive

Table 2 Mineral composition of C. sativus L. and C.angureia L.

Mineral	C. sativus	C. anguria
Fe	0.322 ± 0.10	0.054 ± 0.04
Zn	0.689 ± 0.05	0.384 ± 0.01
Ca	29.6 ± 0.50	20.7 ± 0.10
Mg	134.8 ± 1.00	87.95 ± 0.15
Na	29.5 ± 1.00	20.65 ± 0.15
Mn	0.196 ± 0.10	0.033 ± 0.00
Cu	0.284 ± 0.15	0.046 ± 0.01
K	170.55 ± 0.15	100.3 ± 0.10
P	155.8 ± 0.10	97.9 ± 0.10

Phytochemicals

The result revealed that both the species (C. sativus L. and C.angureia L.) contains tannins, saponins, alkaloids, flavonoids, glycosides, terpenoids and steroids.

Tannins were found to be lightly positive in both species, saponins,alkaloids and flavonoids were found to be moderately positive in C. sativus, while in C. anguria saponins and flavonoids were highly positive and alkaloids was slightly positive. Glycoside, tapinoids and steroids were observed to be highly positive in C. sativus , while in C. anguria were found to be slightly positive. Similar thing was observed by Williams et al., (2019c)

Phytochemical analysis showed that both the species contain bioactive compound which had been reported to have antibacterioal potency and perhaps may have contributed to its antibacterial activity (Rwarinda et al., 2016). Flavonoids are known to be synthesized by plants in response to microbial infection. They have effective antibacterial activities in vitro against a wide array of microorganisms. Their activities are probably due to their ability to complex with extracellular and soluble proteins and also with bacterial cell (Hammer et al.,1999). The presence of tannins could also show that it is an astringent, helps in wound healing and anti-parasitic. Many human physiological activities such as stimulation of phagocytic cell, host – mediated tumor activity and a wide range of anti effection actions, have attributed to tannins. Their mode of action is too complex with proteins through nonspecific forces, such as hydrogen bonding as well as by covalent bond formation. They also complex with polysaccharides which are components of bacterial cell wall. Studies showed that tannins could be toxic to flilamentous fungi, yeast and bacteria. Thus, the mode of antibacterial action of these plants may be related to the ability of these bioactive constituents to inactivate microbial adhesins, enzymes and envelope d transport proteins (Schito, 2006).

Alkaloids are known for decreasing blood pressure and balancing the nervous system in case of mental illness (Prashant et al., 2011). The presence of terpenes suggests its possible use as anti-tumor and anti-viral agent as some terpenes are known to be cytotoxic to tumor cells. Some of the eudesmane (sesquiterpenes) has been reported to exhibit antibacterial properties possess anti-malaria properties; hence the cucumber may be a good source of anti-malaria (Tona et al., 2001). Fruits containing saponins are believed to have antioxidant, anti-cancer, anti- inflammatory, anti-viral and

anti-diarrheal this is the reason why cucumber can be used as medicine (Sharma et al., 2000; Sadique et al., 1978).

Mineral composition

Both the species contain the following minerals Fe, Zn, Ca, Mg , Na, Mn, Cu, K and P. All the minerals were found to be higher in C.sativus (0.322 ± 0.01, 0.689 ± 0.05, 29.60 ± 0.5, 134.8 ± 1.0, 29.5± 1.0, 0.196 ± 0.1, 0.284 ± 0.15, 170.55± 0.15 and 155.8 ± 0.1 for Fe, Zn, Ca, Mg , Na, Mn, Cu, K and P respectively) than in C. anguria (0.054 ± 0.04, 0.384 ± 0.00, 20.7 ± 0.1, 87.95 ± 0.15, 20.65± 0.15, 0.033± 0.00, 0.046 ± 0.00, 100.3 ± 0.1 and 97.9 ± 0.1 Fe, Zn, Ca, Mg , Na, Mn, Cu, K and P respectively).

Iron is an essential element for blood production. About 70 percent of human body's iron is found in the red blood cells called hemoglobin and in muscle cells called myoglobin. Iron is an important component of hemoglobin, the substance in red blood cells that carries oxygen from the lungs to transport it throughout the body. If the body doesn't have enough iron, it can't make enough healthy oxygen-carrying red blood cells. A lack of red blood cells is called iron deficiency anemia. It also serves as micronutrient (Abbaspour *et al.,* 2014; Ware 2018). Hence cucumber can serve as a source of Fe supplement for the body.

Calcium plays an important role in building and maintaining strong bones and teeth, large part of human blood and extracellular fluids. Approximately 99% of the body calcium is stored in the bones and teeth (Oyvind and Kenneth, 2006). The studied cucumber (C. sativus and C.anguria*)* is essential in building up the level of calcium in the body.

Magnesium is an important mineral element in connection with circulatory diseases such as heart disease (Nwauzoma and Dawari 2013).

Sodium helps in the maintenance of normal acid-base balance. It plays an important role in maintaining the water balance within the cells and in the function of both muscles and nerve impulse. An adult need about 3 g per day of sodium but modern dietary habits take in 5 – 20 g per day (Quilly et al., 2017).

Copper is an essential trace element in human body and exist as an integral part of copper proteins. Ceruloplasmin is concerned with the release of Iron from the cells into the plasma and is involved in energy metabolism (Timothy, 2019). The presence of copper, Zinc and manganese indicates that cucumber is essential for immune function (Shivery and Sofora 2009).

Conclusion

In this study the phytochemicals and mineral composition of two species of cucumber: Cucumis sativus L. and Cucumis anguria L. were investigate and compared. The result revealed that both the spieces (C. sativus L. and C.angureia L.) contains tannins, saponins, alkaloids, flavonoids, glycosides, terpenoids and steroids. Tannins were found to be slightly positive in both the species, saponins, alkaloids and flavonoids were found to be moderately positive in C. sativus, while in C. anguria saponins and flavonoids were highly positive and alkaloids was slightly positive. Glycoside, tapinoids and steroids were observed to be highly positive in C. sativus , while in C. anguria were found to be slightly positive. This indicated that cucumber contain some major phytochemicals that inhibits the growth of microorganism thereby providing very effective source of drugs. Also the result of the mineral composition analysis showed that both the species contain the following minerals Fe, Zn, Ca, Mg, Na, Mn, Cu, K and P. All the minerals were found to be higher in C.sativus than C.anguria. This indicates that cucumber could also be a source of minerals in diet.

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