

Phytochemical Analysis of *Daucus Carota* and *Zingiber officinale* Samples Collected from Gwarimpa Abuja Nigeria

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To cite this article:

Abdulrasheed Hadiza Haruna, Akilu Mariya, Mohammed Mairo. Phytochemical Analysis of *Daucus Carota* and *Zingiber officinale* Samples Collected from Gwarimpa Abuja Nigeria. *Journal of Diseases and Medicinal Plants*. Vol. 6, No. 2, 2020, pp. 45-49.

doi: 10.11648/j.jdmp.20200602.13

Received: June 24, 2020; Accepted: July 20, 2020; Published: July 28, 2020

Abstract: This study aims at determining the phytochemical potentials of *Daucus carota* and *Zingiber officinale* collected from a location in Abuja, FCT. Standard laboratory procedures were employed to achieve the objectives. To ascertain the presence of phytochemical components which may be responsible for the healing and ethno-medicinal properties, a qualitative and quantitative screening of the extracts of the sampled plants was conducted. *Daucus carota* and *Zingiber officinale* were collected from Kado Bimko market, Gwarimpa, Abuja in October, 2016. Vegetable samples were washed, chopped into uniform sizes and dehydrated into powder form in preparation for further analysis. The phytochemical screening of chemical constituents of the vegetable extracts were carried out to confirm if they contain some notable phytochemicals in them, the result obtained showed some differences in the two samples tested, tannins, alkaloids, flavonoids, Terpenes, steroids, Anthraquinones, and resins were present in zingiber officinale sample while daucus carota showed presence of tannins, saponins, flavonoids, glycosides, terpenes, steroids, phenols, and resins. The presence of these important plant constituents suggests that these vegetables could be potential sources of phytochemicals, which are responsible for their curative and healing properties. This however confirms that they can be used in drug development and treatment and management of various diseases in Nigeria.

Keywords: Phytochemicals, *Daucus carota*, *Zingiber officinale*, Phytomedicine

1. Introduction

Phytochemical is a broad term meaning plant (phyto) chemical referring to a wide variety of compounds that occur naturally in plants. It has been demonstrated that fruits, vegetables and grains exert a protective effect against the development of chronic diseases [20, 11, 9, 10] This protective role can be mainly attributed to the phytochemicals in them, which are defined as bioactive non-nutrient compounds in fruits, vegetables, grains, and other plants [19]. So far, about 10,000 phytochemicals have been identified, and still a large percentage remains unknown. These identified phytochemicals include tannins, flavones, terpenoids, steroids, saponins, and alkaloids [3]. According to world health organization [18], up to 80% of the world's

population in underdeveloped countries relies on traditional medicine practices for their primary health care needs [18]. Traditional medicines have been accorded greater acceptance in Africa because of unavailability, unwanted side effects and high costs associated with orthodox medicines, inadequate health facilities and healthcare professionals coupled with inadequate training of health workers [14]. The search for new plant derived chemicals to replace synthetic drugs should thus be a priority in future efforts towards sustainable development [1].

Ginger (*Zingiber officinale*) is a flowering plant whose rhizome, ginger root is widely used as a spice or a folk medicine. It grown mostly in Kaduna, Gombe, Bauchi, Benue, Nassarawa, states of Nigeria. It has been used for over 2000 years for treating diabetes, High blood pressure, cancer, fitness and many other illnesses [2]. The consumption

of ginger led to reduction in blood cholesterol and also served as a potential anti inflammatory and antithrombotic agent [12]. Some health benefits of ginger include: antimicrobial, anti-ulcer, anti-cholinergic, antioxidant, anti-inflammatory, anti-cramp, anti-rheumatic and analgesic properties. It improves blood circulation, helps with cholesterol regulation and hypotensive properties [6].

Carrot (*Daucus carota*) is a root vegetable, usually orange in colour, though purple, black, red, white, and yellow cultivars exist [15]. They are widely cultivated in the northern parts of Nigeria in Zaria, Sokoto, Kano, and Plateau states. Carrots are a domesticated form of the wild carrot, native to Europe and south-western Asia. The plant probably originated in Persia and was originally cultivated for its leaves and seeds. Most of the benefits of carrots can be attributed to their beta-carotene and fibre content. According to the USDA nutrient data, these root vegetables are also a good source of antioxidants, potassium, vitamin K, vitamin C, niacin, and vitamin [17, 7]. Has shown that the presence of α - and β -carotene in blood has a protective effect against atherosclerosis. [13] has demonstrated that high carotenoid diets are associated with a reduced risk of heart disease. The main physiological function of carotenoids is as precursor of vitamin A [13] Carotenoids also act as free-radical scavengers and are very important for health [4, 5].

2. Materials and Methods

2.1. Plant Materials

Fresh carrots (*Daucus carota*) and ginger (*Zingiber officinale*) used for this study were collected from Kado-Bimko market, Gwarimpa Abuja.

2.2. Sample Preparation

The Carrots and Ginger were washed under running tap water, chopped into uniform sizes and dried in an oven at 60° celcius until adequately dehydrated. With the aid of mortar, pestle, miller, grinder, these plant parts were homogenized to fine powder and stored in airtight bottles or containers for phytochemical analysis.

2.3. Extraction of Plant Materials

The plant samples were macerated separately in Ethanol (solvent) for 24 hours. After which it was filtered using suction filtration. The filtrate of each sample was further concentrated using the Rotary Evaporator at reduced temperature and pressure. The concentrated extracts were finally dried on the water bath and transferred to sample bottles for further analysis.

2.4. Preliminary Phytochemical Screening of Different Extracts Samples

Chemical tests for the screening and identification of bioactive chemical constituents in the plant extracted were

carried out using standard procedure.

2.4.1. Test for Tannins

3g of the powdered samples were boiled in 50ml of distilled water for 1 minute on a hot plate. The mixture was filtered and the resulting filtrate was used to carry out the following test for tannins.

i. Lead Sub-Acetate Test

To 1ml of the extract, 3 drops of lead sub-acetate solution was added. Production of brown precipitate indicates the presence of tannins.

ii. Ferric Ammonium Citrate Test

To 1ml of the water extract, 0.25% ferric ammonium citrate solution. To the mixture, sufficient solid sodium acetate was added to adjust the solution of pH 8 using an indicator paper. This was boiled on a water bath and filtered. A dark green precipitate indicates the presence of tannins.

2.4.2. Test for Saponins

i. Froth Test

To a small quantity of the powdered sample, 95% ethanol was added and boiled. The mixture was filtered and 2.5ml of the filtrate was added to 10ml of diluted water in a test tube. The test tube was stoppered and shaken vigorously for about 30 seconds. It was then allowed to stand for half an hour. Persistent homogenous froth is indicative of the presence of saponins.

ii. Fehling's Solution Test

To 2ml of the samples extract, an equal amount of Fehling's solution. A bluish-green precipitate shows the presence of saponin glycoside.

2.4.3. Test for Alkaloids

An extract was prepared by macerating 3g of the powdered samples in 50ml methanol. The extract was evaporated to dryness. 0.5g of the residue was mixed with 10ml of the 1% aqueous hydrochloric acid on a water bath.

1ml each of the filtrate was treated with a few drops of the following reagents:

1. Mayer's reagent (potassium mercuric iodine solution)
2. Dragendorff's reagent (potassium bismuth iodine solution)
3. Wagner's reagent (solution of iodine in potassium iodide)
4. 10% tannic acid solution (a solution of picric acid)

Turbidity or precipitation with all of these reagents is indicative of the presence of alkaloids in the extract.

2.4.4. Test for Flavonoids

5g of the powdered sample was completely de-tanned with acetone. The residue was extracted in warm water after evaporating the acetone on a water bath. The mixture was filtered and the filtrate was used for the following tests:

1. Sodium Hydroxide Test

5ml of 10% sodium hydroxide was added to an equal volume of the de-tanned water extract. A yellow solution indicates the presence of flavonoids.

2. Shinoda Test

0.5g of the powdered sample was extracted in ethanol by boiling on a water bath for 5 minutes, filtered and cooled. To the filtrate was added four pieces of magnesium filing followed by a few drops of concentrated hydrochloric acid. A pink or red color indicates the presence of flavonoids [8].

3. Amyl Alcohol Test

3g of the powdered sample was macerated in 50ml of 1% hydrochloric acid and filtered. The filtrate was used for the following tests:

4. 4ml of the filtrate was shaken with 5ml of amyl alcohol. Production of a yellow color indicates the presence of free flavonoid aglycones.
5. 10ml of the filtrate was shaken with 7ml of amyl alcohol and the mixture was transferred into a separating funnel. The amyl alcohol layer was discarded and the aqueous layer boiled with 10ml of 10% hydrochloric acid for 2 minutes. The acidic solution was cooled and divided into two portions. The first portion was shaken with amyl alcohol. Production of a yellow color indicates the presence of combined flavonoid. To the second portion, magnesium turning were added and the color of the solution was observed. Production of a red color indicates the presence of flavanone and flavonol glycoside.

2.4.5. Test for Glycosides

i. Test for Cardiac Glycosides

0.5g of the powdered sample was boiled with 10ml of 95% alcohol for 2 minutes. The resulting mixture was filtered and cooled. The filtrate was diluted with water and three drops of strong solution of lead sub-acetate was added. This was mixed thoroughly and filtered. The filtrate divided into two portions; one portion was kept for further test and the other portion was extracted with 5ml of chloroform in a separating funnel. The lower chloroform layer was divided into two evaporating dishes, evaporated to dryness and used for the following tests:

ii. Keller-killani Test for Deoxy Sugars

One of the chloroform residues was dissolved in 1ml of glacial acetic acid containing a trace of ferric chloride solution. The mixture was carefully poured on the surface of 1ml of Sulphuric acid already contained in a test tube to form a separate layer. A reddish-brown color at the interface of the liquid indicates the presence of digitoxase.

iii. Legal Test for Cardenolide Aglycone

The second chloroform residue was dissolved in a few drops of pyridine and a few drops of 20% sodium hydroxide was added. A deep red color indicates the presence of cardenolide aglycone [16].

iv. Kedde Test for Free or Combined Cardenolide Aglycone

The reserved filtrate was treated with 1ml of 2% solution of 3, 5 dinitrobenzoic acid in alcohol. The solution was made alkaline with 5% sodium hydroxide. A purple-blue color indicates the presence of the free or combined cardenolide aglycone. [16]

2.4.6. Test for Terpenes and Sterols

5g of the powdered sample was extracted by the maceration with 50ml of ethanol (95%), filtered and the filtrate was evaporated to dryness. The residue was dissolved in 10ml of anhydrous chloroform and then filtered. The filtrate was divided into two equal portions and the following tests were carried out.

i. Liebermann-Burchard Test

The first portion of the chloroform solution from the above was mixed with 2ml of acetic anhydride, followed by the addition of 1ml of concentrated Sulphuric acid down the wall of the test tube to form a lower layer. The formation of reddish-violet colour at the junction of the two liquids and a green colour in the chloroform layer indicates the presence of terpenes.

ii. Salkowski's Test

The second portion of the solution was mixed with 2ml of concentrated Sulphuric acid carefully so that the acid forms a lower layer. A reddish-brown color at the interface indicates the presence of a steroid.

2.4.7. Test for Resins

15ml of petroleum ether extract was made using 0.1g of the powdered sample and filtered into a test tube. An equal volume of copper acetate solution was added and shaken vigorously then allowed to separate. A green color indicates the presence of resins.

2.4.8. Tests for Anthraquinones Derivatives

Borntrager's Tests (To show for the presence of free and/or combined anthraquinones):

0.5g of the powdered sample was boiled with 10ml of 10% hydrochloric acid for 2 minutes. The extract was filtered. To the filtrate, an equal volume of chloroform was added, the test tube was inverted a couple of times avoiding vigorous shaking. The solution was transferred into a separating funnel and the two layers were allowed to separate. The lower chloroform layer was poured into a clean test tube and the ammonia solution was added shaken. The two layers were again allowed to separate. A bright pink color in the upper aqueous layer indicates the presence of free and/or combined anthraquinones.

3. Results

3.1. Phytochemical Screening

The results of the phytochemical screening of the plant samples were studied, analyzed and presented in Tables 1 and 2.

3.2. Phytochemical Screening of *Zingiber officinale* Samples

Table 1 shows all the metabolites that were tested for in this sample. Negative signifies absence of while positive signifies presence of particular constituents or metabolites. *Zingiber officinale* showed presence of Alkaloids, Tannins, Flavonoids, Terpenes, Steroids, Resins and Anthraquinones and absence of Phenols, Glycosides and Saponins.

Table 1. Phytochemical Screening of *Zingiber officinale* Samples.

Parameters tested	Ginger (<i>Zingiber officinale</i>)
Tannins	+
Saponins	-
Alkaloids	+
Flavonoids	+
Glycosides	-
Terpenes	+
Steroids	+
Phenols	-
Resins	+
Anthraquinones	+

KEY: + Positive, - Negative.

3.3. Phytochemical Screening of *Daucus Carota* Samples

Table 2 shows all the metabolites that were tested for this sample. Negative signifies absence of while positive signifies presence of particular constituents or metabolites. *Daucus carota* showed presence of Saponins, Glycosides, Tannins, Flavonoids, Steroids, Resins and Phenols and showed absence of Anthraquinones and Alkaloids.

Table 2. Phytochemical Screening of *Daucus carota* Samples.

Parameters tested	Carrots (<i>Daucus carota</i>)
Tannins	+
Saponins	+
Alkaloids	-
Flavonoids	+
Glycosides	+
Terpenes	+
Steroids	+
Phenols	+
Resins	+
Anthraquinones	-

KEY: + Positive, - Negative.

4. Conclusion

In the present study, the result of phytochemical screening of all samples analysed were found to contain notable constituents of medicinal importance. Both samples showed presence of Tannins, Steroids, Resin, and Flavonoids. The therapeutic effects of these medicinal plants can justifiably be attributed to, among others, the flavonoids, alkaloids, steroids, terpenes, phenols, anthraquinones, tannins, and saponins present. It could therefore be inferred that these secondary metabolites contain bioactive constituents and medicinal properties which can be effective nutraceuticals and as natural supplements.

References

- [1] Abdulrasheed, H. H, Mohammed M. Akilu, M. Phytochemical analysis of *Telfaria occidentalis* and *Ocimum gratissimum* samples collected from Gwarimpa-Abuja, Nigeria.
- [2] B. Tepe, M. Sokmen, H. A. Akpulat, and A. Sokmen, "Screening of the antioxidant potentials of six *Salvia* species from Turkey," Food Chemistry, vol. 95, no. 2, pp. 200–204, 2006. View at Publisher • View at Google Scholar View at Scopus.
- [3] Barbosa A., Silveira G. D., de Menezes I., Neto J., Bitencurt J., Estavam C. D., de Lima A., Thomazzi S. M., Guimaraes A. G., Quintans L. J., et al. Antidiabetic effect of the *Chrysobalanus icaco* L. Aqueous extract in rats. J. Med. Food. 2013; 16: 538–543. doi: 10.1089/jmf.2012.0084. [PubMed] [CrossRef] [Google Scholar].
- [4] Bast A, Van den Berg H, Van der Plas RM, Haenen GRM. β -Carotene as antioxidant. Eur J Clin Nutr. 1996; 50: 554–556. [Google Scholar].
- [5] Bramley P. Is lycopene is beneficial to human health. Phytochem. 2000; 51: 233–236.
- [6] Chinedu I, Jivini S Z. Medicinal Properties of Ginger and Garlic: A Review. Curr Trends Biomedical Eng & Biosci. 2019; 18 (2): 555985. DOI: 10.19080/CTBEB.2019.18.555985).
- [7] D'Odorico A, Martines D, Kiechl D, Egger G, Oberhollenzer B, Bonvicini P, Sturniolo GC, Naccarato R, Willeit J. High plasma levels of alpha- and beta-carotene are associated with a lower risk of atherosclerosis—results from the bruneck study. Atherosclerosis. 2000; 153: 231–239. [PubMed] [Google Scholar].
- [8] Geissmann, T. A.: The Chemistry of Flavonoid Compounds; Pergamon Press, Oxford, London, New York, Paris; 1962; VIII.
- [9] Kruk J. Association between vegetable, fruit and carbohydrate intake and breast cancer risk in relation to physical activity. Asian Pac. J. Cancer Prev. 2014; 15: 4429–4436. doi: 10.7314/APJCP.2014.15.11.4429. [PubMed] [CrossRef] [Google Scholar].
- [10] Kyro C., Skeie G., Loft S., Landberg R., Christensen J., Lund E., Nilsson L. M., Palmqvist R., Tjonneland A., Olsen A. Intake of whole grains from different cereal and food sources and incidence of colorectal cancer in the Scandinavian HELGA cohort. Cancer Causes Control. 2013; 24: 1363–1374. doi: 10.1007/s10552-013-0215-z. [PubMed] [CrossRef] [Google Scholar].
- [11] Mursu J., Virtanen J. K., Tuomainen T. P., Nurmi T., Voutilainen S. Intake of fruit, berries, and vegetables and risk of type 2 diabetes in Finnish men: The kuopio ischaemic heart disease risk factor study. Am. J. Clin. Nutr. 2014; 9: 328–333. doi: 10.3945/ajcn.113.069641. [PubMed] [CrossRef] [Google Scholar].
- [12] M. Yoshikawa, S. Hatakeyama, N. Chatani, Y. Nishino, and J. Yamahara, "Qualitative and quantitative analysis of bioactive principles in *Zingiberis* rhizoma by means of high performance liquid chromatography and gas liquid chromatography. On the evaluation of *Zingiberis* Rhizoma and chemical change of constituents during *Zingiberis* rhizoma processing," Yakugaku Zasshi, vol. 113, no. 4, pp. 307–315, 1993. View at Google Scholar View at Scopus.
- [13] Nocolle C, Cardinault N, Aprikian O, Busserolles J, Grolier P, Rock E, Demigne C, Mazur A, Scalbert A, Amouroux P, Remesy C. Effect of carrot intake on cholesterol metabolism and antioxidant status in cholesterol fed rats. Eur J Nutr. 2003; 42: 254–261. [PubMed] [Google Scholar].
- [14] Piero NM, Njagi MJ, Kibiti MC, Ngeranwa JJN, Njagi NM, et al., 2012. Herbal management of diabetes mellitus: A rapidly expanding research avenue. International Journal of Current Pharmaceutical Research. 2012; 4: 1-4.

- [15] Sifferlin, Alexandra. "Eat This Now: Rainbow Carrots". Time. Retrieved 27 January 2018.
- [16] Sofowora, A., 1993. Medicinal Plants and Traditional Medicine in Africa. 2nd Edn. Spectrum Books Ltd., Ibadan, Nigeria, ISBN-13: 9782462195, Pages: 289.
- [17] USDA, 2019. "Carrots, raw". Vegetables and vegetable products. U.S. Department of Agriculture, Agricultural Research Services. 4/1/2019. <https://fdc.nal.usda.gov/fdc-app.html#/food-details/170393/nutrients>
- [18] World Health Organisation (WHO), 2001. Geneva Legal Status of Traditional Medicine and Complementary/Alternative Medicine: A Worldwide Review. World Health Organisation, Geneva, pp: 129-143.
- [19] Wang L. F., Chen J. Y., Xie H. H., Ju X. R., Liu R. H. Phytochemical profiles and antioxidant activity of adlay varieties. J. Agric. Food Chem. 2013; 61: 5103–5113. doi: 10.1021/jf400556s.[PubMed] [CrossRef] [Google Scholar].
- [20] Yamada T., Hayasaka S., Shibata Y., Ojima T., Saegusa T., Gotoh T., Ishikawa S., Nakamura Y., Kayaba K. Frequency of citrus fruit intake is associated with the incidence of cardiovascular disease: The Jichi Medical School cohort study. J. Epidemiol. 2011; 21: 169–175. doi: 10.2188/jea.JE20100084. [PMC free article][PubMed] [CrossRef] [Google Scholar].
- [21] (<https://ndb.nal.usda.gov/ndb/foods/show/11124>).