

Comparative studies of the phytochemistry, proximate analysis, mineral and vitamin compositions of the methanol leaf extracts of *Cucumis sativus L.* and *Daucus carota L.*

Essien, Augustine Dick^{*1}, Ogbonna, Onyemaechi John¹, Abe, Pierre Noa¹, Nnaoma, Ikenna Elvis² and Omoregha, Charles Uwaifiokun¹

¹Department of Pharmacology, Faculty of Basic Medical Sciences, University of Calabar, Calabar, Cross River State, Nigeria

²Department of Pharmaceutical Technology, Federal Polytechnic, Nekede, Owerri, Imo State, Nigeria

Corresponding author*

Essien, Augustine Dick

Department of Pharmacology,

Faculty of Basic Medical Sciences,

University of Calabar, Calabar, Cross River State, Nigeria

E-mail: onyemajohn59@gmail.com

Abstract

Cucumis sativus and *Daucus carota* are medicinal plants used in folkloric medicine to treat and prevent various diseases but the basis for this has not been highlighted. Quantitative phytochemical analysis revealed the presence of anthocyanins, flavonoids, carotenoids and pyrrolidine in *D. carota* leaf methanol extract but in *C. sativus* only flavonoids and carotenoids was found present although in a lower amounts. Proximate analysis revealed that both plants methanol leaf extracts contain moisture, protein, carbohydrate, fat, fiber and ash. The moisture content of *C. sativus* ($95 \pm 0.02\%$) was more than that of *D. Carota* ($82.20 \pm 0.01\%$) but the protein, carbohydrate, fat, ash and fiber contents of *D. Carota* was more than that of *C. sativus*. The mineral compositions also revealed the presence of Ca, P, Mg, Fe, Zn, Na, and K in both *C. sativus* and *D. carota* although in various proportions. The P, Ca, Mg, Fe and Na contents in *D. carota* were more than that of *C. Sativus*, but *C. sativus* has a higher Zn and K contents than *D. carota*. The vitamin analysis also revealed the presence of important vitamins including A, B₁, B₂, B₆, C, E, niacin and folate. The vitamin A content of *D. carota* were very high ($2,901 \pm 0.02\mu\text{g}$) compared to that of *C. Sativus* ($23 \pm 0.01\mu\text{g}$). These important macroelements, minerals and vitamins embedded in these important plants may be the reasons behind its use in folklore medicine for its various dietary and therapeutic applications.

Keywords: *Cucumis sativus*, *Daucus carota*, Phytochemistry, Proximates, Minerals, Vitamins, Methanol.

1. Introduction

The usage of medicinal plants presents a very important aspect of the traditional medicine which is imbedded in the culture of people of developing countries [1, 2]. In many developing countries, medicinal plants have not been well studied, tested or documented [2] most of the information is still in the hands of traditional healers and knowledge of healers is either lost or passed to next generation by the word of mouth [2,3]. But presently, the basis for the healing power of this plant is not fully elucidated.

Daucus carota (carrot) is a biennial root vegetable with varieties of colours, with a crisp texture when fresh [4]. The most eaten part of the vegetable is the taproot, although the greens are eaten sometimes. This vegetable originated from Persia (now Iran and Afghanistan) but is grown almost in every part of the world now. Carrot seeds have been found in Switzerland and southern Germany dating to 2000 -3000 BC [5]. Poly acetylenes is embedded in Apiaceae vegetables like carrot and show cytotoxic activities [4,6,7], and antifungal activity [4]. Falcarindiol is responsible for the bitter nature of the carrot. Beta-carotene found in carrot are responsible for its bright - orange colour and are metabolized to vitamin A [4,8,9]. Carrot is one of the ten most economically important vegetable crops in the world [4,10]. It has anti-bacterial and anti-fungicidal properties and oil made from its seeds can help control scalp itchiness and provides essential nutrient for hair growth [11,12] and also serve as natural food colorants especially the black carrot [11]. *D. carota* are very useful in diseases of the retina and of the eyes in general [13].

Cucumis sativus linn (cucumber) belongs to the family of Cucurbitaceae that includes more than 800 species that is distributed across tropical and subtropical regions [14,15]. It is an annual climber that can grow up to 2M (6ft 7 in), the plant has large leaves that form a canopy over the fruit. Cucumber can be used to reduce puffiness of the eyes and also serves as skin conditioner and emollient [13], the plant have been evaluated for a wide spectrum of activities including diuretic, Antihyperglycemic, antioxidant, amyolytic, and anti-cancer and analgesic activities using various in- vitro and in-

vivo models [16-23]. But the pharmacological basis for this happenings in this two plants has not been elucidated hence this study.

2. Materials and methods

The leaf samples of the two plants were harvested from a farm in Uhuokwu village in Oriendu Autonomous community, Ohuhu Umuhia North Local Government Area of Abia State, Nigeria. The plant samples were identified by a plant Taxonomist from Botany Department of the University of Calabar as *Cucumis sativus* and *Daucus carota*. The plant leaf samples were washed and shade dried at room temperature for 2 weeks. The dried sample were crushed into powder and extracted using methods described previously by [24- 27]. The resultant dried extracts were labeled and stored in the refrigerator at 4 °C and used for the rest of the study.

2.1 Statistical analysis

The results obtained were expressed as Mean \pm standard deviation (S.D) of three determinations.

3. Results

Table 1: Quantitative phytochemical results of *Cucumis sativus L.* and *Daucus carota L.* Methanol Leaf Extract (mg/kg)

Constituents	<i>Cucumis sativus</i>	<i>Daucus carota</i>
Phenols (Anthocyanins)	2.20 \pm 0.02	1000.20 \pm 0.22
Flavonoids	10.20 \pm 0.01	14.30 \pm 0.21
Carotenoids	2.60 \pm 0.01	191.10 \pm 0.21
Pyrrolidine	-	2.01 \pm 0.01
Alkaloid	0.34 \pm 0.02	-
Tannin	0.22 \pm 0.02	-
Terpenes	3.10 \pm 0.02	-

The values presented in this table are on dry weight basis. The values are Mean \pm S.D of three determinations

Table 2: proximate compositions of *Cucumis Sativus L.* and *Daucus carota L.* Methanol leaf Extracts (%)

Constituents	<i>Cucumis sativus</i>	<i>Daucus carota</i>
Moisture	95.00 \pm 0.02	82.20 \pm 0.01
Protein	0.82 \pm 0.02	0.98 \pm 0.02
Carbohydrate	2.01 \pm 0.01	7.10 \pm 0.02
Total fat	0.12 \pm 0.02	0.19 \pm 0.01
Saturated fat	0.03 \pm 0.02	0.03 \pm 0.02
Ash	0.53 \pm 0.02	0.66 \pm 0.01
Fiber	0.99 \pm 0.01	2.99 \pm 0.01

The values presented in this table are on dry weight basis. The values are Mean \pm S.D of three determinations

Table 3: Mineral Compositions of the Leaf Methanol Extracts of *Cucumis sativus L.* and *Daucus carota L.* (Mg/Kg)

Constituents	<i>Cucumis sativus</i>	<i>Daucus carota</i>
Calcium	15.00 \pm 0.01	23.10 \pm 0.01
Phosphorus	23.00 \pm 0.01	43.20 \pm 0.01
Magnesium	13.00 \pm 0.02	18.10 \pm 0.01
Iron	0.32 \pm 0.01	0.72 \pm 0.01
Zinc	0.30 \pm 0.02	0.22 \pm 0.02
Sodium	3.00 \pm 0.02	36.00 \pm 0.01
Potassium	148.00 \pm 0.02	52.10 \pm 0.02

The values presented in this table are on dry weight basis. The values are Mean \pm S.D of three determinations

Table 4: Vitamin Compositions of the Leaf Methanol Extracts of *Cucumis sativus L.* and *Daucus carota L.* (Mg/Kg)

Constituents	<i>Cucumis sativus</i>	<i>Daucus carota</i>
Vitamin A	23.00 \pm 0.01 μ g	2,901.100 \pm 0.02 μ g
Vitamin B ₁	0.03 \pm 0.01	0.099 \pm 0.02
Vitamin B ₂	0.03 \pm 0.02	0.063 \pm 0.02
Vitamin B ₆	0.44 \pm 0.01	0.210 \pm 0.01
Vitamin C	6.11 \pm 0.02	9.210 \pm 0.01
Vitamin E	0.09 \pm 0.01	0.440 \pm 0.02
Niacin	0.41 \pm 0.01	1.220 \pm 0.01
Folate	15.00 \pm 0.02 μ g	13.00 \pm 0.01 μ g

The values presented in this table are on dry weight basis. The values are Mean \pm S.D of three determinations

4. Discussion

Cucumis sativus are among the most water rich foods and contain protein (0.82%), carbohydrate (2.01%) and fat (saturated 0.03% and total 0.12%), and contain small amounts of provitamin A, vitamins B, C and E, its high dietary and therapeutic value is embedded in their minerals which are highly alkaline. They contain potassium in high amount (148mg), calcium, phosphorus, sodium, magnesium, iron and various trace elements most notably sulphur in smaller amounts. The high amount of water help facilitate the elimination of waste substances from the bloodstream through urine or skin and also facilitate the movement of faeces through the intestine, they hydrate the skin and provide the sulphur needed for the healthy skin cells, nails and hairs. *C. sativus* are also effective beauty treatment [11].

Daucus carota contain protein, carbohydrate and fat. They also contain numerous minerals and vitamins including calcium, phosphorus, magnesium, iron, zinc, and sodium also contain vitamins including C, A, B₁, B₂, B₆, E, niacin and folate. These plants leaf also contain carotenoids and among the most notable is beta-carotene which the body transforms into vitamin A. Carotenoids are essential for the proper functioning of the retina for night vision or in low light situation, they also help to maintain the skin and mucosa in good state and prevent cancer, gastric acid and colitis [13]. *D. carota* also contain anthocyanins in black carrot extract and provide many health benefits with antioxidant properties [11], and may also be useful in cancer treatment and may counteract toxins that can damage healthy cells during chemotherapy [11,12]. These macromolecules, minerals, and vitamins may be the reason for the plant use in traditional medicine in the treatment and prevention of various diseases.

5. Conclusion

Cucumis Sativus L., and *Daucus Carota* are two very important plants that is cultivated in tropical and subtropical regions. Our work has elaborated that this important plants may contain many important Phytochemicals, macro and micro elements, minerals and vitamins, and these important constituents may be the reasons behind its use in the treatment and prevention of many diseases in traditional medicine.

Acknowledgement

The authors are grateful to all staff of the Department of Pharmacology, University of Calabar, Cross River State, Nigeria for their technical assistance.

Conflict of interest

The authors declare that there was no conflict of interest regarding the publication of this paper.

References

- [1] Kloucek, P., Polesny, Z., Svobodova, B., Vlkova, E., Kokoska, L. Antimicrobial screening of some peruvian medicinal plants used in Calleria District. *J. Ethno Pharmacology* 2005; 99:309-312.
- [2] Amiri, M.S and Joharchi, M.R. Ethno-botanical investigation of traditional medicinal plants commercialized in the markets of Mashhad, Iran. *Avicenna journal of Phytomedicine* 2013; 3(3): 254-271.
- [3] Yirga, G. "Assessment of traditional medicinal plants in Endrta District, Southeastern Tigray, Northern Ethiopia" *J. Med Plants Res.* 2010; 4: 255-260.
- [4] *Daucus carota* - Wikipedia, the free encyclopedia. Available from url https://en.wikipedia.org/wiki/Daucus_carota
- [5] Robatsky, et al (1999), p.6
- [6] Zidorn, C., Johrer, K., Ganzera, M., Schubert, B., Sigmund, E. M, Mader, J., Greil, R., Ellmerer, E.P., Stuppner, H. Polyacetyleness from the Apiaceas vegetables carrot, celery, fennel, parsley and parsnip and their cytotoxic activities. *Journal of Agricultural and food Chemistry* 2005; 53 (7): 2518- 2523.
- [7] Baranska, M., Schulz, H., Baranski, R., Nothnagel, T and Christensen, L.P. In situ simultaneous analysis of polyacetylenes, carotenoids and polysaccharides in carrot roots. *Journal of Agricultural and food Chemistry* 2005; 53(17):6565-6571.
- [8] Strube, M., Ove Dragsted, L. Naturally occurring antitumourigens IV carotenoids Except beta- carotene- Copenhagen: Nordic council of ministers, 1999; P 48.
- [9] Novotny, J.A., Dueker, S.R., Zech, L.A, Clifford A.J. Compartmental analysis of the Dynamics of B- carotene metabolism in an adult volunteer. *Journal of lipid research* 1995; 38(8): 1825-1838
- [10] Simon et al (2008). P.327
- [11] World Carrot Museum: Discover the power of carrots, the black carrot, pp1-3
- [12] Jeremy, C., Emmanuel, G., Eric, L., Mathilds, B., Didier, P. Carotenoid biosynthesis genes provide evidence of geographical subdivision and extensive linkage disequilibrium in the carrot. *Springer-Verlag* 2010; 121: 659-672.

- [13] Pamplona- Roger, G. M. Encyclopedia of foods and their healing power: A guide to food science and diet therapy. Education and Health library, Hang Tai Printing Co.Ltd. Hong Kong, 2005; 24-25.
- [14] Adnane, B., Sebastien, F., Christelle, T., Pascal, A., Anish, P.K,K.,Manash, C., Abdullah, A.W., Monther, T.S, Mahmoud, A.W., Abdullah, A.A., Abdelhafid, B. Development of a Cucumis sativus TillinG platform for forward and Reverse Genetics. *PLOS ONE* 2014; 9 (5):e97963.
- [15] Jeffrey. C. Systematics of the Cucurbitaceae: and Overview. In Bates DM RW, Jeffrey, C., editor Biology and Utilization of the Cucurbitaceae. New York, U.S.A: Cornell University 1990; 3-9.
- [16] Pradhan D., Biswasroy, P., Singh, G., and Suri, K.A. Anti- ulcerogenic activity of Ethanolic extract of Cucumis sativus L. against NSAID (aspirin) induced Gastric Ulcer in wistar albino rats. *International Journal of Herbal Medicine* 2013; 1 (3): 115-119.
- [17] Gill, N.S., Bajwa, J., Sharma, P., Dhiman, K., Sood, S., Sharma, P.D et al. Evaluation of antioxidants and antiulcer activity of traditionally consumed Cucumis melo seeds. *J pharmacol Toxicol* 2011; 6: 82-89.
- [18] Chu, Y.F., Sun, J., Wu, X., Liu, R.H. Antioxidant and antiproliferative activities of common vegetables. *J Agric. food chem.* 2002; 50 (23): 6910- 6916.
- [19] Pellegrini, N., Serafimi, M., Colombi, B., Del, R.D., Salvatore, S., Bianchi, M et al. Total antioxidant capacity of plant foods, beverages and oils consumed in Italy assessed by three different in vitro assays. *J. Nutr* 2003; 133: 2812-2819.
- [20] Repka, V., fischerova I. Induction and distribution of amylolytic activity in *Cucumis sativus L.* in response to virus infection. *Acta virologica* 1999; 43 (4): 227-235.
- [21] Villasenor I.M., Simon, M.K., Villanueva. A.M. Comparative potencies of nutraceuticals in chemically induced skin tumor prevention. *Nutr Cancer* 2002; 44 (1) 66-70.
- [22] Patil, M.K., kandhare, A.D., Bhise, S.D. Pharmacological evaluation of ameliorative effect of aqueous extract of *Cucumis sativus L.* fruit formulation on wound healing in wistar rats. *Chron Young Sci* 2011; 2:207-213.
- [23] Nadkarni, A.K; Nadkarni; K.M Indian material medica. Bombay popular prakasham 2005, 403-404.
- [24] Braide, V.B. Anti-inflammatory effect of Kolaviron, a biflavonoid of *Garcinia kola* seeds. *Fitoterapia* 1993; 64:433-436.
- [25] Udia, P.M, Braide, V.B and Owu, D.U. Anti spasmodic and spasmolytic effects of methanolic extract from seeds of *Garcinia kola* on isolated rat small intestine. *Nigeria J. physiol. Sci.* 2009; 24: 111-116.
- [26] Ogbonna, O.J., Udia, P.M., Onyekpe, P. I. and Ogbeihe G.O. Comparative studies of the phytochemical and Proximate analysis, Mineral and Vitamin compositions of the root and leaf extracts of *Tetracarpidium conophorum*. *Arch. Appl. Sci. Res.* 2013; 5:55-59.
- [27] Khattak, K.F. free radical scavenging activity, Phytochemical composition and Nutrient analysis of *Eleagnus umbellata* berry. *J. med plants Res* 2012; 6 (39):5196-5203
- [28] Saidu, A.N; Oibiokpa, F.I and Olukotun, I.O. Phytochemical screening and hypoglycemic effect of Methanolic fruit pulp extract of *Cucumis sativus* in alloxan induced diabetic rats *J. Med. Plants res* 2014; 8(39) : 1173-1178.