

Congolese Vitamin E Dietary Sources: A Review

Moukobolo Kinsangou
Franck Arnaud^{1,2}
Poaty Henriette^{1,3*}

Abstract

Introduction: Vitamin E is a micronutrient considered to be an anticancer and antitoxic agent. Indeed, its antioxidant property allows to fight against reactive oxygen species (ROS) at the origin lipids, proteins and DNA damages involved in the genesis of several human diseases such as infections, cancers. However, its systematic intake in cancer prevention as a therapeutic adjuvant is sometimes controversial. Currently, according some reviews, the best therapeutic approach in cancers, with none harmful effects, would be the dietary intake of foods rich in vitamin E in a short-term. Thus, the objective of the present work is to make a review of foods rich in vitamin E (alpha-tocopherol), available and accessible on the Congolese public markets.

Literature review: Firstly, we surveyed published articles and books on vitamin E. Secondly; we listed all the foods rich in vitamin E that are more consumed in central Africa.

Results: Literature review shows that food rich in vitamin E are oils: especially unrefined palm oil, peanut oil; cereals like soybean, rice, wheat; green vegetables like spinach, squash, beans, moringa leaves, cassava leaves; fruits as avocado or mango.

Conclusion: There are various foods consumed in Congo, which are rich in vitamin E specifically unrefined oils, green vegetable, fish and eggs. The data from this work may orient clinicians to promote dietary intake rich in vitamin E instead of the synthetic vitamin E consumption.

Keywords: Vitamin E; Alpha-tocopherol; Congolese foods

- 1 Faculty of Health Sciences, University Marien Ngouabi, Brazzaville, Congo
- 2 Teaching Hospital, Brazzaville, Brazzaville, Congo
- 3 National Research Institute on Health Sciences, Brazzaville Congo

*Corresponding author: Henriette Poaty

✉ henriettepoaty@gmail.com

Poaty, BP 2672, Faculty of Health Sciences, University Marien Ngouabi, Brazzaville, Congo.

Tel: 2424066865761

Citation: Arnaud MKF, Henriette P (2021) Congolese Vitamin E Dietary Sources: A Review. Int J Appl Sci Res Rev Vol. 8 No. 6:21

Received: May 06, 2021; Accepted: May 30, 2021; Published: June 08, 2021

Introduction

Vitamin E is a fat-soluble molecule produced exclusively by the vegetable. It is divisible in two members: tocopherols and tocotrienols, containing each four variants: alpha (α), beta (β), gamma (γ) and delta (δ) [1-3]. Alpha-tocopherol is the variant most used by the organism because of its bioavailability and antioxidant activity. The functions of vitamin E are various **Table 1** [4-10] regulation of cell growth and differentiation, reproduction, immunity [4-7]. A deficiency of this micronutrient can lead to numerous pathologies like: Heart disease, Ataxia with vitamin E deficiency (AVED) [4-10] **Table 1**. Vitamin E is considered as an anticancer and antitoxic agent. Indeed, in increased oxidative stress conditions, the antioxidant property allows to decrease reactive oxygen species (ROS) or nitrogen species (RNS) activities in the body [11]. ROS and RNS are toxic molecules which can alter

the cell genome and other cellular and tissular components. The alterations can decrease immunity leading to various diseases including cancer and viral infections [12].

One of the therapeutic applications of the antioxidant property is: the supplementation of synthetic vitamin E in several neoplasms as lung, breast or prostate cancers. It is used in chemoprevention or in adjuvant therapy after chemotherapy, however, vitamin E supplementation is controversial by some authors [13]. Indeed, in some cancers, vitamin E supplement may have the opposite effects. It indexed to increase recurrence of cancer and the appearance of metastases [14].

Literature Review

The current trend is therefore to promote the consumption of foods rich in vitamin E. The objective of the present work, is

to make a review of foods rich in vitamin E (especially alpha-tocopherol form), available and accessible on the African public markets particularly in Congo.

Databases

The review search was performed on the usual databases: PubMed and Google scholar. The keywords used were: vitamin E, food and vitamin E, rich food vitamin E, African foods rich in vitamin E. Among the scientific journals selected, we note: journals of agriculture and agriculture and food; nutrition journals. The selected published articles also allowed us to access to other relevant articles.

Published articles

Several articles were selected from Science Direct and Hinari. Abstracts from published international conferences and international conferences have been also retained. A total of 34 out of 120 scientific published articles were selected according to the following inclusion criteria:

- i) Trial reports, published articles, thesis.
- ii) Articles including two our keywords.
- iii) Articles less than 26 years old.

Table 1 Vitamin E functions, targets tissues and indexed pathologies.

Vitamin E	Functions	Target tissues	Pathologies
Alpha- tocopherol	Antioxidant	Liver	Retinitis pigmentosa
	Anti-inflammatory	Adipocytes	Ataxia with vitamin E deficiency
	Anticoagulant	Heart	Arthrosclerosis
	Immunoregulators	Salivary glands	Heart disease
	Inducer of apoptosis	Placenta	Cystic fibrosis
	Reproduction	Brain	Cancers
	Growth factor	Uterus	Pre-eclampsia
	DNA repair	Lungs	Stroke
			Alzheimer's disease
			Diabetes

Table 2 Some foods rich in vitamin E (alpha-tocopherol) consumed in Congo.

Forms	Food	Dose of vitamine E (mg/kg)	
Oils	Unrefined palm oil	200-1000	
	Argan	695-700	
	Coconut	100-600	
	Wheat	200-400	
	Peanut	150-300	
	Cod liver oil	300	
	Soybean	22-201	
	<i>Jatropha curcas</i> oil from Benin	199	
	Cereals	Soybean	1500
		Wheat	910
Rice		465	
Corn		200	
Plants		<i>Moringa</i> leaves	130-190
	Spinach	150	
	<i>Cucurbita pepo</i> (courges)	27-75	
	Green bean	30-40	
	Basilic	107	
	Parsley	40	
	Lettuce	6	
Fruits	<i>Vitex doniana</i> (black plum)	32	
	Avocado	10-20	
	Tomato	13.4	
	Banana	11	
	Mango	4.7	
Fish and others	Eggs	20-39	
	Eel	10-20	
	Canned sardines	20	

Table 3 Some foods rich in vitamin E consumed in Europe.

Forms	Food	Dose of vitamine E (mg/kg)
Oils	Sunflower	200-765
	Grape seed	100-525
	Olive	10- 300
	Canola	120-250
	Colza	20-25
	Safflower	11.8
Cereals	Oats	210
	Almond	150-200
	Hazel nuts	150-200
	Raye	92
Plants	Chick peas	184-204
	Cresson	2-152
	Broccoli	100-150
Fruits	Kiwi	16
	Jack fruit	10,4
Fish	Salmon	Feb-39

Results and Discussion

The literature search [15-17] highlighted several African foods rich in vitamin E, reported in **Table 2** [18-20]. With globalization, some European foods are also present in African markets and vice versa. In comparison, some foods rich in vitamin E and widely sold on the European and African markets [21-25] are transcribed in **Table 3** [26-33].

The data in the literature provided us a list of foods rich in tocopherol most often, without specifying the concentration of other vitamin E forms or variants. It should be noted that the concentrations reported are approximate because the results vary according to the technique of analysis, the eating habits and the origin of the food.

The oils

It emerges from the synthesis of the consulted articles that the vitamin E is the main fat-soluble micronutrient in vegetable oils consumed in Africa, which are very rich in alpha-tocopherol [1]. At the head, we note unrefined palm oil at concentrations of 200 to 1000 mg/kg. In general, the refining of palm oil decreases the vitamin E concentration. The same applies to refined sunflower oil, whose alpha-tocopherol content is lower than the crude oil [17]. We can note that: palm oil may increase cholesterol (Total, LDL and HDL) compared to olive oil and sunflower oil. In addition, it can decrease platelet aggregation [20,21]. However, refined palm oil, richer in saturated fatty acids, increases platelet aggregation and can be toxic for kidneys, lungs, liver and heart [22]. Thus, to benefit from a correct contribution in vitamin E, it is recommended to use unrefined palm oil or not to heat it too much when cooking food.

Others oils rich in vitamin E are, Argan oil, coconut oil, peanut oil, *Jatropha curcas* oil [23,24]. Peanut oil frequently used in African cooking, contains 150 to 300 mg of tocopherol and it is therefore richer in vitamin E than olive oil (10 to 300 mg of vitamin E). *Jatropha curcas* oil from Benin is traditional oil which availability on the local market remains low.

Cereals, vegetables and fruits

Vitamin E is also present in high concentrations in some cereals such as: soybean, rice and corn. We can also found the nutrient in green vegetables like: Spinach, *Moringa* leaves, beans, *Cassava* leaves (Saka-Saka), *Cucurbita pepo* also called in Congo courges or pistachio [18]. Many African fruits are also rich in vitamin E for example: black plum, avocado, lychee, and banana. The consumption of cereals, vegetables and fruits does not pose too much of a problem, because they are usually included in the dietary habits of Africans.

Fish and other foods

Given the geographical situation of the Congo (presence of sea and the longest river in the world), the public Congolese markets are full of many fatty fishes such as: catfish, Thomson fish, mackerel fish or Eel with no negligible dose of vitamin E. Eggs widely consumed at low cost, are also rich in vitamin E.

Conclusion

Foods consumed in Congo (and in others African countries), especially vegetable oils and green plants are particularly rich in vitamin E. The data from this work promote dietary intake rich in vitamin E, instead of the synthetic vitamin E supplement. All the aliments cited in this paper are available on African public markets.

References

- 1 Ju J, Picinich SC, Yang Z, Zhao Y, Suh N (2010) Cancer-preventive activities of tocopherols and tocotrienols. *Carcinogenesis* 31: 533-542.
- 2 Bharat BA, Sundaram C, Prasad S, Kannappan R (2010) Tocotrienols the vitamin E of the 21st century: Its potential against cancer and other chronic diseases. *Biochem Pharmacol* 80: 1613-1631.
- 3 Greenlee H, Kwan ML, Ergas IJ, Strizich G, Roh JM (2014) Changes in vitamin and mineral supplement use after breast cancer. *BMC* 14: 382.
- 4 Traber MG (2014) Vitamin E Inadequacy in Humans: Causes and Consequences. *Adv Nutr* 5: 503-514.
- 5 Deivendran R, Yeong HH (2015) Effects of Dietary Vitamin E on Fertility Functions in Poultry Species. *Int J Mol Sci* 16: 9910-9921.
- 6 Abdelouahed K (2002) Mécanisme moléculaire de l'effet protecteur de la vitamine E dans l'athérosclérose. *J Physiol Pharmacol* 80: 662-669.
- 7 Wang X, Quinn PJ (1999) Vitamin E and its function in membranes. *Prog Lipid Res* 38: 309-336.
- 8 Lecerf JM (2013) l'huile de palme: Aspects nutritionnels et métaboliques. Rôle sur le risque cardiovasculaire. *Oilseeds and facts, Crops and Lipids* 20: 147-159.
- 9 Landrier JF (2011) Vitamine E et physiologie du tissu adipeux. *Oilseeds and facts, Crops and Lipids* 18: 83-87.
- 10 Edem DO (2002) Palm oil: Biochemical, physiological, nutritional, hematological, and Toxicological aspects: A review. *Plant Foods for Human Nutrition* 57: 319-341.
- 11 Gliszczynska-Swigło A, Sikorska E, Khmelinskii I, Sikorski M (2007) Tocopherol content in edible plant oils. *Polish J Food Nutr Sci* 57: 157-161.
- 12 Ga YL, Sung NH (2018) The Role of Vitamin E in Immunity. *Nutrients* 10: 1614.
- 13 Cardenas E, Ghosh R (2013) Vitamin E: A Dark Horse at the Crossroad of Cancer Management. *Biochem Pharmacol* 86: 845-852.
- 14 Weiping Y, Li J, Sook-Kyung P, Jing L, Archana G (2009) Anticancer actions of natural and synthetic vitamin E forms: RRR- α -tocopherol blocks the anticancer actions of γ -tocopherol. *Cancer Prev Res* 2: 143-152.
- 15 Boschin G, Arnoldi A (2011) Legumes are valuable sources of tocopherols. *Food Chem.* 127: 1199-1203.
- 16 Camara EG, Nunes Costa P, Gurgel CSS, De Lima Beserra AF, De Souza Almeida FN (2014). Alpha-tocophérol and gamma-tocophérol concentration in vegetable oil. *Food Sci Technol Res* 34: 379-385.
- 17 Imoisi OB, Illori GE, Agho I, Ekhatior JO (2015) Palm oil, its nutritional and health Implications. *J Appl Sci* 19: 127-133.
- 18 Upadhyay K, Solanki R (2018) Recovery of vitamin E from edible oil -A review. *Int J Eng Res Technol* 7: 120-212.
- 19 Kassardjian E, Ferguson AR, Ferguson LR, macrae E (2006) Le kiwi, votre Partenaire santé. *Phytothérapie* 4: 87-92.
- 20 Tholstrup T, Hjerpsted J, Raff M (2011) Palm olein increases plasma cholesterol moderately compared with olive oil in healthy individuals. *Am J Clin Nutr* 94: 1426-1432.
- 21 Choudhury N, Tan L, Truswell AS (1995) Comparison of palmolein and olive oil: effects on plasma lipids and vitamin e in young adults. *Am J Clin Nutr* 61: 1043-1051.
- 22 Ebong PE, Owu DU, Isong UE (1999) Influence of palm oil (elaeis guineensis) on Health. *Plant Foods Hum Nutr* 53: 209-222.
- 23 Charrouf PZ (2002) l'huile d'argane, une prodigieuse vitalité née au bord du désert. *Espérance Médicale* 87: 1-9.
- 24 Djenontin ST, Dangou J, Wotto DV, Sohounhoue KCD, Lozano P (2006) Composition en acides gras, stérols et tocophérols de l'huile végétale non conventionnelle extraite des graines de jatropha curcas (Euphorbiaceae) du Benin *J Soc Ouest-Afr Chim* 22: 59-67.
- 25 Brigelius-Flohé R, Kelly FJ, Salonen JT, Neuzil J, Zingg JM (2002) The European perspective on vitamin E: current knowledge and future research. *Am J Clin Nutr* 76: 703-716.
- 26 Calmés S, Serra F, Palou A (2018) Vitamin E metabolic effect and genetic variants. A challenge for precision nutrition in nutrition and associated disturbances. *Nutrients* 10: 19-23.
- 27 Han SN, Adolfsson O, LEE CK, Prolla T, Ordovas J (2004) Vitamin E and Gene Expression in Immune Cells. *Ann N Y Acad Sci* 1031: 96-101.
- 28 Herrera E, Barbas C J (2001) Vitamin E: action, metabolism and perspectives. *J Physiol Biochem* 57: 43-56.
- 29 Makoto A, Sato Miyata A, Tanabe T, Takahashi E, Kayden HJ (1995) Human α tocopherol transfer protein: cDNA cloning, Expression and chromosomal localization. *Biochem J* 306: 437-443.
- 30 Pedersen Ji, Muller H, Seljeflot I, Kirkhus B (2005) Palm oil versus hydrogenated soybean oil: effects on serum lipids and plasma haemostatic variables. *Asia Pac J Clin Nutr* 14: 348-357.
- 31 Saini RK, Keum YS (2016) Tocopherols and tocotrienols in plants and their products: A review on methods of extraction, chromatographic separation, and detection. *Food Res Int* 82: 59-70.
- 32 Olson ME (2001) Introduction to the Moringa family In: *The Miracle Tree - Moringa oleifera: Natural Nutrition for the Tropics* p. 177.
- 33 Adrian AF, Murphy SP, Lacey R, Custer LJ (2007) Tocopherol and Tocotrienol Levels of Foods Consumed in Hawaii. *J Agric Food Chem* 55: 769-778.