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Proximate, Mineral and Vitamin Composition Ofsorghum Bicolor, Carica Papaya and Hibiscus Sabdariffaleaves

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Abstract: Introduction
Vegetables are particularly rich source of antioxidants, which are substances that may protect the body's cells against the oxidative damaging effects of free radicals
Objective
The aim of this study was to determine the chemical composition of Sorghum bicolor, Carica papaya and Hibiscus sabdariffa leaves
Methodology
Fresh leaves of Sorghum bicolor, Carica papaya and Hibiscus sabdariffa were identified at the Herbarium unit of the Department of Plant Science and Biotechnology, University of Nigeria, Nsukka, Enugu State. Chemical compositions of the leaf samples were also determined using standard procedures.
Result
Sorghum b. had the highest percentage of carbohydrate content (64.01%) and Sorghum bicolor leaves had the highest amount of carbohydrate (64.01%), fat (2.33%), moisture (9.25%), fiber (9.35%) and ash (8.48%). Carica papaya had the highest amount of protein (12.87%). Sorghum bicolor had the highest content of zinc (7.46mg/100g), magnesium (23.23mg/g), manganese (33.34mg/g), and phosphorus (155.58mg/100g). Hibiscus sabadriffa had the highest content of iron (13.36mg/g), Vit B_2 (0.27mg/100g).Hibiscus sabdariffa has the highest Value for Vitamin C 13.07mg/100g). Sorghum b. had the highest value in Zinc, Manganese, Phosphorus, Magnesium and least value in Iron. Hibiscus s. had the least value in Zinc, Manganese, Phosphorus Magnesium and highest value in Iron, meanwhile Carica papayawas second in all the tested minerals.
Conclusion
In conclusion, the studied leaves had shown to be a good source of crude fibre, protein, carbohydrate.Sorghum b. had the highest percentage of carbohydrate content (64.01%) and Hibiscus sabdariffa has the highest Value for Vitamin C. Sorghum b. had the highest value in Zinc, Manganese, Phosphorus, Magnesium and least value in Iron.

Keywords:*vegetables,carbohydrate,vitaminC,folicacid,Zinc,protein*

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I. Introduction

Vegetables are particularly rich source of antioxidants, which are substances that may protect the body's cells against the oxidative damaging effects of free radicals. Leafy vegetables are important items of diet in many Nigerian homes. Apart from the variety which they add to the main menu (Mepha, Eboh & Banigo,2007), they are valuable sources of nutrients especially in rural areas where they contribute substantially to protein, minerals, vitamins, fibres and other nutrients which are usually in short supply in daily diets (Mohammed & Sharif,2011).It is worthwhile to note that consumption of numerous types of edible plants as source of food could be beneficial to nutritionally marginal population especially in developing countries where poverty and climate is causing havoc to the rural populace. In many developing countries, the supply of minerals is inadequate to meet the mineral requirements of farm animals and rapidly growing population. Vegetables, if consumed in sufficient amount would contribute greatly towards meeting human nutritional requirement for normal growth and adequate protection against diseases arising from malnutrition (Adefemi, Asadu, Oyakilome, Ajibulu& Asaolu, 2012).

Natural antioxidants in vegetables and fruits, such as vitamins and polyphenols have been associated with the prevention of degenerative disease such as cancer and cardiovascular diseases (Liu, 2004). The production of superoxide occurs continuously during normal aerobic metabolism (Ou, Huang, Hampsch, Flanagan &Deemer, 2002). There is an increasing interest in the antioxidant activity presents in the diet, since they play important roles in organism's defense system against ROS (Leite et al., 2012). Vegetables are particularly rich source of antioxidants, which are substances that may protect the body's cells against the oxidative damaging effects of free radicals. Leafy vegetables are important items of diet in many Nigerian homes. Apart from the variety which they add to the main menu (Mepha, Eboh& Banigo,2007), they are valuable sources of nutrients especially in rural areas where they contribute substantially to protein, minerals, vitamins, fibres and other nutrients which are usually in short supply in daily diets (Mohammed & Sharif,2011). In Africa and in most of the developing countries, plants or herbs has been in use to treat different ailment like diabetes, hypertension, diarrhea and anaemia but not much work has been done using Sorghum bicolor leaves, Carica papaya leaves and Hibiscus sabdariffa leaves to treat anaemia. Despite these traditional health care methods, African medicine is used by 80 % of the rural populations and appears sure means of eradication of diseases. In the search of fighting against anaemia disorder, the chemical compositionof Sorghum bicolor leaves, Carica papaya leaves and Hibiscus sabdariffa leaveswere investigated in this study.

II. Materials And Methods

Materials

The vegetables that were used for this study were the fresh leaves of Sorghum bicolor, Caricapapaya and Hibiscus sabdariffa. The leaves were collected in the zoological garden of University of Nigeria, Nsukka and identified at the Herbarium unit of the Department of Plant Science and Biotechnology, University of Nigeria, Nsukka, Enugu state.

Preparation of samples for chemical analysis

Five kilograms (5kg) of each of the fresh leaves of Sorghum bicolor, Carica papayaand Hibiscus sabdariffawere weighed out using a digital balance scale. The leaves were sorted by removing extraneous materials, washed with tap water for five minutes and drained with the use of plastic sieve then spread evenly on trays and place in an open space under the shade which allowed for cross ventilation for seven days at room temperature. Then the dried leaves were pulverized to a fine powder, separately using Warburg laboratory blender. It was packaged in labeled polyethylene bags and stored in desiccators.

Proximate Analysis

The proximate composition of the three dried leaves were analysed with respect to its moisture content, ash, crude fiber, crude protein and fat content were determined using the Association of Official Analytical Chemists, A.O.A.C (2005) method. The total carbohydrate content was determined by difference. Carbohydrate = 100% - (%Crude fiber + %Crude protein + %Ash + %Fat + %Moisture)

Mineral Analysis

Magnesium (Mg), iron (Fe), zinc (Zn), phosphorous (P) and Manganese (Mn) content of each sample were estimated using the method of AOAC (2000). Two grams of each sample were ashes in muffle furnace at 550^{o}C for 6 to 8 hours. The ash was dissolved with HCl. The samples were analyzed for minerals – Mg, Fe, Zn, P, and Mn using atomic absorption spectrophotometer(AAS) (Mode 303 Perkin Elmer, Norwalk, USA).

Vitamin Analysis

Pro-vitamin A (β- carotene) was determined using the method adopted from International Vitamin A Consultative Group (IVACG) (1992), Vitamin B_2, B_3, B_6, Folic acid and vitamin Cwere determined using AOAC (2000) method while Vitamin E was determined according to AOAC (2000)) method.

Statistical analysis

The chemical composition data collected were analyzed by using Statistical Product and Service Solution (SPSS) version 21.0. Means and Standard deviations of the data were obtained. One-way analysis of variance (ANOVA) and Duncan Studentised New Multiple Range Test were used to separate and compare means (Steel & Torrie, 1960). The differences in means were considered significant at 5% probability.

III. Results

Proximate composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves

The proximate compositions of the samples were presented in table (1). The moisture contents of the Hibiscus s., Carica p. and Sorghum b. leaves obtained were 8.45%, 8.58% and 9.25% respectively.Sorghum b.

had the highest percentage, followed byCarica p. whileHibiscus s. had the least value with difference of 0.67between Sorghum b, andCarica p.betweenCarica p. andHibiscus s.the value of their difference was 0.13. In the case of Ash values 7.34%, 7.58% and 8.48% were obtained respectively.Sorghum b. had the highest percentagefollowed byCarica p. while Hibiscus s. had the least value with difference of 0.90between Sorghum b. andCarica p. The difference in value betweenCarica p. andHibiscus s. was 0.13.Coming to protein, 11.75%, 12.87% and 6.58% were the values obtained respectively in which Carica p. had the highest value followed by Hibiscus s.While Sorghum b. hadhad the least value with differences of 1.12 between Carica p. and Hibiscus s. The difference between Hibiscus s. and Sorghum b. was 5.17 in value. Crude fiber values obtained were7.35%, 7.45% and 9.35% respectively. Sorghum b. had the highest percentage followed by Carica p. whileHibiscus s. had the least value with differences of 1.90between Sorghum b, andCarica p. Similarly, between Carica p. andHibiscus s. the difference was 0.10. Crude fat values obtained were 2.09%, 2.24%, and 2.33% respectively. Sorghum b. had the highest percentage followed by Carica p. and Hibiscus s. whichhad the least value with differences of 0.09between Sorghum b, andCarica p. Between Carica p. andHibiscus s. the value of their difference was 0.15. Obtained carbohydrate values were 63.02%, 61.28% and 64.01% respectively. Sorghum b. had the highest percentage followed by Hibiscus s. while Carica p. had the least value with differences of 0.99 between Sorghum b, andCarica p. The value of 1.75 was the difference betweenHibiscus s. andCarica p.

Table 1: Proximate composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves (%)

Samples	Moisture	Ash	Protein	Crude fibre	Fat	Carbohydrates
HB	8.45 ± 0.02^{b}	7.34 ± 0.01^{b}	11.75 ± 0.01^{b}	7.35 ± 0.01^{b}	2.09 ± 0.01^{a}	63.02 ± 0.03^{b}
CP	8.58 ± 0.01^{b}	7.58 ± 0.01^{b}	12.87 ± 0.01^{a}	7.45 ± 0.01^{b}	2.24 ± 0.01^{a}	61.28 ± 0.02^{c}
SE	9.25 ± 0.40^{a}	8.48 ± 0.01^{a}	6.58 ± 0.01^{c}	9.35 ± 0.01^{a}	2.33 ± 0.01^{a}	64.01 ± 0.02^{a}

Phytochemical composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves

Mineral composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves

The mineral compositions of the samples were presented in table (2).Hibiscus s. leaves had zinc of (6.36mg/100g), Iron of (13.36mg/100g), Manganese of (25.56mg/100g), Phosphorus of (125.58mg/100g) and Magnesium of (12.28mg/100g). Carica p. had Zinc of (6.56mg/100g), Iron of (12.55mg/100g), Manganese of (28.45mg/100g), Phosphorus of (133.35mg/100g) and Magnesium of (13.36mg/100g). Sorghum b. had Zinc of (7.47mg/100g), Iron of (11.25mg/100g), Manganese of (33.34mg/100g), Phosphorus of (155.58mg/100g) and Magnesium of (23.23mg/100g).Sorghum b. had the highest value in Zinc, Manganese, Phosphorus, Magnesium and least value in Iron.Hibiscus s. had the least value in Zinc, Manganese, Phosphorus Magnesium and highest value in Iron, meanwhile Carica papayawas second in all the tested minerals.

Table 2: Mineral composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves (mg/100g)

Samples	Zinc (mg/100g)	Iron (mg/100g)	Manganese (mg/100g)	Phosphorus (mg/100g)	Magnesium (mg/100g)
HB	6.36 ± 0.01^{b}	13.36 ± 0.01^{c}	25.56 ± 0.01^{c}	125.58 ± 0.01^{c}	12.28 ± 0.01^{c}
CP	6.56 ± 0.01^{b}	12.55 ± 0.01^{b}	28.45 ± 0.01^{b}	133.35 ± 0.01^{b}	13.36 ± 0.01^{b}
SE	7.47 ± 0.02^{a}	11.25 ± 0.01^{a}	33.34 ± 0.01^{a}	155.58 ± 0.01^{a}	23.23 ± 0.01^{a}

Means±Standard deviation of triplicate determination: Mean values of different superscripts in the same column were differed significantly at ($P<0.05$) **Key:**HB: *Hibiscus sabdariffa***,** CP*: Carica papaya***,** SE: *Sorghum bicolor*

Vitamin composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves

The vitamin compositions of the samples were presented in table (3). The folate, Beta Carotene, Vitamin B_2, Vitamin B_3, Vitamin B_6, Vitamin C and Vitamin E of *Hibiscus sabdariffa* obtained were 6.26mg/100g, 8.96mg/100g, 0.27mg/100g, 0.05mg/100g, 13.07mg/100g and 0.07mg/100g respectively. The folate, Beta Carotene, Vitamin B_2, Vitamin B_3, Vitamin B_6, Vitamin C and Vitamin E of *Carica papaya*obtained were 8.76mg/100g, 9.35mg/100g, 0.26mg/100g, 0.05mg/100g, 0.85mg/100g, 12.26mg/100g and 0.09mg/100g respectively while the folate, Beta Carotene, Vitamin B_2, Vitamin B_3, Vitamin B_6, Vitamin C and Vitamin E of *Sorghum bicolor* obtained were 2.51mg/100g, 5.59mg/100g, 0.18mg/100g, 0.02mg/100g, 0.69mg/100g, 9.58mg/100g and 0.11mg/100g respectively.

Table3: Vitamin composition of Hibiscus sabdariffa, Carica papaya and Sorghum bicolor leaves (mg/100g)

Sample	Folate (mg/100g)	Beta carotene (mg/100g)	Vitamin B_2 (mg/100g)	Vitamin B_3 (mg/100g)	Vitamin B_6 (mg/100g)	Vitamin C (mg/100g)	Vitamin E (mg/100g)
HB	6.26 ± 0.03^{c}	8.96 ± 0.01^{c}	0.27 ± 0.03^{a}	0.05 ± 0.00^{b}	0.80 ± 0.01^{c}	13.07 ± 0.01^{c}	0.07 ± 0.01^{b}
CP	8.76 ± 0.01^{b}	9.35 ± 0.01^{b}	0.26 ± 0.03^{a}	0.05 ± 0.00^{b}	0.85 ± 0.00^{b}	12.26 ± 0.01^{b}	0.09 ± 0.01^{b}
SE	2.51 ± 0.01^{a}	5.59 ± 0.01^{a}	0.18 ± 0.01^{a}	0.02 ± 0.13^{a}	0.69 ± 0.00^{a}	9.58 ± 0.01^{a}	0.11 ± 0.01^{a}

Means±Standard deviation of triplicate determination: Mean values of different superscripts in the same column were differed significantly at ($P<0.05$) **Key:**HB: Hibiscus sabdariffa**,** CP: Carica papaya**,** SE: Sorghum bicolor

IV. Discussion

Moisture content is a widely used parameter in the processing and testing of food. It is an index of water activity on foods. An appreciable amount of moisture was observed in these leaves. A high value of moisture in these vegetables will make them susceptible to deterioration. *Sorghum bicolor*leaves had higher (9.25%). The observed presence of moisture implies that these leaves may have short shelf life because microorganisms that cause food spoilage thrive in foods with high moisture content (Adepoju *et al*., 2006). Moderate value of ash content was observed in the leaf samples with *Hibiscus sabdariffa* leaves ranking highest (8.48%) but was found to be low when compared with other leafy vegetables like *Talinum triangulare* (20.05%), *Ipomea batatas* (11.10%). *Vernonia colorate* (15.86%) and *Moringa oleifera* (15.09%) (Lockeet, Calvert & Grivett, 2000), *Ocimum gratissium* (18.00%DW), *Hibiscus esculntus* (8.00% DW) (Akindahunsi & Salawu, 2005) which are known rich sources of essential minerals. There was a moderate crude protein content in the leaf samples. *Carica papaya* was found to contain highest (12.87%) amount of crude protein but was found to be lower when compared to the findings of Maisarah *et al.* (2014) who recorded 33.4% crude protein in *Carica papaya* leaf. When these leaves are consumed it could contribute appreciable amount of protein to an individual's daily protein requirement which is beneficial for growth and development in the body systems. The crude fat content of *Hibiscus sabdariffa, Carica papaya and Sorghum bicolor* leaves were low. These suggest that these leaves may not be good sources of dietary fat. This also supported by Ene-Obong (2001) who stated that fats are generally low in extract of green leafy vegetables. Consuming foods low in dietary fat will be beneficial in weight management and treatment of cardiovascular diseases. *Hibiscus sabdariffa, Carica papaya and Sorghum bicolor* leaves contain moderate amount of crude fibre when compared to other green leafy vegetables like Oha" (*Pterocarpus soyauxii*) 13.1%, "Nuturukpa" (*Pterocarpussan talinoides*) 10.55%, "Okazi" (*Gnetum africanum*) 24.6% (Ekwmankama, 2008) and pigweed (*Amaranthus hybridus*) 8.61% (Akubugwo, Obasi, Chinyere& Ugbogu, 2007). *Sorghum bicolor* ranked higher (9.35%) in crude fibre content. High fibre content in foods help in digestion and prevention of colon cancer (UICC/WHO, 2005). Non-starchy vegetables are the richest sources of dietary fibre (Agostoni, Riva& Giovannini, 1995) and according to Saldanha (1995) are employed in the treatment of diseases such as obesity, diabetes and gastro-intestinal disorders. The carbohydrate content of *Hibiscus sabdariffa, Carica papaya and Sorghum bicolor* leaves were 63.02%, 61.28% and 64.01% respectively. These leaves were found to contain high content of carbohydrate when compared to some other vegetables such as *Amaranthus hybridus* (52.18%) fresh samples (Akubugwo, 2007). The result of this study shows that *Hibiscus sabdariffa, Carica papaya and Sorghum bicolor* leaves contain appreciable amount of essential minerals. Iron is important in the diet especially for pregnant and nursing mothers as well as infants. It is also needed in the convalescents and the elderly to reduce cases of diseases associated with iron such as aneamia (D'Mello, 2003). The highest (13.36mg/100g) content of iron was found in *Hibiscus sabdriffa,* leaves. According to Barminas, Charles& Emmanuel (1998), an average culinary preparation contains about 300g of vegetables and this would result in the intake of 30g dry weight leaves per serving portion. In this study, the manganese in the analysed sampled varied between 33.34mg/100g to 25.56mg/100g with *Sorghum bicolor* leaves had the highest (33.34mg/100g) and *Hibiscus sabdariffa* with the least (25.56mg/100g) manganese concentrations. From Table (2) it can be seen that *Sorghum bicolor* contained the highest amount of zinc (7.46mg/100g). Also it's observed that *Sorghum bicolour* contained the highest amount of phosphorus (155.58mg/100g) and magnesium (23.23mg/100g) Zinc is important for nerve function and male fertility (Ayoola, Adeyeye & Onawumi,2010) and healthy functioning of the heart and normal growth (Elizabeth, 1994). Phosphorus is associated with growth and maintenance of bones, teeth and muscles. Magnesium is known to prevent cardiomyopathy, muscle degeneration, growth retardation, alopecia, dermatitis, immunologic dysfunction, gonadal atrophy and bleeding disorders.*Carica papaya* leaves were found to have the highest (8.76mg/100g) folate content followed by *Hibiscus sabdariffa*leaves. It was observed that the leaf samples had moderate Beta Carotene content. *Carica papaya* leaf had the highest (9.35mg/100g) Beta carotene content. Pro-vitamin A is a vitamin that protects the body cells from damaging the effects of free radicals, they act as good source of Vitamin A and enhancing the functioning of the immune system. Similarly, pro-vitamin A also helps the reproductive system to function properly. Deficiency of ascorbic acid is associated with pains in the joint and defect in skeletal calcification, anaemia, manifestation of scurvy haemorrhage from mucus membrane of the mouth and gastrointestinal tract (Hunt, Goff and Holbrook, 1980). Ascorbic acid functions as an antioxidant, to prevent or at least minimize the function of carcinogenic substances from dietary material

V. Conclusion

The three leaves were found to contain high amount of carbohydrate, moisture, considerable amount of crude fiber, protein, fat and ash.*Sorghum b*. had the highest percentage of carbohydrate content (64.01%) and *Hibiscus sabdariffa* has the highest Value for Vitamin C 13.07mg/100g). *Sorghum b*. had the highest value in Zinc, Manganese, Phosphorus, Magnesium and least value in Iron. *Hibiscus s.* had the least value in Zinc, Manganese, Phosphorus Magnesium and highest value in Iron, meanwhile *Carica papaya*was second in all the tested minerals.

Reference

[1]. Adefemi, O.S, Asadu, S.S, Oyakilome, I.G, Ajibulu, K.E & Asaolu, M.E (2012). Proximate and mineral compositions of Nigeria leafy vegetables. *Journal of Food Research*, 1,(3),214-218

[2]. Adepoju, O.T., Onasanya, L.O., & Udoh, C.H. (2006). Comparative studies of nutrient composition of cocoyam *(Colocassia esculenta)* leaf with some green leafy vegetables. *Nigeria Nutrition Sciences*, 27:40-43.

[3]. Agostoni C, Riva R, Giovannini M (1995). Dietary Fiber in Waning Foods of Young Children. Pediat. (96):1000-1005.

[4]. Akindahunsi, A.A. & Salawa, S.O. (2005). Phytochemical Screening and antinutrient composition of selected tropical green leafy vegetables. *African Journal of Biotechnology*, 4 (6): 497-50.

[5]. Akubugwo, I.E., Obasi, N.A., Chinyere, G.C. & Ugbogu, A.E. (2007). Nutritional & Chemical value of *Amaranthus hybridus* leaves. *Nigerian Africa Journal Biotechnology*, 6(24): 2833-2839.

[6]. AOAC (2000). Official methods of Analysis of the Association of Official Analytical Chemists, Washington D.C. 16th Ed.

[7]. AOAC (2005). Official methods of Analysis of the Association of Official Analytical Chemists, Washington D.C. 17thEd.

[8]. Ayoola, P.B., Adeyeye A. and Onawumi O.O.(2010). Trace Element and Major Evaluation

[9]. Ekwmankama (2008). Nutrient composition of indigenous vegetables (*Pterocarpus soyanxii, Pterocarpus santalinoides*&*Gnetum africanum. Nigeria Journal Nutrition Science*, 29: 195-200

[10]. Elizabeth, K. (1994). *Immense Help fromNature's Workshop*. 1st Ed. Elikaf HealthServices Ltd., pp: 207-209

[11]. Hunt, S., Goff J.L and Holbrook, J (1980). Nutrition principles and chemical practices. John Wiley and sons, New York, pp: 49-52

[12]. International Vitamin A Consultative Group (1992) Nutrition Communications in Vitamin A Programs: A Resource Book.IVACG, The Nutrition Foundation, Inc., 1126 Sixteenth Street, N.W., Washington, D.C. 20036.

[13]. Leite A.M., Mayo B., Rachid C.T., Peixoto R.S. & Silva J.T. (2012) Assessment of the microbial diversity of Brazilian kefir grains by PCR-DGGE and pyrosequencing analysis, Food Microbiology, 31,215-221.

[14]. Liu R.H. (2004). Potential synergy of phytochemicals in cancer prevention: mechanism of action. *Journal of Nutrition*, 134, 3479S-3485S.

[15]. Lockeett, C.T., Calvert, C.C., & Grivett, L.E. (2000). Energy and micronutrient composition of dietary & medicinal wild plants consumed during drought study of rural Fulani North eastern Nigeria. *Internal Journal Food Science Nutrition*, 518:195-208.

[16]. Maisarah, A. M., Nurul Amira, B., Asmah, R. & Fauziah, O. (2013). Antioxidant analysis of different parts of *Carica papaya*. International Food Research Journal 20(3): 1043-1048.

[17]. Mepba, H. D, Eboh, L. & Banigo, D.E.B. (2007). Effects of processing treatments on the nutritive composition and consumer acceptance of some Nigeria edible leafy vegetable. *African Journal of Food, Agricultural Nutrition and Development*, 7(1)55-58.

[18]. Mohammed, M.I. & sharif, N. (2011). Mineral compostion of some leafy vegetables and consumed in Kano, Nigeria. *Nigeria Journal of Basic and Applied Science*, 19(2)208-211

[19]. Ou, B., Huang D., Hampsch-Woodill M., Flanagan J.A. & Deemer E.K. (2002) Analysis of antioxidant activities of common vegetables employing oxygen radical absorbance capacity (ORAC) and ferric reducing antioxidant power (FRAP) assays: a comparative study. *Journal of Agriculture Food Chemistry*, 50, 3122-3128.

[20]. Saldanha LG (1995). Fibre in the diet of U. S. Children: results of national surveys. Pediat. (96):994-996.

[21]. Steel R. G.D. & Torrie J.H. (1960) principle and procedures of Statistics with special McGraw-Hill Book company, New York, Toronto, London, 481, 15-81.

[22]. UICC/WHO (2005) Global Action Against Cancer NOW. Geneva: UICC and WHO Publications Department.

[23]. WHO/UNICEF/UNU (2001) Iron deficiency anaemia: assessment, prevention, and control. Geneva: *World HealthOrganization*

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