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# DETERMINATION OF IODINE CONTENT OF SOME COMMONLY UTILIZED LEAFY VEGETABLES: *SPINACEA OLERACEA* LINN (SPINACH), *BRASSICA OLERACEA* VAR (CABBAGE), *HIBISCUS SABDR1FFA* LINN AND *LACTUCA SATIVA* L. (LETTUCE) FOUND IN KANO METROPOLIS VEGETABLE MARKETS

**Umar Sani Gwarzo**
Department of Chemistry
Federal College of Education, Kano
E-mail: *umargwarzo@yahoo.com*

## ABSTRACT

The leaves of Spinacea olarecea L. (spinach), Brassica olarecea V. (cabbage), Hibiscus sabdriffa L. and Lactuca sativa L. (lettuce) were analyzed for iodine, moisture, dry matter and ash contents. The results have shown that Hibiscus sabdriffa has the highest iodine (0.0043%) and dry matter (74.60%) contents; salad has the highest moisture content (10.41%) and cabbage with the highest ash content (6.35%). This indicates that consumption of these plants could serve as a good food supplements for man and may assist in suppressing iodine deficiency disorders (IDD).

**Keywords:** Green Leafy Vegetables, Iodine, IDD.

## Introduction

Vegetables are plants that are consumed in relatively small quantities as a side-dish or a relish with the staple food. Most vegetables are the leaves, roots or stems of herbaceous plants although flower calyces, immature seeds or fruits may also be consumed as vegetables (Ripe *et.al*, Tomori and Obijole, 2000). Nutritionally, vegetables are good sources of vitamins, proteins, minerals and fibers (Tomori and Obijole, 2000). Leafy crops are used frequently as boiled vegetables and are often added to soups and stew and may have high nutritional value (Tomori and Obijole, 2000, Osaki *et.al,* 2003, Ismail and Ayodele, 2003 and Gwarzo *et.al,* 2006). There is an increasing awareness of the value of leafy vegetables in contributing to a balanced diet particularly in areas where animal protein is deficient. In addition to their iron content, leafy vegetables contribute significant amount of beta-carotene (vitamin A precursor) and ascorbic acid (vitamin C.), proteins, minerals and carbohydrates. Among the mineral elements supplied by food and water to man and other animals is iodine. It is required by animals in order to form the thyroid hormones (Ismail and Ayodele, 2003) while its deficiency is the major cause of goiter (Thomas and Majekodunmi, 2001) and other iodine deficiency disorders (IDD) such as cretinism, endemic cognitive disorders and motor or intellectual sub-normality (Thomas and Majekodunmi, 2001). Dietary sources of iodine are known to include iodized salt, sea food (fish, crab, shrimp, oyster, luster, and sea weeds etc), milk, vegetables and grains grown in iodine rich soil ( Ismail and Ayodele, 2003, Thomas and Majekodunmi, 2001) . The distribution and amounts of iodine availability in foods depend on its contents in soil, its geo-chemical cycle and the geological history of the area (Ismail and Ayodele, 2003). Although the iodine content of some of the plants in this work has already been determined elsewhere (Thomas and Majekodunmi, 2001), this article reports the iodine level of some vegetables from Kano, Nigeria because of the inherent variability in its concentration due to the factors listed above (Ismail and Ayodele, 2003).

## Experimental

### Samples and sample preparation

Samples of *Spinacea olarecea* (spinach), *Brassica olarecea* (cabbage), *Lactuca sativa* (lettuce) and *Hibiscus sabdriffa* were purchased from various vegetable markets within Kano metropolis, identified at the Biological Sciences Department of Ahmadu Bello University, Zaria and voucher specimen kept there. They are believed to have been grown in the bank of dams within Kano state. The samples were pooled together, thoroughly washed with tap water, washed with distilled water, cut in to pieces and then air dried.

### Determination of iodine

The iodine content of the plants was determined as molecular iodine ($I_2$) based on the methods of Liprot (1971) and Jackson (1976) which are based on the oxidation of iodide ions ($I^-$) in to molecular iodine ($I_2$). When $I^-$ is treated with

concentrated $H_2SO_4$ and $H_2O_2$, $I_2$ is librated. The librated $I_2$ was extracted into tetrachlomethane which developed a purple color whose intensity is proportional to the concentration of $I^-$ in the sample.

The samples were ashed in a muffle furnace (Gallenkamp hot box) at 550°C. 1.0g of each of the ash was measured into small different beakers, 20cm$^3$ of distilled water added followed by 20cm$^3$ 1M sulphuric acid and then 10cm$^3$ of 10% v/w hydrogen peroxide. The mixture was gently boiled and then filtered off using a Buchner funnel already fixed to a vacuum pump. The resulting filtrate was transferred into a small separatory funnel and shaken with 3 - 4cm$^3$ tetrachloromethane. The lower violet layer was then run in to 250cm$^3$ volumetric flask and further extractions on the aqueous layer were made and added to the 250cm$^3$ to ensure total extraction of the iodine and the 250cm$^3$ flask made to the mark with more tetrachloromethane. The procedure is repeated with ashes from cabbage, lettuce, and *Hibiscus sabdariffa.*

For calibration a 0.01M iodine solution was prepared in a 50cm$^3$ volumetric flasks. 25cm$^3$ of this solution is kept and the remainder was diluted to a series of solutions for calibration graph. Each of the solution in the series is taken in to 1cm$^3$ cuvette and absorbances taken from a spectrophotometer (Jenway 6305) at 450nm. This made it possible to obtain the concentrations of iodine in the samples (Jackson, 1976).

**Determination of moisture content**

2.0g of the washed fresh samples were weighed in a pre-weighed porcelain crucible and dried in an air circulating oven (Gallenkamp, UK) at 105°c to a constant weight for about 3 hours, cooled in a desiccator and then weighed (AOAC, 1990). The percentage loss in weight was expressed as moisture content.

**Determination of dry matter**

For the dry matter content, similar determination as above was carried out on 2.0g dry sample to estimate residual moisture content which was finally converted to percentage dry matter (Hassan and Umar, 2006; AOAC, 1990).

**Determination of ash content**

2.0 g of the air dried samples were weighed into a pre weighed porcelein crucible and heated in a muffle furnace (Gallenkamp hot box) at 550°c for 24 hours, allowed to cool and then weighed. The percentage ash weighed was expressed as ash content (AOAC, 1990).

**Results and discussion**

From table 1 above, the iodine content of *Hibiscus sabdriffa* is the highest (0.0043%) followed by spinach (0.0034%); cabbage (0.0036%) and then lettuce (0.0023%). These values indicate that these vegetable contains significant amount of iodine. In fact, the method used in this study gave relatively higher values compared to others (Thomas and Majekodunmi, 2001) and this may be attributed to its high accuracy and precision. The same table indicates the moisture contents of the vegetables. *Hibiscus sabdariffa* has the least moisture content (6.13%) followed by spinach (6.25%). Moisture is the water content of plants and knowledge of it furnishes one with optimum processing condition of the vegetables (Anhawange *et al*, 2006).

**Table 1: Iodine, moisture, dry matter and ash contents of *Spinacea oleracea* linn (spinach), *Brassica oleracea* var (cabbage), *Hibiscus sabdriffa* linn and *Lactuca sativa* l. (lettuce) found in Kano metropolis vegetable markets**

| | Iodine % | Moisture % | Dry matter % | Ash % |
|---|---|---|---|---|
| **Spinach** | 0.0034±0.0015 | 6.25±0.53 | 72.02±5.05 | 5.25±1.10 |
| **Cabbage** | 0.0032±0.0011 | 7.83±0.75 | 76.05±2.70 | 6.35±0.069 |
| **Salad** | 0.0023±0.0017 | 10.41±1.20 | 64.13±4.25 | 4.72±0.27 |
| ***Hibiscus sabdriffa*** | 0.0043±0.0020 | 6.13±0.45 | 74.60±5.16 | 5.89±0.93 |

The dry matter content of cabbage is the highest (76 .03%) and is in conformity with similar study elsewhere (Anhawange *et al*, 2006) and may be as a result of the inherent properties of the plants analyzed and the precision of the method used. This is followed by *Hibiscus sabdriffa* (74.60%), spinach (72.02%) and the least is lettuce (64.13%). The presence of dry matter in a vegetable shows a high nutritive value of a particular plant feed.

The ash content of cabbage in the highest (6.35%) followed by spinach (5.89%) *Hibiscus sabdariffa* (5.89%) and lettuce with the least (4.72%) and the ash content of a plant material is a measure of its mineral content. The relatively high ash content of these vegetables compares favorably with other plants that offer large amounts of protein (Anhawange *et.al*, 2006)

**Conclusion**

The study has shown that these vegetables when taken in addition to iodine supplemented salt will help to deter iodine deficiency disorders (IDD) in humans.

**References**

Anhawange, B.A; Ajibola, V.O. and Okibe F.G. (2006): Nutritive value and anti-nutritive factors in *Hibiscus sabadraffa* Linn. *J. of Fisheries International* 1(2-4): 73-76.

AOAC (1990): Official methods of analysis, 14th edition, Association of Official Analytical Chemists, Washington DC.

Gwarzo, U.S.; Gimba, C.E. and Dim, L.A. (2006). Mineral composition of *Hibiscus cannabinus* Linn. *Chemclass Journal.* (3):51-56.

Hassan, L.G. and Umar, K.J. (2006): Nutritional value of Balsam apple (*Mormodica chrantia* L.) leaves. *Pak. J. of Nutr*., 5(6):522-529.

Ismail, I.M. and Ayodele, J.T. (2003): Iodine level in Kadawa and Tiga agricultural soils of Kano, Kano state, *Nig. J. of Applied and Pure Sciences,* 1 (1): 29-32.

Jackson, A. (1976): A colorimetric determination of the Iodine content of seaweeds and of the manganese content of *Chamaenerion angustfolium* (rose bay willow herb).*The School Science Review*, 51 (174):113-116.

Liprot, G.F. (1971). Modem Inorganic Chemistry 2nd edition published by ELBS and Mills and Boon Ltd., London. Pp. 339.

Osaki, M.; Yamada, S.; Ishizawa, I; Watanabe, I.; Shinano, I.; Thuah, S.J. and Urayama, M. (2003): Mineral characteristics of leaves of phylogeny sown in various soil types the temperate region. *Plant Foods for Human Nutr*. 58:117-137.

Ripe, R.P.; Rice, L.W. and Tindal H.D. (1986): Fruit and vegetable production in Africa N. Hong Kong. Macmillan Publishers Ltd.

Thomas S.A. and Majekodunmi, O.B. (2001): A survey of the Iodine contents in some food stuffs. *J. Chem. Soc. Nig.* 26 (2): 205 - 210.

Tomori, W.B and Obijole, O.A (2000): Mineral Composition of Some less Utilized Vegetables in Nigeria. *Afr. J. Sci. Tech.* 1 (2): 153-157.