

Short Communication

Nigerian dates: Elemental uptake and recommended dietary allowances

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Dry dates were purchased weekly from the open market in Benin City. Atomic absorption spectrophotometer was used to determine the following elements in the mesocarp of the dates: Mg, Ca, Fe, Cu, Zn, P, Pb, Hg, Cr and Cd. The flame photometer was used to determine Na and K. Results obtained indicated that K had the highest concentration, followed by Ca, Mg and Na, respectively. The other elements were present in lower concentrations. Hg, Cr, Cd, and Pb were not detectable. The overall results suggest that over 100 mg of the mesocarp of dates would be required to meet the recommended dietary allowance for all ages. Additionally, the mesocarp of dates could be a useful source of the elements that the body cannot synthesize, which are needed daily for healthy living. The uptake and interrelationship of the mineral elements detected are discussed.

Key words: Mesocarp, elemental uptake, recommended dietary allowance, atomic absorption spectrophotometer, flame photometer.

INTRODUCTION

Living organisms cannot synthesize mineral elements like other nutrients. Consequently, for the body to meet the needs of mineral elements, they are usually acquired through food intake. In the human body, the minerals function as structural components of body organs, tissues and constituents of body fluids and tissues as electrolytes, and catalysts in enzyme and hormone systems (Underwood, 1977). The functional roles of elements are interrelated and balanced against each other, and most often cannot be considered as single elements with independent and self-sufficient roles in the organized bodily processes. A number of trace elements (E.g., Copper, Zinc, Iron and Selenium), in addition to certain vitamins (E.g., vitamins A, D, F, D12 and Folacin) and other nutrients are strongly related to adequate immune response. These nutrients act together and/or separately, to form an active immune response (McDowell, 1992).

Date is the name of the fruit of the date palm which is believed to have originated somewhere in the desert oases of Northern Africa and perhaps Southern Asia (<http://lifestyle.iloveindia.com>; "Date Palm", 2008). All

parts of the date palm has useful economic purposes, for example, at various stages of the maturity of the dates, the fruits are eaten. The fruit provides a concentration of high energy yielding nutrients like glucose, fructose, sucrose, etc. The trunk is used as plank for building houses, bridges, fences, etc. (Walid Al-shahib et al., 2003; Alabduhadi et al., 2004) In the desert, the palm acts as shades and protection from desert winds around dwelling houses. The date fruits are commonly consumed in Nigeria, especially in its ecological areas. Additionally, it is sold in the open market along other staple foods. In short, it has become a staple food among the Northerners of Nigeria and some parts of the world, like the Arab countries (UNO, 2003). The recommended dietary allowances (RDAs) serve as a nutritional norm for planning and assessing intakes and the levels of intake of essential nutrients considered fit or adequate to meet the requirement for healthy individuals. Dr A. Harper, when introducing the vision of the RDAs in 1974, stated that "However, requirements may differ with age and body size, among individuals of the same body size, owing to differences in genetic make-up, with the physiological state of the individuals growth rate, pregnancy, lactation and with sex."

Several reports on the nutritional constituents of the date have been presented by authors in Saudi Arabia.

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Table 1. Some mineral constituents of date mesocarp. (mg/100 g).

Month	Ca	K	Mg	Fe	Cu	Zn	P	Pb	Hg	Cr	Cd
April	72	600	45	2.3	0.45	0.60	70	ND	ND	ND	ND
May	87	525	47	1.2	0.10	0.50	80	ND	ND	ND	ND
June	75	562	30	2.0	0.35	0.80	76	ND	ND	ND	ND
Mean	78	562	40.66	1.83	0.30	0.63	75.33	ND	ND	ND	ND

Currently, scanty results are available in Nigeria on the nutritional benefits/constituents of the date. This paper is therefore aimed at presenting a nutritional guide on some of the elemental constituents of dry dates and the RDAs using a known weight of the mesocarp. It is hoped that the information generated would assist in developing a nutritional norm for planning and assessing intake of essential elements in human nutrition.

MATERIALS AND METHODS

Collection of samples

Dried date samples were purchased at random from the open market at Aduwawa cattle market in Benin City on biweekly basis for twelve weeks.

Preparation of samples for analysis

Ten gramme of the mesocarp of dates were obtained from the seeds and ashed in the Muffle Furnace at 500°C for 3 h. The ash was dissolved in dilute HCL (10 ml of 20%), transferred to a 100 ml flask and made-up to mark with deionized water.

Instrumental determinations

A computerized atomic absorption spectrophotometer, Unicam Series, Model 969, was used in the determination of the following elements, as described by Perkin-Elmer Corp (1968); Ca, Mg, Fe, Cu, Zn, and Mn, Hg, Pb, Cr, Cd. The potassium and sodium were assayed for with a Flame-Photometer (Sherwood, 410). The method described by Watanabe and Olean (1965) was used in the determination of P.

RESULTS AND DISCUSSION

The results of the mineral constituents of the dates mesocarp are presented in Table 1. The results revealed that some of the micro elements present in the mesocarp of the dates were in different concentrations. Additionally, the results also suggest that plant nutrients are mainly of the inorganic nature, unlike man and animals that require organic compounds in addition to their inorganic nutrients. The elements detected are classed among the essential ones for plants. It is obvious that the elements detected were translocated after their absorption by the root from the soils. In effect, the amount detected in the

mesocarp was dependent on the amount in the soil, the efficient mechanism of absorption of the nutrients by the plant and the need of the plant for the nutrients. The above factors suggest why varied concentrations of the mineral elements were detected in the mesocarp of the dates. Among the elements detected, Potassium has the highest concentration, followed by Calcium, Magnesium, Phosphorus, Iron, Zinc and Copper, respectively. In plant nutrition, potassium is considered as the most important cation with regard to its content in plant tissues, physiological and biochemical functions. Authors like, Ansari et al. (1972) have observed in their studies that potassium is mobile in the plant and is taken up at higher rate, being one of its main features. Groome et al. (1974) also observed in their studies that the high rate of potassium uptake indicates that it is a stronger competitor against the uptake of other cation species. Additionally, the elemental interrelationship as observed in the dates mesocarp agrees with the findings of Grimme et al. (1974), who reported that the absorption rate of other cations is enhanced when the potassium uptake is low.

Our present results also agree with the observations of Mengel et al. (1979), who reported that, potassium uptake is always higher than that of calcium in plant tissues. This suggests that plants have not developed an efficient uptake mechanism for calcium.

The concentration of magnesium in the mesocarp of the dates was lower than that of calcium and potassium as also observed by Mengel et al. (1972) in plant nutrition. On the other hand, Grimme et al. (1972) observed that in the presence of low level of potassium, higher magnesium contents occurred.

The results of Iron, Zinc and Copper detected in the mesocarp of the dates were in consonance with earlier findings of Lingle et al. (1963), Chaudhry et al. (1972), Mengel et al. (1979) etc. However, ample evidence is already available in literature that higher plants require Iron, Zinc and Copper in small quantities or amounts, being micronutrients.

The results for the RDAs indicates that a range of 102 to 1968 mg of dates mesocarp would be required daily to meet the needs of the elements detected, depending on the individual (Table 2). These results suggest that, the elemental concentration of the mesocarp of dry dates is rather low. However, in animal and human nutrition, Ukhun and Dibie (1990) have indicated that overall sources, that is, cumulative intakes of nutrients from

Table 2. Weight of date mesocarp required to meet the recommended dietary allowances for the mineral elements detected (mg).

	Mg	K	Ca	Fe	Cu	Zn	P	Pb	He	Cr	Cd
Children/Ages 1 – 3	102	414-562	1968	546	233-333	1587	ND	ND	ND	ND	ND
4 – 6	153	138-294	1968	546	333-900	1587	ND	ND	ND	ND	ND
7 – 10	218	178-534	1968	546	333-667	1587	ND	ND	ND	ND	ND
Adolescents 11+	358	272-814	2951	656	833-900	2381	ND	ND	ND	ND	ND
Adult (Men and Women)	449 - 512	333 - 1000	1968 - 2951	546 - 656	500 - 1000	2381	ND	ND	ND	ND	ND

different sources, may be more important than a single and isolated source in the feeding habits of many people.

Accordingly, the small amounts of micro and macro elements detected in the mesocarp of dates could be regarded as important in being part of the cumulative intake of these mineral elements in human nutrition. Further research is under way, to enable us compare dates mesocarp from all the growing parts or zones of Nigeria, since soil nutrients varies from one ecological zone to the other.

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