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Density and Prevalence of Geohelminth in Date Fruits and Tiger Nuts in Abuja Metropolis, North Central Nigeria

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Abstract

A study on the density and prevalence of geohelminth in date fruits and tiger nuts in was carried out between May and August, 2017 in Abuja metropolis. Total of 108 date fruits and 1537 tiger nuts was acquired from six different localities in Abuja, Nigeria. The date fruits were grouped in threes, each set with an average of 17.8g per chunk. The tiger nuts were grouped into 5 sets of 10g each. Each of the sets was washed in 10ml normal saline. Each resultant suspension was strained through a piece of double layered improvised cheesecloth (bandage), which filtered off particles but allowed the passage of helminths eggs and larvae. Each filtrate was transferred to a clean labelled centrifuge tube. The filtrate was centrifuged at 2500rpm for one minute. After processing and decanting the supernatant into a disinfectant jar using Pasteur pipette, the sediments were agitated to form suspension with the remaining fluid in the tube. 20µl of the suspension was picked using pipette and applied on the center of a clean grease-free labelled slide for microscopic examination under a cover slip to avoid air bubbles using the X40 objectives. Identified geohelminths include ova of *Ascaris lumbricoides*, *Trichuris trichura, Taenia spp, Enterobius vermicularis,* and Hookworm.

Keywords

Prevalence, Date Fruit, Tiger Nut, Soil Transmitted Helminthes, Abuja, Nigeria

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1. Introduction

The prevalence of soil transmitted helminthes (STH) infection is mainly attributed to their chronic and insidious impact on the health quality of life those infected rather than the mortality they cause [1]. Globally, over 267 million preschool-age children and 568 million school-age children live in areas where STHs are intensively transmitted and are in need of treatment and preventive interventions [2]. The habit of walking bare feet on sand and eating unwashed fruits and vegetables has greatly encouraged the transmission of helminthic infections. Despite all the medical and pharmaceutical advance as well as progress in sanitary engineering, intestinal parasitic infections remain the most prevalent in the world, especially in developing countries struggling with water scarcity, poor hygiene and lack of adequate health care services [3].

Date palm (*Phoenix dactylifera L.*) is considered among the oldest cultivable crop that was extensively grown in northern Africa and Middle East [4]. Date fruits develop through five different stages Hanabauk, Kimri, Khalal (or Bisr), Rutab, and Tamra [5]. The date is considered to be an important subsistence crop in arid and semi-arid regions and plays an important socioeconomic strategy for many countries [6]. In Nigeria, it is called Dabino and is commonly used by Nigerian

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Muslims to break their Ramadan fast. Pollinated dates are harvested from September to December. Because all dates on a tree may not mature at the same time, they are handpicked several times during the fall from bunches on the trees. This ensures that the dates are picked at their peak level of sugar content and flavor. The nutritional value and its health benefits are well known across the globe due to rich in high profile nutrients and health promoting properties. Dates are loaded of various nutrients with medicinal importance for ailment of certain diseases. Wonderfully delicious, dates are one of the most popular fruits packed with an impressive list of essential nutrients, vitamins and minerals that are required for normal growth, development and overall well-being. It is the sources of natural sugar like glucose, fructose and sucrose that furnishes body with instant energy [7]. It is also useful in cases of fatigue and they are particularly beneficial to adolescents, youth athletes, pregnant and lactating mothers [8].

Tiger nut (*Cyperus esculentus lativum*) is an underutilized tuber of the family *Cyperaceae,* which provides rhizomes from the base of the tuber that is somewhat spherical [9]. It is a tuber that grows freely and is consumed widely in Nigeria, other parts of West Africa, East Africa, parts of Europe especially Spain as well as in the Arabian Peninsula [10]. Tiger nut is widely used for human and animal consumption as a nutritious food and feed in Africa, Europe and America [11]. The cultivation time is between April and November. Being cultivated through continuous irrigation, tiger nut has to be properly dried before storage. It is known as "Äya" in Hausa, "Ofio" in Yoruba and "Akiausa" in Igbo where there varieties (black, brown and yellow) are cultivated [12]. Among these, the yellow variety is preferred over others because of its inherent properties such as large size, attractive color and fleshier nature. In Nigeria, tiger nut is available in fresh, semi-dried and dried form in the market where it is sold locally and consumed.

Date fruits and tiger nuts are available in Abuja all year round. They are highly patronized by travelers in Nigeria due to its sweetness, cheapness and high nutritional value. They are sold in shopping malls, supermarkets and they are also been hawked around. These dry fruits are often eaten as soon as they are bought by travelers. Geohelminth contamination could possibly be as a result of insanitary handling by both hawkers and buyers, who dip their hands into the fruit heaps in receptacles to select or taste the fruit before purchase.

2. Materials and Method

2.1. The Study Area

The study was carried out in selected regions (Karmo, Dutse, Gwagwalada, Garki, Zuba and Masaka) in Abuja metropolis. Abuja is a federal capital territory in central Nigeria. It was found in 1976 from parts of the state of Nasarawa, Niger and kogi. The territory is located just north of the confluence of the Niger River and Benue River. Abuja is bordered by the states of Niger to the West and North, Kaduna to the Northeast, Nasarawa to the East and South and Kogi to the Southeast. Lying between latitude 8°25 and 9°20 North of the equator and longitude 6°45 and 7°39 East of Greenwich meridian, Abuja is geographically located in the center of the country. The FCT has a landmass of approximately 7,315km^2 and it is situated within the savannah region with moderate climatic condition. Abuja's vegetation is mainly savannah with limited forest areas. They produce crops like yam, beans, maize, millet and sorghum.

2.2. Study Sample/Technique

108 date fruits and 1537 tiger nuts were acquired from six different localities in Abuja. The date fruits were grouped in threes, each set with an average of 17.8g per chunk. The tiger nuts were grouped into 5 sets of 10g each. Each of the sets was washed in 10ml normal saline. Each resultant suspension was strained through a piece of double layered improvised cheesecloth (bandage), which filtered off particles but allowed the passage of helminths eggs and larvae. Each filtrate was transferred to a clean labelled centrifuge tube. The filtrate was centrifuged at 2500rpm for one minute. After processing and decanting the supernatant into a disinfectant jar using Pasteur pipette, the sediments were agitated to form suspension with the remaining fluid in the tube. 20µl of the suspension was picked using pipette and applied on the center of a clean grease-free labelled slide for microscopic examination under a cover slip to avoid air bubbles using the X40 objectives. The whole area under the cover slip was checked for eggs and larvae of geohelminths. The process was systematically repeated until the sediment in each centrifuge tube was examined.

2.3. Statistical Analysis

Data collected were analysed using descriptive statistics. Variation in contamination among the selected region of Abuja was tested using chi-square test.

3. Results

Results showed that of the each sets of Date fruits and Tiger nuts examined were contaminated with ova of parasites. *Ascaris lumbricoides* (63.9%) was the most prevalent parasite in the date fruits and tiger nuts from all the selected regions while *Fasciola hepatica* and *Schistosoma spp* (0.2%) were jointly the least prevalent parasites (Table 1).

It was observed that date fruits and tiger nuts acquired from Gwagwalada region were highly contaminated with parasites (Table 2). However, there was statistical significance in the level

of parasite contamination in the selected regions (df=5, p<0.05).

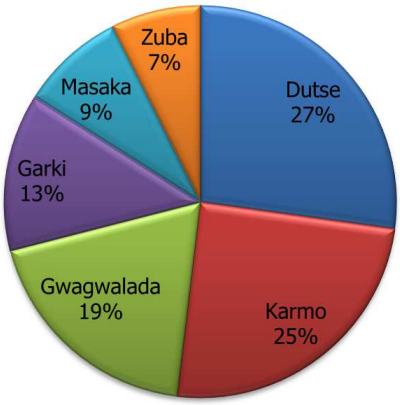

Figure 1. Degree of parasite contamination in date fruit from the six studied locations in abuja metropolis.

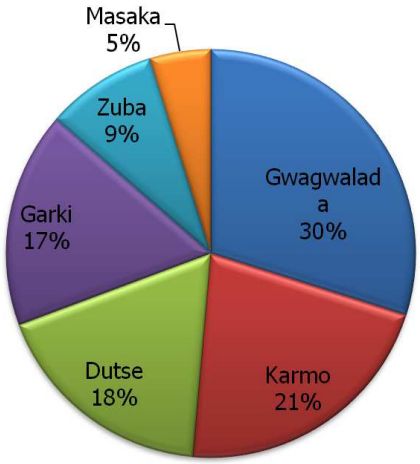

Figure 2. Degree of parasite contamination in tiger nut from the six studied locations in Abuja metropolis.

Table 1. Distribution of geohelminths ova on Date fruits and tiger nuts from different parts of Abuja metropolis.

Geohelminth	Karmo	Masaka	Dutse	Zuba	Gwagwalada	Garki	Total (%)
Ascaris lumbricoides	57	19	56	12	76	44	264 (63.9)
Hookworm	18	-	15	-	13	6	52 (12.6)
Taenia spp	14	3	3	8	6	1	35 (8.5)
Hymenolepis diminuta	5	2	-	14	11	13	45 (10.9)
Trichuris trichiuria	-	2	-	-	-	-	2 (0.5)
Enterobius vermicularis	-	-	5	-	-	-	5 (1.2)
Clonorchis sinensis	-	-	8	-	-	-	8 (1.9)
Fasciola hepatica	-	-	1	-	-	-	1 (0.2)
Schistosoma	-	-	1	-	-	-	1 (0.2)

Table 2. Percentage of parasite contamination in the study area.

Location	No. of geohelminth	Percentage (%)
Karmo	94	22.8
Masaka	26	6.3
Dutse	89	21.5
Zuba	34	8.2
Gwagwalada	106	25.7
Garki	64	15.5

Table 3. Degree of parasite contamination in date fruits and tiger nuts.

Location	No. of geohelminth in Date fruit	% contamination	No. of geohelminth in Tiger nut	% contamination
Karmo	40	24.7	54	21.5
Masaka	14	8.6	12	4.8
Dutse	44	27.2	45	17.9
Zuba	12	7.4	22	8.8
Gwagwalada	31	19.1	75	29.9
Garki	21	13	43	17.1

4. Discussion

The overall parasitic contamination rate (26.9%) in the present study was in agreement with previous findings within Nigeria [13] and Iran [14]. However, the present result was lower than findings of similar studies from Bahir Dar City, Northwest Ethiopia (39.1%) [15]; Cape Coast metropolis market in Ghana (52.4%) [16]; Dessie towns in Ethiopia (63.4%) [17]; Tarcha town of Southwest Ethiopia (39.0%) [18]; Sharkyia governorate of Egypt (39%) [19]; and Southern Thailand (35.1%) [20]. On the other hand, it is higher as compared to studies from Maiduguri, Nigeria [21] and in Khartoum state, Sudan [22]. These variations between the present study and previous results might be as a result of the difference in geographical locations, climatic and environmental conditions, discrepancy in the kind of fruit samples examined, techniques employed during the study, and the sanitary status of the study community.

Ascaris lumbricoides (63.9%) and hookworm (12.6%) were

the most prevalent geohelminth found in this present study. This result is similar to the findings of Eneanya and Njom [23], who have reported that *Ascaris lumbricoides* occurred most frequently in fruits and vegetables in Enugu, Southeast Nigeria. This study is also in line with other researchers [8, 23, 24], who have reported that fruits and vegetables sold in various markets were highly contaminated by geohelminths parasites including *Ascaris lumbricoides* and hookworm. The contamination could possibly be as a result of improper handling by both hawkers and buyers, who dip their hands into the fruit heaps in receptacles to select or taste the fruit before purchase [8] In addition, the high prevalence of hookworm and *Ascaris lumbricoides* might be due to poor sanitation, climatic conditions, soil types [25], and the use of human waste-contaminated water for irrigation. Moreover, these geohelminth parasites are carried easily by runoff water or flood which then attaches itself to the body of these fruits and nuts thereby contaminating them and posing a serious public health risk. Furthermore, the water used to wash these fruits by the sellers' before selling then can also play a role in the transmission of geohelminth.

Trichuriasis which occurs by ingestion of contaminated food and water with embryonated eggs of *T. trichiura*. In the present study, eggs of *T. trichiura* were detected in date fruits acquired from Masaka region. This finding was consistent with previous reports from Khartoum state, Sudan [22]; Mazandaran province, northern Iran [26]; Accra, Ghana [27]; villages of Qazvin province, Iran [28]; and in various parts of Nigeria [8, 29, 30].

In contrast with previous studies [8, 23, 24], no ova of hookworm was recovered from fruits and nuts bought from Masaka locality. This could be attributed to the improved level of hygiene practiced by the sellers during transportation and marketing of these fruits and nuts. Moreover, Masaka is less populated when compared with the regions where these studies were carried out.

This present study have shown that only date fruits and tiger nuts bought from Dutse locality harbored the eggs of *Enterobius vermicularis, clornochis sinensis, Fasciola hepatica* and *Schistosoma intacalatum*. Contamination by these parasites may be as a result of several factors. For instance, date fruits are imported into Nigeria from Egypt, Iran, Iraq [31], there is possibility that these fruits and nuts was contaminated with pathogens when they were imported with other farm produce. Also, contamination could be influenced by the use of untreated waste water and manure as fertilizers for crop production, irrigation and various agronomics practices and habits of man [8]. Moreover, contamination can also occur in the field or orchard during harvesting, transporting, processing, distribution and marketing or even in the home when fruits are handled under dirty environment. In addition, poor storage, runoff of water containing the eggs and larvae of parasites around areas where these fruits and nuts are cultivated and sold are also possible causes of contamination.

5. Conclusion

This study have shown high level of parasite contamination in date fruits and tiger nuts sold in Abuja where they may pose serious health problems to consumers. Reducing the trends of soil transmitted diseases requires an integrated effort. Therefore, we recommend to the different organs of government and public health sectors to create a task force that will continuously monitor the hygienic level of the fruits and nuts being sold and also engage in massive community enlightenment on the need to adequately wash fruits and nuts before consumption. Moreover, social media outlets should also endeavor to make people understand the various modes of transmission, prevention, and control, so as to interrupt the chain of transmission and eliminate these diseases. Furthermore, community deworming at three months intervals should also be a priority in order to reduce worm load.

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