



Full Length Research Paper

## Geohelminth parasite-stages found on Fresh Vegetables at the Eke-Awka Market, Anambra State, South-Eastern Nigeria

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### Abstract

Soil-transmitted helminth parasites or Geohelminths are one of the most common causes of human diseases that result in serious health and economic issues in many developing and developed countries. Commonly cultivated and consumed vegetables brought for sale in Eke-Awka market in Awka South Local Government Area of Anambra State were screened thoroughly using sedimentation method for evaluation of parasite and factors of contamination of fresh vegetables sold in Eke-Awka market in Department of Parasitology and Entomology Laboratory, Nnamdi Azikiwe University, Awka, Anambra state, Nigeria. A pilot visit revealed that over 15 different types of vegetables are sold at Eke-Awka market in alternate days of the market, 9 types of vegetables were used for this study. Eke-Awka market was visited 6 times on every Eke day, and in every visit 2 of the samples of each vegetables used were procured, for assessment and analysis at the laboratory and each visit gave me 18 of the total samples. One hundred and eight (108) samples of nine different vegetables types such as fluted pumpkin, scent leaf, water leaf, bush buck, garden egg leaf, green amaranth, carrot, garden egg and bitter leaf were obtained from twelve (12) different sellers each. Ova and larvae of intestinal nematodes were recovered. About 38% of the samples were positive for different species of parasites, comprising larvae of *Strongyloides stercoralis* (57.4%), eggs of *Ascaris lumbricoides* (33.3%), and eggs of Hookworm (9.3%). The study also showed that garden egg leaf with 75% infection rate had the highest parasite load while water leaf and Bush buck, each with 17% had the least parasite load. There was significant difference ( $p < 0.05$ ) in the range of parasites from the vegetables in Eke-Awka market. These findings indicated that Soil-transmitted helminth parasites can be transmitted through the consumption of edible raw vegetables.

**Keywords:** Geohelminths, raw edible fresh vegetables, market

### Introduction

Fresh vegetables are considered as vital nutrients of a healthy diet as they supply the body with essential supplements and way that people get infected with intestinal parasites is through the consumption of contaminated vegetables and fruits which are essential for a healthy human body (Idahosa, 2011). Consuming fresh vegetables usually reduces the risk of stroke, cardiovascular diseases, and protects against certain types of cancers (Alhabbal, 2015). Moreover, vegetables are vital sources of energy that are depended

upon by all levels of human as food supplements or nutrients (Simon *et al.*, 2014). They substantially improve food quality as rich sources of water, vitamin C, carotene, mineral elements such as iron, and vitamins including thiamine (vitamin B12), niacin and riboflavin (Nazemi *et al.*, 2012; Ebrahimzadeh *et al.*, 2013; Duedu *et al.*, 2014). Fresh salad vegetables are essential for good health and they form a major component of human diet in every family in Nigeria (Amaechi *et al.*, 2016). In many countries, vegetables are eaten raw or lightly cooked to preserve flavor, and this practice

may favor the likelihood of food-borne parasitic infections (Said, 2012; Sunil *et al.*, 2014).

Recently, it has been reported (Alhabbal, 2015) that there is an increasing number of cases of food-borne illness mainly linked to eating fresh vegetables. Serious outbreaks of intestinal parasitic infections that were associated with raw vegetables have been reported from developed and developing countries (Ul-Haq *et al.*, 2014), and these probably were due to poor sanitation and inadequate personal hygiene (Tefera *et al.*, 2014). Several surveys have been done in different parts of the Africa Ghana (Duedu *et al.*, 2014), Nigeria (Shehu *et al.*, 2014; Ikpeze and Chima, 2017), Ethiopia (Tefera *et al.*, 2014) indicated that the vegetables can be a major source for transmitting protozoan cysts (*E. histolytica*; *Giardia lamblia*; *E. coli*; *Balantidium coli*), oocysts (*Isospora belli*; *Cryptosporidium* spp.), and helminthes' eggs and larvae (*Strongyloides stercoralis*; *T. trichiura*; *Enterobius vermicularis*; *Fasciola hepatica*; *A. lumbricoides*; *Toxocara* spp.; *Hymenolepis nana*; *Hymenolepis diminuta*; *Taenia* spp.).

Nigerians like other West Africans are fond of eating raw and unwashed fruits. Cultivation of these fruits using rain during wet season and irrigation during dry season engender parasites contamination. These two sources of water are highly polluted with human and animal faeces which represent high risk to farmers and consumers of food product. Different parasitic stages can contaminate vegetables. Most contamination occurs in vegetables before harvest, either by contaminated manure in soil, sewage, irrigation water, and wastewater from livestock operations or directly from wild and domestic animals (Pires *et al.*, 2012). Contaminations also occur during harvesting, transport, processing, distribution, and marketing or even at home (Van Duyn and Pivonka, 2000). Ikpeze and Chima (2017) carried out a survey on some edible raw vegetables and fruits displayed for sale were procured from Nkwo-Edo market Nnewi and assessed for contamination by ova and larvae

of STHs during the peak rainy season period of June and July, 2017, and reported that Garden egg, Bitter leaf, and 'Utazi' leafy vegetables, as well as oil palm, African pear, Carrots, and Garden egg fruits were contaminated with different STHs comprising eggs of *Ascaris lumbricoides*, larvae of *Strongyloides stercoralis*, eggs of hookworm species, and ova of *Trichuris trichiura*. The present study was aimed at identifying the Geohelminth parasite stages and their prevalence on fresh vegetables on sale at Eke-Awka Market, Anambra. State Nigeria.

### Materials and Methods

Eke-Awka, is largest market in Awka, capital of Anambra state in Nigeria. Majority of the rural inhabitants of the area are peasant farmers and petty traders of low economic status. The watering of vegetables is through rainfall and irrigation. It is a common practice that majority of the farmers used animal dung to augment the commercially processed fertilizers to limit their cost of farming. Fresh vegetables sold in this market included Bush buck (*Gongronema latifolium*), water leaf (*Talinum triangulare*), scent leaf (*Ocimum gratissimum*), green amaranth (*Amaranthus viridis*), fluted pumpkin (*Telfaria occidentalis*), Bitter leaf (*Veronia amygdalina*), garden egg leaf, (*Solanum melongena*), carrot (*Daucus carota*), Garden egg (*Solanum macrocarpon*). The vegetables used in this study were Water Leaf, Green, Bush buck, Bitter Leaf, Fluted Pumpkin, Scent Leaf, Garden egg, Garden egg leaf and carrot selected because they are commonly cultivated and consumed by the people and are sold daily in the market. Eke-Awka market was visited 6 times on every Eke day. On each visit, 2 samples of each vegetables (a total of 18 samples) were procured for assessment and analysis same day. Sample collection was between 8.00 am - 9.30 am. A typical scene of vegetables on sale at Eke-Awka Market is shown in Plate 1.

The vegetables were collected and wrapped with a labelled dry paper and put in a dry bucket to prevent desiccation and denaturing

of the vegetables and was transported to the laboratory for identification and analysis. The samples were collected under normal purchase conditions from randomly selected sellers.



**Plate 1:** A typical scene of vegetables on sale at Eke-Awka Market.

A total of 108 vendors were interacted with during the study while Botanical names of the vegetables were ascertained at the Herbarium of Botany Department Nnamdi Azikiwe University, Awka. The parasitological analysis (sedimentation techniques) of these samples was carried out at Department of Parasitology and Entomology laboratory, Nnamdi Azikiwe University, Awka. Each of the samples were examined macroscopically for the presence of segments of adult helminths. One-hundred-gram weight of each vegetable sample was placed separately in a plastic container and washed with 100 ml physiological saline solution (0.79% NaCl) for the removal of parasitic ova, cysts or larva. The suspension was strained through a sterile sieve to remove undesirable materials, the filtrate was poured into a test tube and was centrifuged at 2500 revolution per minute for 2 minutes. After centrifugation the supernatant was discarded into the disinfectant jar, a drop of the suspension was

applied to the center of a clean microscope glass slide and a clean cover slip was placed gently on slide to avoid air bubbles. The preparation was examined under the microscope using X10 and X40 objectives. The parasites were identified based on the key and pictorial guide by Arora and Arora (2008) and Ash and Orihel (2007).

## Results and Discussions

In this study, 108 samples were identified as being contaminated with at least one type of parasite; the overall contamination rate was 38%. Table 1 summarizes the percentage of each sample contaminated.

**Table 1:** Overall prevalence of STHs on vegetables sampled in Eke-Awka

Vegetables	Examined No.	STHs-contaminated	
		No	%
Fluted pumpkin	12	5	41.7
Scent leaf	12	5	41.7
Water leaf	12	2	16.7
Bush buck	12	2	16.7
Garden egg leaf	12	9	75.0
Green amaranth	12	3	25.0
Carrot	12	6	50.0
Garden egg	12	5	41.7
Bitter leaf	12	4	33.3
<b>Total</b>	<b>108</b>	<b>41</b>	<b>38.0</b>

The STHs identified according to their characteristic morphology (Plate 2) were *Strongyloides stercoralis* (57.4%), *A. lumbricoides* (33.3%) and hookworm (9.3%). The frequency of occurrence of parasites on selected vegetables (Table 2) were *Strongyloides stercoralis* (57.4%), *A. lumbricoides* (33.3%) and hookworm (9.3%). Recovery of parasites from fresh sold vegetables is an indication of the quality of the overall process of cultivation, irrigation and post-harvest handling, and may be helpful in indicating the incidence of intestinal parasites among a local community (Alade, 2013). The consumption of vegetables raw or undercooked is done in the

belief that raw or undercooked vegetables would give more nutrient (Hedberg *et al.*, 1994), and this serves to promote parasites transmission. This study has shown that STH-contaminated fresh vegetables were sold in Awka and environs. These vegetables should be considered as potential sources of STH parasitic infections especially when they are not properly cooked ('Half-done') or consumed raw in delicacies like African salad and bean porridge. Ikpeze and Chima (2017) reported contamination of raw edible fruits and vegetables with *Ascaris lumbricoides* eggs (59.3%), larvae of *Strongyloides stercoralis* (22.2%) while Usip *et al.* (2017) recorded *Ascaris lumbricoides* (49.4%), *Strongyloides stercoralis* (26.5%) in contrast to Amaechi *et al.* (2016) who reported *A. lumbricoides* (28.0%), and *Hookworm* ova (3.3%), as the commonest contaminating parasites in the different areas they studied.



**Plate 2:** Stages of Geohelminth parasites from vegetables on sale at Eke-Awka Market. [A] Ovum of Hookworm; [B] Ovum of *Ascaris* species; [C] Larva of *Strongyloides* species.

**Table 2:** Distribution of parasites on vegetables sampled in Eke-Awka market.

Vegetables	Total No. (Frequency %)	<i>Ascaris</i> eggs	<i>Strongyloides</i> larvae	Hookworm ova
Fluted pumpkin	8 (14.81)	4	4	0
Scent leaf	12 (22.22)	0	10	2
Water leaf	2 (3.7)	2	0	0
Bush buck	2 (3.7)	1	0	1
Garden egg leaf	10 (18.52)	5	5	0
Green amaranth	3 (5.55)	1	2	0
Carrot	6 (11.11)	4	1	1
Garden egg	6 (11.11)	0	6	0
Bitter leaf	5 (9.26)	1	3	1
<b>Total (%)</b>	<b>54 (100)</b>	<b>18 (33.3)</b>	<b>31 (57.4)</b>	<b>5 (9.3)</b>

The present study recorded *Strongyloides stercoralis* (57.4%) and *A. lumbricoides* (33.3%) as being the most occurring parasites on vegetables in the study area. It is likely that differing findings by previous researchers could be due to differences in the areas of study which differ both in geographical location, climatic, environmental conditions, the general behavioral attitude to hygiene and the socio-economic activities of producers, sellers and

consumers. *Strongyloides* rhabdatiform larva was the most frequently identified parasite on the vegetables in the present study, and was differentiated microscopically from the rhabdatiform larvae of other hookworms by their very short buccal cavities (McPherson & Pincus 2016). This might be because the *Strongyloides* has a free-living state that does not require a host for its proliferation, in addition to its parasitic mode of life (Tefera *et al.* 2014).

## Conclusion

The STHs parasites contaminated some of the fresh vegetables sold in Eke-Awka market. It is obvious that humans are at high risk of infections from contaminated fresh vegetables eaten raw on daily basis. Prevention of contamination remains the most effective way of reducing vegetable borne parasitic infections, and this can be achieved by proper washing of vegetables, improved hygienic practices of vegetable handlers, and improvements in sanitation standards. Comprehensive health education should also be given to vendors and farmers.

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