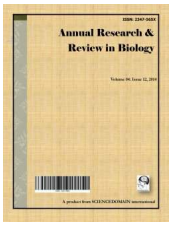

Annual Research & Review in Biology

19(4): 1-6, 2017; Article no.ARRB.35806
ISSN: 2347-565X, NLM ID: 101632869

Prevalence of Helminth Eggs on Raw Vegetables and Fruits Sold in Selected Markets in Makurdi, Benue State, Nigeria

E. U. Amuta[1], V. U. Obisike[1*] and N. I. Acham[2]

[1]Department of Biological Sciences, University of Agriculture, Makurdi, Nigeria.
[2]Department of Biological Sciences, Benue State University, Makurdi, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author EUA designed the study. Authors VUO and NIA wrote the protocol and wrote the first draft of the manuscript. Author NIA managed the analysis of the study (sample collection and parasitological analysis). Author VUO performed the statistics. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARRB/2017/35806
Editor(s):
(1) Gabriela Civeira, Professor, Faculty of Agriculture and Agrifood Sciences, University of Morón, Argentina.
(2) George Perry, Dean and Professor of Biology, University of Texas at San Antonio, USA.
Reviewers:
(1) Danuta Kosik-Bogacka, Pomeranian Medical University, Poland.
(2) Enedina Jiménez Cardoso, Hospital Infantil de México Federico Gómez, Mexico.
(3) Panagiotis Simitzis, Agricultural University of Athens, Greece.
Complete Peer review History: http://www.sciencedomain.org/review-history/21874

Original Research Article

Received 29th July 2017
Accepted 2nd October 2017
Published 13th November 2017

ABSTRACT

Humans, in their effort to be fed with a healthy diet, regularly consume raw (fresh) vegetables and fruits. Unfortunately, raw vegetables and fruits could serve as carriers of parasitic pathogens.
Aim: A study conducted between November 2014 and February 2015 aimed at determining the prevalence of parasitic helminth eggs on fresh vegetables and fruits sold in four major markets in Makurdi, Benue State.
Methods: A total of 131 samples of fresh vegetables and 59 samples of fresh fruits were examined for helminth eggs and larvae using standard methods.
Results: Data showed prevalence of parasite eggs on vegetables as follows: *Ascaris lumbricoides* (41.1%), hookworm (8.9%), *Trichuris* spp (12.1%), *Toxocara canis* (13.7%), *Taenia* spp (13.7%), *Strongyloides stercoralis* (7.3%) *and Paramphistome* (3.2%); while prevalence of parasite eggs on fruits was as follows: *Ascaris lumbricoides* (38.7%), hookworm (8%), *Trichuris* spp (16%), *Taenia*

**Corresponding author: E-mail: talk2vu@gmail.com;*

spp (20%), *Strongyloides stercoralis* (89.3%) *and Paramphistome* (8%). A very strong positive correlation existed between the prevalence of parasitic helminth eggs in vegetables and that of fruits sold in Makurdi ('r' =0.9405). Pumpkin and water leaf were the most contaminated of among the vegetables sampled. Location related prevalence of parasite eggs on vegetables and fruits were not significant (P>0.05).
Conclusion: The need to treat or thoroughly wash vegetables and fruits before consumption should not be overlooked.

Keywords: Helminth eggs; vegetables; fruits.

1. INTRODUCTION

Many fruits and vegetables are rich sources of small proportions of proteins, fats and relatively high levels of vitamins such as vitamin A, C and K, alpha, beta carotene, folic acid etc and minerals such as calcium, magnesium, potassium and iron, etc. [1,2,3].

Humans in their effort to be fed with a healthy diet regularly consume raw vegetables and fruits that could serve as possible channels for the transmission of parasites [4]. Intestinal parasites are common in developing nations and in Nigeria in particular [5], this could be attributed to open defecation being practiced in some rural and pre-urban areas of the country.

Benue state is acclaimed to be the "food basket" of Nigeria where varieties of fruits and vegetables abound. This study was carried out to estimate the prevalence and distribution of transmissible parasites found on fruits and vegetables. Findings are expected to provide necessary guidelines concerning safety and consumption of fresh fruits and vegetables. In Benue State Nigeria, the large River Benue and its tributaries provide good river banks and available water for all year farming of fruits and vegetables. Most of the human inhabitant of the river bank areas bath, defecate, dump refuse etc in the river, drainage systems are also channeled to the river thus, and the chances of helminthic infection appear to be very high.

2. MATERIALS AND METHODS

2.1 Description of Study Area

Makurdi, the Benue State capital was used in this study. Benue state is in the North central, Nigeria along the River Benue and holds a base for the Nigerian Air force's MIGZI and SEPECAT Jaguar aircraft squadrons. Benue State is predominantly an agricultural catchment area specialising in cash crops, subsistence crops and a variety of potentials [5].

Makurdi lies at 7.74 North latitude and longitude 8.51 East and 104 meters elevation above sea level. The major ethnic groups are Tiv, Idoma and Igede. As of 2007, Makurdi has an estimated population of 500,797 people [5] Makurdi is a major transhipment point for cattle from Nigerian's Northern State. There are extensive limestone and marble deposits' in the Makurdi [6]. It has four major markets namely; Wadata, Wurukum, North-bank and Modern market.

2.2 Area of Sampling and Subjects

The study was carried out between November, 2014 and February, 2015. Fruits and vegetables were sampled from the four major markets of Makurdi, Benue state. The majority of the farmers convey their farm products for sale in these markets and the majority of the population depend on these markets for the supply of vegetables and fruits. Three [3] types of fruits and four [4] types of vegetables were sampled from clusters of sellers (Table 1), samples were collected into separate sterile polythene bags. A total of 190 samples of fruits and vegetables were examined.

The parasitological analysis of these fruits and vegetables was carried out in the department of Biological Sciences laboratory, Benue State University, Makurdi using sedimentation techniques [7] where 200 g of each sample was washed in 250 ml of sterile distilled water in separate sterile container [7]. The suspension was filtered through a doubled layered sieve [7]. Filtrate was transferred in clean specimen bottle and centrifuged at 3000 rpm for 5 minutes [8].

The sediment was mixed and a drop was placed on a clean grease-free slide. A clean cover slip was placed gently to avoid air bubbles and over-flooding. The samples were examined under the microscope using the ×4 and ×10 resolutions for examining the presence of helminthes eggs. The helmithes eggs were identified using manual District Laboratory Practice in Tropical Countries [8].

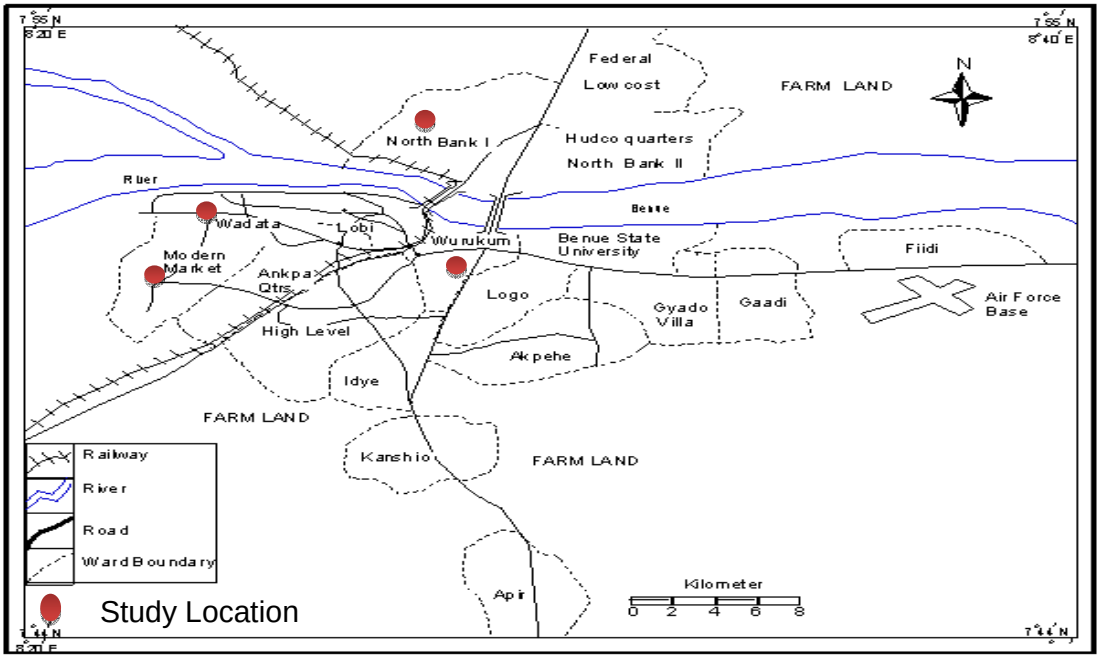

Fig. 1. Map of Makurdi showing the study locations
Source: Google map

Table 1. Vegetables and fruits used in this study, including their common name and scientific names

Vegetable		Fruits	
Common name	**Scientific name**	**Common name**	**Scientific name**
Cabbage	*Brassica deracea*	Garden egg	*Solanium nelegneta*
Waterleaf	*Talinum triangulare*	Tomato	*Solanium lycopersicum*
Fluted pumpkin	*Telfairia occidentalis*	Okro	*Abelmoschus esculentus*
Carrot	*Daucus carota*		

3. RESULTS AND DISCUSSION

Three different types of fruits and four different types of vegetables were sampled from four major markets in Makurdi town. A total of 131 vegetables and 59 fruit samples were examined for helminth parasites. A total of 75 helminth eggs were recovered from fruits and 124 from vegetables as shown in Table 2. Eggs were from the parasites of *A. lumbricoides* (52.54%), *S. stercolaris* (15.25%), *T. canis* (20.34%) and *T. trichiuria* (11.86%). This result contradicts earlier findings which reported that *T. trichiuria* eggs were most prevalence [7]. Table 2 shows the frequency of helminth parasite isolated on fruits and vegetables from the various markets. Table 3 shows the overall distribution of helminth egg recovered which also revealed that *Ascaris lumbricoides* was the most prevalent. The overall prevalence was 31.05% which is lower than that observed in earlier research [5].

Fig. 2 reveals the level of contamination of vegetable samples in the various markets sampled. Fig. 3 described the type of helminth eggs on fruits sold in Makurdi.

The vegetable *T. Triangulare* (waterleaf) (32.20%) was the most contaminated and the least contaminated were the fruit tomatoes (8.47%). Similar findings have been reported by previous researchers [7,9] though, some previous research reported tomato as the most contaminated of all the samples [9]. The smooth surface of tomato appears to be responsible for the reduced rate of adherence to its surface. Contamination of vegetables and fruits didn't significantly vary with market locations. Observations however show that markets like

Wadata and Wurukum which are characterized by refuse dumps, poor drainages, lack of portable water and toilets appear to have more fruits and vegetable contaminations than the Modern market which has cemented floors, good drainages, toilets and commercial water sources.

The contamination of fruits and vegetables is the result of the overall process of cultivation, irrigation and handling after harvest [3,10]. Although the population of these helminth parasites is not high, however, its effect is deleterious to human health.

Fruits and vegetables are frequently contaminated because they are cultivated in manure rich soil since rural farmers use animal and human excreta as organic fertilizer. In recent years, it has been reported that, there is an increase in the number of reported cases of food-borne illness linked with fresh fruits and vegetables consumption due to the contamination arising as consequence of soil organic fertilization such as manure, sewage and sludge. These plants are usually brought to the markets unwashed to prevent easy spoilage.

The prevalence of helminths in these markets could also be as a result of faecal contamination of water sources used in crop irrigation [10].

Helminths encountered during this study were *Ascaris lumbricoides, Strongyloides stercolaris, Trichuris trichiuria* and *Toxocara canis.* Helminthiasis is a serious health problem especially in children [11]. *A. lumbricoides* was the most common helminth egg detected as in other studies; this finding results from its remarkable infections and versatility [12,13]. It causes ascariasis and it is the largest intestinal helminth of man with infection similar to those of hookworm in children [14]. Other parasites found are *T. trichiuria* causing Trichiuriasis and dysentery syndrome (TDS) that negatively affect growth. *S. stercolaris*, a pathogen of major importance results in overwhelming infections in immuno compromised patients. It often leads to death [15] *T. canis* was also found, that could lead to loss of vision [16-18].

The consumption of raw fruits and vegetables is a major way in the transmission of parasite of food-borne illness because consumer wants to retain natural taste and preserve heat susceptible nutrients [19,20]. This in essence may increase food-borne parasitic infections.

Table 2. Prevalence of helminth eggs detected on fruits and vegetables sold in Makurdi

Parasites	Fruits		Vegetables	
	Frequency	Prevalence (%)	Frequency	Prevalence (%)
Ascaris lumbricoides	29	38.7	51	41.1
Taenia spp	15	20	17	13.7
Trichuris spp	12	16	15	12.1
Strongyloides	7	9.3	9	7.3
Hookworm	6	8	11	8.9
Paramphistome	6	8	4	3.2
Toxocara canis	0	0	17	13.7
Total	75	100	124	100

r =0.9405

Table 3. General distribution of helminth eggs on fruits and vegetables in various markets

Fruits	Wurukum	North-bank	Wadata	Modern market	Helminth egg	
					Number	%
Garden egg	2	3	2	0	7	11.86
Tomatoes	1	0	3	1	5	8.47
Okro	4	2	5	2	13	22.03
Pumpkin	3	1	3	0	7	11.86
Waterleaf	4	5	6	4	19	32.20
Cabbage	3	0	4	1	8	13.56
Total	17	11	23	8	59	

$\chi 2$ =4.812; p> 0.05

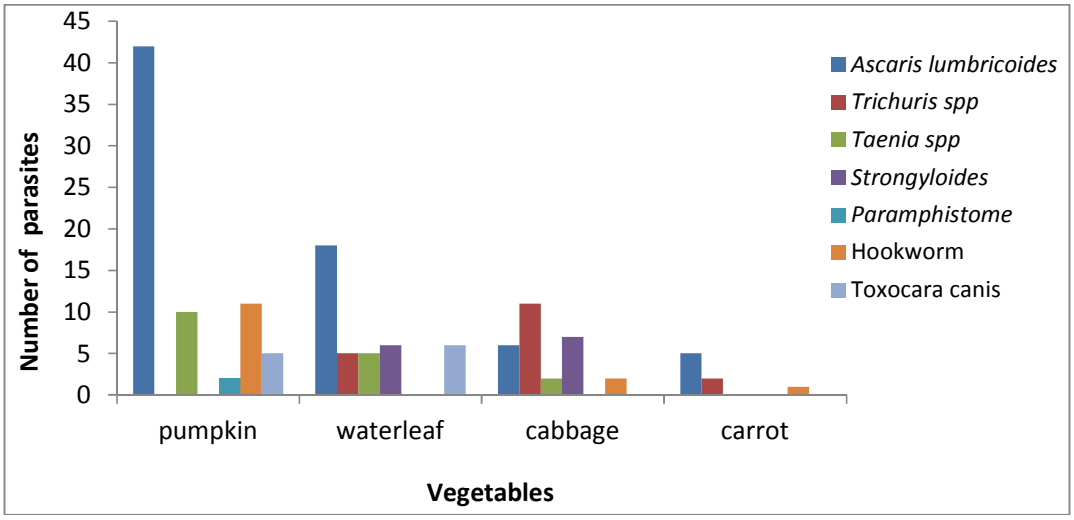

Fig. 2. Helminth eggs on vegetables sold in Makurdi
P>0.05

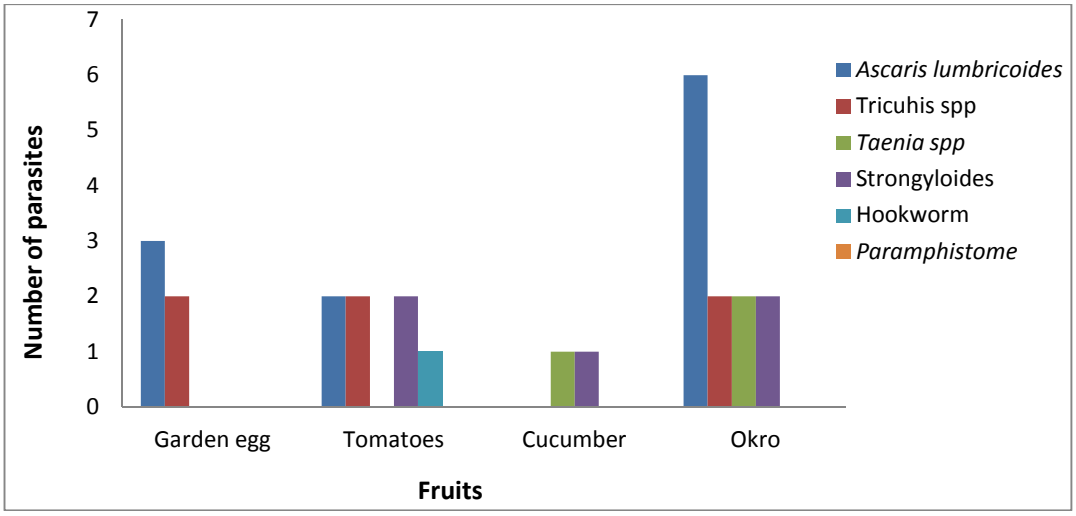

Fig. 3. Helminth eggs on fruits sold in Makurdi
P>0.05

4. CONCLUSION AND RECOMMENDATION

From this research, fruits and vegetables are quite contaminated with soil transmitted helminths in Makurdi, Benue State, suggesting existence of a great risk of acquiring infections from consuming improperly washed fruits and vegetables. The use of animal and human excreta is largely employed as fertilizer and therefore, the potential risk of being infected after the consumption of unwashed samples is great. It is therefore recommended that sewage should be treated before being used as organic fertilizer and proper washing of fruits and vegetables with salt solution before eating them.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Obetta SE, Nwakonobi TU, Adikwu OA. Microbial effects on selected stored fruits and vegetables under ambient conditions in Makurdi, Benue State, Nigeria.

Research Journal of Applied Sciences, Engineering and Technology. 2011;3(5): 393-398.

2. Kalia A, Gupta RP. Fruit microbiology. In Hui YH, Cano J, Gusek MP, Sidhu W, Sinha JW, NK. Handbook of fruit and fruit processing. 1 Ed., St. Lackwell Publishing, 2006;3-28.
3. Eni AO, Oluwawemitan IA, Solomon OU. Microbial quality of fruits and vegetables sold in Sango Ota, Nigeria. African Journal of Food Science. 2010;4(5):291-296.
4. Daryani A, Ettehad GH, Sharif M, Ghorbani L, Ziaei H. Prevalence of intestinal parasites in vegetables consumed in Ardabil, Iran. Food Control. 2008;9(8):790-794.
5. The World Gazette; 2007.
   Available:http://www.nfer.ac.uk/research-areas/pims-data/summaries/fsr-a-research-review-of-outdoor-learning.cfm
   (Retrieved 2014-09-23)
6. Encyclopedia Britannica Inc. Great fruits; 2014.
   (Retrieved 2014-09-21)
7. Amaechi AA, Ineregbu EI, Nwokeji CM. Geohelmithes ova and larvae contamination on vegetables and fruits sold in Owerri, Southeast Nigeria. International Science Research Journal; 2011. ISSN: 2006-1317.
8. Cheesbrough M. District laboratory practise in tropical countries (Part II). Cambridge, University Press UK. 2006;454.
9. Alade GO, Alade TO, Adewuyi IK. Prevalence of intestinal parasites in vegetables sold in Ilorin, Nigeria. American-Eurasian J. Agric. & Environ. Sci. 2013;13(9):1275-1282. ISSN: 1818-6769.
10. Orlandi PA, Chu DT, Bier JW, Jackson GJ. Parasites and food supply. Food Technol. 2002;56(4):72-81.
11. Saray AK, Jandon BN, Ramachendran K. Study of Vitamin B12 and folic acid deficiency hookworm disease. Amerian Journal of Clinical Nutrition. 1971;24:3-6.
12. Onadeko MO, Ladipo A. Intestinal parasitic infestation in rural communities: A focus for primary health care in Nigeria; 1989.
13. WHO. Prevention and control of schistosomiasis and soil transmitted helmmths: Report of a WHO expert committee. WHO Technical Report Series, No. 922. 2002;12,21-22,35.
14. Stephenson LS. Helminth parasites a major factor in malnutrition. World Health Organisation Forum. 1994;15:169-172.
15. Cahill KM, Shevchuk M. Fulminant, systemic strongyloidiasis in AIDS. Ann. Trop. Med. Parasitol. 1996;90:313-18.
16. Markell EK, Voge M. Markell and Voge's medical parasitology. 9th Ed. St. Louis: Saunders Elsevier; 2006.
17. Holland C, Smith HV. Toxocara: The enigmatic parasite. Wallingford, UK and Cambridge, MA: CABI Publishing; 2006.
    Available:http://site.ebrary.com/lib/stanford/docDetail.action?docID=10157926
18. Steward JM, Cubillan LD, Cunningham ET. Prevalence, clinical features, and causes of vision loss among patients with ocular toxocariasis. Retina. 2005;25(8):1005-13.
19. JIFSAN. Improving the safety and quality of fresh fruits and vegetables: A training manual for trainers. University of Maryland, Symons Hall, College Park MD. 2002;20(742):1-23.
20. Slifko TR, Smith HV, Rose JB. Emerging parasites zoonoses associated with water and food. International Journal of Parasitology. 2009;30:1379-1393.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/21874