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Burden of Intestinal Parasites on Selected Vegetables Sold in Major Markets in Port Harcourt Metropolis.

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Abstract

The study was undertaken to determine the burden of intestinal parasites on vegetables at three markets in Port Harcourt metropolis. A total of 160 vegetables were sampled from Fruit garden market, Mile Three market and Port Harcourt township market for intestinal parasites contamination. The 5 vegetables examined include: Oha leaf (*Pterotocarpus mildbreadii*), Okazi/Afang leaf (*Gnetum africanum*), Pumpkin leaf (*Cucurbita specie*), Water leaf (*Talinum Triangulare*) and Tomatoes (*Lycopersicum sativus*) which is a fruit. The samples were examined for parasites using the sedimentation and formol ether concentration methods. From the investigation, a total of 136 (85.0%) of the vegetables were positive for intestinal parasites in which Pumpkin leaf recorded the highest parasite contamination 34 (21.3%). This is followed by Oha leaf 32 (20.0%) while tomatoes recorded the lowest parasitic contamination of 16 (10%). The isolated parasites were *Ascaris lumbricoides* 62 (38.75%), followed by larva of *Strongiloides stecoralis* 48 (30%), then Hookworm 21 (13.1%) while *Entamoeba histolytica* recorded 5 (3.23%). Port Harcourt township had the highest number of parasites 50 (31.3%), while both fruit garden market and Mile III market recorded 43 (26.8%) of parasitic load. Statistically there was no significant difference in parasitic detection among the 3 markets ($p>0.05$). Similarly, there was a statistically significant difference between formal ether concentration method when compared to sedimentation method ($p<0.05$). Formol ether method is a far better method than sedimentation method. Thorough washing of vegetables should be encouraged to reduce the rate of infection.

Keywords: Vegetables, formol-ether method, concentration, sedimentation, intestinal

Introduction

Vegetable is an edible plant or part of a plant other than a sweet fruit or seed. The word “vegetable” is based on culinary and cultural tradition. Vegetables contain phytochemicals which may have antioxidant, antibacterial, antifungal, antiviral and anticarcinogenic properties (Steinmetz and Pottar, 1996). Some vegetables are used in desserts and other sweet dishes such as pumpkin pies and carrot cakes (Whitaker, 2001). Intestinal parasites populate the gastrointestinal track in humans and other animals. They can live in any part of the body but mostly prefer the intestinal wall. The mucoid plaque buildup provides an ideal breeding environment for parasites. The means of exposure to parasites include ingestion of undercooked meat, drinking of infected water and unwashed vegetables. The major groups of parasites include protozoans (organism having only one cell) and parasitic worms (helminthes). Each of these parasites can infect the digestive track and sometimes two or more can cause infections at the same time.

Parasites can get into the intestine by passing through the mouth from uncooked or unwashed



vegetables contaminated water or hands or by skin contact with larva infected soils. When the organisms are swallowed they quickly move into the intestine where they can reproduce and produce symptoms. Children are particularly susceptible if they are not thoroughly cleaned after coming in contact with infected soil that is present in the environment that they frequently visit such as sandboxes and school playground. However, people in developing countries are also at particular risk due to eating vegetables from sources that may be contaminated with parasites that colonize the gastrointestinal track (Zuk *et al.*, 2007). Such parasites include: *Ascaris lumbricoides*, *Hookworm*, *Trichuris trichuria*, *Strongyloides stecoralis*, *Enterobius vermicularis*, *Entamoeba histolytica* etc. A good or well adapted parasite does not kill its host because it depends on its host for a steady supply of food over a long period of time. Worms spend part of their life in an intermediate host of different species (Doyle, 2003). It has been estimated that humans harbor about 300 species of parasite and over 70 species of protozoa (Orlandi *et al.*, 2002; Brucher, 2000., Cox, 2002).

Many of these have coexisted with us for thousands of years and have been identified among humans by archeologists (Dittmar and Teengen, 2003; Golocalves *et al.*, 2003). The role of vegetables in nutrition and healthy diets are well recognized. Vegetables are common and are important source of nourishments and a vital ingredient in healthy and balanced diets (Silvia *et al.*, 2007). The symptoms of parasitic infection include abdominal pain, myositis, constipation, anaemia, rectal haemorrhage, chest pain, chills, chronic fatigue, diarrhoea, digestive disturbance, dizziness, fever, headache, joint pain, weight loss due to malnutrition, vomiting, sweating, insomnia, rectal prolapse, lung congestion, memory loss, night sweats and muscle spasms (Dariel, 2007). In recent times, there has been increased reported cases of food borne illness linked to vegetable. The consumption of fresh or raw vegetables is the major way of transmission of parasites (Daryani *et al.*, 2008). Protozoa and helminthes are readily transported to food by contaminated

vegetables and water (Maizels and Yazdanbakhsh, 2003). People who eat vegetables are likely to have reduced risks of some chronic diseases. Vegetables provide nutrients vital for health and maintenance of the body. Eating a diet rich in vegetables as part of an overall health diet may reduce risk for type 2 diabetes. Eating vegetables rice in potassium may reduce the risk of developing kidney stones and may help reduce bone loss. Vegetables that are low in calories per cup instead of some other higher calorie food may be useful in helping to lower calorie intake (Sally, 2006).

This study is aimed at providing public health authorities with vital information on the surface contamination of vegetables which is achieved by determining the parasite load on vegetables commonly sold in major markets in Port-Harcourt metropolis. The information so gotten would go a long way in helping growers, processors and consumers of vegetables.

Materials and Methods

Area of Study

The study was carried out on vegetables sold in 3 major markets in Port Harcourt namely Fruit Garden, Mile 3 and Port-Harcourt Township.

Sample collection

The samples collected include; Oha leaf (*Pterocarpus mildbreadii*), Okazi/Afang leaf (*Gentum africanum*), Pumpkin leaf (*Cucurbita specie*), Waterleaf (*Talinum triangulare*) and Tomatoes (*Lycopersicum sativus*). These 5 varieties of vegetables were chosen because they are the major vegetables eaten in the area. The vegetables were randomly picked from each of the markets. A total of 160 pieces of the same was picked with 40 pieces from each of the varieties.

Sample Analysis

Macroscopically, each of the samples was carefully examined for the presence of segment of cestodes and adult nematodes.

Microscopic analysis

Sedimentation method

About 50g of each of the vegetables was washed in distilled water in a clean container for the removal of parasite ova, larvae and cyst. The suspension was strained through a sterile guaze to remove undesirable materials (Nyanrango *et al.*, 2008). The filtrate was centrifuged at 5000rpm for 5 minutes and the supernatant discarded into a disinfectant jar and the sediment was mixed and a drop placed on a grease free slide. Saline and iodine were added on both sides of the slide and coverslip applied. The smear was examined with x10 and x40 objective of the microscope and examined for the presence of parasites.

Concentration method

Modified formol-ether method (Cheesbrough, 1988)

About 50g sample of each vegetable was washed in distilled water in a container for removal of parasite ova, larvae and cyst. The suspension was strained through a gauze to remove undesirable materials. The filtrate was centrifuge at 5000 rpm for 5 minutes and the supernatant discarded into a jar (Damen *et al.*, 2007). Estimated 1 gram of the deposit was added into 4ml of 10% formol water. The bottle was capped and mixed thoroughly by shaking. It was sieved and the suspension collected into a beaker. About 3-4 ml of diethyl ether was added into the suspension in a tube and mixed for 1 minute. The tube was centrifuged at 3000 rpm

for 1 minute. The layer of the vegetable debris was loosened from the side of the tube and the tube inverted to discard the ether, vegetables debris and formol water.

The bottom of the tube was tapped to re-suspend and mix the deposit. A drop of the sediment was placed on a glass slide and covered with a cover slip. The preparation was examine with x10 and x40 objective to examine eggs and cysts. A drop of iodine was applied for ease of identification of cyst.

Statistical Analysis

Data generated was analyzed using a statistical software. Data was expressed as percentages. A p-value of \leq was considered statistically significant.

Result

Table 1 shows the number of parasite detected according to the variety of the vegetables in accordance to the market. The overall prevalence rate showed a microbial burden of 136 (85%). Port-Harcourt township market showed the highest microbial burden of 50 (31.3%) while Fruit garden and Mile 3 showed a burden of 43 (26.8%) each. Similarly, Pumpkin leaf had microbial burden of 34 (21.3%), followed by Oha leaf 32(20%), Okazi leaf 30(19%) and Waterleaf had 24(15%) while tomatoes showed the least 16 (10%). There was no significant relationship in the 3 markets under study ($p>0.05$).

**Table 1: Number of parasites according to the varieties of vegetables in the three markets.**

Vegetable	Number Examined	Fruit Garden Market (%)	Mile Market (%)	1 Port Harcourt Township (%)	Total (%)
Oha Leaf	40	9(20.9)	11(25.5)	12(24)	32(20)
Okazi leaf	40	9(20.9)	11(25.5)	10(20)	30(19)
Pumpkin leaf	40	13(30.2)	10(23.3)	11(22)	34(21.3)
Waterleaf	40	7(16.3)	6(13.9)	11(22)	24(15)
Tomatoes	40	5(11.6)	5(11.6)	6(12)	16(10)
Total	160	43(26.8)	43(26.8)	50(31.3)	136(85)

Also, *Ascaris* showed the highest prevalence rate of 62(38.75%), followed by *Strongyloides stercoralis* 48(30%), then hookworm 21(13.1%)

while *Entamoeba histolytica* had the least prevalence rate of 5 (3.13%). Table 2 shows the parasitic load in each of the vegetables.

Table 2: Parasitic load in each of the vegetables

Vegetable	Number examined	<i>Strongyloides stecoralis</i> (%)	<i>Ascaris</i> (%)	Hookworm (%)	<i>Entamoeba histolytica</i> (%)	Total (%)
Oha Leaf	40	15(31.25)	13(21)	4(19)	0(0)	32(20)
Okazi leaf	40	11(22.9)	15(24.2)	4(19)	0(0)	30(19)
Pumpkin leaf	40	12(25)	15(24.2)	5(23.8)	2(40)	34(21.3)
Waterleaf	40	10(20.8)	11(17.7)	3(14.3)	0(0)	24(15)
Tomatoes	40	0(0)	8(13)	5(23.8)	3(60)	16(10)
Total	160	48(30)	62(38.75)	21(13.1)	5(3.13)	136(85)

Figure 1 showed the parasitic density according to the markets under survey.

Frequency

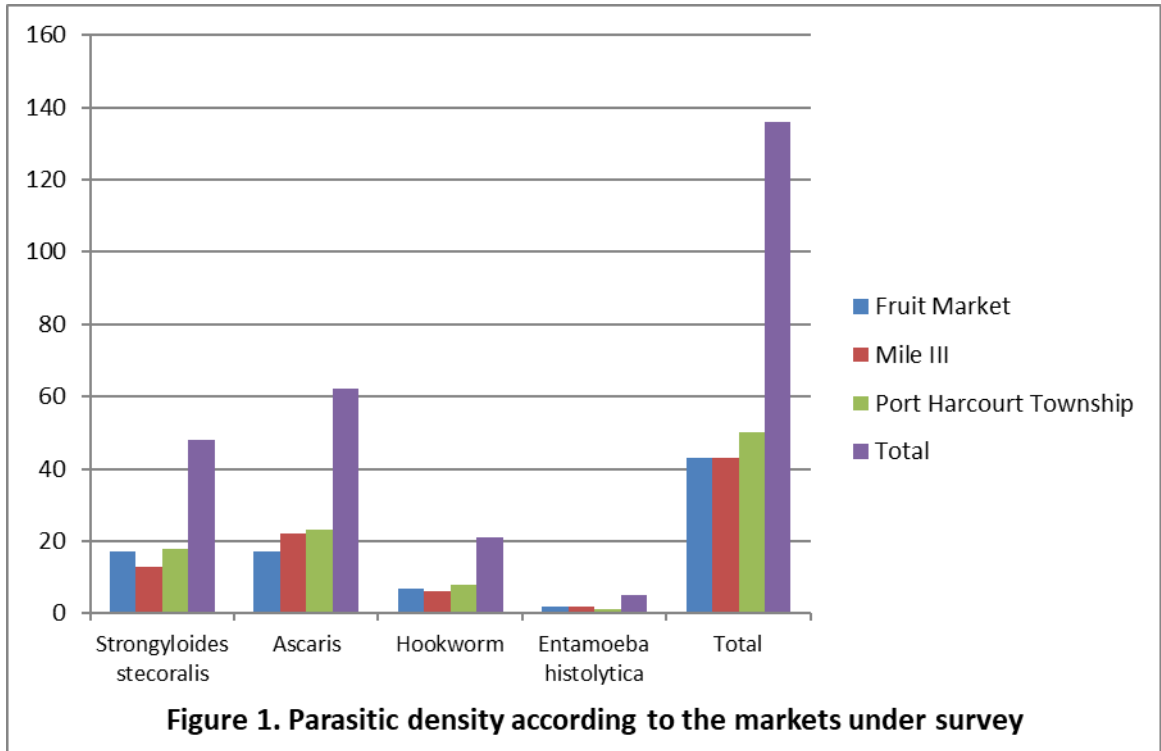


Figure 1. Parasitic density according to the markets under survey

Figure 2 shows the parasitic burden on vegetables by both the sedimentation method and the formol-ether concentration method. Formol-ether method had a higher detection capability 87(54.4%) compared to sedimentation

technique of 49(30.6%). There was a statistical significant difference in the detection capabilities of the two methods adopted ($p < 0.05$).

Frequency

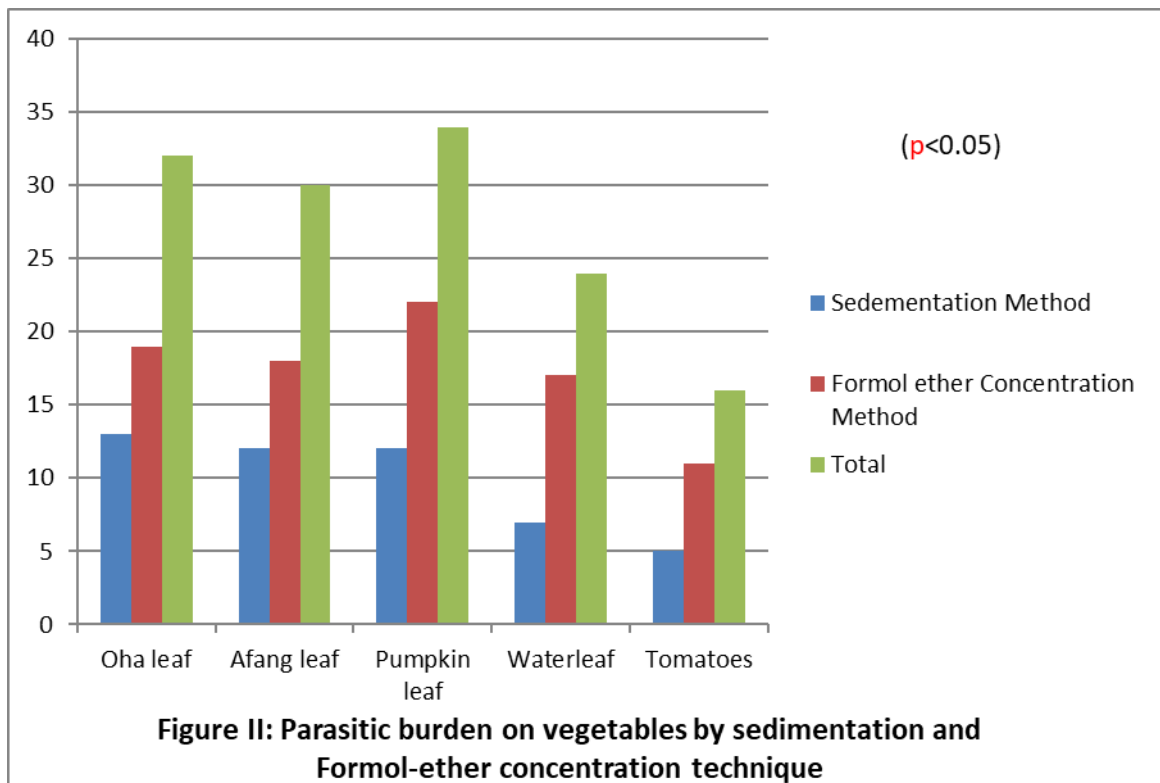


Figure II: Parasitic burden on vegetables by sedimentation and Formol-ether concentration technique



Discussion

From this study, it can be seen that the degree of contamination of vegetables was attributed to the fact that Pumpkin leaf and other green vegetables had uneven surfaces that make parasite eggs and trophozoite to attach to the surface of the vegetables more easily than tomatoes that had smooth surface, hence tomatoes had the least prevalence rate. Four major parasites were identified from the 160 vegetables from 3 different markets namely: *Strongyloides stercoralis* 48(30%), *Ascaris* 62(38.75%), Hookworm 21(3.1%) and *Entamoeba histolytica* 5(3.1%). However, the intestinal parasites isolated from the study sites differ from those isolated in a previous study; *Ascaris* (54.2%), *Trichuris trichura* (9.3%) and Hookworm (36.4%) Uneke (2003). Similarly, Damen *et al.*, (2007) isolated *Trichomonas hominis* (24.9%), hookworm (19.8%), *Ascaris* (17.1%), *Strongyloides stercoralis* (16.7%), *E. histolytica* (14%), *Trichuris trichuria* (5.1%) and *Hymenolepis nana* (2.4%) in Jos. Generally, the high prevalence of protozoan and helminths in this study might be due to lack of modern health enlightenment and illiteracy. Moreover, these contaminated vegetables are sometimes eaten raw or undercooked to retain natural taste and preserve heat labile constituents that are nutritious (Silvia *et al.*, 2007).

Despite the variation in the parasites isolated, it was observed from the studies, that *Ascaris* ova are common to the vegetable examined. This could be due to the fact that this parasite can tolerate adverse environmental conditions which could also serve as indicator of water pollution. Vegetables in each of the markets selected for this study had almost same rate of parasitic contamination. Also in this study, more parasites were seen in concentration methods (formol ether) than in the sedimentation method. This may be attributed to the ability of the formol saline to fix and concentrate the parasite upon centrifugation.

The variation in the various market shows also that there was no significant difference in parasite detection ($p > 0.05$), but Port Harcourt

township market had the highest prevalence of parasites than Fruit garden and Mile III markets.

Conclusion

From the study, it is concluded that common parasites are found on vegetables and this may be a good source of infection to man. Consequently, washing of the vegetables with salt and vinegar can reduce the parasites' density. Educating the general public on the health implication of these parasites is vital to reducing the rate of infection by parasites.

Community mobilization on sanitization in markets and communities and use of sanitary inspectors (environmental health officers) to keep the norms of good sanitary habit and hygiene should be re-introduced to bring back good sanitary condition in our markets generally.

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