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A Survey on Parasitic Cysts, Larvae and Ova on Some Fruits and Vegetables sold in Kashere Market

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Abstract
A survey on the contamination of vegetables and fruits with ova, larvae and cysts of parasitic protozoans and helminthes sold in Kashere market was carried out between the months of August and September, 2019. The sedimentation technique was used to assess it. Three vegetable leaves; Hibiscus subdariffa (sorel), Amaranthus cruentus (water leaf), Allium cepa (Onion) and three fruits; Cucumis melo (sweet melon), Solanium lycopersicum (tomato) and Psidium guajava (guava) were bought randomly from sellers. Out of the 150 samples collected (75 vegetable leaves and 75 fruits), 67(43 vegetable leaves and 24 fruits) were infested with cysts, larvae and ova of various protozoans and helminthes representing 44.7%. Among the leaves, Allium cepa was the higher infested with 72% while Hibiscus subdariffa had the lowest contamination with 40%. Solanium lycopersicum was highly contaminated among fruits with 44% while Psidium guajava was the least infested with 20% of samples. There was significant difference in the contamination among the fruits and vegetables at $P \leq 0.05$. The following worm eggs, larvae and protozoan cysts were recovered; hoohworms, Strongloides stercoralis, Trichuira trichuris, Entamoeba coli, E. histolytica, Giardia lamblia and Ascaris lumbricoides. Ascaris lumbricoides was the commonest worm recovered with 12 samples out of 150 among the fruits and vegetable leaves, Entamoeba coli had the least frequency with only one positive case. There was also signicant difference among the parasites recovered at $P \leq 0.05$. This signifies a lower level of sanitation among the sellers and therefore putting all consumers at risk.

Keywords: Vegetables, Fruits, Ova, Larvae, Cysts

Introduction

The importance of vegetables and fruits lies in their contributions to calories, proteins, minerals, vitamins and other dietary constituents. Vegetables and fruits substantially improve food quality and also claimed to have laxative effect (Abougrain et al.2010). Fresh fruits and vegetables are extraordinary source of nutrients, micronutrients, vitamins and fiber for humans and essential basic raw materials for the food industries. They are living organs detached from their parent plants and have high water content which contributes to their fragility (Beuchat and Doyle 2007).

Fruits and vegetables are edible parts of plants organs exist in a very diverse way; leaves (lettuce and cabbage for instance), stems (leek and asparagus), flowers (cauliflower and broccoli), roots (beet and carrot), bulbs (garlic and onions) and fruits in their botanical meaning, e.g. simple fruits as tomatoes, cucumber and pepper, stone fruits such as peach, seed fruits such as apple, multiple fruits such as pineapple and raspberry and fruits consumed in their immature form such as green beans (Umoh and Galadima ,2001). Plant tissues in fruits and vegetables consist of an assemblage of cells surrounded by pectin and cellulosic cell wall organized in a network, and a middle lamella rich in pectin cementing the cell walls together (Beuchat and Doyle 2007). The consumption of fruits and vegetables helps in protecting human body from a number of diseases by providing nutrients, vitamins, minerals, protein, and fibers (Beuchat and Doyle 2007). It could also have a positive impact on body-weight regulation and related conditions, including diabetes and hypertension (Idahosa, 2011). However, fruits and vegetables, especially, those that are consumed raw and or not properly washed, have been the major way for the transmission of human pathogens

(Abougrain *et al.*, 2010, Berger *et al.*, 2010, Idahosa, 2011).

These parasites are made up of different species which are biologically distinct and exert defined pathogenic effects. Among these parasites of great concerned in this study are the nematodes, cestodes, trematodes (all Helminthes) and protozoa (Lucas and Gilles, 2006).

These are round worms of relatively simple structure; they are known to be second to insects as successful animals. Majority are parasitic, however, some are found in fresh water, mud and widely spread all over the world. They are cylindrical, unsegmented tapered at both ends, they possess a body cavity and alimentary canal, usually, the females are larger than the males some have buccal capsule with teeth e.g. *Ancylostoma duodanale* (Manu, 2000).

Tapeworms: They have posterior and anterior ends; they are hermaphrodites and have well developed respiratory and nervous system more than of nematodes. Their bodies are segmented and have alimentary canal. E.g. *Taenia saginata*, *Taenia solium* etc. (Manu 2000).

Trematodes: They sometimes called flukes; they cause fluke disease in livestock and also in man. They are unsegmented mostly flat, leaf like worms (schistosomes are an exception) with body cavity. They vary in size from 1mm to 7mm in length, they have attachment organ, a digestive system which consist of a mouth and an esophagus. They have a simple nervous system (Cheesebrough, 1998).

Protozoans: These are single cell (unicellular) organisms' mostly free living and they multiply in the human hosts. They are bilaterally symmetrical, having exonemes and four flagella e.g. *Giardia lambilia.* Motile trophozoites can be found in faeces. (Cheesebrough, 1998), (Lucas and Gilles, 2006). In Nigeria, the cultivation of fruits and vegetables for commercial and domestic purposes is mostly carried out by peasant farmers that depend on irrigation or natural rainfall (Luka *et al.*, 2000). These fruits and vegetables though seasonal, are mostly cultivated in the same piece of land each year. As a result of this continuous land usage, there is a possible depletion of nutrients hence the need for fertilizer or manure application. Most farmers use untreated animals and human faeces as manure, which are known to contain various species of parasites that are of medical and veterinary importance (Okoronkwo, 1998). Indiscriminate faecal disposition in bushes and farm lands with a belief of enriching the lands is also a common practice by farmers and indicated citizens (Bouhoum and Amahmid, 2002) .

Organic fertilizers (sewage sludge, animal manure and compost) may also be a potential risk of contamination of fruits or vegetable (Bouhoum and Amahmid, 2002). Contamination may also occur when food, particularly vegetables and the fruit are rinsed in polluted potable water (Avicoglu *et al*., 2011). Fresh vegetables can be agents of transmission of protozoan cysts and helminthes eggs and larvae (Daryani *et al*., 2008; Erdogrul and Sener, 2005; Coelho *et al*., 2001). Outbreaks of intestinal parasitic infections which is epidemiologically associated with the consumption of raw vegetables have been reported from developed and developing countries (Ortega *et al*., 1997; Mintz *et al*., 1993; Zahid *et al*., 2004).

Our hospitals and clinics are crowded daily with patients both old and young with one complaints of food borne parasitic infection and others, which may be as the result of consumption of unwashed or not properly washed vegetables or fruits, that are been contaminated by parasites.

Although vegetables and fruits have been long consumed as source of vitamins, minerals, vegetable protein and as fibers which aid digestion, there have often been reported cases of illnesses emanating from consumption of these food sources. Many cases of illness are caused by consumption of vegetables and fruits contaminated by parasites. Therefore, parasites that affect fruits and vegetables need to be investigated and reported for proper control in order not to affect those that are of medically important.

This study aims at carrying out a survey on eggs, larvae and cysts of parasitic protozoan and helminthes on fruits and vegetables sold in Kashere market. the specific objectives as follows;To

determine the eggs, larvae and cysts of parasitic protozoans and helminthes of the vegetables sold in Kashere market; To determine the eggs, larvae and cysts of parasitic protozoan and helminthes of fruits sold in Kashere market; To determine the most contaminated fruits and vegetables.

Materials and Methods

Study Area

This study was carried out in Kashere Akko Local Government, Gombe State, between the month August and September. Kashere is 60km away from Gombe (The State Capital), 100km away from Alkaleri on Bauchi Road and 30km away from Billiri. The map the study area is show on figure 1. Kashere is situated at an elevation of 431 meters above sea level. The vegetation can be classified as Sudan savannah with scattered trees. The population is made up of mostly farmers and civil servants. The indigenous population is composed of mainly of Jukun, Fulani, Tangale, Hausa etc.

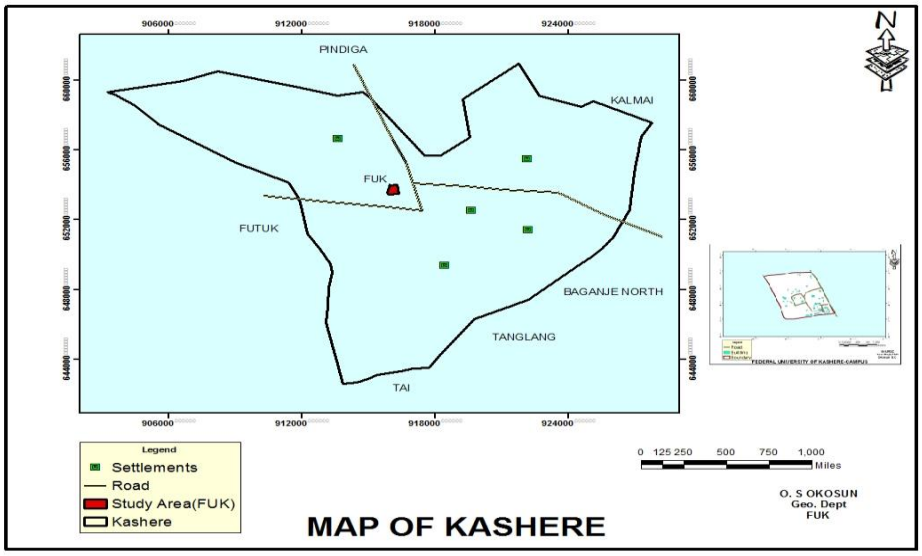

Figure 1: The Study Area

Sample Collection Method

Vegetables

Spring onions (*Allium cepa*) albasa in Hausa, *Amarantus cruentus (*alehu in Hausa) and *Hibiscus subdariffa (*known as yakuwa in Hausa) were collected from Kashere markets. The collections were done 3 times in a week for 4 consecutive weeks.

Fruits

Sweet melon *(Cucumis melo),* Guava (*Psidium guajava)* and tomatoes (*Solanium lycopersicum)* were collected from Kashere markets The collection was done 3 times in a week for 4 consecutive weeks. Each sample was put in a separate sterile polythene bag and was transported to the Biological Sciences Laboratory of Federal University of Kashere (FUK).

Sedimentation Technique

Samples of vegetables and fruits were washed separately in 100ml distilled water in plastic container and the water was put in a sterile beaker for each preparation. The suspension was strained through a sterile sieve to remove undesirable materials like sand. The water was left to settle for 30 minutes before decantation without disturbing the settled suspension and the decant water discarded. A 15ml of 10% formalin was added to the filtrate; the solution formed was stirred fervently and was put into a centrifuge tube. The tube was placed in a centrifuge and spun at 3000rpm for 5 minutes (Damen *et al.,* 2007). The resulting supernatant was decanted and discarded to leave only the sediment for laboratory analysis. The sediments were tapped to mix and a drop was

applied on the center of a clean glass slide and one drop of lugol's iodine was added. The glass slide was covered gently with cover slip to avoid air bubbles and over-flooding; the slide was then placed on a microscope for viewing under objectives X 10 and X 40.

Identification of Parasites

The cysts, ova and larva of parasites were identified by their morphological features such as shapes and sizes using the identification guide described by Arora and Arora, (2008).

Statistical Analysis

The results obtained were analyzed using two-way Analysis of Variance (ANOVA) for any significance differences on the parasitic contamination of fruits and vegetables at $P<0.05$ level of significance.

Results and Discussion

The results obtained are presented on tables 1 to 4 that show overall infection rate of vegetables and fruits collected from Kashere market. From the tables, the Spring onions (*Allium cepa*) had the highest rate of infestation with 72% while Guava (*Psidium guajava*) had least with 20%.

Total number screened was 150 out of about 67(44.7%) was tested positive for the parasites.

$$\frac{\text{Number tested positive}}{\text{Total number screened}} \times 100$$

$$\frac{67X100}{150\ X\ 1} = 44.7\%$$

Table 1: Rate of infestation of parasites on the vegetables.

Samples(leaves)	Number examined	No. positive	Positive %
Hibiscus subdariffa	25	10	40
Amaranthus cruentus	25	15	60
Allium cepa	25	18	72
Total	75	43	57

Table 2: Rate of infestation of parasites on the fruits.

Samples(fruits)	Number examined	No. positive	Positive %
Solanum lycopersicum	25	11	44
Cucumis melo	25	8	32
Psidium guajava	25	5	20
Total	75	24	32

Table 3: Distribution of different species of parasites on vegetables.

Samples (leaves)	Hookworm	*Strogloides sterocolaris*	*Trichuria trichuiris*	*Entamoeba coli*	*Entamoeba histolytica*	*Gardia duodanale*	*Ascaris lumbricoides*
Hibiscus subdariffa	1	1	1	-	-	-	3
Amaranthus cruentus	1	1	1	-	1	-	1
Allium cepa	3	2	-	1	1	2	2
Total	5	4	2	1	2`	2	6

Table 4: Distribution of different species of parasites on fruits.

Samples	Hookworm	*Strogloide*	*Trichura*	*Entamoeba*	*Entamoeba*	*Giardia*	*Ascaris*

(fruits)		*sterocolaris*	*trichuiris*	*coli*	*histolytica*	*duodanale*	*lumbricoide*
Solanum lycopersicum	1	3	1	-	1	1	1
Cucumis melo	2	1	-	-	-	1	2
Psidium guajava	1	-	-	-	-	-	3
Total	4	4	1	0	1	2	6

The study showed high parasites infestation of fruits and vegetables sold in Kashere market. The presence of such high density of parasites on the fruits and vegetables indicates a high risks of infection. Examination of fruits and vegetables showed that they were highly contaminated. For each species of fruits and vegetables, 25 samples were examined which indicated that 40% was contaminated. A 72% for spring onions (*Allium cepa*), 44% for Tomatoes (*Solanum lycopersicum*), 32% for sweet melon (*Cucumis melo*) and 20% for Guava (*Psidium guajava*). There was significance difference in the distribution of parasites on the fruits and vegetables at 5% level of confidence, meaning that parasites were not evenly distributed. The high prevalence of parasites could be attributed to the farming and handling during to the time of consumption.

The parasites isolated from the fruits and vegetables include hookworms, *Entamoeba coli*, *Ascaris lumbricoides*, *Trachuris trachiura*, *Giardia duodinale*, *Strongloides stercoralis* and *Entamoeba histolytica*. The risk of infection with intestinal parasites to the population is increased because these contaminated of fruits and vegetables sometimes eaten raw or undercooked to retain the natural taste and preserve heat labile nutrient and not properly washes sometimes. Additionally, fruits and vegetables purchased from the market have been proved to have high rate of infestation with these parasites which correlate with the observations made by Nyrango *et al* (2008).

Contamination of fruits and vegetables with human pathogenic species of parasite as recorded in this study revealed 67 (44.7%) of the samples to be contaminated and unfit for human consumption out of the one hundred and fifty (150) total samples of fruits and vegetables examined. This result is in agreement with the findings of (Damen *et al.*, 2007) where they reported 36.0% cases of parasitic contamination of fresh vegetables in Jos, Nigeria. It is also quite in accordance with the reports of (Umeche, 1991) that screened fruits sold in Calabar, Nigeria for parasites. However, the Works of (Umoh *et al.*,2001) and (Dauda *et al.*, 2011) showed lower contamination, where they recorded 13.5% and 14% positive cases of parasites on fruits and vegetables sold in Kaduna and Zaria respectively all in Nigeria. The variation in prevalence of contamination with other reports corroborates the point that prevalence of specific parasites in food supplies varies between countries and regions and show that the pattern of quality could be improved for fruits and vegetables sold in places where contamination is still high (Anantaphruti, 2001). The highest parasite found was *Ascaris lumbricoides.* This may be as a result of the viability of their eggs in the soil for months and being the commonest parasite in the tropics (Stephenson, 1986, Auta *et al*, 2013 and Auta *et al*., 2014). This corroborated with the works of (Ohaeri and Unogu 2011) and (Nasiru *et al.*,2015) who reported that *A. lumbricoides* was the most prevalent helminth observed on fruits and vegetables (80.6% and 65.8%) in Umuahia, Abia State and Gusau, Zamfara State respectively, all in Nigeria. Also, it is in line with the work of Dauda *et al.*, (2011) who reported 24% for *A. lumbricoides*. He also reported that people consuming vegetables irrigated with raw waste water are exposed to the risk of infection with *Ascaris lumbricoides*, *Entamoeba histolytica* and *Giardia lamblia*. Ascariasis and Gardiasis diseases are among the commonest parasitic

Infections associated with raw fruits and vegetables, which causes considerable morbidity in pregnant women, children and adults. The detection of these geohelminth and protozoan cysts, ova/ larvae on fruits and vegetables in the studied market, has a significant public health implication. Some of the vegetables and fruits are processed and

eaten uncooked, which could lead to infection and disease especially when served to the public (Putignan and Menichella, 2010). The highest prevalence of parasitic contamination on vegetables compared to fruits is similar to what (Nasiru *et al.*, 2015 Omowaye and Audu, 2012 and Idahosa 2011) reported. This may be due to the rough surface and leaf folds of this vegetable which may retain dirt that cannot be easily washed off (Simon-Oke *et al.*, 2014). Highest prevalence in the markets could be attributed to the differences in personal hygiene, source of water and other environmental factors. The variation of this result and findings of previous researches could be due to the fact that areas of study differ in geographical location, climatic, environmental conditions, general behavioral attitude to hygiene and the socio-economic activities of producers, sellers and consumers.

Conclusion

Fresh or minimally processed fruits and vegetables can be source of disease causing parasites. The source of contamination as well as the route of transmission is of great importance with soil, water and the fruits and vegetables consumed as food particularly significant. About 44.7% of 150 sample examined were contaminated with parasites, of which *A. lumbricoides*, had the highest prevalence followed by *S. stercoralis* and Hookworms respectively. Environmental conditions. Such as the contamination of soil with human faeces, poor sewage disposal and the use of night soil as fertilizer contribute immensely to the contamination of vegetables. Some of these fruits and vegetables are eaten raw within the market and sometimes in combination with cooked food.

All fruits and vegetables sold within the market were contaminated with parasitic cysts/eggs. Vegetables, due to their rough/folded leaves are more contaminated with parasite cysts, eggs and larvae than fruits. *Ascaris lumbricoides* is the most prevalent parasite that contaminated fruits and vegetables sold in Kashere market. Variations in the percentage positive samples are a reflection of the poor sanitary conditions of the locality.

In view of the above findings and observation, the public health protection measures against human infection with parasites from contaminated fruits and vegetable include the following recommendations:

The use of untreated human and animal excreta as fertilizer should be discouraged. However, if faeces must be used as fertilizer, it must be properly fermented; Consumers should wash all fruits and vegetables thoroughly before eating; There is a need to educate the masses on the inherent dangers in eating improperly washed fruits and vegetables; Campaigns should be intensified on environmental hygiene and personal prophylaxis, such as washing of hands before and after eating; Improvement of sanitary system and improved disposal system should be provided in villages or rural areas; There should be public awareness training for vegetables growers and handlers at all levels and their personal hygiene emphasized.

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