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HELMINTHES IN COMMERCIALLY SOLD SPINACH *(SPINACIA OLERACEA)*: THE PUBLIC HEALTH PERSPECTIVE

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ABSTRACT
Helminthes in Spinach (*Spinacia oleracea*) occurs through faecal contaminated irrigation water and fecal pollution of soil with eggs of Helminthes. The distributions of helminthes were determined in 150 commercially sold Spinach in Ega market over a period of eight (8) weeks. The samples were washed with sterile distilled water, filtered and centrifuged at 500rpm for 5 minutes and examined microscopically. A total of 116 helminthes eggs/ova were counted and all samples tested had more than one type of parasite ova. *A.lumbricoides* 37 (31.9%), *F.hepatica* 15(12.9%), *S.mansonii* 14(12.1%), *S.stercoralis* 18(15.5%), *E.vermicularis* 22(19.0%) and *T.trichuira* 10 (8.6%). The incidence of helminthes in commercially sold Spinach may be due to poor water quality, used of poorly composted animal dung as manure and poor handling of vegetables produce. Thorough washing and adequate cooking of vegetables prior to use are highly recommended.
Keywords: Helminthes, spinach, parasites, Health, infection.

INTRODUCTION
In many parts of the world, including Nigeria, there is an increase in consumption of raw fresh produce like vegetables, fruits and sprouts. Vending of cut salad vegetable, fruits and sprouts is a common practice in Nigeria and it is becoming popular to eat healthy raw salad preferentially to other fast food. Several out breaks of human gastro-enteritis have been linked to the consumption of contaminated fresh vegetables, fruits and sprouts **[1, 2]**. Epidemiological associations have been made by Tjoa *et al.,* **[3].** Helminthes are distributed in all area of the world that supports human existence. Some of the worms are restricted to a given geographical region and many as reported has a higher incidence in the tropical area **[4]**. Worm infection, especially those species that do not require alternative host or special climatic condition for development has been estimated to affect billions in developing countries. The primary targets of helminthes infection are malnourished children. Spinach which is one of the most popular vegetable, are not only a mainstay in local farmers market but also in abundance during raining season and a popular bedding plant crop **[5]**. Vegetables are crops that require careful handling and intense labour **[6]**. Spinach is highly perishable and loss its quality especially when not properly preserved in hydro cooled environment. Affected plant may show symptoms of nitrogen, potassium or phosphate deficiencies **[7]**. Several plant wilt during hot season, then recovered at night, root develope small tan galls which fused to cause extensive swelling a borne outbreaks of infection, and distortion of root system. Photosynthesis area reduces and tunnel offers entry way for disease **[8]**. Early infection reduces plant yield. Gaurabahtin *et a*l.,**[9]** reported that the presence of protozoa on leafy vegetables and their sequestration of enteric bacteria in vesicles indicates that they may play a vital role in the ecology of human pathogen on

produce. The use of waste water irrigation can increase the available water supply and provided important nutrients for the leafy vegetables or crops, but its use for agricultural purpose can pose a significant occupational and health hazards or public health risk **[10]**. The result indicates that water, soil and vegetable are heavily contaminated and suggest a vicious circle between human and environment **[6].** The nematode (round worms) Ascaris lumbricoides is an example of a helminthes pathogen that can be transmitted by food **[11]**. Beutchat, **[8]** revealed that the risk of disease transmission is increased when fruit and vegetables are eaten raw. The vegetable of fruit borne outbreak of infection, rather than individual cases include the helminthes parasites. These are *Fasciola hepatica, Ascaris lumbricoides* **[12]** *Trichuris trichuria* hookworm **[13]**. Soil nematode (round worm) Ascaris lumbricoides is an example of helminthes that can be transmitted by food **[11]**. Beutchat **[8]** revealed that the risk of disease transmission is increasesd when fruit and vegetables are eaten raw. The vegetable or fruit borne outbreaks of infection, rather than individuals cases including the helminthes parasites. These are Fasiola hepatica Ascaris lumbricoides, *Trichuris trichuria* **[12]**, Hookworm **[13]**. Transmitted helminthes are endemic in developing countries, a study was carried out on sewage farms, streams and vegetables to determine the source and route of soil transmitted helminthes in Sanlurfa Turkey. In addition, water from stream and vegetables samples from city market contain 187 (59.5%) of the total 314 samples including 88.4% of stool samples, 60.8% of the water samples 84.4% for soil samples and 14% of the vegetable samples were positive for soil transmitted helminthes eggs. These results show that water, soil and vegetables are heavily contaminated and suggest a vicious cycle between human and the environment. Study revealed that many Ascaris from the host and the environment such as soil in Shanty town and vegetable sold in the market resulted in continuous active transmission of Ascaris in the area **[14]**. In developing countries, the incidence of food borne pathogens on fruit and vegetables can be much higher particularly in countries in which irrigation with untreated or insufficient treated wastewater is common. A study has shown that 20% of 50 cabbage salad samples and 6 of 7 (85%) samples of beans sprout contain *Listeria monocytogenese* **[15**, **16]**. This work aims at studying the frequency and distribution of Helminthes in Spinach (*pinacia oleracea*) and to suggest possible ways of minimizing contact of crops with contaminants.

MATERIAL AND METHODS

Sample collection: A total of 150 samples were bought randomly from different sellers in Ega market, in Idah, Kogi State over a period of eight weeks (8). The spinach were imported from various villages around Idah and from northern part of Nigeria. Averages of 32 samples were examined weekly. Samples were examined in the laboratory using the sedimentation concentration method **[17]**, 25g of spinach samples were weighed into 250mls of sterile distilled water and was stirred with steering rod. These was concentrated using the centrifuge at 500rpm for 15 minutes. Sediments were observed using sterile microscope slide with Lugol's iodine. Helminthes were identified according to the key provided by WHO **[18]**.The level of significance were determined using Chi-square at 95% level of significance.

RESULTS

A total of 116 ova of six (6) helminthes parasites were observed in all the samples. These ova include *Ascaris lumbricoides*, *Fasciola hepatica*, *Strongyloides stercoralis*, *Shistosoma mansoni*, *Trichiuris trichura* and *Enterobius vermicularis*. The most isolated helminthes ova were *A. lumbricoides* 37(31.9%), and the least was *T.trichura* 10 (8.6%). The frequency of mixed occurrence of two or more helminthes ova were also observed in the entire sample tested with the mean value of occurrence for each weak were statistically different (P>0.05).

DISCUSSION

The results demonstrated a high prevalence of helminths in commercially sold spinach sold in Ega market, Idah central market, Kogi state (Table 1,2,3). The study has further highlighted the poor sanitation of the farm environment, poor water quality, untreated irrigation water, untreated human sewage and animal waste as possible sources of contamination. These water sources are rich in pathogenic microorganisms **[18]**. Vegetables and fruits get contaminated with microorganism while grown in the field or orchards or during harvesting, post harvesting handling, processing and distribution. The high helminthes isolates (Table 1) could be due to the frequency of contact with soil containing the eggs/ova of parasites, use of improperly composed manure, poor harvest washing of spinach with contaminated water, untreated irrigation water containing fecal materials/sewage. Ayre et al., **[19]** reported that untreated poor post harvest handling are major risk factor, and most ignorant consumers without proper washing and cooking of vegetable exposed them to pathogenic infections. Most helminthes infections from vegetables consumption are the causes of mortality rate among humans especially children. *A lumbricoides* eggs can remain viable in the soil over a long period of time **[12]**. *F. hepatica* eggs are frequently excreted with cow dumps and may used as manure for growing spinach. Live stock contaminates washing sites and irrigation water with their dung's. Nigeria is home to many cattle and livestock owners. In a work carried out in Norway by Robertson and Gjerde, **[20]**, showed no association between imported produce and the detection of parasites, and parasites have been detected on vegetables and fruits obtained in a highly developed, wealthy country without there been an outbreak situation, but in developing countries soil transmitted helminthes (STH) infections are endemic and a study in Sanliurfa Turkey, revealed that stools from farm house inhabitants as well as soils and vegetables samples were all positive for STH eggs. These results indicate that water soil and vegetables are heavily contaminated and suggest a circle between humans and the environment. Improving the environment is imperative for the control of STH **[11]**. Macpherson *et al.,* **[21]** estimates, suggest that almost half of the population of the world is affected by water-borne and food-borne infections. Parasitic food-borne and water-borne zoonosis contributes to the inflictions of a heavy toll on human health and serious direct and indirect losses to the agricultural industries. The consumption of raw or uncooked vegetables facilitates transmission of large numbers of zoonotic infections. Emigration and the importation of food from endemic regions have resulted in increasing diagnosis of these infections in non endemic countries. The method of irrigation can influence how effectively pathogens present in irrigation water are transmitted to surface, drip irrigation or surface irrigation can minimize contact of crops with contaminants, compared to

spray irrigation because the edible portion will not be wetted directly. However post harvest washing of fruits and vegetables are commonly used to reduce the microbial load of crop produce. There is a growing awareness that good quality water is an important factor in the production of safe fruits and vegetables. As the population increases, demands on limited water resources will increase while the quality of available water decreases. Further investigations on may include research into simple and inexpensive methods for improving the microbial quality of marginal irrigation water at the farm level and qualitative assessment of the risk of disease from pathogens present in surface and ground water used to irrigate crops.

CONCLUSION

It can be concluded that the minimal processed food like spinach can be a source of human pathogens and good quality water is an important factor in producing safe fruits and vegetables, information on how best to utilize declining water resources while maintaining food safety will be very vital.

Table 1: Frequency of occurrence of Helminthes in spinach samples from Ega market (N=200)

Helminthes eggs	No. of positive samples	Prevalence (%)
Ascaris lunbicoides	40	34.5
Trichuris trichura	19	16.4
Strongyloides stercoralis	13	11
Fasciola hepatica	17	14.7
Schistosoma mansoni	14	12.1
Enterobius vermicularis	13	11.2
Total	116	58

Table 2: Frequency of occurrence of mixed infection of helminthes ova/eggs spinach samples from Ega market

Helminthes eggs	No. of positive samples	Prevalence (%)
A.Lumbricoides, S.stercoralis, T.trichura	21	36.8
A.lumbricoides, F. hepatica, S.stercoralis	9	15.8
A.lumbricoides, T.trichura, E.vermicularis	7	12.3
S.stercoralis, S.mansoni	2	3.5
T.trichuri, S.mansoni	1	1.8
A.lumbricoides, S.stercoralis, S. mansoni	1	1.8
A.lumbricoides, T.trichuri, E. vermicularis, S.stercoralis.	6	10.5
A.lumbricoides, T.trichuri, E. vermicularis, S.stercoralis, S. mansoni	4	7.0
A.lumbricoides, T.trichuri, F.hepatica, S.stercoralis, S. mansoni	6	10.5
Total	57	100

Table 3: Occurrence of helminthes ova/eggs in spinach in eight (8) market days in Eight (8) weeks

	WEEK (%)								
Organism	1	2	3	4	5	6	7	8	Total
A.lumbricoides	6(16.2)	5(13.5)	4(10.8)	3(8.1)	5(13.5)	5(13.5)	3(8.1)	6(16.2)	37(31.9)
S.stercoralis	2(11.1)	2(11.1)	4(10.8)	1(5.6)	1(5.6)	3(16.2)	2(11.1)	3(16.7)	18(15.5)
T.trichuira	2(20)	2(20)	1(1)	2(20)	1(1)	1(1)	-	1(1)	10(8.6)
F.hepatica	5(33.3)	3(20)	2(13.3)	1(6.7)	-	1(6.7)	1(6.7)	2(13.3)	15(12.9)
E.vermicularis	1(4.5)	2(9.1)	3(13.6)	4(18.2)	3(13.6)	5(22.7)	2(9.1)	2(9.1)	22(19)
S.mansoni	2(14.3)	3(21.4)	2(14.3)	1(7.1)	1(7.1)	2(14.3)	1(7.1)	2(14.3)	14(12.1)
Total	**18(15.5)**	**17(14.7)**	**16(13.8)**	**12(10.3)**	**11(9.5)**	**17(14.7)**	**9(7.8)**	**16(13.8)**	**116(100)**

Note: The mean values for all the weeks were different (P>0.05). Values in parenthesis are percentages.

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