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Prevalence of parasitic contamination of raw vegetables in Khorramabad, Iran

Behrouz Ezatpour [a,1], Ali Sharafi Chegeni [b,*], Foad Abdollahpour [c,1], Mehdi Aazami [d,2], Masoud Alirezaei [e,1]

[a] Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, P.O. Box: 381351551, Iran
[b] Lorestan University of Medical Science, Khorramabad, P.O. Box: 381351698, Iran
[c] Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, P.O. Box: 381351698, Iran
[d] Alborzi Clinical Microbiology Research Center, School of Medicine, Shiraz University of Medical Sciences, Shiraz, P.O. Box: 71937, Iran
[e] Division of Biochemistry, School of Veterinary Medicine, Lorestan University, Khorramabad, P.O. Box: 465, Iran

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ABSTRACT

It is well known that raw vegetable was considered as an agent for transmission of intestinal parasite and fresh vegetables have an important role in human nutrition. Therefore, the present study was designed to detect the parasite contamination in many common raw vegetables in Khorramabad, Iran. A total of 550 fresh vegetable samples which belonged to spring (275) and winter (275) were randomly collected. All samples were examined according to standard methods for detection of protozoan cyst, oocysts, helminth eggs as well as larva. The findings indicated 52.7% positive for intestinal parasites and the highest contaminated sample was leek 80% in spring and 43.6% in winter. However, the least contaminated samples were green onion (34.5%) in spring and garden cress (10.9%) in winter. Chi-square test indicated the significant difference between contamination in spring when compared to winter ($p < 0.002$). Our data demonstrated importance of raw vegetables in transmission of some intestinal parasites and highlight the role of raw vegetables in threatening public health.

1. Introduction

Vegetables are essential part of a healthy human diet owing to their nutritional value. Raw vegetables are great source of vitamins, dietary fiber and minerals; and their regular consumption is associated with a reduced risk of cardiovascular disease, stroke and certain cancers (Van Duyan & Pivonka, 2000). Some vegetables are eaten raw as salad to retain the natural taste and preserve heat labile nutrients. Vegetables can become contaminated with enteric bacterial, viral and parasitic pathogens throughout the process from planting to consumption. The extent of contamination depends on several factors that include, among others, use of untreated waste water and water supplies contaminated with sewage for irrigation, post-harvest handling and hygienic condition of preparation in food service or home settings (Al-Binali, Bello, El-Shewy, & Abdulla, 2006; Amoah, Drechsel, Abaidoo, & Klutse, 2007).

In recent years, there has been an increasing in number of reported cases of food-borne illnesses linked to consuming of fresh vegetables. The consumption of raw vegetables plays a major epidemiological role in the transmission of parasitic food-borne diseases. Intestinal parasites are widely prevented in developing countries, probably due to poor sanitation and inadequate personal hygiene (Al-Binali et al., 2006). Several studies in different parts of the world showed that the vegetables can be agent for transmission of protozoan cysts, oocysts, helminthes eggs and larvae (Al Salem & Tarazi, 1992; Anuar & Ramachandran, 1977; Bailenger, 1962). This problem is becoming increasing concern because of the expanding number of susceptible people (i.e., the elderly and the immunocompromised) more extensive produce trade across international borders, and change in national and international policies concerning food safety (Akhlaghi & Oormazdi, 2000).

Up to our knowledge, there are limited studies on the possible contamination of freshly eaten vegetables in Iran and referring to existing scientific literature, no previous surveys have been conducted to evaluate the presence of parasitic contamination in vegetables in Khorramabad. Therefore, this study was designed to detect the parasitic contamination in some common green vegetables used for raw consumption in Khorramabad, Iran.

* Corresponding author. Tel./fax: +98 6612219480.
E-mail addresses: bezatpour@gmail.com (B. Ezatpour), sharafy2004@yahoo.com (A.S. Chegeni), bio7983@yahoo.com (F. Abdollahpour), mehdi.azami@gmail.com (M. Aazami), alirezaei_m54@yahoo.com (M. Alirezaei).
[1] Tel./fax: +98 661 3204005.
[2] Tel./fax: +98 711 6474304.

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Table 1
Distribution of eggs and cysts of parasites in considered vegetables from spring.

Vegetables	No.	Pathogenic parasites					Nonpathogenic parasites				
		Giardia cycts no. (%)	Ascaris eggs no. (%)	*E. vermicularis* no. (%)	*S. stercoralis* no. (%)	*F. hepatica* no. (%)	*Free-living larva* no. (%)	*E. coli* no. (%)	*I. butschlii* no. (%)	*E. nana* no. (%)	Total no. (%)
Leek	55	5(9.1)	3(5.5)	4(7.3)	0(0)	0(0)	21(38.2)	8(14.6)	2(3.6)	1(1.8)	44(80)
Green onion	55	0(0)	6(10.9)	2(3.6)	2(3.6)	0(0)	6(10.9)	3(5.5)	0(0)	0(0)	19(34.5)
Radish	55	2(3.6)	0(0)	3(5.5)	3(5.5)	0(0)	3(5.5)	10	3(5.5)	1(1.8)	25(45.5)
Garden cress	55	6(11)	2(3.6)	1(1.8)	0(0)	1(1.8)	15(27.3)	2(3.6)	2(3.6)	1(1.8)	30(54.5)
Mint	55	3(5.5)	2(3.6)	1(1.8)	0(0)	2(3.6)	18(32.7)	0(0)	1(1.8)	0(0)	27(49)
Total	275	16(5.8)	13(4.7)	11(4)	5(1.8)	3(1.1)	63(22.9)	23(8.4)	8(2.9)	3(1.1)	145(52.7)

2. Materials and methods

2.1. The study area

The study was carried out in Khorramabad, the capital and largest urban center in Lorestan state, west of Iran between winter and spring 2011. Khorramabad is at a height of about 1125 m above sea level with a latitudinal position of latitude 33°26′ N and longitude 45°17′ E. The city has a population of 354,855 based on 2011 census ("Statistics in Iran, I.B.O. population cencus", 2011). The temperature mean value of Khorramabad is 17.60 °C, however, during the cooler periods (November and March) the average temperature drops to about 5 °C, relative humidity mean value is 46.08% and precipitation mean monthly value is 42.74 mm ("Available from this site: http://www.climate-charts.com/Locations/i/IR40782.php,").

2.2. Sampling

A total of 550 samples of fresh vegetables (275 samples in spring and 275 samples in winter), including Leek (*Allium porrum*), Green onion (*Allium ascalonicum*), Mint (*Mentha piperita*), Radish (*Raphanus sativus*), Garden cress (*Lepidium sativum*) were randomly collected in batches of five per day from retailers at different points. During spring vegetables available in Khorramabad markets are from the fields around the Khorramabad district; but due to the unfavorable climatic conditions in winter, the vegetables are imported from Khuzestan province (south of Iran) at that season.

2.3. Procedure for sample preparation & determination of parasites

The vegetables (250 g) were collected and weighted into sterile nylon bags and transported for analysis to Parasitological Laboratory of the Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran. Sample washed by vigorous shaking with 1 L of physiological normal saline (0.95% NaCl). The washing water was then left for about 12 h for sedimentation to take place. The top layer was discarded and the remaining washing water was centrifuged at 2000 rpm for 15 min according to previous report with modification (Uga et al., 2009). The supernatant was discarded and the sediment carefully collected. The sediment was mixed and examined as follow:

1 Direct smear: a drop of the sediment was applied on the center of a clean grease-free slide. A clean cover slip was placed gently to avoid air bubbles and over flooding. The preparation was examined under a light microscope using × 10 and × 40 objectives (two for each sample) (Garcia & Bruckner, 1993).
2 Iodine smear: a drop of the sediment was mixed with a drop of Lugol's Iodine solution and examined as in direct smear (two for each sample) (Garcia & Bruckner, 1993). Smears were used for detection of parasitic eggs, cysts and larva. Parasites found under the light microscope were identified as described by Downes (Downes & Ito, 2001).

2.4. Data analysis

Statistical analyses were carried out using Chi-square test of the SPSS software version 16 for windows (SPSS Inc., Chicago, IL, USA) to compare the rate of contamination of vegetables among different seasons. A P-value <0.05 was considered statistically significant.

3. Results

In the present study, five pathogenic and four nonpathogenic parasites were found in contaminated vegetables. Tables 1 and 2 summarize the results of the presence of various parasites such as nonpathogenic parasites (*Free-living* larvae, *Entamoeba coli* cyst, *Iodamoeba butschlii* cyst and *Endolimax nana* cyst) and pathogenic parasites (*A. lumbricoides* eggs, *Enterobius vermicularis* eggs, *Giardia* spp. cysts, *Strongyloides stercoralis* eggs and *Fasciola hepatica* eggs) on some raw vegetables (Leek, Green onion, Radish, Garden cress, Mint). From the total samples in spring, 35.3% were being contaminated with the nonpathogenic parasites and 17.5% were found to be contaminated with the pathogenic parasites (Table 1). In contrast, 21.1% were found to be contaminated vegetables with the nonpathogenic parasites in winter and 5.5% were found to be contaminated with the pathogenic parasites (Table 2).

Table 2
Distribution of eggs and cysts of parasites in considered vegetables from winter.

Vegetables	No.	Pathogenic parasites					Nonpathogenic parasites				
		Giardia cycts no. (%)	*A. lumbricoides* no. (%)	*E. vermicularis* no. (%)	*S. stercoralis* no. (%)	*F. hepatica* no. (%)	*Free-living larva* no. (%)	*E. coli* no. (%)	*I. butschlii* no. (%)	*E. nana* no. (%)	Total no. (%)
Leek	55	1(1.8)	1(1.8)	2(3.6)	1(1.8)	0(0)	16(29.1)	2(3.6)	1(1.8)	0(0)	24(43.6)
Green onion	55	0(0)	1(1.8)	0(0)	1(1.8)	0(0)	9(16.4)	1(1.8)	1(1.8)	0(0)	13(23.6)
Radish	55	0(0)	0(0)	1(1.8)	1(1.8)	0(0)	12(21.8)	4(5.5)	0(0)	0(0)	18(32.7)
Garden cress	55	2(3.6)	0(0)	0(0)	0(0)	0(0)	3(5.5)	0(0)	1(1.8)	0(0)	6(10.9)
Mint	55	0(0)	1(1.8)	0(0)	0(0)	1(1.8)	7(12.7)	1(1.8)	0(0)	0(0)	10(18.2)
Total	275	3(1.1)	3(1.1)	3(1.1)	3(1.1)	1(0.3)	47(17.1)	8(2.9)	3(1.1)	0(0)	71(25.8)