

Parasitic Contamination in Raw Vegetables and Effect of Washing Procedure in Hamedan, Iran

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Background & Aims of the Study: Complex surface of vegetables facilitate attachment and transmission of several pathogens. No previous study has been conducted in survey of parasitic contamination of vegetables in Hamedan. This study aimed to detect the parasitic contamination in common raw vegetables in Hamedan markets.

Material and Methods: For this cross sectional study, 150 grams of raw vegetables, including (Mentha, Basil, Chives, Garden cress, and Radish) were collected from 12 retail stores in Hamadan, Iran, in 2017. Each sample washed in three ways; washing by potable water (a), saline solution (b) and a commercial routine detergent (Reeka, company, Iran) (c) for five minutes. After that, the washing solutions were separated and centrifuged at 1800 RPM for 5 minutes.

Results: The results showed that various parasites including: helminthic parasites (*Strongyloides stercoralis* eggs, *Ascaris lumbricoides*, *Toxocara* sp, *Taenia* sp, *Nemadoda*, and free-living larvae) and protozoan parasites (*Giardia lamblia* trophozoite, *Giardia lamblia* cyst, and *Amoeba* trophozoite). This study showed the contamination rate of Mentha (27.08%) and Radish (24.16%) are more than Garden cress. It was observed that *Ascaris* eggs and *Tennia* eggs are at the highest and the least Parasitic contamination in vegetables washed with potable water, respectively.

Conclusion: One of the ways to eliminate parasitic contamination of vegetables is to use saline solution and detergent to reduce parasites.

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Background

Vegetables, due to a great source of dietary fibers, protein, fluid, vitamins and minerals play the special role in the healthy human diet; and their regular consumption is protective against many cancers and lowers the occurrence of coronary heart disease (1). This importance has been contributed to the substantial increase in consumption of fresh vegetables. The consumption of raw vegetables without proper washing is an important route in the transmission of parasitic diseases (2). In many developing

countries, use of insufficiently treated wastewater to irrigate vegetables has been reported to be responsible for the high rates of contamination with pathogenic parasites (3). There has been an increase in the number of reported cases of food-borne illness linked to fresh vegetables (3). Contamination of soil with animal wastes and increased application of improperly composted manure to the soil in which vegetables are grown also play a role in parasite contamination of green vegetables (4). Bad hygienic practice during production, transport, processing and preparation by

handlers including consumers also contributes in vegetable contaminations (5). Other factors which affect the susceptibility of the public to food borne diseases also play a role in increasing the number of infected cases. Especially in High susceptible persons because of ageing, malnutrition, HIV infection and other underlying medical conditions (6). However, the recent increase in reports of food borne disease associated with fresh fruits and vegetables has raised concerns from public health agencies and consumers about the safety of these products. Referring to existing data, a limited number of surveys have been done to evaluate the prevalence of parasitic contamination in vegetables in Iran; and no study was conducted in the Hamedan district as the first city in terms of tourism in the west part of Iran.

Aims of the study: The objective of this study was to investigate the prevalence of parasitic contamination in vegetables used for raw consumption in Hamedan and the effect of different washing procedures to remove the parasites from the vegetables.

Materials & Methods

For this cross sectional study, 150 grams of raw vegetables, including (Mentha, Basil, Chives, Garden cress, and Radish) were collected from 12 retail stores in Hamadan, Iran, in 2018. Then, all of samples transmitted to the Parasitology laboratory of veterinary science. In order to identification of parasites fonna, each sample washed in three ways; washing by potable water (a), saline solution (b) and a commercial routine detergent (Reeka, company, Iran) (c) for five minutes. After that, the washing solutions were separated and centrifuged at 1800 RPM for 5 minutes. In order for identification of parasite egg, a wet smear from each sediment prepared

and egg parasites observation were done by light microscope (10 and 40 magnification).

Results

Parasitic contamination including helminthic eggs and protozoan cysts in washed vegetable by potable water, saline solution, and detergent showed in table 1. The results showed that Chives had the least contamination (11.25%) and Mentha had the highest contamination (27.08) that shown in Figure 1.

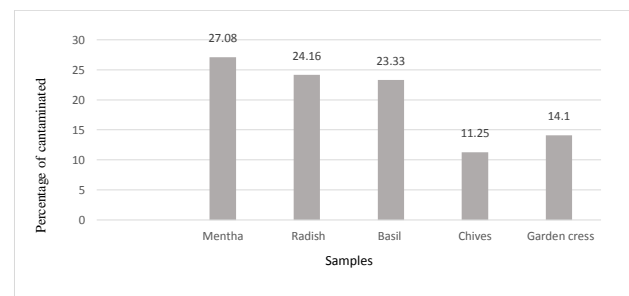


Figure1) The percentage of contaminated samples in each type of raw vegetable

The results of detected various parasites including helminthic parasites (*Strongyloides stercoralis* eggs, *Ascaris lumbricoides*, *Toxocara* spp, *Taenia* spp, *Nemadoda*, and free-living larvae) and protozoan parasites (*Giardia lamblia* trophozoite, *Giardia lamblia* cyst, and *Amoeba* trophozoite) on several raw vegetables (Mentha, Basil, Chives, Garden cress, and Radish) summarized in tables 2 and table 3.

Table 2) Helminthic eggs frequency in different raw vegetables according to washing procedure (Number (%))

Vegetable type (No)	<i>Ascaris lumbricoides</i>			<i>Toxocars.sp</i>			<i>Trichostrongylus</i>			<i>T aenia spp</i>			Nemadoda			Free-living larvae		
	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent
Mentha (12)	6 (50)	5 (41.66)	8 (66.66)	7 (58.33)	6 (50)	8 (66.66)	2 (16.66)	10 (83.33)	0 (0)	0 (0)	0 (0)	3 (25)	2 (16.66)	10 (83.33)	0 (0)	8 (66.66)	0 (0)	3 (25)
Radish (12)	3 (25)	3 (25)	3 (25)	2 (16.66)	1 (8.33)	9 (75)	0 (0)	1 (8.33)	0 (0)	0 (0)	1 (8.33)	0 (0)	2 (16.66)	1 (8.33)	0 (0)	1 (8.33)	2 (16.66)	4 (33.33)
Basil (12)	7 (58.33)	2 (16.66)	7 (58.33)	5 (41.66)	5 (41.66)	11 (91.66)	3 (25)	4 (33.33)	0 (0)	6 (50)	2 (16.66)	0 (0)	0 (0)	4 (33.33)	0 (0)	8 (66.66)	4 (33.33)	5 (41.66)
Chives (12)	6 (50)	5 (41.66)	3 (25)	3 (25)	3 (25)	5 (41.66)	0 (0)	0 (0)	0 (0)	7 (58.33)	0 (0)	1 (8.33)	2 (16.66)	2 (16.66)	0 (0)	1 (8.33)	0 (0)	1 (8.33)
Garden cress (12)	3 (25)	3 (25)	3 (25)	2 (16.66)	1 (8.33)	11 (91.66)	0 (0)	0 (0)	0 (0)	5 (41.66)	0 (0)	0 (0)	0 (0)	3 (25)	0 (0)	2 (16.66)	3 (25)	3 (25)
Total (60)	25 (41.66)	18 (30)	24 (40)	19 (31.66)	16 (26.66)	44 (73.33)	5 (8.33)	15 (25)	0 (0)	19 (31.66)	3 (5)	4 (6.66)	6 (10)	20 (33.33)	0 (0)	20 (33.33)	9 (15)	16 (26.66)

Table 3) Protozoan cysts frequency in different raw vegetables according to washing procedure (Number (%))

Vegetable type (No)	<i>Giardia lamblia</i> trophozoite			<i>Amoeba</i> trophozoite			<i>Giardia lamblia</i> cyst		
	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent	Potable water	Saline solution	Detergent
Mentha (12)	3 (25)	2 (16.66)	1 (8.33)	1 (8.33)	0 (0)	0 (0)	10 (0)	0 (0)	0 (0)
Radish (12)	6 (50.00)	6 (50.00)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Basil (12)	2 (16.66)	3 (25)	7 (58.33)	2 (16.66)	3 (25)	0 (0)	3 (25)	2 (16.66)	5 (41.66)
Chives (12)	0 (0)	2 (16.66)	6 (50)	0 (0)	1 (8.33)	1 (8.33)	8 (66.66)	0 (0)	0 (0)
Garden cress (12)	3 (25)	3 (25)	0 (0)	1 (8.33)	1 (8.33)	1 (8.33)	1 (8.33)	0 (0)	0 (0)
Total (60)	100	141	14 (23.33)	4 (6.66)	5 (8.33)	2 (3.33)	42	2 (3.33)	5 (8.33)

Discussion

The vegetables and fruits are as a means for transmission different types of parasites that leading cause parasitic infection in human and animals (7). This study evaluated the prevalence of parasitic contamination in vegetables used for

raw consumption and the effects of different washing procedures to remove the parasitic infection in Hamedan. In this study were used from the three methods, potable water, saline solution, and a commercial routine detergent which was different from methods used in other studies such as saline solution containing detergent (1% sodium dodecyl sulfate and 1%

Tween 80) (8,9), physiological saline (10) and the results revealed that among the three methods, saline solution and routine detergent are the most effective method for eliminating helminth eggs and protozoa respectively.

It was observed that *Ascaris* eggs and *Tennia* eggs are at the highest and the least parasitic contamination in vegetables washed with potable water, respectively. In addition, among all kinds of protozoa, *Giardia* trophozoite were seen abundantly. Several kinds of research have been conducted on the parasitic contamination of different type vegetables. The study of Bekele et al conveyed *Ascaris lumbricoides* (20.83%) is the most frequently detected parasites in raw vegetables and *Isospora belli* were the least prevalent parasite (3.06%) (11).

Fallah et al. with similar results showed the prevalence of parasitic contamination in the raw vegetable is 32.6% of unwashed and 1.3% of traditional in Shahrekord city (12). Another study reported *Giardia lamblia* parasite present in vegetables were 34.78% and there had a significant relationship between the type of vegetable and the type of parasite that this result agrees with the present study (8).

In contrast, the study was done by Ezatpour et al that reported Leek (80%) and Garden cress (54.5%) being the most contaminated vegetable in spring (13). However, this study showed the contamination rate of *Mentha* (27.08%) and *Radish* (24.16%) are more than Garden cress. This study comparing with other similar studies done in the field, illustrated a different rate of parasitic contamination that this can be related to several factors such as type and number of samples examined, methods used for detection of the parasites, geographical location, human and animal fertilizers.

Conclusion

The evidence from this study emphasizes the importance of raw vegetables in the transmission of pathogenic and non- pathogenic parasites to

human. It is recommended to wash and sterilize raw vegetables before using it. One of the ways to eliminate parasitic contamination of vegetables is to use saline solution and detergent to reduce parasites.

Footnotes

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Conflict of Interest:

The authors declared no conflict of interest.

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