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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network

RESEARCH ARTICLE BIOSCIENCE RESEARCH, 2019 16(3): 2751-2755. **OPEN ACCESS**

Detection of parasitic contamination in raw vegetables at a local market in Samut Songkhram province, Thailand

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Parasitic disease is a public health problem in tropical areas. Eating and drinking contaminated food and water is the main reason of infection. Samut Songkhram is a small province in central Thailand, which has become famous because of its local market, Romhoob, a popular tourist destination. The purpose of this study was to detect parasitic contamination of 10 types of raw vegetables: lettuce, Chinese cabbage, parsley, scallion, mint, Chinese leek, celery, collard, cabbage, and canton. Detection of parasitic contamination in this study used a sedimentation technique. Samples were taken from eight stores from September–October 2016. The number of eggs was counted and the results were expressed as a percentage. We found four species of parasite eggs contaminated with *Ascaris* spp., *Enterobius vermicularis*, *Fasciola* spp., and hookworm in eight types of vegetables: lettuce, Chinese cabbage, parsley, scallion, mints, Chinese leek, celery, and collard. The results show that there is a risk of parasitic infection when consuming raw vegetables and consumers should be careful when selecting and eating raw vegetables.

Keywords: Soil-transmitted parasites, Parasitic contamination, Parasitic infection

INTRODUCTION

Parasitosis is a common disease in many countries, especially in developing countries, including Thailand (Boonjaraspinyo et al., 2013). There are approximately 2 billion people in the world infected with intestinal parasites (Al-Delaimy et al., 2014). Thailand, located in Southeast Asia, is a tropical area, and this environment supports a high prevalence of soil-transmitted parasites (Suwansaksri et al., 2003). There are reports in rural communities of Thailand where patients comprise more than 35% of the population (Suwansaksri et al., 2003). The consumption of vegetables contaminated with parasites is a common cause of infection. Previous studies have confirmed that vegetables contaminated with the eggs and larvae of parasites are transmitted to humans (Asadpour et al., 2016).

Samut Songkhram Province is located in central Thailand and is located in a plain through which the Maeklong River flows. This area is suitable for cultivation, farming, and fishery. Samut Songkhram has many bazaars and local markets, of which the Romhoob market is particularly famous (Chaiphongpachara et al., 2017). This tourist destination is visited by many customers who come to purchase fruits and vegetables, which may be contaminated with

parasites, endangering people's health.

Several reports have found parasitic contamination of vegetables in many places, however, no study has been reported at local markets in the Samut Songkhram Province of Thailand. The present study focused on the detection of parasites on 10 types of commonly consumed raw vegetables available at this market.

MATERIALS AND METHODS

Collection of samples

In this descriptive study, a total of 160 samples (16 samples from each type of raw vegetable) were detected from the Romhoob market (Geographic coordinate: 13.407531**,** 99.999548), Maeklong sub-district, Mueang Samut Songkhram district, Samut Songkhram Province. Ten types of commonly consumed raw vegetables were selected in this study, including lettuce (*Lactuca sativa*), Chinese cabbage (*Brassica rapava*), parsley (*Petroselinum crispum*), scallion (*Allium cepa*), mint (*Metha cordifolia*), Chinese leek (*Allium tuberosum*), celery (*Apium graveolens*), collard (*Brassica oleraceae*), cabbage (*Brassica oleracea*), and canton (*Brassica chinensis*). For each type of vegetable, 16 samples from different vendors were collected. Samples, which were stained with soil, mud, or other subtances on their branches, leaves, stems, or roots, were collected between September and October 2016 at 06.30 – 07.30 hours. Each vegetable (500 g) was collected, identified, and transported to the laboratory of College of Allied Health Sciences (Suan Sunandha Rajabhat University, Thailand).

Detection of parasite eggs

First, the samples were sliced into small equal pieces of 300 g and placed in 1,000 ml beakers. Then, 15 g of salt was mixed with 4 l of water and this solution was poured into the beakers containing the samples. One drop of dishwashing liquid was added to the beakers to reduce the surface tension of the parasite eggs and vegetables. Next, the beakers were shaken with an orbital shaker at 240 times per min, followed by filtering with 1,000 ml of a sedimental cylinder. After 24 h, water on the surface was removed until only 20 ml of the sediment remained, and 1 ml was placed in a centrifuge tube and dropped onto a slide. After covering the slide with a coverslip, the sample was visualized through a light microscope with a simple direct smear method. Finally, the results were recorded and the types of parasite eggs were determined.

Data analysis

After filtering the parasite eggs with a sedimental cylinder and detecting the parasites by light microscopy, the number of eggs was counted and the results were expressed as a percentage.

RESULTS

After sedimental analysis of the 10 types of vegetables (lettuce, Chinese cabbage, parsley, scallion, mint, Chinese leek, celery, collard, cabbage, and canton), we found that parasite eggs were most commonly found in lettuce (16 samples; 100%). The second most common were Chinese cabbage, scallion, and parsley (14 samples; 87.5%), followed by collard (12 samples; 75%), Chinese leek (10 samples; 62.5%), and celery (50%; 8 samples). Finally, of the vegetables contaminated with parasite eggs, the least likely to be contaminated was mint (2 samples; 12.5%). No parasite eggs were found in canton and cabbage (Table 1).

Table 1; Percentage of parasites in 10 types of vegetables.

Type of vegetables	Samples (N)	Percentage of parasites
Lettuce	16	100 (16)
Chinese cabbage	16	87.5 (14)
Scallion	16	87.5 (14)
Parsley	16	87.5 (14)
Collard	16	75 (12)
Chinese leek	16	62.5 (10)
Celery	16	50 (8)
Mint	16	12.5 (2)
Canton	16	0
Cabbage	16	0
Total	160	56.25 (90)

When classifying the types of parasite eggs found on each type of vegetable, we found that most vegetables were contaminated with two types of parasites: lettuce with *Ascaris* spp. (Figure 1) and *Enterobius vermicularis*, scallion and Chinese leek with *Ascaris* spp. and hookworm (Figure 2), and Chinese cabbage with *Ascaris* spp. and *Fasciola* spp. The vegetables that were contaminated with only one type of parasite were parsley and mint with *Ascaris* spp., and collard with *E*. *vermicularis*. These results show that the most common type of parasite egg is *Ascaris* spp. (82.5%; 66 eggs), followed by *E*. *vermicularis* (7.5%; 6 eggs), hookworm (7.5%; 6 eggs), and *Fasciola* spp. (2.5%; 2 eggs) (Table 2).

Table 2; Prevalence of parasitic contamination on vegetables.

Type of vegetable	*Ascaris* spp.	*Enterobius vermicularis*	*Fasciola* spp.	Hookworm	Total
Lettuce	83.33 (10)	16.67 (2)	-	-	100 (12)
Chinese cabbage	93.33 (28)	-	6.67 (2)	-	100 (30)
Scallion	66.67 (8)	-	-	33.33 (4)	100 (12)
Parsley	100 (4)	-	-	-	100 (4)
Collard	-	100 (2)	-	-	100 (2)
Chinese leek	83.33 (10)	-	-	16.67 (2)	100 (12)
Celery	66.67 (4)	33.33 (2)	-	-	100 (6)
Mint	100 (2)	-	-	-	100 (2)
Canton	-	-	-	-	0
Cabbage	-	-	-	-	0
Total	82.50 (66)	7.5 (6)	2.5 (2)	7.5 (6)	100 (80)

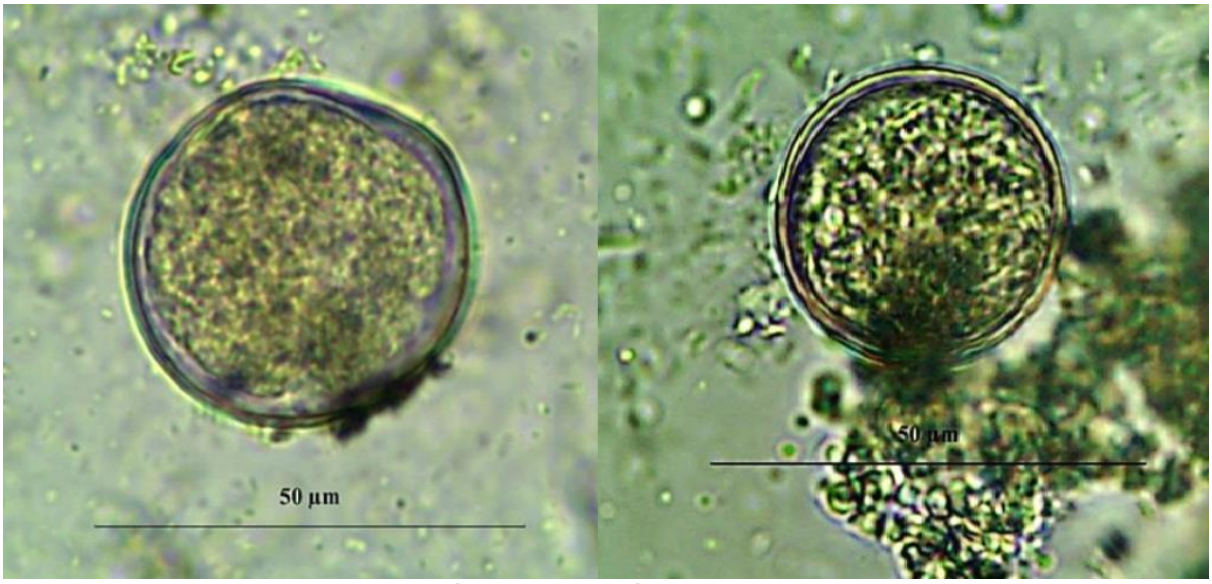

Figure 1; *Ascaris* spp. Egg

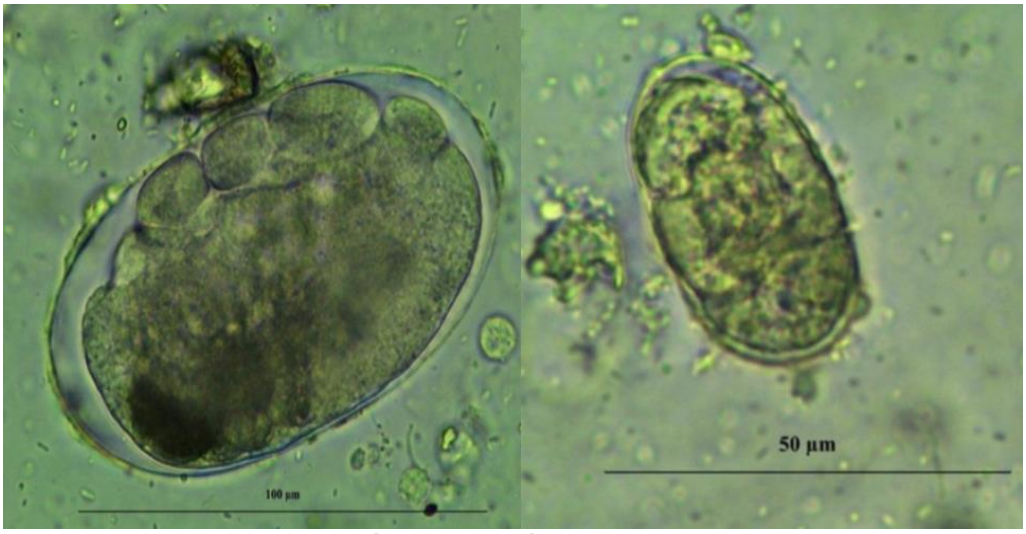

Figure 2; Hookworm egg

DISCUSSION

We found parasite eggs on eight of the ten vegetables obtained from the Romhoob market in the Samut Songkhram Province of Thailand. The contaminated vegetables were lettuce, Chinese cabbage, parsley, scallion, mint, Chinese leek, celery, and collard. Intestinal parasites are very prevalent and the consumption of vegetables can play an important role in the transmission of parasites (Nouroozi, 2015). It is possible that pouring human or animals feces on these plants as fertilizers is harmful to humans (Asadpour et al., 2016). Since these plants are grown to be consumed, we might be directly infected by their consumption. Presumably, price is a relevant factor because cabbage and canton, the two vegetables which were not contaminated, are more expensive, thus consumers may select clean and complete products, and sellers may be more prone to take extra care washing and selecting these vegetables. Previous studies have shown that infectious parasite eggs can be found in all fresh markets, therefore we should not be too frightened with the results. Instead, we should focus on regularly washing fresh vegetables before consumption.

We found four types of parasites in the samples tested: *Ascaris* spp., *E*. *vermicularis*, *Fasciola* spp., and Hookworm. *Ascaris* spp., *E. vermicularis*, and *Fasciola* spp. are instantly infectious once consumed. These helminths are an important route of transmission of intestinal parasites in humans (Asadpour et al., 2016). This result was consistent with a previous study reporting parasitic contamination of raw vegetables in traditional markets in Hue, Vietnam. This study also found the most common parasite eggs found on vegetables were *Fasciola*, *Ascaris*, and *Trichuris* (Ho et al., 2014). Hookworm is not contagious when consumed but instead by contact through the skin (Hotez, 2008), and is still one of the four main soil-transmitted helminths. Hookworm is an important public health concern cause of physical growth retardation and intellectual development retardation of humans (Zheng et al., 2009). Therefore, public health agencies in Samut Songkhram should focus on this parasite to monitor and control hookworm disease.

Our results did not allow the identification of the species of *Ascaris* spp., *Fasciola* spp., and hookworm because they are similar in morphology, making identification difficult. Because the samples in this study were limited to one location, even though it is the biggest market in the province, our results may underrepresent the number and types of parasites actually present. Nevertheless, this research provides useful information for the general public for selection, cleaning, cooking, and eating of market vegetables.

CONCLUSION

Our results indicate that the consumption of raw vegetables presents a risk of parasite infection, likely from human and animal feces. Consumers should cook vegetables by boiling or another heating process to ensure they are well-cooked (Nasr et al., 2013). If eaten raw, consumers should ensure the vegetables are washed well to reduce the risk of parasite infection.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEGEMENT

We would like to thank the College of Allied Health Science, Suan Sunandha Rajabhat University, Thailand for their kind support of our research. This work was supported by Suan Sunandha Rajabhat University, Bangkok, Thailand who provided facilities throughout this work.

AUTHOR CONTRIBUTIONS

TC and PK designed and performleed the experiments and also wrote the manuscript. WW, WSNA, PD, and PD reviewed the manuscript. All authors read and approved the final version.

REFERENCES

Al-Delaimy AK, Al-Mekhlafi HM, Lim YAL, Nasr NA, Sady H, Atroosh WM, Mahmud R, 2014. Developing and evaluating health education

learning package (HELP) to control soil-transmitted helminth infections among Orang Asli children in Malaysia. Parasit Vectors 7(1): 416.

Asadpour M, Malekpour H, Jafari A, Bahrami S, 2016. Diversity of parasitic contamination in raw vegetables commonly consumed in Shiraz, southwest of Iran. Asian Pacific J Trop Dis 6(2): 160–162.

Boonjaraspinyo S, Boonmars T, Kaewsamut B, Ekobol N, Laummaunwai P, Aukkanimart R, Wonkchalee N, Juasook A, Sriraj P, 2013. A cross-sectional study on intestinal parasitic infections in rural communities, northeast Thailand. Korean J Parasitol 51(6): 727–734.

Chaiphongpachara T, Pimsuka S, Na Saisanan Ayudhaya W, Wassanasompong W, 2017. The application of geographic information system in dengue haemorrhagic fever risk assessment in Samut songkhram province, Thailand. Int J Geomate 12(30): 53–60.

Ho LQC, Thong HT, Chao N Van, Hung PHS, Hai V Van, An L Van, 2014. Microbial and parasitic contamination on fresh vegetables sold in traditional markets in Hue City. J Food Nutr Res 2(12): 959–64.

Hotez P. Hookworm and poverty. 2008. Annals of the New York Academy of Sciences. Vol. 1136. p. 38–44.

Nasr NA, Al-Mekhlafi HM, Ahmed A, Roslan MA, Bulgiba A, 2013. Towards an effective control programme of soil-transmitted helminth infections among *Orang Asli* in rural Malaysia. Part 1: prevalence and associated key factors. Parasit Vectors 6:27.

Nouroozi RV, 2015. Detection of Parasitic Contamination in Ready-to-Eat Fresh Packaged Herbs Sold in Tehran, Iran. J Community Health Res 4(2): 99–104.

Suwansaksri J, Garnngarndee U, Wiwanitkit V, Soogarun S, 2003. Study of factors influencing intestinal parasitic infections in a rural community in northeastern Thailand. Southeast Asian J Trop Med Public Health 34(2): 94–97.

Zheng Q, Chen Y, Zhang HB, Chen JX, Zhou XN, 2009. The control of hookworm infection in China. Parasit Vectors 2(1): 44.