



Identification of *Ascaris lumbricoides* Egg in cauliflower (*Brassica oleracea* var. *botrytis*) by sedimentation method

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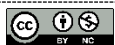
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Abstract

Background: *Ascaris lumbricoides* is the causative agent of a helminthic diseases known as ascariasis. According to the World Health Organization (WHO), helminthic diseases constitute more than half of the health issues in developing countries. It is caused by poor sanitation and a tropical climate that supports the development of worms. Transmission of worm eggs to humans can be through vegetables that grow near the ground, one of them is cauliflower. **Objectives:** The study aimed to identify the presence of *Ascaris lumbricoides* eggs in cauliflower sold at Krembung Market, Sidoarjo Regency. **Materials and Methods:** The method used is sedimentation using 0,2% NaOH reagent with the principle of centrifugal force which results in the separation of worm eggs and supernatant. This method can precipitate eggs without damaging them, making it easier to identify the type of worm eggs. **Results:** The research was carried out in April 2023 and the results showed that from the 12 samples sold on mats, there were 2 samples (17%) contaminated with infertile *Ascaris lumbricoides* eggs. Meanwhile, from 12 samples sold on table, no *Ascaris lumbricoides* eggs (0%) were found. **Conclusions:** Based on the research results, *Ascaris lumbricoides* eggs were found in 2 out of 12 samples of cauliflower sold on mats.

Keywords

Ascaris lumbricoides, Ascariasis, Sedimentation



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1. Introduction

Vegetables are a source of vitamins and fiber. Vegetables that are not hygienic can be contaminated with worm eggs. According to the World Health Organization (WHO), more than half of the health problems in developing countries are caused by worm diseases due to poor sanitation and tropical climates that support worm development (Yulianti et al., 2022). Worm infections are caused by Soil Transmitted Helminths, which are a type of intestinal nematodes that thrive in warm and moist soil, especially in countries with

tropical climates. One example of Soil Transmitted Helminths is the roundworm *Ascaris lumbricoides*. *Ascaris lumbricoides* has a high prevalence rate due to its ability to produce a very large number of eggs, estimated at 100,000 to 200,000 eggs per day (Budiarti, 2020). Many types of vegetables grow close to the ground and are vulnerable to contamination with worm eggs, including cauliflower. This vegetable resembles broccoli with its white color. The dense and closely packed structure of cauliflower allows for the presence of worm eggs inside. If cauliflower is not properly processed, humans may inadvertently swallow worm eggs when consuming the vegetable. As a result, a person may suffer from worm infestation (Putra et al., 2019).

Ascariasis is a worm infestation disease caused by the eggs of the roundworm *Ascaris lumbricoides*. Ascariasis can cause clinical symptoms such as coughing, including coughing up blood or hemoptysis, with high eosinophil levels, shortness of breath, with or without fever. These symptoms are known as Loeffler's Syndrome (Bestari et al., 2020).

Previous research by Dimas Putra in 2019 found that 20% of 10 broccoli samples were contaminated with *Ascaris lumbricoides* worm eggs (Putra et al., 2019). This research differs from the previous one. In that research, broccoli samples were used, while in this research, cauliflower was used as the sample. Cauliflower and broccoli have the same classification but different species. Additionally, broccoli and cauliflower have very similar morphologies but different colors. Other differences also exist in the sampling location and the samples examined, namely cauliflower sold on tables and sold only on mats near the ground to see if it affects worm egg contamination in cauliflower. The sampling location in this research was at the Krembung Market, Sidoarjo Regency. This location was chosen for several reasons. First, the prevalence of ascariasis in Sidoarjo Regency is high at 44% (Charisma et al., 2018). Second, there are still areas with poor sanitation, especially waste disposal sites that are often damp or watery.

This study aims to identify *Ascaris lumbricoides* worm eggs, calculate the number and percentage of cauliflower contaminated with *Ascaris lumbricoides* eggs sold at the Krembung Market, Sidoarjo Regency.

2. Materials and Methods

2.1. Types of research

This research is an observational cross-sectional study research method conducted in April 2023 at the Parasitology Laboratory of the Medical Laboratory Technology Department, Health Polytechnic of the Ministry of Health, Surabaya, located at Jl. Karangmenjangan No.18A, Surabaya, East Java.

The samples were cauliflower from the Krembung Market in Sidoarjo Regency. There were 6 cauliflower vendors, where 3 vendors sold cauliflower with table mats and 3 vendors sold cauliflower with floor mats. From each vendor, the researcher bought 4 cauliflowers selected randomly. The samples were examined using the sedimentation method. The results obtained were analyzed descriptively.

2.2. Research methods

The research conducted used the sedimentation method. This method is based on centrifugal force which results in the separation of worm eggs and supernatant (Aritonang & Rezki, 2018). The sedimentation method has several advantages, including being more effective in detecting protozoa and various types of worm eggs. This method can precipitate eggs without damaging them, making it easier to identify the type of worm eggs (Aryawan, 2019).

The equipment used in this research includes a microscope, centrifuge, digital scale, beaker glass, pipette droppers, stirring rods, tweezers, test tubes, tube racks, glass slides, and cover slips. The materials used are cauliflower vegetables and 0.2% NaOH reagent. Following are the research procedures. First, cauliflower is weighed 50 grams for each sample. Second, cauliflower is soaked for 30 minutes in 100 mL of 0.2% NaOH solution. Third, the 0.2% NaOH solution is poured into a test tube and allowed to stand for 1 hour. Fourth, the supernatant is discarded, leaving 10-15 mL, then centrifuged for 5 minutes at a speed of 1500 rpm. The supernatant is discarded, and the sediment is pipetted with 1 drop onto a glass slide. Cover with a cover slip. Fifth, observed using a microscope with lens magnifications 10x-40x (Asihka et al., 2014).

3. Results and Discussion

3.1. Results

After the examination, a total of 24 samples of cauliflower were inspected. Twelve samples were cauliflower sold on table, while the other 12 samples were cauliflower sold only on mats or near the ground. None of the cauliflower sold on table were contaminated with *Ascaris lumbricoides* eggs.

This is described with a percentage of positive samples for *Ascaris lumbricoides* eggs of 0% and a negative percentage of 100%. Meanwhile, there were 2 samples of cauliflower sold on mats that were contaminated with *Ascaris lumbricoides* eggs. Out of the 12 cauliflower samples, 17% tested positive for *Ascaris lumbricoides* eggs, and 83% tested negative. The discovered worm eggs were infertile. The following is a Table 1.

Table 1. Results of examinations to identify *Ascaris lumbricoides* eggs in cauliflower using the sedimentation method that sold in Krembung market, Sidoarjo regency

Sample Code	Sold on table		Sample Code	Sold on mats / near the ground	
	Positive	Negative		Positive	Negative
1	-	Negative	1	-	Negative
2	-	Negative	2	-	Negative
3	-	Negative	3	Positive	-
4	-	Negative	4	-	Negative
5	-	Negative	5	-	Negative
6	-	Negative	6	-	Negative
7	-	Negative	7	Positive	-
8	-	Negative	8	-	Negative
9	-	Negative	9	-	Negative
10	-	Negative	10	-	Negative
11	-	Negative	11	-	Negative
12	-	Negative	12	-	Negative
Number of <i>Ascaris lumbricoides</i> eggs	0	12	Number of <i>Ascaris lumbricoides</i> eggs	2	10
Percentage	0 %	100 %	Percentage	17 %	83 %

Note: Negative = no eggs of that type of worm were found; Positive = eggs of that type of worm were found.

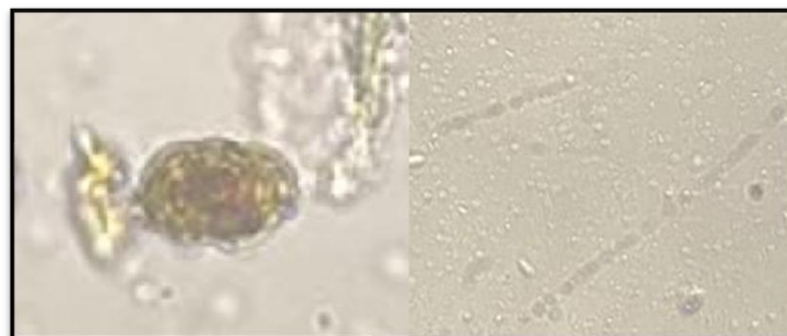


Figure 1. (Left) Positive for infertile *Ascaris lumbricoides* eggs, (Right) Negative for *Ascaris lumbricoides* eggs with a 40x objective lens magnification

3.2. Discussion

Contamination of *Ascaris lumbricoides* eggs can be caused by several factors. According

to a journal by Sibuea in 2022, contamination of worm eggs can also occur through water used for irrigation or cleaning vegetables. For example, if the water used comes from a river containing *Ascaris lumbricoides* eggs due to direct defecation into the river by the local community. Another factor that can cause contamination is the lack of cleanliness in vegetable processing (Sibuea, 2022).

Based on previous research by Indah Setyaningsih in 2020, there are several differences. The study used Soil Transmitted Helminth (STH) egg research subjects consisting of several types of worm eggs, while this study specifically examined one type of STH egg, *Ascaris lumbricoides*. Differences also exist in the location, samples, and of course, the research results. Similarities between the previous research and this study that is in the method of worm egg examination, namely sedimentation, and observational research methods. The research conducted by Indah Setyaningsih yielded 31% positive egg results and 16% positive *Ascaris lumbricoides* worm larvae from a total of 16 lettuce samples (Setyaningsih, 2020). Meanwhile, in this study, *Ascaris lumbricoides* worm eggs were found in 2 samples or 17% of the 12 cauliflower samples sold on mats.

The sedimentation method has been utilized in this research. This method is based on centrifugal force, which results in the separation of worm eggs and supernatant (Aritonang & Rezki, 2018). The sedimentation method has several advantages, including its effectiveness in detecting protozoa and various types of worm eggs. This method can precipitate eggs without damaging them, making it easier to identify the types of worm eggs (Aryawan, 2019).

This research indicates that cauliflower vegetables have the potential to spread ascariasis disease. Therefore, preventive measures need to be taken to prevent contamination of *Ascaris lumbricoides* eggs on cauliflower by cleaning it with flowing water before cooking and consumption (Muslimin et al., 2022).

4. Conclusions

Based on the research findings, the conclusion is *Ascaris lumbricoides* eggs were found in 2 out of 12 samples of cauliflower sold on mats in Krembung Market, Sidoarjo Regency.

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Author Contributions: NPR: Conceptualization, Formal analysis, Investigation, Resources, Writing - Original Draft, Writing - Editing, Software, Project administration, Funding acquisition. RS: Validation, Supervision, Review. SSEA: Methodology, Data Curation, Visualization.

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