

Prevalence of Soil Transmitted Helminths Egg Contamination in Cabbage (*Brassica oleracea var. capitata*) and Cucumber (*Cucumis sativus*)

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ABSTRACT

Soil Transmitted Helminths (STH) are soil-transmitted intestinal nematodes that can contaminate vegetables consumed raw, such as cabbage (*Brassica oleracea var. capitata*) and cucumber (*Cucumis sativus*), which are commonly served as raw side dishes (lalapan). This descriptive study aimed to determine the prevalence of STH eggs contaminating cabbage and cucumber sold at two food stalls near SDN 016 Samarinda Seberang. Fourteen samples of each vegetable were examined using the sedimentation method, and the results were analyzed univariately. No STH eggs were found in any of the 28 samples examined, giving a prevalence of 0%. Good stall sanitation, proper washing practices, and dry, sun-exposed storage of the vegetables are suggested as the main reasons no contamination was detected.

INTRODUCTION

Vegetables are plants that offer many health benefits to the human body. Most vegetables are consumed after boiling or stir-frying, but some types can be eaten directly after washing, commonly known as raw vegetable side dishes or lalapan. The habit of consuming lalapan is spread almost evenly across Indonesia, with the highest consumption level found on the island of Java (Yamin, Priaryuningtyas, & Galuh., 2021).

Soil Transmitted Helminths (STH) are a group of intestinal nematodes that require soil as a medium for the transmission of their eggs and larvae. In Indonesia, the most commonly found species are *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), and *Ancylostoma duodenale* and *Necator americanus* (hookworm). The World Health Organization (WHO) recorded that approximately 1.5 billion people worldwide were infected with STH in 2018, with the highest number of cases originating from the Southeast Asia region (Lalangpuling, Nikiulub, & Pinontoan, 2021).

Data from the Indonesian Ministry of Health in 2015 showed that the prevalence of helminthiasis across all age groups ranged from 40% to 60%, with approximately 195 million people living in areas with a high rate of helminthiasis (Prabandari, Ariwarti, Prasdistya, & Sekar Sari., 2020). In Samarinda, according to data from 2012 through 2016, the highest incidence of intestinal parasitic infections was among children aged 1–5 years, and the second-highest incidence was among children aged 5–10 years (Irianto, Azahra, Makkadafi., 2023).

Raw vegetable dishes have the potential to become a vector for STH transmission because they do not go through a cooking process capable of killing microorganisms attached to the surface of the vegetables. Cabbage and cucumber are two types of vegetables commonly used as lalapan. Previous studies reported an STH egg prevalence of 25% in cabbage sold in a traditional market in Bekasi (Anindita, Lerrick, & Inggraini, 2022) and 8.3% in cabbage sold in a traditional market in Medan (Husaini, Saragih, Rahma, & Lubis, 2022). Research on cucumber also showed fairly high contamination, with 6 of 12 samples testing positive for STH among street vendors and 2 of 6 samples positive among restaurants at Palembang (Leo, Dalilah, Dwi, Chairil, and Susilawati., 2021).

Most of these previous studies were conducted at traditional wet markets in other major cities, such as Bekasi, Medan, and Palembang. Contamination data for vegetables served directly at food stalls in East Kalimantan, particularly Samarinda, remain scarce. This gap carries clear public health relevance because, as noted above, children aged 1–10 years are the group most affected by intestinal parasitic infections in Samarinda, and food stalls located near elementary school are a direct point of exposure for this vulnerable age group. The present study addresses this gap determining the prevalence of STH egg contamination in cabbage and cucumber served together as lalapan at food stalls around SDN 016 Samarinda Seberang.

The research location was chosen around SDN 016 Samarinda Seberang because the area is a densely populated neighborhood with fairly high street vendor activity, including vendors selling lalapan as a main menu item. Based on this background, the present study aims to determine the prevalence of STH

egg contamination in cabbage and cucumber served as lalapan around SDN 016 Samarinda Seberang, and to identify the frequency of each STH species found.

LITERATURE REVIEW

Soil Transmitted Helminths

STH consists of four main species, namely *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), *Ancylostoma duodenale* and *Necator americanus* (hookworm), and *Strongyloides stercoralis* (threadworm), which is less commonly found in Indonesia (Sumanto, 2016). STH worm infections are classified as chronic infections that do not cause obvious clinical symptoms and require a long period of time for their effects to become clearly apparent (Lestari & Suraini, 2023).

STH infection is classified as a Neglected Tropical Disease (NTD) that is frequently found in tropical and subtropical regions with poor sanitation and hygiene condition. The age group most vulnerable to STH infections is children living in areas with poor environmental conditions (Ribado Meñe et al., 2023).

The World Health Organization (WHO) reports that more 1.5 billion people are infected with STH, as reported from 112 countries each year, with the highest rates occurring in tropical and subtropical regions, such as Indonesia. According to data from the Ministry of Health of the Republic of Indonesia, the prevalence of intestinal parasitic infections among children aged 1–6 years or 7–12 years is quite high, ranging from 30% to 90% (Lalangpuling, Nikiulub, & Pinontoan., 2021). This figure is closely related to sanitation conditions and hygiene practices within the community.

These findings not only demonstrate the link between STH and health problems in individuals, but also highlight its connection to sanitation issues and community behavior as a whole.

Vegetables as a Medium for Parasite Transmission

Vegetables consumed raw, such as lalapan, can become a medium for STH transmission if the cultivation process involves inadequate manure fertilization or irrigation, and if washing prior to serving is not carried out optimally (Yamin, Priaryuningtyas, & Galuh., 2021). Cabbage (*Brassica oleracea* var. capitata) and cucumber (*Cucumis sativus*) are two vegetables commonly used as lalapan and have the potential to act as STH vectors.

Beyond cabbage and cucumber, other raw vegetables commonly served as lalapan, such as lettuce or basil have also been reported to carry STH eggs. Basil sold as lalapan in Semarang shows 25% eggs contamination (Yamin, Priaryuningtyas, & Galuh, 2021), and a comparison of cabbage and lettuce sold in Medan found differing contamination rate between the two vegetables (Husaini, Saragih, Rahma, & Lubis, 2022). These finding indicate that the risk of STH transmission through lalapan is not confined to a single vegetable type.

Cabbage and cucumber were prioritized in this study because they were two vegetables most consistently served together as lalapan at food stalls around the study location, even so, extending future screening to a wider range of lalapan vegetables, including lettuce or basil would provide a more comprehensive risk in this setting.

Methods for Examining STH in Food Items

There are three common methods used to examine STH contamination in food items, namely the sedimentation, flotation, and Kato-Katz methods. The sedimentation method makes use of gravitational force to settle STH eggs, which have a higher specific gravity than the examination solution, making it simple and easy to perform, although it is less sensitive for detecting light contamination (Nurdin et al., 2023). Flotation uses the difference in specific gravity between the solution and the STH worm eggs, so that the eggs float to the surface of the solution (Nurhidayanti & Indah Sari, 2023). Meanwhile, the Kato katz is the gold standard for STH screening, but it has limitations because its sensitivity is not high enough to detect mild infections (Sandika, 2020).

H1: There is no STH contamination in cabbage and cucumbers.

H2: There is STH contamination in cabbage and cucumbers.

Conceptual Framework

Based on this literature review, the present study uses a conceptual framework in which STH contamination in cabbage and cucumber is examined through the sedimentation method to determine the presence or absence of STH eggs in both samples.

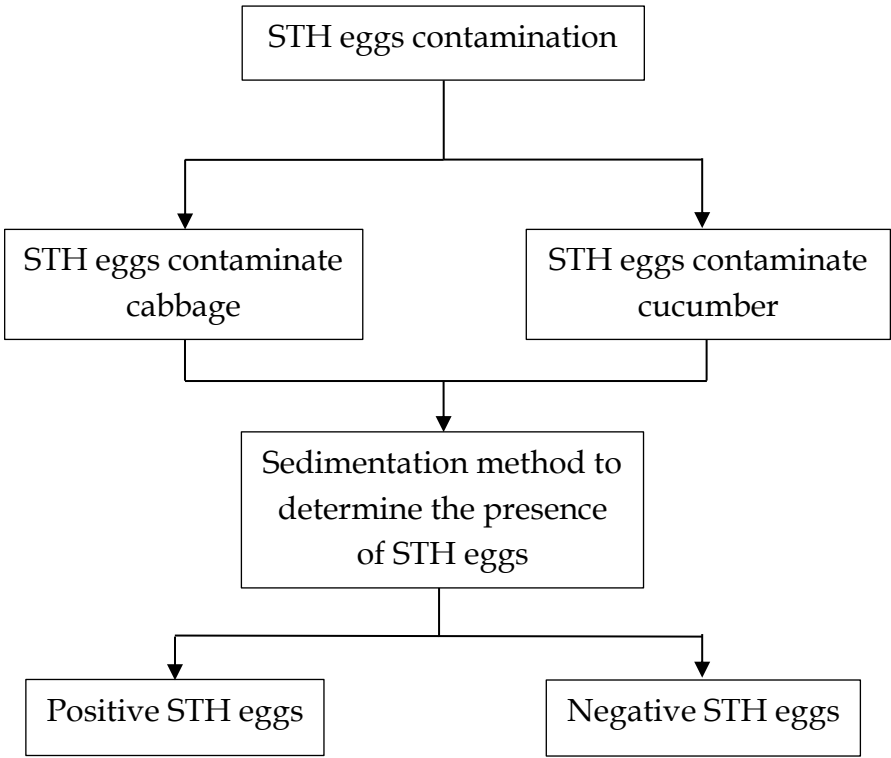


Figure 1. Conceptual Framework

METHODOLOGY

This study is a descriptive observational study with a cross-sectional design. The research was conducted at lalapan food stalls around SDN 016 Samarinda Seberang for sample collection, and at the Parasitology Laboratory, Department of Medical Laboratory Technology, Polytechnic of Health, Ministry of Health East Kalimantan, for sample examination.

The population of this study was all lalapan vendors serving cabbage and cucumber around SDN 016 Samarinda Seberang. Samples were collected using a purposive sampling technique from two food stalls, with a total of 14 cabbage samples and 14 cucumber samples (28 samples in total), consisting of 7 samples of each vegetable from each stall.

The two food stalls were selected purposively because, during the sampling process, there were four food stalls. One of the four food stalls closed suddenly for an indefinite period, and another stall had a fluctuating menu or did not serve lalapan every day. Therefore, only two stalls served lalapan vegetables every day. A total of 28 samples (14 cabbage and 14 cucumber) was considered adequate for an initial descriptive assessment of contamination status at these two vendors, and is comparable to the sample sizes used in similar prevalence studies on lalapan vegetables. Sample were collected on a sunny day. This could affect the research process because STH eggs require moisture and a location sheltered from direct sunlight to survive (Husaini, Saragih, Rahma, & Lubis, 2022).

Examination was carried out using the sedimentation method with a 0.2% NaOH solution. Cabbage and cucumber samples were cut into small pieces, weighed to 50 grams, and then soaked in 500 mL of 0.2% NaOH solution for 30 minutes. Approximately 10-15 mL of the soaking water was taken and centrifuged at 1,500 rpm for 5 minutes. The resulting pellet was examined under a microscope at 10x and 40x magnification to identify the presence of STH eggs (Mada, Wardani, Mujahid, & Almanfaluhti, 2023).

Data analysis is a systematic process for collecting and describing data with the aim of providing important information. The data referred to in this study is the prevalence of Soil Transmitted Helminths eggs in cabbage and cucumber, which will be analyzed using univariate analysis. After obtaining the results, a table of the examination results was created. The results were calculated using the following prevalence formula:

$$P = \frac{f}{n} \times 100\%$$

Where f is the number of positive samples and n is the total number of samples.

RESEARCH RESULT

This study used 28 samples consisting of 14 cabbage samples and 14 cucumber samples collected from two different lalapan food stalls around SDN 016 Samarinda Seberang. The results of the microscopic examination using the sedimentation method are presented in Table 1 and Table 2 below.

Microscopic observation of the sediment pellet from all 28 samples revealed no eggs structures consistent with the morphology of STH eggs observed at 10x and 40x magnification.

Figure 2 shows the steps involved in the process, from sample collection to observation under a microscope.

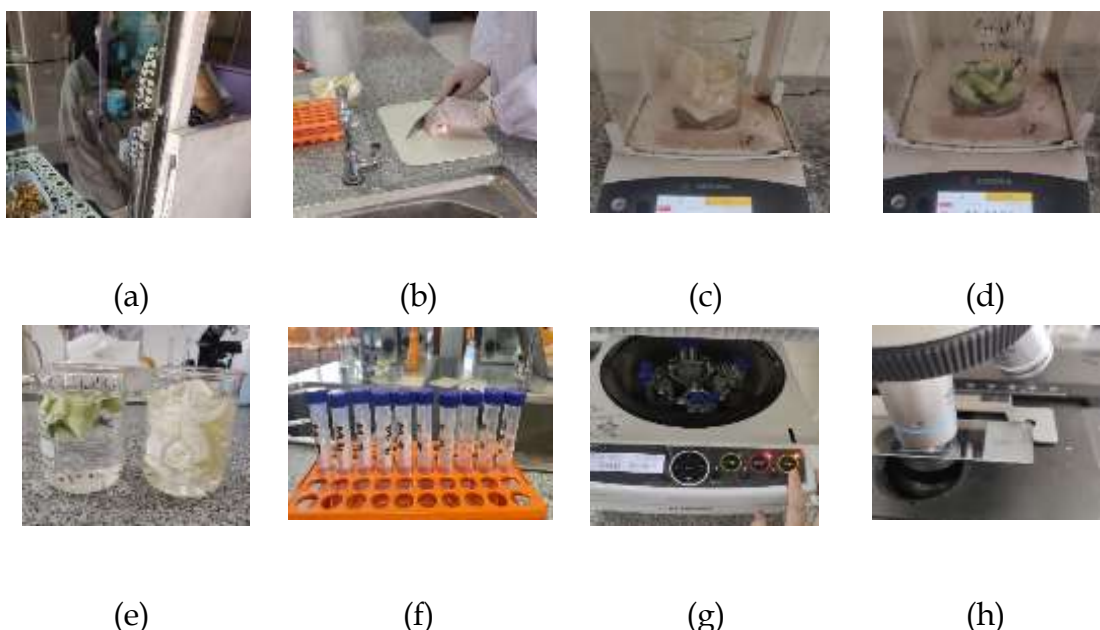


Figure 2. Documentation of the sample preparation and examination procedure: (a) sample collection at the food stall, (b) cutting of the vegetable sample, (c) weighing of the cabbage sample, (d) weighing of the cucumber sample, (e) soaking in 0.2% NaOH solution, (f) transfer of the soaking water to centrifuge tubes, (g) centrifugation, and (h) microscopic observation.

Table 1. Percentage of Soil Transmitted Helminths Eggs in Cabbage and Cucumber.

Soil Transmitted Helminths Eggs	Frequency	Percentage
Positive	0	0%
Negative	28	100%
Total	28	100%

Table 2. Species Identification of Soil Transmitted Helminths Eggs in Cabbage and Cucumber.

Soil Transmitted Helminths Eggs	Frequency	Percentage
<i>Ascaris lumbricoides</i>	0	0%
<i>Trichuris trichiura</i>	0	0%
<i>Ancylostoma duodenale</i>	0	0%
<i>Necator americanus</i>	0	0%

Both tables were obtained by applying the following prevalence formula :

$$P = \frac{f}{n} \times 100\%$$

$$P = \frac{0}{28} \times 100\%$$

$$P = 0 \times 100\%$$

$$P = 0\%$$

Based on Table 1 and Table 2, all 28 samples examined tested negative for STH egg contamination, giving a contamination prevalence of 0% for the cabbage and cucumber samples examined. No STH species, whether *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale*, or *Necator americanus*, were found in any of the samples observed microscopically.

DISCUSSION

Observations at the two lalapan food stalls used as sampling sites showed fairly good environmental conditions and sanitation. Both stalls separated the area for washing raw food ingredients from the cooking area, thereby minimizing the risk of cross-contamination, and used clean running water to wash the vegetables. Neither stall was located near a drainage channel that could act as a source of soil contamination.

The first food stall features a well-organized layout. The area for washing raw food ingredients and utensils is separate from the cooking area, so there is no risk of cross-contamination between raw food ingredients and cooked food. Plates and bowls containing cooked food or fresh vegetables are placed on display shelves that are directly exposed to sunlight.

The second food stall also showed similar conditions. The washing area was located at the back of the stall, while the cooking area was at the front. The food was also placed in a display case covered with a curtain to keep insects from landing on it.

This result differs from several previous studies. Virginitha (2019) found STH eggs in 2 of 27 cabbage samples (7%) collected from a traditional market in Samarinda, while Anindita, Lerrick, and Inggraini (2022) reported a considerably higher prevalence of 25% in cabbage sampled from a traditional market in Bekasi, and Husaini, Saragih, Rahma, and Lubis (2022) found 8.3% contamination in cabbage from a traditional market in Medan. Leo, Dalilah, Dwi, Chairil, and Susilawati (2021) reported even higher contamination in cucumber, 6 of 12 sample (50%) among street vendors and about 2 of 6 sample (33%) among restaurants in Palembang.

Taken together, these comparisons suggest that the point of sale is an important factor shaping contamination levels: studies conducted at traditional wet markets, where vegetables are typically displayed in open-air conditions, handled by multiple people, and stored for longer periods before purchase, tend to report higher STH contamination than studies conducted at food stalls, where vegetables are usually purchased in small quantities, prepared shortly before serving, and washed immediately prior to use. Differences in irrigation water source, the use of manure-based fertilizer during cultivation, and regional sanitation infrastructure may also contribute to the variation in prevalence observed across these studies. STH eggs contamination in raw vegetables also depends on hygiene and washing practice at the point of sale (Ahmed et al., 2025).

Washing vegetables with clean running water has been shown to reduce STH egg contamination compared with unwashed vegetables (Ahmed et al., 2025). In addition to using clean running water, washing vegetables with apple

cider vinegar or white vinegar has been shown to remove microorganisms, including parasites, from vegetables. However, the best washing method is still clean running water (Temesgen, Robertson, Stigum, & Tynes., 2021).

STH eggs also require a moist environment, protected from direct sunlight and rich in oxygen, in order to survive. Dry conditions, exposure to sunlight, and clean storage areas can accelerate the deterioration of STH eggs. The vegetables stored at both stalls were kept in dry containers and placed on display shelves exposed to sunlight. This can also reduce the level of STH egg contamination on cabbage and cucumbers (Husaini, Saragih, Rahmah, & Lubis, 2022).

Vendors personal hygiene also plays a key role in determining the level of STH egg contamination in vegetables, particularly those consumed raw, such as lalapan. One aspect of personal hygiene that vendors often overlook is the condition of their fingernails. Nails that are long, dirty, and unkempt can serve as a breeding ground for dirt, including STH eggs. Transmission of STH eggs can occur through dirty fingernails, as there is a possibility that STH eggs attached to the nails may be ingested while eating (Napitupulu, 2022).

The zero-percent result of this study is consistent with the findings of Setyowatiningsih, Suratih, and Wikandari (2023), who emphasized that vendor hygiene, along with proper washing and vegetable handling practices, plays an important role in reducing the level of STH egg contamination in raw vegetable dishes.

CONCLUSIONS

Based on the examination of 28 cabbage and cucumber samples served as lalapan at two food stalls around SDN 016 Samarinda Seberang, no STH egg contamination was found in any of the samples, giving an STH contamination prevalence of 0% in this study. Good stall sanitation, the practice of washing vegetables with running water, and the storage of vegetables in dry, sun-exposed locations are thought to be contributing factors to the absence of detected contamination.

RECOMMENDATIONS

The community around the research location is still advised to remain cautious when choosing raw food, given that STH contamination may still occur in other types of raw vegetable dishes that were not examined in this study, and is encouraged to take deworming medication regularly as a preventive measure.

ADVANCED RESEARCH

This study has limitations in terms of the number of locations and types of samples examined, and it has not quantitatively linked the examination results to vendor personal hygiene factors. Future research is recommended to expand the number of food stalls and types of raw vegetable dishes examined, as well as to analyze the relationship between vendor personal hygiene and the frequency of STH egg contamination in the vegetables served.

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REFERENCES

- Ahmed, A. A., Sayed, F. G., Galal, L. A., Ismail, T., Abdel-aal, S., & Gaber, M. (2025). Washing methods to avoid parasitic contamination of raw vegetables in Assiut, Egypt: A comparative efficacy study. *Journal of Parasitology Reseachr*, 18(2), 166–173.
<https://doi.org/10.21608/puj.2025.399843.1303>
- Anindita, R., Lerrick, V. D. P., & Inggraini, M. (2022). Pemeriksaan Telur Soil Transmitted Helminth (Sth) Pada Kubis (*Brassica Oleracea*) Dan Kemangi (*Ocimum Basilicum*) Di Pasar Tradisional Bekasi. *Meditory: The Journal of Medical Laboratory*, 10(2). <https://doi.org/10.33992/meditory.v10i2.2280>
- Husaini, F., Saragih, C. R. R., Rahma, H., & Lubis, I. A. (2022). Perbedaan Kejadian Kontaminasi Sth Pada Kubis Dan Selada Di Pasar Tradisional Dan Modern Kota Medan. *Jurnal Kedokteran STM (Sains Dan Teknologi Medik)*, 5(2), 141–151. <https://doi.org/10.30743/stm.v5i2.330>
- Irianto, F. S., Azahra, S., & Makkadafi, S. P. (2023). Analisis Kadar Hemoglobin Pada Anak Terinfeksi Kecacingan Di Kota Samarinda. *Jurnal Ilmu Kedokteran Dan Kesehatan*, 10(11), 3335–3341.
<https://doi.org/10.33024/jikk.v10i11.10867>
- Lalangpuling, I. E., Nikiulub, F. M., & Pinontoan, S. P. M. (2021). Identifikasi Telur Soil Transmitted Helminths (STH) dan Hubungannya dengan PHBS pada Anak-Anak yang Tinggal Disekitar Daerah Tempat Pembuangan Akhir Sampah Sumompo. *Kesehatan Lingkungan*, 11(2), 83–92.
<https://doi.org/10.47718/jkl.v10i2.1172>
- Leo Medianto Faziqin, Dalilah, Dwi Handayani, Chairil Anwar, & Susilawati. (2021). Contamination of Soil Transmitted Helminths (STH) Eggs in Raw Vegetables at Street Food Stalls and Restaurant in Lorok Pakjo Village, Palembang. *Bioscientia Medicina: Journal of Biomedicine and Translational Research*, 5(6), 599–607. <https://doi.org/10.32539/bsm.v5i6.397>
- Lestari, D. D., & Suraini. (2023). *Gambaran Infeksi Cacing Soil Transmitted Helminths Pada Murid Sekolah Dasar di Daerah Pesisir Pantai Pasir Jambak*. 1–23.
- Mada, S. S., Wardani, D. P. K., Mujahid, I., & Almanfaluthi, M. L. (2023). Perbedaan Hasil Identifikasi Telur Soil Transmitted Helminth pada Selada antara Metode Sedimentaso NaOH 0,2% dan Flotasi NaCl. *Prosiding Asosiasi Institut Pendidikan Tinggi Teknologi Laboratorium Medik*, 2, 315–324.
- Napitupulu, L. (2022). Pemeriksaan Telur Cacing Soil Transmitted Helminthes (Sth) Pada Kuku Petani Di Desa Naman Teran. *The Indonesian Journal of Medical Laboratory*, 3(1), 14–20.
<https://www.ijml.jurnalsenior.com/index.php/ijml/article/view/28>
- Nurdin, R. A., Triyani Latif, U. A., & Purnama Wirawan, H. (2023). Identifikasi parasit pada feses domba (*Ovis aries*) menggunakan metode uji apung dan uji sedimentasi pada Balai Besar Veteriner Maros. *Filogeni: Jurnal Mahasiswa Biologi*, 3(2), 65–71. <https://doi.org/10.24252/filogeni.v3i2.29828>

- Prabandari, A. S., Ariwarti, V. D., Pradistya, R., & Sekar Sari, M. M. (2020). Prevalensi Soil Transmitted Helminthiasis Pada Siswa Sekolah Dasar Di Kota Semarang. *Avicenna: Journal of Health Research*, 3(1), 1–10. <https://doi.org/10.36419/avicenna.v3i1.337>
- Ribado Meñe, G., Dejon Agobé, J. C., Momo Besahà, J. C., Abaga Ondo Ndoho, F., Abdulla, S., & Adegnika, A. A. (2023). Prevalence, intensity and associated risk factors of soil-transmitted helminth infections among individuals living in Bata district, Equatorial Guinea. *PLoS Neglected Tropical Diseases*, 17(5), e0011345. <https://doi.org/10.1371/journal.pntd.0011345>
- Sandika, Y. (2020). Systematic Review: Akurasi Pemeriksaan Metode Kato Katz Dengan Metode Direct Slide Dan Metode Flotac Pada Infeksi Telur Cacing Soil Transmitted Helminth. *Occupational Medicine*, 53(4), 12.
- Setyowatiningsih, L., & Wikandari, R. J. (2023). FAKTOR RISIKO KONTAMINASI TELUR CACING SOIL TRANSMITTED HELMINTHS PADA SAYUR LALAPAN. *Jurnal Kedokteran Universitas Palangka Raya*, 11(1), 36–40. <https://doi.org/10.37304/jkupr.v11i1.8745>
- Sumanto, D. (2016). *Parasitologi Kesehatan Masyarakat* (H. Wartomo (ed.); 7th ed.). Yoga Pratama.
- Temesgen, T. T., Robertson, L. J., Stigum, V. M., & Tysnes, K. R. (2021). Removal of Parasite Transmission Stages from Berries Using Washing Procedures Suitable for Consumers. *MDPI*, 10, 481.
- Virginitha, N. C. (2019). *Identifikasi Cacing Nematoda Usus Kelompok Soil Transmitted Helminths (STH) pada Sayuran Kubis (Brassica oleracea) di Pasar Segiri Samarinda*.
- Yamin, B., Priaryuningtyas, R. A., & Galuh, R. (2021). Prevalensi dan Hubungan Higiene Sanitasi Terhadap Kontaminasi Telur STH pada Sayur Kemangi (*Ocimum basilicum* L.) yang Dijual Sebagai Hidangan Lalapan di Kecamatan Semarang Barat. *Jurnal Analis Medika Biosains (JAMBS)*, 8(2), 82. <https://doi.org/10.32807/jambs.v8i2.227>