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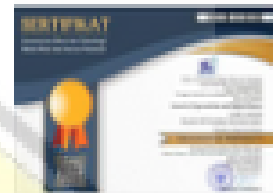
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TEMPLATE AND HOW



The Correlation between Personal Hygiene of Greengrocer and Coliform Bacteria Contamination in Lettuce in Jember Traditional Markets

 Qinthar Layallia Faza¹, Diana Chusna Mufida^{2*}, Muhammad Ali Shodikin², Bagus Hermansyah³, Elvia Rahmi Marga Putri⁴
¹Faculty of Medicine, University of Jember,

²Microbiology Departement, Faculty of Medicine, University of Jember

³Parasitology Departement, Faculty of Medicine, University of Jember

⁴Clinical Pathology Departement, Faculty of Medicine, University of Jember

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*)Corresponding author:

 E-mail: chusna.fk@unej.ac.id

Phone number: +6281334605168

Abstract

Lettuce is a vegetable that is usually consumed in raw condition or unprocessed by people. Unprocessed vegetables can cause food-borne diseases. Lettuce that is not processed and being consumed directly can cause contamination by Coliform bacteria. The purpose of this study is to know the correlation between Greengrocer's personal hygiene and Coliform bacteria contamination in lettuce in Jember traditional markets. This research used a descriptive observational design with the cross-sectional approach. It took place in eight traditional markets in Jember Regency and Microbiology Laboratory, Faculty of Medicine, University of Jember. The samples used were 41 lettuces purchased from 41 traditional market sellers. The microbiological examination was performed in the laboratory using the most probable number method. The results showed that lettuce sellers had bad personal hygiene (92,7%) and the data from the most probable number test found 97,6% contaminated by Coliform bacteria. The bivariate analysis was used to know the relationship between personal hygiene vegetable seller and contamination Coliform bacteria in lettuce. The *p*-value was 0,072, which means there was no relationship between personal hygiene vegetable seller and contamination Coliform bacteria in lettuce.

Keywords: Lettuce, Coliform, Contamination, Personal Hygiene.

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Introduction

Personal hygiene is maintaining hygiene and health in a person to prevent disease in individuals and others (Silalahi & Putri, 2017). The habit of implementing a clean lifestyle needs to be considered and accustomed to because cleanliness will affect a person's health. The behavior of applying good personal hygiene to traditional greengrocers can be by using complete personal protective equipment such as aprons, head coverings, gloves, and footwear (Khaerunisa & Cahyono, 2019).

Traditional markets are a place for distributing vegetables, including lettuce, from producers to consumers. Greengrocers personal hygiene is certainly an important component and needs to be considered in food safety management. The common knowledge of personal hygiene for greengrocers when carrying out buying and selling activities causes the risk of bacterial

contamination. Based on previous research in West Jakarta, lettuce was contaminated with *Escherichia coli* bacteria belonging to the Coliform bacteria group (Oliani & Pasaribu, 2017).

Lettuce (*Lactuca sativa L.*) is a vegetable that is commonly eaten in raw conditions. Lettuce is easy to find in traditional and modern markets. In addition, lettuce contains minerals such as iodine, phosphorus, iron, copper, cobalt, zinc, calcium, and potassium, as well as manganese to keep the body's immune in balance (Aini et al., 2010). Its production in Indonesia in 2010 reached 41.11 tons per year ([BPS] Badan Pusat Statistik, 2016). Lettuce is usually processed into various dishes such as pecel, gado-gado, salad, and fresh vegetables by the Indonesian people (Fauzi et al., 2013).



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Coliform bacteria are microorganisms used as indicators of contamination in water, food, and dairy products. Water contaminated by bacteria will affect the contamination of vegetables by bacteria. Besides being influenced by the quality of water contaminated with bacteria, it is also influenced by post-harvest times that do not pass the sterilization stage. Therefore, it causes bacterial contamination to occur very easily. In addition, these bacteria can produce several toxins, such as indole and skatole, which can cause disease if the amount is excessive in the body (Adrianto, 2018). This study aimed to prove the presence of bacterial *Coliform* contamination in lettuce in Jember Regency, which was associated with the personal hygiene of greengrocers in traditional markets.

Method

This study used a descriptive-analytic research design using a cross-sectional approach. This research was carried out for four months, from November 2020 to February 2021. This research ethics approval was approved by the chairman of the research ethics committee of the Faculty of Medicine, University of Jember on June 16, 2021 (No 1.518/H25.1.11/KE/2021). It took place in the Microbiology Laboratory of the Faculty of Medicine, University of Jember and in 8 markets in Jember Regency, including Tanjung Market, Kepatihan Market, Gebang Market, Arjasa Market, Mangli Market, Pelita Market, Saturday Market, and Kreongan Market. Primary data was obtained from the MPN examination of lettuce and greengrocers questionnaires in the eight markets with inclusion criteria: greengrocers willing to be interviewed by researchers and greengrocers willing to sign informed consent. The exclusion criteria were lettuce with holes

and leftover lettuce from the previous day's sale.

The microbiological test of this study used the MPN (Most Probable Number) test with the MPN 333 method, which was incubated for 24 hours at 37°C and 44°C in lactose broth media. Each temperature contained 45 test tubes. The samples used were tested in three comparisons, namely 1:1, 1:10⁻¹, and 1:10⁻². Each comparison was carried out on the same three tubes. A positive result was indicated by the presence of gas in the Durham tube (Anwarudin et al., 2019; Krisnamurti, 2017). Bivariate analysis in this study used the Chi-square correlation test.

Result

The personal hygiene behavior of lettuce traders in traditional markets includes the habit of washing hands using soap and running water or hand sanitizer after and before serving buyers, there are only 2 respondents, while 39 (95.1%) other respondents have not gotten used to washing their hands. Respondents who have clean, unpainted hands, short nails are 15 respondents (36,6%). Respondents do not have open wounds on the body as many as 16 respondents (39%). Respondents who do not smoke when trading is 23 respondents (56.1%). Respondents who obediently wear personal protective equipment (PPE), such as masks as many as 3 respondents (7.3%), wearing footwear as many as 37 respondents (90.2%), wearing aprons as many as 7 respondents (17.1%), wearing covers head as many as 24 respondents (58.5%). Respondents who still sell when they are sick such as diarrhoea, flu, and fever, are 26 respondents (63.4%). The distribution of greengrocers' personal hygiene is shown in detail in Table 1.

Table 1. Distribution of greengrocers' personal hygiene

No	Personal Hygiene	Total Frequency	
		N	%
1.	Washing hands after serving buyers		
	- No	39	95,1
	- Yes	2	4,9
2.	Hands in clean condition, short nails, unpainted		
	- No	26	63,4
	- Yes	15	36,6
3.	No open wound		
	- No	25	61,0
	- Yes	16	39,0
4.	Greengrocers don't smoke		
	- No	18	43,9
	- Yes	23	56,1
5.	Greengrocers wearing mask		
	- No	38	92,7
	- Yes	3	7,3
6.	Greengrocers wearing footwear		
	- No	4	9,8
	- Yes	37	90,2
7.	Greengrocers wearing apron		
	- No	34	82,9
	- Yes	7	17,1
8.	Greengrocers wearing cover head		
	- No	17	41,5
	- Yes	24	58,5
9.	Greengrocers don't sell when they're sick		
	- No	26	63,4
	- Yes	15	36,6

The results of the MPN test observations were converted into a standard Thomas table for each sample. Based on Table 2, it was found that 41.5% of the lettuce washing water samples tested for MPN at 37 °C for 24 hours were positive for Coliform bacteria with an amount of ≥ 1898 . In addition, the results of the lettuce washing water samples tested for MPN at 37 °C for 48 hours were positive for Coliform bacteria with an amount of ≥ 1898 as many as 97,6%. At a temperature of 44 °C, incubated for 24 hours, 95.1% of samples were positive for Coliform bacteria as many as ≥ 1898 . In Figure 1, the results of the positive MPN test if there was gas trapped in the Durham tube and the culture media became cloudy. Table 3 in this study showed no relationship between the personal hygiene of lettuce traders in the traditional market of Jember Regency with Coliform bacterial contamination ($p=0.072$).

Discussion

Personal hygiene is behavior to maintain a person's cleanliness and well-being, both physically and psychologically. The purpose of maintaining personal hygiene is to minimize the entry of microorganisms (portal of entry) (Isro'in & Andarmoyo, 2012). Greengrocers' personal hygiene is an effort that greengrocer makes to maintain and protect their health and hygiene, especially when buying and selling. Efforts include washing hands with soap before and after buying and selling transactions with consumers, not smoking, using complete PPE, such as masks, covering the head, aprons, footwear, gloves (Theopilus et al., 2020). In addition, every month, the

greengrocers must also carry out physical examinations to monitor the health of greengrocers and prevent infectious diseases. Personal hygiene of greengrocers is also an effort to create market hygiene that is clean and free from disease transmission (Efendi & Syifa, 2019).

Contamination is the entry of foreign substances into unwanted food. Sources of bacterial contamination can be caused by poor personal hygiene of greengrocers, which is transmitted to food sold, such as lettuce. Contaminated vegetables cause food-borne disease (Muna & Khariri, 2020). Cases of food-borne diseases in the world reach 250 cases dominated by infectious diseases. The cause of infectious diseases in food-borne diseases is the *Coliform* bacteria (Herman et al., 2015).

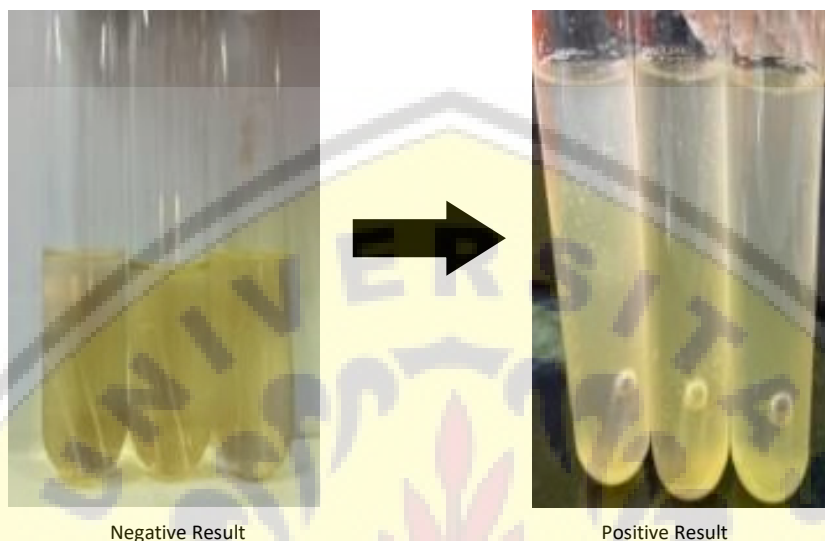
This study explained no relationship between the personal hygiene of lettuce traders in the traditional market of Jember Regency with *Coliform* bacterial contamination because after the analysis test using the Chi Square test, the p-value of this study is 0.072, which if $p>0.05$ indicates that the study does not have a significant relationship. This research is supported by research conducted by Nuraya & Nindya, (2017) which states that there was no relationship between the personal hygiene behavior of greengrocers and the presence of *Escherichia coli* bacteria in layer cake snacks in Surabaya ($p=0.879$). Then, this research contradicts the research conducted by Riana & Sumarmi, (2018) which states that there was a significant relationship between the hygiene and sanitation of snack traders and Coliform contamination in Surabaya ($p=0,005$).

Table 2. Distribution of The total number of *Coliform*

MPN Index	Frequency of Positive Test Results	
	N	%
MPN test at 37 °C for 24 hours		
4	2	4,9
20	1	2,4
27	2	4,9
29	1	2,4
46	2	4,9
76	3	7,3
95	1	2,4
190	5	12,2
271	3	7,3
438	4	9,8
≥ 1898	17	41,5
MPN test at 37 °C for 48 hours		
438	1	2,4
≥ 1898	40	97,6
MPN test at 44 °C for 24 hours		
271	2	4,9
≥ 1898	39	95,1

Table 3. Chi-square test of the relationship of personal hygiene to the incidence of *Coliform* bacterial contamination

Variable	Contamination Status					p-value
	Positive	%	Negative	%	Total	
Greengrocers' Personal Hygiene						
- Good	2	66,7	1	33,3	3	0,072
- Bad	36	94,7	2	5,3	38	

**Figure 1.** MPN test observation results

This study had no relationship because the sample of lettuce washing water tested was contaminated by various microorganisms such as *Coliform* bacteria during the planting, harvesting, distribution, and consumption processes (Cossu et al., 2017). Proven in research conducted by Alen et al 2015, stated that lettuce was positive containing pesticide residues commonly used by farmers as an example of pesticide pronenofos. If *Coliform* bacteria contaminate lettuce, it won't be good for consumers' health, coupled with the consumption of people who like fresh vegetables (Abass et al., 2019). To support personal hygiene behavior, greengrocers can make several efforts, namely: washing hands using soap and running water or using hand sanitizer before and after serving buyers, having clean hands, short and unpainted nails, not suffering from open wounds on body parts, do not smoke, do not sell in conditions of diarrhea, fever, flu, and orderly use PPE when selling (Nuraya & Nindya, 2017; Sari et al., 2019).

Conclusion

Based on the results of research conducted by researchers in 8 traditional markets in Jember Regency in November 2020-February 2021, it can be concluded that there is no relationship between personal hygiene and *Coliform* bacterial contamination on lettuce at traditional markets in Jember Regency with $p = 0.072$. The personal hygiene quality of lettuce traders at Traditional Markets in Jember Regency is still in the bad category, namely 92.7% and 97.6% of lettuce samples are positively contaminated by *Coliform* bacteria so that they are not suitable

for direct consumption.

Conflict of Interest

The authors declare no conflicts of interest

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Author Contribution

Diana Chusna Mufida and Muhammad Ali Shodikin contributed to the design and implementation of the research. Qinthar Layalia Faza, Bagus Hermansyah, and Elvia Rahmi Marga Putri contributed to the analysis of the results and the writing of the manuscript.

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