Jurnal Pijar MIPA
https://jurnalfkip.unram.ac.id/index.php/JPM

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

Food Safety Assessment of Wet Noodles: Detection of Methanyl Yellow in Kebon Roek Traditional Market, Mataram City

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Received: May 30, 2026. Accepted: July 18, 2026. Published: July 26, 2026

Abstract: Wet noodles are one of the most commonly consumed food products in Indonesia and are often used as an alternative staple food to rice. To enhance product appearance, some producers may add coloring agents to wet noodles. One of the prohibited synthetic dyes is Metanil Yellow, which can cause various health problems, including respiratory irritation, skin irritation, eye irritation, and an increased risk of cancer when consumed continuously over a long period. This study aimed to determine the presence of Metanil Yellow in wet noodles sold at Kebon Roek Market in Ampenan, Mataram City, in 2025. This study employed a descriptive qualitative research design. Samples were selected using purposive sampling based on the physical characteristics of wet noodles suspected to contain Metanil Yellow. A total of five wet noodle samples were analyzed qualitatively using the wool yarn method at the Environmental Health Laboratory of the Mataram School of Environmental Engineering (STTL Mataram). A positive result for Metanil Yellow was indicated by a purple-reddish color change in the wool yarn after the addition of 37% hydrochloric acid (HCl). The results showed that none of the tested samples exhibited a color change in the wool yarn after testing, indicating that all samples were negative for Metanil Yellow. These findings suggest that the wet noodles sold at Kebon Roek Market, Ampenan, Mataram City, during the study period complied with food safety standards prohibiting synthetic dyes in food products.

Keywords: Food Safety; Methanyl Yellow, Synthetic Dye; Wet Noodles; Wool Yarn Method.

Introduction

Food is a basic human necessity that plays an essential role in maintaining health and quality of life. In addition to providing nutritional value, food must also be safe for consumption. One of the factors influencing consumer acceptance of food products is color, as it is often the first attribute used to assess product quality. Therefore, food additives, including colorants, are commonly used to improve the appearance and attractiveness of food products [1-2].

Food safety is currently a public health issue that requires special attention due to the continued use of non-compliant food additives in various food products. Continuous monitoring of chemical contamination in food is essential to prevent health risks from consuming hazardous substances. Implementing an effective food safety system requires regular monitoring and laboratory testing to protect consumers from potential exposure to hazardous substances in food [3].

Developments in the food, cosmetics, and pharmaceutical industries, along with the limited availability of natural dyes, have led to an increase in the use of synthetic dyes. Therefore, the use of natural dyes is gradually being abandoned and replaced by synthetic dyes. Synthetic dyes have several advantages over natural dyes. These include easy availability in the market, guaranteed color availability, a variety of color types, greater convenience and ease of use, greater economy, greater stability and resistance to environmental impacts, greater durability and stronger coloring power.

With the rapid development of the food industry, the use of synthetic colorants has increased due to their advantages, such as brighter colors, greater stability, easy availability, and lower cost compared to natural colorants. However, the misuse of synthetic dyes that are not intended for food products remains a significant concern. One of the prohibited synthetic dyes is Metanil Yellow, a yellow-colored dye commonly used in the textile, paint, paper, and detergent industries [4-5]. According to the Indonesian Food and Drug Authority (BPOM Regulation No. 37 of 2013), Metanil Yellow is classified as a hazardous substance and is prohibited for use in food products [6].

Metanil Yellow is a synthetic azo dye known to have toxic effects on various organ systems in the body. Toxicological studies have shown that long-term consumption of Metanil Yellow can cause liver and kidney damage through oxidative stress mechanisms. Increased liver enzyme levels, decreased serum protein levels, and histopathological changes in liver and kidney tissues have been observed in test animals exposed to Metanil Yellow [7].

Consuming food containing Metanil Yellow may cause various adverse health effects. Short-term exposure can lead to digestive tract irritation, nausea, vomiting, diarrhea, skin irritation, eye irritation, and respiratory problems. Long-term exposure may increase the risk of urinary tract and bladder cancer [8-9-10]. Due to these health risks, continuous monitoring of food products is necessary to ensure consumer safety.

Several recent studies indicate that Metanil Yellow remains an illicit dye that is attracting attention in the field of food safety. Metanil Yellow is a synthetic azo dye that has

How to Cite:
D. Yuliansari, N. Nurhidayatullah, and R. Renaldi, "Food Safety Assessment of Wet Noodles: Detection of Methanyl Yellow in Kebon Roek Traditional Market, Mataram City", *J. Pijar.MIPA*, vol. 21, no. 4, pp. 724–728, Jul. 2026. https://doi.org/10.29303/jpm.v21i4.12347

the potential to cause toxic effects such as methemoglobinemia, anemia, cyanosis, and potentially trigger tumor formation if exposed to it over long periods [11]. Therefore, continuous identification of Metanil Yellow in food products is essential as part of food safety monitoring efforts.

Furthermore, developments in analytical methods in several recent studies have shown increased sensitivity in detecting Metanil Yellow. A combination of Fourier Transform Infrared (FTIR) and chemometrics methods effectively detected Metanil Yellow in food products [12]. These findings demonstrate that monitoring the use of illicit dyes remains a relevant research focus in ensuring food safety for the public.

Snack samples still tested positive for Methanyl Yellow, indicating that the misuse of dangerous synthetic dyes is still prevalent in foods sold in the community [13]. In addition to impacting the liver and kidneys, recent research also shows that Metanil Yellow can trigger oxidative stress in the digestive system and nervous tissue. Exposure to this substance has been reported to cause decreased antioxidant enzyme activity, increased cell damage, and changes in brain tissue structure in laboratory animals. These conditions indicate that Metanil Yellow has the potential to cause neurotoxic effects upon long-term exposure [14]. Therefore, the use of Metanil Yellow in food is prohibited in various countries, including Indonesia, to protect public health from the effects of long-term exposure.

Wet noodles are among the most popular foods in Indonesia and are often used as an alternative to rice. Besides being a source of carbohydrates, wet noodles continue to be developed as a functional food product through various innovations in raw materials and fortification. Recent studies have shown that modifications to wet noodle formulations can increase nutritional value, fiber content, protein content, and antioxidant activity without reducing consumer acceptance. This demonstrates that wet noodles not only serve as an alternative food but also have the potential to be a food product that can improve the community's nutritional quality [15]. The characteristic yellow color of wet noodles may encourage some irresponsible producers to add synthetic dyes to enhance their appearance. According to [16], wet noodles have a high moisture content, making them susceptible to spoilage and potential misuse of food additives, including prohibited substances. Therefore, monitoring the safety of wet noodles is important to protect public health.

Kebon Roek Market in Ampenan, Mataram City, is one of the traditional markets, and the largest in the city of Mataram, which is frequently visited by consumers because it has many choices of traders and also serves as a distribution center for various food products, including wet noodles. Preliminary observations indicated that several vendors sell wet noodles in this market. Considering the continued reports of Metanil Yellow misuse in food products in several regions of Indonesia [17], it is important to investigate the presence of this prohibited dye in wet noodles sold at Kebon Roek Market. Therefore, this study aimed to identify the presence of Metanil Yellow in wet noodles sold at Kebon Roek Market, Ampenan, Mataram City, using the qualitative wool yarn method.

The findings of this study are expected to provide information on the safety of wet noodles available to consumers and serve as a reference for relevant authorities to strengthen food safety monitoring and control programs.

Research Methods

This study employed a descriptive qualitative research design to determine the presence of Metanil Yellow in wet noodles sold at Kebon Roek Market in Ampenan, Mataram City. The study was conducted from March to June 2025, and laboratory analysis was performed at the Environmental Health Laboratory of the School of Environmental Engineering (STTL) Mataram.

The population in this study was all wet noodles sold by traders at Kebon Roek Market, Ampenan, Mataram City. It was found that there were 14 traders selling wet noodles. The determination and sampling were carried out using a purposive sampling technique, namely based on physical characteristics that were suspected of containing Metanil Yellow dye, such as wet noodles that looked strikingly yellow, bright, shiny, tended to fluoresce, had an inhomogeneous color, and had an unnatural odor. Based on these criteria, 5 wet noodle samples were obtained for use in this study.

Metanil Yellow content in wet noodle samples was qualitatively identified using the wool thread method, as modified from [18]. This method is based on the ability of Metanil Yellow dye to bind to protein fibers (wool thread) in acidic conditions, then producing a characteristic color change upon the addition of concentrated hydrochloric acid.

The wet noodle samples were first ground using a blender until a homogeneous texture was achieved. Twenty-five grams of the homogenized sample was weighed using an analytical balance, then transferred to a beaker and 50 mL of distilled water was added. The mixture was stirred until homogeneous, then 2 mL of a 10% HCl solution was added while stirring again using a stirring rod to optimize the dye extraction process. Once homogeneous, 30 mL of the mixture was withdrawn using a volumetric pipette and transferred to a beaker for testing.

Next, approximately 5 cm of wool thread was added to the sample solution. The mixture was heated on a hot plate until boiling for 30 minutes. During the heating process, the dye contained in the sample was adsorbed onto the wool thread fibers. After heating, the wool yarn was removed using tweezers and washed with distilled water to remove any remaining solution.

The washed wool yarn was placed on a watch glass and then dripped with a few drops of 37% HCl solution. The results were observed based on the color change that occurred on the wool yarn. A sample was declared positive for Metanil Yellow if the wool yarn turned reddish-purple upon addition of concentrated HCl. Conversely, if no color change occurred or the wool yarn retained its original color, the sample was declared negative for Metanil Yellow[18].

The examination was conducted in duplicate for each sample to ensure consistency of results. Data obtained from the laboratory analysis were presented descriptively in the form of tables and narrative explanations.

Results and Discussion

This study aimed to identify the presence of the synthetic dye Metanil Yellow in wet noodles sold at Kebon

Roek Market, Ampenan, Mataram City. Qualitative analysis was conducted using the wool yarn method on five wet noodle samples selected based on physical characteristics suspected of indicating the presence of Metanil Yellow. Each sample was tested in duplicate to ensure the reliability of the results.

Table 1. Qualitative Test Results of Metanil Yellow in Wet Noodles

Sample	Replication I	Replication II	Result
A	Negative	Negative	No Metanil Yellow detected
B	Negative	Negative	No Metanil Yellow detected
C	Negative	Negative	No Metanil Yellow detected
D	Negative	Negative	No Metanil Yellow detected
E	Negative	Negative	No Metanil Yellow detected

The results showed that all five wet noodle samples tested negative for Metanil Yellow in both replications. No purple-reddish color change was observed on the wool yarn after the addition of 37% hydrochloric acid (HCl), indicating the absence of Metanil Yellow in all samples examined.

The absence of Metanil Yellow in all wet noodle samples may also be influenced by the characteristics of the wet noodle product itself. The yellow color in wet noodles generally comes from the use of eggs, high-protein wheat flour, or the addition of permitted food coloring such as tartrazine (CI 19140) within the maximum limits set by the Indonesian Food and Drug Authority (BPOM). Therefore, producers do not need to use Metanil Yellow as a coloring agent because the desired yellow color can be obtained from raw materials and legal food additives. Furthermore, the use of Metanil Yellow in wet noodles is relatively easy to detect through laboratory testing, potentially resulting in sanctions for producers who violate food safety regulations [6][15].

The findings revealed that none of the wet noodle samples sold at Kebon Roek Market contained Metanil Yellow. The negative results were confirmed by the absence of a purple-reddish color change on the wool yarn after treatment with 37% HCl. According to the wool yarn method, the appearance of a purple-reddish color indicates the presence of Metanil Yellow; therefore, the absence of such a color change confirms that the samples were free from this prohibited synthetic dye.

The absence of Metanil Yellow in all tested samples suggests that the producers and suppliers of wet noodles distributed in Kebon Roek Market comply with food safety regulations regarding the use of food additives. According to the Indonesian Food and Drug Authority, Metanil Yellow is a prohibited synthetic dye due to its harmful effects on human health. Consumption of foods containing Metanil Yellow may cause gastrointestinal irritation, skin irritation, eye irritation, respiratory disorders, and may increase the risk of urinary tract and bladder cancer following long-term exposure [8-9].

The results of this study are consistent with those; all wet noodle samples analysed in Karawang Regency were negative for Metanil Yellow [18]. Similarly, all tested wet noodle samples tested negative for Metanil Yellow by both qualitative testing and UV-Visible spectrophotometric confirmation [19]. The consistency of these findings may indicate improved awareness among food producers of the dangers posed by prohibited food additives, as well as increased government oversight of food safety practices.

The negative results also indicate that the wool yarn method can serve as an initial screening method for detecting Metanil Yellow. The principle of this method is the ability of azo dyes in acidic conditions to bind to the protein fibers in wool yarn. If the sample contains Metanil Yellow, the dye molecules will be adsorbed on the wool yarn during the heating process and produce a reddish purple color change after being dipped in concentrated HCl. Conversely, if no color change occurs, it can be indicated that the sample does not contain Metanil Yellow or its content is below the detection limit of the qualitative method used [11][18].

Although no Metanil Yellow contamination was detected, continuous food safety monitoring remains essential. Cases of misuse of hazardous food additives are still reported in several regions of Indonesia. Factors such as limited producer knowledge, economic motivations, and inadequate supervision may contribute to the illegal use of hazardous substances in food products [20]. Therefore, ongoing education for food producers and vendors, combined with routine inspections by regulatory authorities, is necessary to ensure consumer safety and prevent the circulation of unsafe food products.

Metanil Yellow is a non-food azo dye that can cause various toxic effects, including hepatotoxicity, nephrotoxicity, neurotoxicity, genotoxicity, reproductive system disorders, and even carcinogenic potential if exposed to it over a long period [25]. The use of Metanil Yellow as a food dye poses a threat to public health, so stricter monitoring is needed.

A negative sample result does not necessarily mean the food is safe, especially since the test was conducted at only one location. Therefore, monitoring the use of hazardous synthetic dyes should be carried out periodically and continuously. A recent literature review explains that Metanil Yellow is an azo dye that can cause toxic effects such as methemoglobinemia, anemia, organ disorders, and even potentially trigger tumor formation if exposed to it over a long period [11]. The study also emphasizes the importance of qualitative and quantitative analysis methods as part of a food safety monitoring system. In addition, a recent study emphasized that Metanil Yellow remains a concern in food safety monitoring because this substance is still found in several food and beverage products circulating in the community, so regular laboratory testing is necessary [20].

On the other hand, there are still studies that find the misuse of Metanil Yellow in food. Wet yellow noodles sold at the Deli Tua Market, analysed using Thin Layer Chromatography (TLC), showed that one sample contained Metanil Yellow [21]. These results indicate that although cases of its use in wet noodles have begun to decline in some areas, misuse of prohibited synthetic dyes persists, so regular monitoring and laboratory testing remain necessary.

In addition to wet noodles, many other foods can be supplemented with metanil yellow to enhance their appearance. One such food ingredient is yellow tofu. In a study conducted on yellow tofu marketed in Kendari City [22], the researchers concluded that the use of illegal synthetic dyes in yellow tofu has decreased due to increased

government food safety oversight and increased producer awareness of the risks of using prohibited food additives.

Other food products that may also contain metanil yellow include jelly and stick noodles. The identification of metanil yellow in yellow jelly products sold at Way Kandis Market in Bandar Lampung yielded negative results [23]. However, on metanil yellow testing on ready-to-eat stick noodles showed that products still contained dangerous synthetic dyes [24]. These findings suggest that the misuse of synthetic dyes is still possible in certain types of food, requiring regular food safety monitoring. These differences in results may be influenced by variations in food product types, producer characteristics, and the level of supervision in each region.

This study has some limitations. The number of samples analyzed was relatively small, and only a qualitative method was employed. Future studies should include a larger sample size, cover a wider geographical area, and utilize quantitative analytical methods to obtain more comprehensive data. In addition, investigations of other prohibited food additives, such as borax, formaldehyde, and Rhodamine B, are recommended to provide a broader assessment of food safety in traditional markets.

Overall, the findings indicate that the wet noodles sold at Kebon Roek Market, Ampenan, Mataram City, during the study period were free of Metanil Yellow contamination and complied with food safety standards prohibiting synthetic dyes in food products. These results provide valuable information for consumers and may serve as supporting data for food safety monitoring programs in Mataram City.

The results of this study also reflect the increasing effectiveness of the government's food safety monitoring system, implemented through the Food and Drug Monitoring Agency (BPOM) and regional health departments. Routine monitoring of food additive use, coupled with coaching for businesses, can improve producers' compliance with permitted food additive use. The existence of regulations prohibiting the use of Metanil Yellow in food is one factor encouraging producers to switch to using dyes that have obtained distribution permits, thereby reducing the risk of misuse of textile dyes in food [3][6].

Conclusion

Based on the results of this study, all five wet noodle samples collected from Kebon Roek Market, Ampenan, Mataram City, tested negative for Metanil Yellow using the qualitative wool yarn method. The absence of a purple-reddish color change on the wool yarn after the addition of 37% hydrochloric acid (HCl) indicated that none of the samples contained Metanil Yellow. These findings demonstrate that the wet noodles sold at Kebon Roek Market during the study period were free from the prohibited synthetic dye Metanil Yellow and complied with food safety regulations concerning the use of food colorants. Therefore, the tested products can be considered safe with respect to Metanil Yellow contamination. Although all samples tested negative, continuous monitoring and regular inspection of food products remain necessary to ensure food safety and prevent the misuse of hazardous food additives. In addition, public awareness and education for food producers and vendors should be continually improved to support the distribution of safe, healthy food products to consumers.

Author's Contribution

D. Yuliansari and Nurhidayatullah: Contributed to the conceptualization and design of the study and also supervised the entire research process, provided theoretical insights, and reviewed the final draft. Renaldi: Contributed to the sample collection, sample testing, and data analysis. All authors have read and approved the final manuscript.

Acknowledgements

All praise and gratitude are due to Allah SWT, who has bestowed His mercy and guidance, enabling the completion of this research entitled "Identification of Methanyl Yellow Content in Wet Noodles at Kebon Roek Market, Ampenan, Mataram City."

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