

Analysis of Methanol Yellow in Yellow Food Circulating in the Jambi City Market

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Abstract

Introduction: Metanil yellow is a synthetic dye commonly used in the textile, paper, paint industry, but is sometimes misused as a food coloring. The misuse of methanil yellow coloring includes noodles, crackers and snacks and tofu which has a striking yellow color.

Research Objectives: To determine the presence of Methanil Yellow dye in yellow food circulating in Angso Duo. **Research Methods:** By using the identification of Color Reaction, Thin Layer Chromatography (TLC) and UV-VIS Spectrophotometry. **Research Results:** Based on the results of research conducted on 9 yellow food samples circulating in the Angso Duo market using the Color Reaction method, Simple Application, Thin Layer Chromatography (TLC) and UV-Vis Spectrophotometry showed negative results (-). **Conclusion:** In this study, it can be concluded that the 9 food samples did not identify any prohibited dyes, namely methanil yellow and free from the colorant content of methanil yellow.

Keywords: Methanil Yellow; TLC; and UV-Vis; Spectrophotometry;

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Intoduction

Based on the Regulation of the Head of the Drug and Food Control Agency Number 11 of 2019 concerning Food Additives, it is stated that Food Additives are materials that are added to food to affect the nature and/or shape of the food. Food additives can be in the form of preservatives, sweeteners, flavor enhancers, dyes, thickeners and so on. The purpose of adding food additives to food in general is to increase the nutritional value of food, improve the aesthetic and sensory value of food, improve the color of food, and extend the shelf life of food (Saparinto & Hidayati, 2006).

Synthetic dyes are widely used as food additives because their use is more practical and the price is cheaper (Pranata, 2008). One of the dyes that is prohibited from being used in food products is metanil yellow based on the food law regulation No. 18 of 2012.

Methanil yellow or often referred to as Acit yellow is a synthetic dye that is prohibited from being used in food, this dye is generally used as a dye in textiles, paper, ink, plastic, leather, paint, as well as an acid-base indicator in the laboratory. However, this dye is often misused to color various types of food, including crackers, noodles, tofu, and yellow snacks.

Metanil yellow is a synthetic dye that is classified as azo dye, in azo dye molecules, the azo bond is the most labile bond so that it can be easily broken down by azo reductase enzymes in the human body, in the human body the azo reductase enzyme can be found in various organs including, liver, heart, lungs, spleen, brain, kidneys, and muscle tissue. After the azo bond is broken down enzymatically, the aromatic amine portion will be absorbed by the intestine, and excreted through the urine, so it is stated that the products degraded by the azo dye or methanyl yellow can cause carcinogenicity (Yusuf, 2011).

The impact that occurs can be irritation of the respiratory tract, skin, eyes and danger to the bladder. If ingested methanil yellow can cause nausea, vomiting, stomach pain, diarrhea, fever, malaise and low blood pressure. A further danger is that it can cause cancer of the bladder and urinary tract (Aritonang, 2012b).

Metanil yellow can also cause cancer, poisoning, irritation of the lungs, eyes, throat, nose, and intestines. The effect of methanil yellow dye is that in addition to being carcinogenic, this dye can damage the liver in experimental animals, is dangerous for hypersensitive and can cause acute symptoms such as red, inflamed, swollen skin, purple spots on the skin, blurred vision in people with asthma and other allergies (Aritonang, 2012a).

The main health hazard due to prolonged exposure to methanol yellow can cause cancer of the urinary tract and bladder. Acute symptoms when exposed to methanyl yellow include irritation of the skin, impaired vision/blurring. If inhaled it will cause irritation to the respiratory tract, in large quantities it can cause tissue damage and inflammation of the kidneys (Mariska, 2015).

dye methanyl yellow in food, namely sweets (Sumanti et al., 2010), breadcrumbs (Yuni & Ani, 2019), yellow tofu (Mariska, 2015) on average stated that these foods contained Methanyl Yellow. The presence of these harmful dyes in yellow food

circulating in the market does not comply with the Regulation of the Minister of Health of the Republic of Indonesia Number 033 of 2012 concerning Food Additives.

The aims of this research are to determine the presence of Methanyl Yellow dye in yellow food circulating in the market. In addition, this research is also expected to provide insight into knowledge and skills in the field of food chemistry, especially regarding the use of Methanyl Yellow in yellow foods, either by researchers, users of these ingredients or people who consume a lot of yellow food ingredients.

Metode Penelitian

The research method used is experimental research using color reaction identification, Thin Layer Chromatography (TLC), and UV-VIS Spectrophotometry.

A. Tools and Ingredients

1. Tools

set of chromatography tools, chamber thread wool, water bath, beaker glass, dropper pipette, test tube, tube clamp, tube rack, blender, analytical balance, Erlenmeyer, 10 ml volumetric flask, 50 ml volumetric flask, 10 ml measuring cup, glass measuring 100 ml, 10 ml volume pipette, stirring rod, capillary tube, filter paper, oven, and spoon.

2. Ingredients

Methanyl yellow, yellow tofu, yellow noodles, breadcrumbs, yellow macaroni, bread jam, antaka seasoning, yellow jelly, yellow crackers, ground spices, silica gel, 70% ethanol, aquades, 2% ammonia, n-butanol, acetic acid, 0.1 N HCl, and alcohol.

B. How it Works

1. Sampling

A sampling of yellow food was carried out at the Angso Duo traditional market. Researchers took as many as 9 samples consisting of wet food, namely yellow tofu, yellow noodles, bread jam, yellow jelly, and dry food, namely yellow macaroni, breadcrumbs, Tanaka seasoning, yellow crackers, and ground spices. Based on the consideration of different samples.

2. Reagent Manufacturing

a. Ammonia 2 %

Made by dissolving 38.5 ml of 26% concentrated ammonia with 70% ethanol to 500 ml.

b. Hydrochloric acid 0,1 N

Made by dissolving 0.83 ml of concentrated HCl with distilled water up to 100 ml.

c. Ethanol 70%

Made by dissolving 364.6 ml of 96% ethanol with up to 500 ml of distilled water.

3. Preparation of Sample Solution

- a. The sample was dried using an oven then mashed and weighed 10 grams.
- b. The weighed samples were soaked for 24 hours using a 2% ammonia solution in 70% alcohol.
- c. The results were filtered using filter paper to obtain the filtrate.
- d. The filtrate was evaporated using a water bath up to ± 3 ml
(Novriyanti, 2019)

C. Qualitative Analysis

1. Identification of Methanyl Yellow by Color Reaction

Some sample filtrate was added to 1 ml of dilute HCl solution until a dark purple color was formed (Dawile et al., 2013).

2. Simple Identification Application

Test with wool and dilute HCl.

Wool yarn was prepared several cm and soaked in a dilute HCl solution, the wool yarn that had been soaked was varied in the test method by being left straight and wet. So it's ready to be tested. In these two variations each wool yarn is cut 5 cm long and soaked in some standard solution. Observe the test results.

3. Sample Identification by Thin Layer Chromatography (TLC)

- a. TLC is heated or activated at a temperature of 105°C for 5 minutes so that it does not bind water vapor so that the TLC plate becomes homogeneous. The TLC plate is marked 1 cm from the bottom edge of the line called the starting line, then the top is lined 1 cm with a distance of 8 cm from the starting line and this is called the distance traveled by the solvent.
- b. The sample filtrate and standard solution were spotted on TLC approximately 1 cm at a distance from the sample spot. Spotting is done repeatedly, and let the stain begins to dry.
- c. The eluent solution was prepared in a volume ratio of n-butanol: glacial acetic acid: Aquadest (4: 5: 1) and chloroform: ethanol in a certain ratio. The TLC chamber which has been filled with 5 mL of eluent is prepared, then closed for half an hour so that the steam in the chamber becomes saturated so that it is homogeneous.
- d. The chamber is tightly closed with aluminum foil, ensuring that the chamber is not opened during expansion. The eluent is allowed to migrate upwards to the finish line, then the plate is removed from the chamber and allowed to dry. The sample stain was seen for its R_f, then compared with the R_f of a standard solution of Methanyl yellow (Mariska, 2015).

4. Identification of Samples by Spectrophotometry

a. Preparation of Methanol Yellow Standard Mother liquor

Weigh methanyl yellow dissolved in ethanol to 100 ml so that the concentration is 100 ppm.

b. Determination of Maximum Wavelength

From the methanyl yellow liquor, 0.5 ml, 1 ml, 1.5 ml, 2 ml, and 2.5 ml pipettes were pipetted using a volume pipette. Then ethanol was added in a measuring flask up to 10 mL so that the concentration was 5 ppm, 10 ppm, 15 ppm, 20 ppm, and 25 ppm. One of the dilution solutions was measured for maximum absorption at a 200-800 nm wavelength. The absorbance of each dilution solution was measured at the obtained wavelength. The wavelength of each sample was measured and then equated with the wavelength of methanyl yellow.

Research Result

From the results of the research conducted, the following results were obtained :

A. Qualitative analysis of samples with Color Reaction

Table 1. Qualitative Analysis of Yellow Food with Color Reaction

No	Sample	color before dropping HCl	Color after dropping HCl	Description
1	MY	Yellow	Purple	(+)
2	TK	Light Yellow	Light Yellow	(-)
3	MK	Light Yellow	Light Yellow	(-)
4	JK	Light Yellow	Light Yellow	(-)
5	SI	Light Yellow	Light Yellow	(-)
6	MR	Yellow	Yellow	(-)
7	KMK	Yellow	Yellow	(-)
8	BA	Light Yellow	Orange	(-)
9	BG	Golden Yellow	Golden Yellow	(-)
10	TP	Yellow	Yellow	(-)

Description :

- | | |
|-----------------------------------|---------------------------------------|
| 1. MY : Methanyl Yellow | 6. MR : Makaroni |
| 2. TK : Tahu kuning/Yellow Tofu | 7. KMK : Kerupuk mie kuning/Crackers |
| 3. MK : Mie kuning/Yellow Noodles | 8. BA : Bumbu Antaka/antaka seasoning |
| 4. JK : Jelly kuning/Yellow Jelly | 9. BG : Bumbu giling/Ground seasoning |
| 5. SI : Selai kuning | 10. TP : Tepung panir/Bread Crumb |

B. Qualitative analysis of samples by Thin Layer Chromatography (TLC)

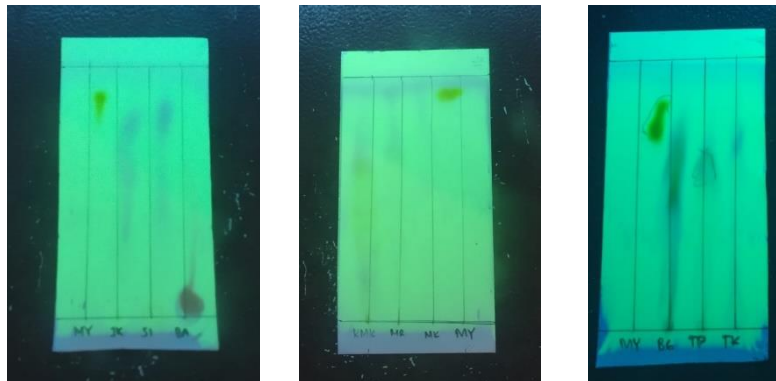


Figure 1: TLC results under UV 254 nm

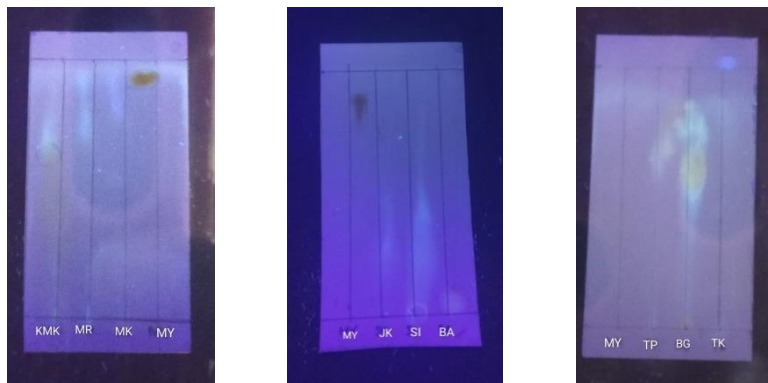


Figure 2: TLC results under UV 366 nm

Table 2: Analysis of Qualitative RF Values of Yellow Food with Thin Layer Chromatography (TLC)

NO	Sample	Rf	Stain Color			Result
			Visual	UV 254 nm	UV 366 nm	
1	MY	0,8	Yellow	Yellow	Orange	(+)
2	TK	-	-	-	-	(-)
3	MK	-	-	-	-	(-)
4	JK	-	-	-	-	(-)
5	SI	-	-	-	-	(-)
6	MR	-	-	-	-	(-)

7	KMK	-	-	-	-	(-)
8	BA	-	-	-	-	(-)
9	BG	-	-	-	-	(-)
10	TP	-	-	-	-	(-)

C. Qualitative analysis of samples with UV-Vis Spectrophotometry

Table 3: Qualitative Analysis of Yellow Food with Uv-Vis Spectrophotometry

No	Sample	maximum wavelength (nm)	Description
1	MY	419,5 nm	(+)
2	TK	259,5 nm	(-)
3	MK	267,5 nm	(-)
4	JK	249,5 nm	(-)
5	SI	202,5 nm	(-)
6	MR	241,5 nm	(-)
7	KMK	256,5 nm	(-)
8	BA	498,0 nm	(-)
9	BG	262,0 nm	(-)
10	TP	263,0 nm	(-)

Discussion

Testing of yellow food samples was carried out qualitatively. The qualitative test was carried out using the Color Reaction, Thin Layer Chromatography (TLC) method, and the UV-Vis Spectrophotometry method which has the working principle that when the light is absorbed, some is reflected and some are emitted. analysis methanyl yellow in yellow food was carried out because methanyl yellow is a dye used to color wool, nylon, leather, paper, paint, aluminum, detergents, wood, fur, and cosmetics. If ingested methanyl yellow can cause nausea, vomiting, stomach pain, diarrhea, fever, malaise, and low blood pressure. A further danger is that it can cause cancer of the bladder and urinary tract (Aritonang, 2012).

According to BPOM RI regulation No. 37 of 2013 states that methanyl yellow is a dye that is prohibited from being used, but even though its use is prohibited in food, methanyl yellow is still found easily in the field and even sold freely in the market. Therefore, to find out whether methanyl yellow is still widely circulated in the market, especially in yellow food, a qualitative test was carried out on samples of yellow food.

According to previous research conducted by Novriyanti (2019) regarding the identification and determination of methanyl yellow in yellow foods circulating in the community, levels of methanyl yellow stated that direct effects in the form of digestive irritation and nausea, and vomiting can be felt when consuming food products containing methanyl yellow.

Qualitatively, the color reaction produced in the standard solution of methanyl yellow was initially yellow and diluted HCl was added to produce a dark purple color. Followed by the examination of the color reaction of 9 yellow food samples which were pipetted 2 ml of each sample with the sample code TK, MK, MR, JK, KMK, SI, BA, BG, TP were put in a test tube and added 1 ml of dilute HCl as a reagent. The results obtained in each sample do not show a color change, because the resulting color is only like the basic color of the sample dye methanyl yellow.

For further identification, thin layer chromatography (TLC) was used. The results of the Thin Layer Chromatography (TLC) study showed that the standard solution of methanyl yellow visually produced a yellow color and an R_f of 0.8. While the 9 yellow food samples did not identify the presence of methanyl yellow, because the TLC plate seen did not show the same spots as the standard methanyl yellow and did not show any stains on the TLC plate.

This research was continued by using a UV-Vis spectrophotometer to see the wavelength obtained by the methanyl yellow standard. The results showed that the wavelength obtained from the standard solution of methanyl yellow was 419.5 nm. so that the maximum wavelength value is not too much different from the literature, which is 417 nm and is still within the standard maximum wavelength range. The UV-Vis spectrophotometry method was also carried out on 9 yellow foods, although it had been tested through the color reaction method and also the thin layer chromatography method, no methanyl yellow dye was identified, but to see the wavelength produced each. The wavelength of each sample can be seen in table 5. dye was not identified in methanyl yellow food, caution is needed in consuming food sold at the Angso Duo Traditional market.

Synthetic dyes are prohibited in Indonesia based on the Regulation of the Minister of Health of the Republic of Indonesia No. 33 of 2012 concerning dyes, it is not permitted to use methanyl yellow dye because this dye is only used for dyeing the textile (fabric), paper and paint industries, and may not be used as an additive for food. This research proves that no methanyl yellow dye has been identified and it is possible that in this food there are synthetic dyes that are permitted or synthetic dyes that are not permitted in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No. 33 of 2012.

Conclusion

Based on the results of research that has been carried out on 9 yellow food samples circulating in the Angso Duo traditional market using the Color Reaction, Thin Layer Chromatography (TLC) and UV-Vis Spectrophotometry methods, negative results (-) prove that the 9 food samples are not identified the presence of a prohibited dye, namely methanyl yellow and free from the content of methanyl yellow dye.

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