

IDENTIFICATION OF DRUG CHEMICAL CONTENT IN SLIMMING HERBAL MEDICINE: A CASE STUDY IN MEDAN CITY

Putri Tri Hartini¹, Hendri Faisal², Indah Pertiwi³, Meiva Amelia Lubis⁴

^{1,2,3,4}Designation Department of Pharmacy, Faculty of Pharmacy and Health Sciences, Institut Kesehatan Helvetia, Medan, Indonesia

Email: hrtinidoc26@gmail.com

DOI: <https://www.doi.org/10.58257/IJPREMS38589>

ABSTRACT

Jamu, a traditional Indonesian herbal medicine, is composed of plant, animal, and mineral extracts, and has been used for generations. However, some slimming herbal products may contain synthetic pharmaceutical compounds, such as furosemide, sibutramine e hydrochloride, and hydrochlorothiazide, raising safety concerns. This study aimed to identify the medicinal chemicals in the slimming herbal products available in Medan City in 2024. A laboratory-based experimental method was employed, including both qualitative and quantitative analyses. The procedure involved preparing test solutions, comparator standards for sibutramine e hydrochloride and furosemide, and thin-layer chromatography (TLC) and UV-Vis spectrophotometry. Qualitative analysis showed that out of 10 samples, one tested positive for furosemide. Quantitative analysis at 358 nm revealed a furosemide concentration of 7.79% in Sample B. No None of the samples contained sibutramine e hydrochloride. These findings highlight the potential adulteration of herbal products with synthetic pharmaceuticals, emphasizing the need for stricter quality control and regulations to ensure consumer safety.

Keywords: Jamu, Medicinal Chemicals, TLC, UV-Vis Spectrophotometry, Medan.

1. INTRODUCTION

Indonesian people are still lacking in maintaining their quality of life, one of which is the lack of maintenance of a good diet, resulting in obesity. Obesity is a condition in which an individual experiences excess fat, obesity, or excess fat accumulation due to an imbalance in energy intake received with energy used (1). The amount of energy that comes in comes from the food or drinks we consume (2). Obesity is celebrated every March 4 to raise awareness and concern of the global community regarding the importance of preventing and treating obesity by implementing a clean and healthy lifestyle (3).

Materials or ingredients in the form of plant materials, animal materials, mineral materials, or a mixture of these materials have been used for generations as a treatment, and can be applied in accordance with applicable norms are called traditional medicines. Traditional medicine is divided into several types, including herbal medicine. Jamu is a traditional Indonesian medicine made from a combination of ingredients or extracts from plants, animals, or minerals that have been used for treatment for generations (4).

The behavior of insulting the physical appearance of others is often a concern in society, so that the desire of obese people to control body weight in an easy and fast way (practical) arises, resulting in an increasing number of people turning to various slimming products made from natural ingredients, usually called slimming herbs (5).

Slimming can be done in two ways: naturally and with help. Naturally, maintaining an ideal body is accomplished by adjusting the diet and exercising regularly. This is beneficial because it is both healthy and physiological. However, many people are impatient to do so because the results will usually be seen over a long time span, for example, within six months. In line with the habits of metropolitan people who like fast or instant things, the choice to achieve ideal weight falls on fast and immediate results. For this reason, many obese people use slimming drugs, slimming supplements, and medical measures, as well as a variety of other ways that are considered the right choice for slimming. Slimming with the help of drugs is a cheaper option than medical measures, therapies, or others. There are two types of slimming drugs in the market: modern and traditional. Traditional slimming medicine is a preferred choice and trusted by the community. This is because some of its contents and dosage forms are familiar to the public (6).

Medicinal Chemicals are synthetic compounds or active chemicals that are used as the main ingredients in the production of chemical drugs or as finished products used in health (7). Medicinal chemicals in herbal medicine can be harmful to consumers due to contraindications to certain diseases suffered by patients. Another serious problem of consuming jamu containing medicinal chemicals is the occurrence of gastric perforation and kidney failure as side effects of the addition of these medicinal chemicals (8). Regulation of the Minister of Health of the Republic of Indonesia Number 007 of 2012 concerning Traditional Medicine Registration article (7) explains that Traditional Medicines are prohibited from containing several ingredients, one of which is medicinal chemicals that are the result of isolation or synthetic medicinal

properties (9). The medicinal chemicals that are usually added to slimming herbs are furosemide and sibutramine HCl hydrochlorothiazide (1).

In a previous study conducted by Hibatullah et al. in 2022, four samples of slimming herbs contained sibutramine hydrochloride (1). In another study in Malang City, three out of four samples of slimming herbs contained sibutramine hydrochloride medicinal chemicals (10). Other studies using TLC and UV-Vis Spectrophotometry have also obtained two samples containing the chemical drug furosemide (11). The purpose of this study was to determine the content of BKO medicinal chemicals in herbal slimming products in Medan City using thin layer chromatography and Uv-Vis spectrophotometry. This study aimed to determine the presence or absence of medicinal chemicals in slimming herbs. This was chosen because the method used was simple.

2. METHODOLOGY

This study employed an experimental laboratory approach to identify the medicinal chemicals in slimming herbal products using Thin-Layer Chromatography (TLC) and UV-Vis Spectrophotometry. Conducted at the Chemistry Laboratory of the Helvetia Institute of Health from June to July 2024, this research involved systematic sample preparation, standard comparator formulation, qualitative TLC analysis, and quantitative UV-Vis spectrophotometric measurements. Various laboratory tools and reagents were utilized to ensure the accuracy of the detection of sibutramine e hydrochloride and furosemide. The following subsections outline the research location, equipment, materials, and analytical procedures.

2.1 Place and Time

The research was conducted at the Chemistry Laboratory of the Helvetia Institute of Health from June to July 2024.

2.2 Tools

Analytical balance, beaker glass, enlemeyer, measuring flask, volume pipette, glass funnel, steam cup, magnetic stirrer, spatula, dropper pipette, capillary tube, stirring rod, filter paper, aluminum foil, cuvette, chromatography chamber, camag UV lamp at 254 nm, drying oven binder, TLC plate, and Uv-Vis spectrophotometry.

2.3 Materials

Ten Samples of slimming herbs, acetone, chloroform, n-hexane, 96% ethanol, methanol, ethyl acetate, Sibutramine Hydrochloride, Furosemide.

2.4 Preparation of Test Solution of Slimming Herb Sample

Each sample of slimming herb was weighed as much as 2.1 grams. The sample was placed into an enlemeyer, 10 ml ethanol was added, and the mixture was shaken with 96% ethanol until homogeneous, and then filtered into a beaker glass. The filtrate was poured into a porcelain cup and evaporated in a waterbath (12).

2.5 Preparation of Sibutramine Hydrochloride Comparator Standard Solution for TLC

Ten milligrams of sibutramine e hydrochloride chemical raw material was placed into an enlemeyer, dissolved in methanol, shaken until the omogen, and then filtered. The filtrate was then poured into a porcelain cup (12).

2.6 Preparation of Furosemide Comparator Standard Solution for TLC

22.5 mg of raw chemical drug Furosemide was dissolved with 96% ethanol in 25 ml in an Erlenmeyer .(11)

2.7 Qualitative Analysis of Sibutramine Hydrochloride and Furosemide Medicinal Chemicals by TLC Method

The stationary phase preparation was performed with a silica gel GF 254 TLC plate with a size of 10x5 cm and 10 x 1.5 cm) activated by heating in the oven for 30 min at 120 °C, then given a line with a pencil at a distance of 1 cm from the top edge and 1 cm from the bottom edge to show the elution process preparation of mobile phase eluent sibutramine hydrochloride, namely acetone, chloroform, and N-hexane in the ratio (5:3:2) mixed, and then placed into the chamber to be saturated.(13) Testing with TLC, namely, the sample of jamu and sibutramine hydrochloride comparison standards are bottled on the TLC plate and then placed in a chamber that has been saturated with the mobile phase. Then, wait until the eluted mobile phase reaches its limit. If the eluent rises, the plate is lifted and dried/aerated. Observe the spot on the TLC plate with UV light at 254 nm, and calculate the RF value of the sample and standard comparison (12). The Rf value is also called the retention factor, which is the ratio of the distance traveled by the compound to the distance traveled by the solvent (14).

2.8 Quantitative Analysis of Frusemide Medicinal Chemicals Using UV-Vis Spectrophotometry

The furosemide standard solution (112.5 mg dissolved in 125 ml of 96% ethanol in an Erlenmeyer and stirred until homogeneous (11). Determination of the maximum wavelength by means of the absorption of 900 ppm solution was performed at a wavelength of 200-400 nm which served to determine the standard curve and measurement of the absorption of the test solution (11). The furosemide calibration curve was prepared by making a standard curve with

concentrations of 20, 40, 60, 80, and 100 ppm. A total of 0.2 ml, 0.4 ml, 0.6 ml, 0.8 ml, 1.1 ml. Then, the absorbance of the standard solution was measured and linear regression was calculated.(11) Determination of furosemide content in slimming herbs by weighing 22.5 mg of each slimming herbs sample, put into Erlenmeyer dissolved using 96% ethanol as much as 25 ml. The sample solution was then homogenized using a magnetic stirrer for 5 min, and absorption at the maximum wavelength was measured to determine the chemical content of the drug in the sample.(11) .

2.9 Qualitative Data Analysis

Data were obtained from identification using the TLC method with stationary phase silica gel GF 254 with development distance and mixed mobile phase, saturation (filter paper), and spot appearance (UV light 254 nm). The TLC data were obtained by calculating the RF that has been obtained.

2.10 Quantitative Data Analysis

The levels of medicinal chemicals were determined by determining the regression value and calculating the coefficient of variation of the linear regression. The calculation of levels was performed using the formula $y = a + bx$. Simple linear regression was used to determine whether there was a significant influence between one independent variable (y) on one dependent variable (x), to determine how the effect (positive or negative) was, how big the effect was, and to predict the value of the dependent variable using the dependent variable (15).

3. RESULTS AND DISCUSSION

3.1 Research Results

The

Table 1. Results of Rf Values of Slimming Herb Samples and Standard Comparator

No.	Sibutramine mobile phase sample	Stain distance	Eluent distance	Rf Value
1.	Sample A	-	-	-
2.	Sample B	7.7 cm	8 cm	0.96
3.	Sample C	7.1 cm	8 cm	0.88
4.	Sample D	6.6 cm	8 cm	0.82
5.	Sample E	7.4 cm	8 cm	0.92
6.	Sample F	-	-	-
7.	Sample G	-	-	-
8.	Sample H	-	-	-
9.	Sample I	-	-	-
10.	Sample J	6.4 cm	8 cm	0.8
11.	Sibutramine e hydrochloride	1.8 cm	8 cm	0.22

Table 2: Results of Rf Values of Slimming Herb Samples and Standard Comparator

No.	Furosemide mobile phase sample	Stain distance	Eluent distance	Rf Value
1.	Sample A	-	-	-
2.	Sample B	6.2 cm	8 cm	0.77
3.	Sample C	-	-	-
4.	Sample D	6.8 cm	8 cm	0.85
5.	Sample E	6.9 cm	8 cm	0.86
6.	Sample F	-	-	-
7.	Sample G	7.4 cm	8 cm	0.92
8.	Sample H	-	-	-
9.	Sample I	6.8 cm	8 cm	0.85
10.	Sample J	-	-	-
11.	Furosemide	6.3 cm	8	0.78

Table 3. Absorbance Measurement Data of Furosemide Standard Solution and Slimming Herb Samples

Concentration	Absorbance
0	0.004
20	0.214
40	0.313
60	0.431
80	0.590
100	0.719
Slimming Herb Sample	Absorbance
Sample B	0.474 (p1) 0.511 (p2) 0.574 (p3)
Average	0.5196

Table 4. UV-Vis Spectrophotometric Quantitative Analysis Data

Sample B	Absorbance	Concentration	Content (%)
P1	0.474	63.2	7.02
P2	0.511	68.95	7.64
P3	0.574	78.74	8.71
\bar{X}	0.5196	70.3	7.79

3.2 Discussion

Before conducting quantitative analysis on slimming herbal medicine samples, it is necessary to first identify whether there is medicinal chemical content in slimming herbal medicine samples using the thin layer chromatography (TLC) method. Based on the identification results using thin-layer chromatography on 10 samples of slimming herbal medicine, one sample was positive for furosemide medicinal chemicals. TLC results were observed under UV light at 254 nm to observe the stain formed, and the R_f value was calculated. When viewed under UV light at 254 nm, the spot appeared blue, and when viewed visually, the spot appeared faint blue after being sprayed with H₂SO₄ solution.

The spots were visualized, and the R_f values were calculated. For the standard comparison of furosemide drug chemicals, the R_f value was 0.78. For furosemide chemicals B, D, E, G, and I, the R_f values were 0.77, 0.85, 0.86, 0.92, and 0.85, respectively. For the standard comparison of sibutramine medicinal chemicals, the R_f value was 0.22. For sibutramine B, C, D, E, and J, R_f values were 0.96, 0.88, 0.82, 0.92, and 0.8, respectively. The result is declared positive if the difference in the R_f value between the comparator standard and sample is ≤ 0.05 (16). It can be seen that the R_f value of furosemide comparator standard and sample B is positive for containing furosemide medicinal chemicals. However, the other samples did not meet the requirements. Judging by the R_f value of the standard sibutramine comparator, all samples did not meet the requirements, meaning that the sample was declared negative for sibutramine medicinal chemicals. In this study, the slimming herbs were not found to contain sibutramine and were declared safe from sibutramine medicinal chemicals. spots indicate the presence of certain compounds. If the spot had the same R_f value as the furosemide standard, this indicated that furosemide was present in the slimming herbs. In addition, other spots can come from herbal compounds, such as alkaloids, flavonoids, saponins, or tannins (17). The positive samples were then subjected to UV-Vis spectrophotometry to determine the levels of medicinal chemicals.

After obtaining a positive sample containing medicinal chemicals in the qualitative test, a quantitative test was performed using the UV-Vis Spectrophotometry method. For quantitative tests, the maximum wavelength of the furosemide solution was determined at a concentration of 900 ppm and a wavelength of 200-400 nm. The obtained wavelength was 358 nm. The next step was the measurement of the calibration curve of the furosemide solution with measurement concentrations of 20, 40, 60, 80, and 100 ppm. Furthermore, the absorption was measured at a wavelength of 358 nm. The equation from the regression calculation of the calibration curve above was obtained as $y = 0.0673 + 0.006435x$, with a relationship coefficient (r) = 0.9934. According to Sahumena et al. (2020), the coefficient is very good because it is close to 1 in accordance with the requirements and acceptance criteria for a correlation coefficient of > 0.997 .

The next step was to determine the furosemide level in the slimming herbal medicine sample using Uv-Vis Spectrophotometry at a wavelength of 358 nm. The furosemide content in sample B was 8.71%. The concentration of furosemide in the slimming herbs was calculated by entering the absorbance value into the y value in the linear regression equation. In a previous study with similar identification conducted by Ramdan Aresta Permana in 2021, the results of previous research showed that two out of 10 herbal medicine samples were positive for furosemide because the R_f values of the samples and the standard comparison were close to each other. For the Uv-Vis spectrophotometric analysis, the levels in the previous study were higher, with an average content value of sample A 12.27% for sample B 8.90%. Furosemide is a diuretic. Furosemide causes weight loss through the loss of fluid, rather than fat. There are several reasons why furosemide is prohibited in slimming herbs; its side effects can cause body fluid deficiency (electrolyte depletion), which will likely cause hyponatremia, hypochloremic acidosis and hypokalemia, hyperuricemia, dehydration renal insufficiency or renal failure, antihypertension, and allergic reactions(18). According to the Regulation of the Minister of Health of the Republic of Indonesia No. 007 of 2012, traditional medicine is prohibited from containing medicinal chemicals that are isolated or synthetic products with medicinal properties and narcotics or psychotropic drugs (19).

4. CONCLUSION

Results of the identification of furosemide medicinal chemicals in 10 samples of slimming herbs based on qualitative analysis by Thin Layer Chromatography (TLC) using the mobile phase of ethyl acetate: methanol (6:4), there is 1 sample of slimming herbs, namely sample B, which positively contains furosemide medicinal chemicals For the level of furosemide medicinal chemicals contained in sample B of 7.79%.

ACKNOWLEDGEMENTS

The researcher would like to thank the staff of the Chemistry Laboratory of the Institut Kesehatan Helvetia.

5. REFERENCES

- [1] Ghanemi A, St-Amand J. Redefining obesity toward classifying as a disease. European Journal of Internal Medicine. 2018 Sep 1;55:20-2.
- [2] Wolf A, Bray GA, Popkin BM. A short history of beverages and how our body treats them. Obesity reviews. 2008 Mar;9(2):151-64.
- [3] Indonesia KKR. World Obesity Day Guidelines. 2023
- [4] Woerdenbag HJ, Kayser O. Jamu: Indonesian traditional herbal medicine towards rational phytopharmacological use. Journal of herbal medicine. 2014 Jun 1;4(2):51-73.
- [5] Corns C, Metcalfe K. Risks associated with herbal slimming remedies. The journal of the Royal Society for the Promotion of Health. 2002 Dec;122(4):213-9.
- [6] Metcalfe K, Corns C, Fahie-Wilson M, Mackenzie P. Chinese medicines for slimming still cause health problems. BMJ: British Medical Journal. 2002 Mar 16;324(7338):679.
- [7] Campos KR, Coleman PJ, Alvarez JC, Dreher SD, Garbaccio RM, Terrett NK, Tillyer RD, Truppo MD, Parmee ER. The importance of synthetic chemistry in the pharmaceutical industry. Science. 2019 Jan 18;363(6424):eaat0805.
- [8] Yusril M, Handayani V, Handayani S. Identification Test of Medicinal Chemicals (BKO) in Uric Acid Herbal Preparations Circulating in Bantaeng District Using the Densitometric KLT Method.
- [9] Indonesia MHDHAMR. Regulation of the Minister of Health of the Republic of Indonesia. 2012.
- [10] Carmin Dewi Salmaa MHW. Identification of Sibutramine Hcl in Slimming Herbs Sold in Malang City Market Using TLC. 2022.
- [11] Putra AM. Analisis kualitatif sibutramine hidroklorida pada jamu pelangsing yang beredar di Wilayah Banjarmasin Tengah. Jurnal Ilmiah Ibnu Sina. 2016 Mar 31;1(1):36-41.
- [12] Nasution PA, Sa'diyah H, Rahmadani R. Analisis Natrium Diklofenak Pada Jamu Pegal Linu Di Kota Banjarmasin. Journal of Social Research. 2022 Sep 8;1(10):1076-81.
- [13] Rahmadani R, Alawiyah T. Investigation of Paracetamol Content in Jamu Pegal Linu in the Night Market Area of Banjarmasin City, South Kalimantan. J Farm Sains Indones. 2021(2):26-30.
- [14] Abriyani E, Yanti D, Yuliani, Azzahra SS, Firdaus MA. Analysis of Caffeine in Coffee Using Uv-Vis Spectrophotometric Method. J Compr Sci. 2022(5):1398-409.
- [15] Sweet SA, Grace-Martin K. Data analysis with SPSS. Boston, MA, USA: Allyn & Bacon; 1999.
- [16] Bele AA, Khale A. An overview on thin layer chromatography. International Journal of Pharmaceutical Sciences

and Research. 2011 Feb 1;2(2):256.

- [17] Joshi DD. Herbal drugs and fingerprints: evidence based herbal drugs. Springer Science & Business Media; 2012 Nov 2.
- [18] Pritchard A, Spooner H, Hoffman R. Influence of long-term furosemide use on bone mineral content, bone metabolism markers, and water weight loss in horses. Journal of equine veterinary science. 2019 Nov 1;82:102800.
- [19] Indonesia Minister of Health Regulation No. 007 Year 2012.