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Content of Medicinal Chemicals in Traditional Herbal Medicine: A Systematic Literature Review

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A B S T R A C T

Jamu is a traditional medicine made from natural ingredients that are known to be inherited from generation to generation for health. The more widespread the use of traditional medicines is, the more opportunities there are for the adulteration of the ingredients. There are even some herbal medicines that contain medicinal chemicals (BKO). Traditional medicines are prohibited from containing BKO because the BKO content in herbal medicine can be a source of danger in herbal medicine. The method used in this research is data collection carried out by searching databases taken from various scientific articles sourced from PubMed, Science Direct, ResearchGate, WoS (Web of Science), and Google Scholar with articles that have been published from 2013 - 2023. The results that have been obtained from several studies that have been carried out show that there is BKO content in traditional herbal medicine that has been circulating in the community, such as paracetamol, mefenamic acid, phenylbutazone, allopurinol, piroxicam, prednisone, and others.

1. Introduction

Indonesia is characterized by its tropical country, which is rich in agricultural products, one of which is various spices; apart from that, various spices have also been widely used by the community as traditional medicines known as herbal medicine. Jamu is a traditional medicine that has a composition made from various natural ingredients, the composition of which is the result of cultural heritage that has been passed down from generation to generation. People use herbal medicine preparations for daily consumption because they are considered to provide good potential for health, both for the prevention and treatment of disease and in terms of maintaining fitness, beauty, and increasing body stamina.[1]

With a large percentage of herbal medicine use in Indonesia amounting to 59.12%, this value is quite a large value because, with the use of herbal medicine, the public considers that consumption of herbal medicine has relatively smaller side effects if the safety aspects have been met according to existing regulations.[2] The greater the use of traditional medicines based on their potential, the wider the various loopholes in falsifying the content/composition; currently, there is a proliferation of various herbal medicines containing medicinal chemicals (BKO), which are strictly prohibited, whether they are added intentionally or unintentionally. Traditional medicines are prohibited from containing BKO because the BKO content in herbal medicine can be a source of danger in herbal medicine. The addition of BKO provides an instant herbal effect.

When BKO contaminates various herbal medicines in Indonesia, of course, the public will not be aware of this and will not think that there will be fatal dangers

from consuming herbal medicine containing BKO and the lack of knowledge buyers regarding the uncontrolled addition of BKO, both in terms of dosage and use. Currently, herbal medicine production is increasing due to public enthusiasm for herbal medicine products, while the public's knowledge of herbal medicine is still relatively minimal to be able to choose and use products correctly, appropriately, and safely. This can increase risks to consumer health and safety. Therefore, it was a review article regarding the medicinal chemical content of various herbal medicines.

2. Methods

In this study, data collection was carried out by searching databases taken from various scientific articles sourced from PubMed, Science Direct, ResearchGate, WoS (Web of Science), and Google Scholar with articles published from 2013 to 2023 with various keywords, including medicinal chemicals, identification, and traditional herbal medicine. The analysis was carried out by taking data from various studies on traditional herbal medicine preparations containing BKO, which then summarized the results obtained in these studies.

3. Results and Discussion

Table 1 shows the results of the review article regarding the content of medicinal chemicals from various herbs. Many traditional herbal medicines contain medicinal chemicals (BKO) so that the therapeutic effect is stronger and has a faster effect on the body, but in fact this is of course prohibited because there is a need for supervision in the use of drugs to avoid undesirable effects. The use of traditional herbal medicine is generally consumed regularly and for a long time to achieve the desired effect.[17] However, by ignoring the need for traditional medicine to achieve a therapeutic effect, many traditional medicine traders use BKO as an additional ingredient so that the effects desired by consumers appear more quickly compared to herbal medicine without BKO. The research was conducted by[15] using 3 samples (A, B, C) with analysis using 3 methods, namely: TLC, FTIR (Fourier transform infrared), and LC-MS (liquid chromatography-mass spectrometry). In the analysis using FTIR, the paracetamol functional groups were detected as N-H, O-H, C-H, C=O, and C=C. Meanwhile, samples B and C obtained the same functional group as paracetamol.

Then, research conducted by[12] using TLC (thin layer chromatography) found that the Rf value of BKO fenfluramine hydrochloride was 0.51. Meanwhile, samples A & B, when tested, had the same Rf value as BKO. So, it was confirmed that the sample was contaminated with fenfluramine hydrochloride. The side effects of this drug are decreased appetite, fever, diarrhea, nasopharyngitis, and fatigue.[30] Apart from that, there is another BKO analysis using the liquid chromatography-mass spectrometry (LC-MS) instrument in the research[1], starting with determining the detected mass of sildenafil citrate, namely 475,092, which is the BKO standard. After that, analysis was carried out on the sample with a detected mass of 475.1/58.1; this is almost the same as the standard for sildenafil citrate.

Then, in the analysis using the UV-Vis spectrophotometer instrument (Pambajeng & Susilowati, 2023) that there were 2 out of 10 samples contained mefenamic acid contamination, with the maximum absorbance of each sample being 2.444 mg/g and 5.612 mg/g. The large number of traditional herbal medicines that contain BKO will, of course, lead to poor judgment and loss of trust regarding traditional herbal medicine due to the actions of the producers themselves. In fact, with Indonesia's wealth of plants that have many benefits and can be used as traditional herbal medicine, they will have good value and are believed to be a safe and good treatment when consumed according to the dosage.[32]

Table 1. Results of the review article.

No	Herbs	BKO content	Identification	References
1.	Herbal medicine for aches and pains	Paracetamol	The thin layer chromatography (TLC) test showed that the SA, SC, SD, and SE samples had the same average Rf value, namely 1	(3)
2.	Herbal medicine for aches and pains	Phenylbutazone	TLC test with results that sample Z was positive for phenylbutazone with an Rf value of 0.91 & 0.05	(4)
3.	Gout herbal medicine	Allopurinol dan Piroxicam	TLC test with results that the herbal medicine in samples 2 & 4 was positive for BKO	(2)
4.	Rheumatic herbs	Prednisone	TLC-Densitometer with analysis results showed that herbal medicine A was positive for prednisone with a content of 475.421 µg/mL / 4.754%	(5)
5.	Back pain herbal medicine	Diclofenac Sodium	TLC & UV-Vis spectrophotometer tests on samples F & J contained Na Diclofenac of 2.444 mg/g+ 0.16% & 5.612 mg/g +0%.	(6)
6.	Herbal weight gainer	Dexamethasone	UV-Vis Spectrophotometer at a wavelength of 240 nm, the average Dexamethasone in samples A, B, C, D, and E was 0.767%, 0.802%, 0.773%, 0.877%, 1.057%	(7)
7.	Strong herbs	Sildenafil Citrate	Analysis by liquid chromatography-mass spectrometry on 5 samples containing BKO levels: 198.01; 1119.19; 226.00; 156.77; 443.87 µg/kg	(1)
8.	Herbal medicine for aches and pains	Mefenamic acid	BKO analysis of samples using TLC showed that 3 out of 5 samples were positive for mefenamic acid with Rf values: 0.58, 0.55, 0.78.	(8)
9.	Gout herbal medicine	Metampiron	Giving $FeCl_{13}$ in the sample by changing the blue-purple color to pale yellow and adding $AgNO_3$ of dark brown indicates that 5 samples + BKO	(9)
10.	Slimming herbal medicine	Sibutramine Hydrochloride	Of the 20 samples using the TLC method, there were 30% positive samples for BKO	(10)
11.	Herbal medicine for aches and pains	Phenylbutazone	The results of analysis using TLC showed that the sample was positive for BKO with an Rf value of 0.325	(11)
12.	Slimming herbal medicine	Fenfluramine hydrochloride	Analysis of herbal powder using TLC showed that 2 of the 5 samples were positive for BKO with an Rf value of 0.51	(12)
13.	Herbal medicine for aches and pains	Paracetamol	Tests on 4 samples using TLC showed that the samples were positive for containing paracetamol with an average Rf: 0.68.	(13)
14.	Men's healthy herbs	Sildenafil Citrate	TLC analysis was carried out, 5 of the 20 samples were positive for containing sildenafil citrate	(14)
15.	Herbal medicine for aches and pains	Paracetamol	BKO analysis was carried out using TLC, FTIR, and LC-MS; there were 2 samples containing 2 paracetamol contamination.	(15)
16.	Diabetes herbal medicine	Glibenclamide	In the TLC test on 10 samples, 2 samples contained glibenclamide	(16)
17.	Herbal medicine for aches and pains	Paracetamol and Mefenamic Acid	TLC-densitometry method with results of + paracetamol in samples 3, 7, 10 but negative for containing mefenamic acid	(17)
18.	Herbal medicine for aches and pains	Phenylbutazone	Analyzed using the liquid chromatography-mass spectrometry method on four samples, positive results were obtained containing phenylbutazone	(18)
19.	Herbal medicine for aches and pains	Prednisone	It was identified using the TLC method on six herbal medicine samples, and positive results were obtained containing prednisone on 2 herbal medicine samples.	(19)
20.	Herbal medicine for aches and pains	Metampiron	Identified using the TLC method on 21 samples of herbal medicine for aches and pains and obtained positive results containing Methampirone in one sample of herbal medicine for aches and pains	(20)
21.	Antidiabetic herbal medicine	Glibenclamide	Identified using the TLC and Spectrophotodensitometry methods on 3 samples and obtained positive results containing glibenclamide in the herbal medicine samples.	(21)
22.	Herbal medicine for aches and pains	Mefenamic acid	Analyzed using the TLC method and color reagent on 27 herbal medicine samples and obtained positive results containing mefenamic acid in 3 herbal medicine samples.	(22)
23.	Men's healthy herbs	Sildenafil	Analyzed using the TLC method on 13 herbal medicine samples and found to be positive for containing Sildenafil in 5 herbal medicine samples.	(14)
24.	Rheumatic herbal medicine	Prednisone	Identified using the TLC method on 5 samples of herbal medicine, and it was found to be positive for prednisone in 1 sample of herbal medicine	(23)
25.	Herbal medicine for aches and pains	Paracetamol	TLC and UV-Vis spectrophotometer analysis with results of samples C & D containing 8.13 mg/Kg & 6.28 mg/K BKO	(24)
26.	Gout herbal medicine	Allopurinol	Analyzed using the TLC method on 11 herbal medicine samples, positive results for allopurinol were obtained on 1 herbal medicine sample	(25)
27.	Rheumatic herbal medicine	Diclofenac sodium	TLC and UV-Vis Spectrophotometry contained 3 samples + BKO sodium diclofenac	(26)
28.	Herbal medicine for aches and pains	Paracetamol	There is one sample containing BKO with TLC with sample Rf value: 0.15, standard Rf: 0.14	(27)
29.	Herbal medicine for aches and pains	Ibuprofen	It was identified by TLC that there were 2 samples + ibuprofen	(28)
30.	Herbal medicine for aches and pains	Paracetamol	TLC analysis on samples B and D was positive for paracetamol with purple spots on the plate	(29)

4. Conclusion

Based on the results review article conducted in 30 journals regarding the BKO content in traditional herbal medicine, it can be concluded that there is BKO content in traditional herbal medicine circulating among the public, which contains BKO such as paracetamol, mefenamic acid, phenylbutazone, allopurinol, piroxicam, prednisone, and others.

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