

PHYTOCHEMICAL SCREENING OF ALKALOID AND STEROID COMPOUNDS ON KATUK LEAF (*Sauropus androgynus* (L.) Merr) AS AN EFFORT TO INCREASE BREAST MILK PRODUCTION

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ABSTRAK SKRINING FITOKIMIA SENYAWA ALKALOID DAN STEROID SAYUR BENING DAUN KATUK (*Sauropus androgynus* (L.) Merr) SEBAGAI UPAYA MENINGKATKAN PRODUKSI ASI

Latar belakang: WHO merekomendasikan penggunaan obat tradisional untuk memelihara kesehatan. Sebagian besar ibu menyusui menggunakan daun katuk untuk meningkatkan produksi ASI dengan cara disayur bening, tetapi kejadian ASI kurang masih tinggi. Cara pengolahan yang kurang tepat dapat mengurangi efek manfaat daun katuk.

Tujuan: Untuk menentukan pengaturan api kompor gas pada proses pembuatan dan skrining senyawa alkaloid dan steroid sayur bening daun katuk.

Metode: Pembuatan dan skrining senyawa alkaloid dan steroid sayur bening daun katuk dilakukan dua kali. Pembuatan pertama, daun katuk dimasak dengan api besar dan kedua dengan api kecil. Skrining alkaloid menggunakan pereaksi Mayer dan Dragendorff, sedangkan steroid dengan pereaksi asam asetat, anhidrat, dan H₂SO₄ pekat.

Hasil: Berdasarkan hasil penelitian, sayur bening yang dimasak dengan api besar mengandung senyawa steroid, sedangkan sayur bening yang dimasak dengan api kecil mengandung senyawa alkaloid dan steroid. Perbedaan kandungan senyawa disebabkan suhu yang ditimbulkan api besar jauh lebih tinggi dibandingkan dengan api kecil. Alkaloid bersifat tidak tahan panas. Senyawa alkaloid dan steroid berperan dalam meningkatkan produksi ASI. Kesimpulan: Sayur bening yang dibuat dengan api kecil memiliki kandungan senyawa alkaloid dan steroid yang berperan dalam meningkatkan produksi ASI. Oleh karena itu, disarankan memasak sayur bening dengan api kecil untuk meningkatkan produksi ASI.

Saran : Bagi masyarakat untuk membuat sayur bening daun katuk menggunakan api kecil sehingga tidak merusak kandungan senyawa alkaloid dan steroid. Senyawa tersebut berperan dalam meningkatkan produksi ASI.

Kata Kunci: Daun katuk, Kompor gas, Sayur Bening.

ABSTRACT

Background: World Health Organization recommends the use of traditional medicine to maintain health. Some breastfeeding mothers use katuk leaves to increase milk production by means of 3 vegetable dish, but the incidence of insufficient breast milk is still high. Improper processing methods can reduce the beneficial effects of katuk leaves.

Purpose To know determine the setting of the gas stove fire in the process of making katuk leaf dish and screening for phytochemical compounds (alkaloids and steroids) of katuk leaf dish.

Method: The manufacture and screening of alkaloids and steroids compounds in katuk leaf dish was carried out twice. The first preparation, the katuk leaves are cooked over high heat and the second is cooked over low heat. Screening for alkaloids using Mayer and Dragendorff reagents, while steroids with acetic acid, anhydrous, and concentrated H₂SO₄ as reagents.

Results: Based on the research results, vegetable dish cooked on high heat contain steroid compounds, while vegetable dish cooked over low heat contain alkaloids and steroid compounds. The difference in compound content is due to the temperature caused by a large fire which is much higher than that of a small fire. Alkaloids are not heat resistant. Alkaloids and steroid compounds play a role in increasing the milk production.

Conclusion: Vegetable dish made on low heat contain alkaloids and steroid compounds that play a role in increasing breast milk production. Therefore, it is recommended to cook vegetable dish on low heat for increasing breast milk.

Suggestion for the community to make vegetable dish with katuk leaves using low heat so that it does not damage the content of alkaloids and steroid compounds. These compounds play a role in increasing the production of breast milk.

Keywords: Vegetable dish, Gas stove, Katuk leaves.

INTRODUCTION

The World Health Organization (WHO) has recommended the use of natural ingredients for traditional medicine as an effort to improve health (promotive), disease prevention (preventive), and treatment (curative). The use of natural ingredients is considered safer than chemical drugs and has relatively fewer side effects if used properly. (World Health Organization, 2019)

One of the ways to increase breast milk production is by giving a galactagogue (Zuppa *et al.*, 2010). Research in Australia showed 59.9% of postpartum mothers took at least one herb for medicinal purposes during breastfeeding, 24.3% reported using at least one herb to increase breast milk production, 43.4% of breastfeeding women felt herbal medicine to be safer than conventional medicine, and 71.6% previously refused or avoided conventional treatment because of concerns about their baby's health (Sim *et al.*, 2013). In general, Indonesian people, namely 71.8 % use vegetables/plants to increase breast milk production compared to using drugs (Handayani, 2015)

In Indonesia, there are many plants/vegetables that are believed to increase milk production or function as galactagogues, including fennel, moringa leaves, katuk leaves, young papaya fruit, klabet, sweet fennel, torbangun, beluntas, lempuyang, spinach, and cassava leaves. Most of these ingredients have not been scientifically evaluated but are traditionally safe and effective (IDAI, 2010). Most people (50.4 %) use katuk leaves to increase breast milk during breastfeeding by means of vegetable dish. Inappropriate doses and processing methods can reduce the nutritional content and beneficial effects of katuk leaves and can cause side effects (Handayani, Pratiwi and Fatmawati, 2021). Side effects that can be caused include dizziness, nausea, and *bronchiolitis obliterans* (Padmavathi and Rao, 1990).

Phytochemical screening of katuk leaves contains sterols, alkaloids, flavonoids, tannins, triterpenoids, saponins, polyphenols, and glycosides (Selvi S, 2012). The sterol compounds (phytosterols) and alkaloids (papaverin) of katuk leaves have been shown to increase breast milk production. Alkaloids have heat-resistant properties (Lantah, PL, 2017)

The purpose of this study was to determine the setting of the gas stove fire in the process of making katuk leaf vegetable dish and screening for phytochemical compounds (alkaloids and steroids) in

katuk leaf vegetable dish. Efforts to achieve this goal, it is necessary to conduct research on "The Effect of Different Gas Stove Fire Settings on the Content of Alkaloid Compounds and Steroids of Katuk Leaf (*Sauropus androgynus* (L.) Merr) as an Effort to Increase Breast Milk Production.

RESEARCH METHODOLOGY

Making vegetable dish and checking for alkaloid and steroid compounds from katuk leaves were carried out twice. In the first preparation, the katuk leaves are cooked over high heat and the second is cooked over low heat using a Rinnai brand gas stove type RI 602 AG. The production of vegetable dish was carried out at Muhajirin Asri Housing 3 Block E Number 3, Terong Tawah Village, Labuapi District, West Lombok Regency, West Nusa Tenggara Province, while phytochemical screening was carried out at the Pharmacy Laboratory of the University of Muhammadiyah Mataram (UMMAT).

The ingredients for making clear katuk leaf vegetables are 1500 ml of water, 300 grams of young katuk leaves, and 2 teaspoons of salt. Katuk leaves were obtained from Berukelak Environment, Sasake Village, Central Praya District, Central Lombok Regency. The tools used for making katuk leaf vegetable dish are pots, basins, and vegetable spoons. Vegetable dish are made by: a) Select the young katuk leaves until they are a bit old, then separate the katuk leaves from the stems; b) Bring water to a boil in a saucepan, after the water boils add the katuk leaves; c) Cook for 15 minutes after the water boils over high and low heat, with the pan closed; d) If it is wilted / ripe, add salt.

The materials for screening for alkaloids were clear vegetable katuk leaves, chloroform, 25% ammonia, Dragendorff, Mayer, and 2 N HCl. The tools used included filter paper, test tubes, and a Dragendorff atomizer. The procedure for checking is as much as 2 ml of the test solution (katuk leaf clear vegetable) is evaporated on a porcelain cup; The remainder was dissolved with 5 ml of 2 N HCL; The resulting solution is divided into 3 test tubes; The first tube was added with 3 drops of 2 N HCl, which served as a blank; The second tube was added with 3 drops of Dragendorff's reagent and the third tube was added with 3 drops of Mayer's reagent; If an orange precipitate is formed in the second tube and a yellow precipitate is formed in the third tube, it indicates the presence of alkaloids (Farnworth, 1966).

Materials for steroid screening were katuk leaf, glacial acetic acid, ether, and H_2SO_4 . The tools used are filter paper and evaporating dish. Steroid examination was carried out by the Liebermann-Burchard reaction by means of 2 ml of clear vegetable solution from katuk leaves was evaporated in a porcelain cup. The residue was dissolved with 0.5 ml of chloroform, then 0.5 ml of anhydrous acetic acid was added. Then 2 ml of concentrated sulfuric acid was added through the tube wall. If a blue-green ring is formed on the boundary of the solution, it indicates the presence of steroids, whereas if a violet or brownish ring is formed, it indicates the presence of triterpenoids (Ciulei, 1984).

RESEARCH RESULT

Checking the alkaloid compounds and steroids of katuk leaves was carried out twice. The first check was carried out on vegetable dish cooked with katuk leaves (Figure 1) and the second check was for vegetable dish cooked over low heat (Figure 2). Boiling time is 15 minutes. The results of phytochemical screening of alkaloids and steroids in katuk leaf can be seen in Tables 1 and 2.



Figure 1
Gas Stove with High Flame



Figure 2
Gas Stove with Low Flame

Table 1 shows vegetable dish cooked over high heat containing steroid compounds and no alkaloid compounds.

Table 1
Results of Phytochemical Screening of Alkaloid Compounds and Steroids of Vegetable dish from Katuk Leaves Cooked on High Flame

Phytochemical Screening	Reactor	Observation result	Conclusion
Alkaloids	Mayer	No yellow/white precipitate is formed	-
	Dragendorff	No orange precipitate is formed	-
Steroids/Triterpenoids	Acetic Acid, Anhydrous, Concentrated H_2SO_4	Formation of a brownish-blue-green ring	+

Table 2

Results of Phytochemical Screening of Alkaloid Compounds and Steroids of Katuk Leaf Vegetable Cooked on Low Flame

Phytochemical Screening	Reactor	Observation result	Conclusion
Alkaloids	Mayer	No yellow/white precipitate is formed	+
	Dragendorff	No orange precipitate is formed	+
Steroids/Triterpenoids	Acetic Acid, Anhydrous, Concentrated H ₂ SO ₄	Formation of a brownish-blue-green ring	+

Table 2 shows vegetable dish cooked over low heat containing alkaloids and steroids.

DISCUSSION

Boiling on katuk leaves has an impact on the content of phytochemical compounds. Based on the research results, vegetable dish cooked on high heat contain steroid compounds and do not contain alkaloid compounds, while vegetable dish cooked over low heat contain alkaloid and steroid compounds. The difference in compound content is due to the fact that the temperature caused by a large fire is much higher than that of a small fire. A research article mentions that alkaloids have heat-resistant properties (Lantah, PL, 2017). This is likely to cause damage due to the high temperature caused by the large fire during the process of making vegetable dish. Meanwhile, steroids have heat-resistant properties so that they are still detectable both in the manufacture of vegetable dish with high and low heat .

Based on the results of a literature search, consuming boiled water from katuk leaves with a mixture of 300 grams of katuk leaves and 1.5 liters of water boiled for 15 minutes is able to launch breast milk (Situmorang, 2019). It is possible that the boiled water of katuk leaves contains alkaloid and steroid compounds.

Alkaloids (papaverin) are able to increase the expression of prolactin and oxytocin genes because they have the ability to relax smooth muscles and dilate blood vessels, causing smooth circulation of the hormones prolactin and oxytocin through the bloodstream. (Neumann, Russell and Landgraf, 1993) Dopamine is able to inhibit the release of prolactin (Siuciak *et al. al.* , 2006) , (Nishi *et al.* , 2008), but papaverine inhibits dopamine receptors so that it can stimulate the release of prolactin (Milenkovic, Parlow and McCann, 1990). Prolactin plays a role in the synthesis of breast milk.

In addition to alkaloids, katuk leaf vegetable dish contain sterols (phytosterols) so that they can increase breast milk production (Subekti S, 2007). Sterols have specific functions in intracellular signal transduction. Like *cyclic Adenosine Monophosphate* (cAMP), sterols can act as secondary messengers,

which can relay signals from receptors on the surface of target cell molecules in cells. Signals are relayed from hormones and growth factors, and cause some changes in cell activity. Therefore, the sterol content in katuk leaves also helps to increase the signal transduction of the hormone oxytocin (Piironen *et al.* , 2000). Phytosterols are able to stimulate *Epidermal Growth Factor Receptor* (EGF-R) and *Prolactin Receptor* (PRL-R) so that prolactin and EGF which are needed for cell proliferation and maintenance increase (Zuppa AA *et al.* , 2010)

CONCLUSION

Vegetable dish cooked on high heat contain steroid compounds and do not contain alkaloid compounds, while vegetable dish cooked over low heat contain alkaloid and steroid compounds.

SUGGESTION

For the community to make vegetable dish with katuk leaves using low heat so as not to damage the content of alkaloid and steroid compounds. These compounds play a role in increasing the production of breast milk.

REFERENCES

- Ciulei, J. (1984) *Methodology for Analysis of Vegetables and Drugs* . Bucharest Romania: Faculty of Pharmacy.
- Farnworth, NR (1966) 'Biological and Phytochemical Screening of Plants', *J. Pharm. science.* , 55, pp. 55–59.
- Handayani, S., Pratiwi, YS and Fatmawati, N. (2021) 'UTILIZATION OF LOCAL PLANT AS BREAST MILK PROMOTING (GALAKTOGOGUE)', *Malahayati Journal of Midwifery* . doi : 10.33024/jkm.v7i3.4451.
- IDAI (2010) *Indonesia breastfeeding* . Jakarta: IDAI.
- Lantah, PL, LADYM & ARR (2017) 'Phytochemical Content and Anticoidant Content of Kappaphycus alvarezii Seaweed Methanol Extract', *Journal of Fishery Products Technology Media* , 5(3).
- Milenkovic, L., Parlow, AF and McCann, SM (1990) 'Physiological significance of the negative short-loop feedback of prolactin',

- Neuroendocrinology* . doi : 10.1159/000125610.
- Neumann, I., Russell, JA and Landgraf, R. (1993) 'Oxytocin and vasopressin release within the supraoptic and paraventricular nuclei of pregnant, parturient and lactating rats: A microdialysis study', *Neuroscience* . doi : 10.1016/0306-4522(93)90285-N.
- Nishi, A. *et al.* (2008) 'Distinct roles of PDE4 and PDE10A in the regulation of cAMP/PKA signaling in the striatum', *Journal of Neuroscience* . doi : 10.1523/JNEUROSCI.2518-08.2008.
- Padmavathi, P. and Rao, MP (1990) 'Nutritive value of Sauropus androgynus leaves', *Plant Foods for Human Nutrition* . doi : 10.1007/BF02193767.
- Piironen, V. *et al.* (2000) 'Plant sterols: Biosynthesis, biological function and their importance to human nutrition', *Journal of the Science of Food and Agriculture* . doi : 10.1002/(SICI)1097-0010(20000515)80:7<939::AID-JSFA644>3.0.CO;2-C.
- Selvi S, BA (2012) 'Phytochemical analysis and GCMS profiling in the leaves of Sauropus androgynus (L) Merr', *Int J Drug Dev Res.* , 4, pp. 162–7.
- Sim, TF *et al.* (2013) 'The use of herbal medicines during breastfeeding: A population-based survey in western australia', *BMC Complementary and Alternative Medicine* . doi : 10.1186/1472-6882-13-317.
- Situmorang, TS (2019) 'INFLUENCE OF CONSUMPTION OF KATUK LEAVES BOOKE WATER ON THE EXPENDITURE OF BREAST MILK PRODUCTION IN PUBLIC MOTHERS IN MANDIRI PRACTICE MANDIRI MANURUNG MEDAN, 2018', *Indonesian Trust Health Journal* . doi : 10.37104/ithj.v1i2.13.
- Siuciak, JA *et al.* (2006) 'Inhibition of the striatum-enriched phosphodiesterase PDE10A: A novel approach to the treatment of psychosis', *Neuropharmacology* . doi : 10.1016/j.neuropharm.2006.04.013.
- Sri Handayani, Diyan Indrayani, RG (2015) *Preliminary Survey on Herbal Plants to Increase Breast Milk Production* .
- Subekti S (2007) 'Components of sterols in katuk leaf extract (Sauropus androgynus) and their relationship to the quail reproductive system', *Thesis* . Available at: <https://adoc.pub/Component-sterol-dalam-ekstrak-daun-katuk-sauropus-androgynus.html>.
- World Health Organization (2019) *WHO global report on traditional and complementary medicine 2019* , World Health Organization .
- Zuppa AA *et al.* (2010) 'Safety and efficacy of galactogogues: Substances that induce, maintain and increase breast milk production', *Journal of Pharmacy and Pharmaceutical Sciences* .