

## RESEARCH ARTICLE

## Effect of *Katuk* Leaves (*Sauropus androgynus* (L.) Merr) on Breast Milk Production

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### Abstract

Exclusive breastfeeding can reduce infant mortality in Indonesia. Lack of breastfeeding is one of the causes of the low achievement of exclusive breastfeeding. *Sauropus androgynus* (L.) Merr (*katuk*) leaves are believed to increase milk production. Most people process *katuk* leaves to make vegetable soup, while improper processing methods can reduce the beneficial effects. This study aimed to analyze the effect of *katuk* leaf soup consumption on breast milk production. The subjects in the study were postpartum mothers and their babies from October to November 2021 at the Poned Health Center in West Lombok regency who met the sample criteria. This research is a randomized controlled trial. The sample used is 32 respondents. *Katuk* clear soup was given to the intervention group and Asifit to the control group. The data collected was processed by a nonparametric test. The analysis showed no difference in *katuk* clear soup and Asifit on breast milk production ( $p=0.105$ ). Therefore, breast milk production increased due to *katuk* clear soup and Asifit made from *katuk* leaves. This research concludes that *katuk* leaves are proven to increase breast milk production. Therefore, *katuk* leaf vegetables can be used as an effort to increase breast milk.

**Keywords:** Breast milk production, *katuk* leaves

### Introduction

The Indonesian Health Demographic Survey (IDHS) in 2017 showed the infant mortality rate (IMR) was still high, at 24 deaths per 1,000 live births.<sup>1</sup> This figure is still high compared to the target set by the Sustainable Development Goals (SDGs), which is 12 per 1,000 live births.<sup>2</sup> The high IMR is mostly (53%) due to nutritional factors. Diseases caused by malnutrition include pneumonia (20%) and diarrhea (15%).<sup>3</sup>

Exclusive breastfeeding can reduce infant mortality.<sup>4,5</sup> Exclusive breastfeeding can prevent under-five deaths and reduce deaths due to acute respiratory infections and diarrhea.<sup>6</sup> Suboptimal breastfeeding causes 45% of neonatal deaths due to infection, 30% of deaths due to diarrhea, and 18% to acute respiratory distress.<sup>7</sup>

The percentage of children under six months who are exclusively breastfed has increased in the last five years, from 42 percent in the 2012 IDHS to 52 percent in the 2017 IDHS.<sup>1</sup> However, this percentage is still far from the national target of 80%. The coverage of exclusive breastfeeding for infants on average in West Nusa Tenggara (NTB) province in 2018 was above the national target of 82.68%. The lowest breastfeeding coverage in NTB is Mataram city at 70.30%.<sup>8</sup> Previous studies

show the proportion of exclusive breastmilk in infants in rural areas higher than in urban areas.<sup>9,10</sup>

One of the reasons for the low exclusive breastfeeding is the lack of milk production. A previous study shows that confidence and perception of little milk production are a factor for unsuccessful early initiation of breastfeeding.<sup>11</sup> Another study showed that as many as 51.1% of mothers experienced the perception of insufficient breast milk.<sup>12</sup>

In Indonesia, many plants are believed to increase breast milk production, including *katuk* leaves, turi, and moringa.<sup>13</sup> Most of these ingredients have not been scientifically evaluated but are traditionally safe and effective.<sup>14</sup> The results showed that most of the community (50.4%) used the clear vegetable *katuk* leaves to increase breast milk.<sup>13</sup> However, the incidence of insufficient breastfeeding is still high in Indonesia.

Clinical trials showed that giving *katuk* leaf capsules for 15 days postpartum with a dose of 3×300 increased milk production by 66.7 mL (50.7%). Increase prolactin and oxytocin levels, and contain nutrients that are breast milk synthesis's main ingredients.<sup>15</sup> Inappropriate processing and dosage methods can reduce the

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nutritional levels and function of *katuk* leaves.<sup>13</sup>

This study aimed to analyze the effect of *katuk* leaf soup consumption on breast milk production.

## Methods

*Katuk* leaves used are light green to slightly dark green. *Katuk* leaves were taken from Berukelak hamlet, Sasake village, Praya Tengah subdistrict, Central Lombok regency. *Katuk* clear vegetable soup is made with a ratio of 150 grams of *katuk* leaves mixed with 750 mL of water, then cooked for 15 minutes over low heat.

The resulting *katuk* clear vegetable soup is then checked for the content of alkaloids and steroids. It was carried out at the Pharmacy Laboratory of the Universitas Muhammadiyah Mataram.

This research method is a randomized control trial post-test only control group design. The samples in this study were postpartum mothers and their babies with normal birth from October to November 2021 at the Basic Obstetric and Neonatal Emergency Service (PONED) health center in West Lombok regency, namely Gerung, Gunungsari, Kediri, Parampuan, Labuapi, and Dasan Tapen Health Centers. Before conducting the research, the researcher provided counseling about exclusive breastfeeding.

Respondents in this study were divided into two groups, each group of 16 respondents. The

treatment group received *katuk* clear vegetables soup two times a day, while the control group was given Asifit 3 times one caplet for four days. In addition, breast milk production was evaluated on the 5<sup>th</sup> day of the puerperium, using a weight test, with OneMed brand electric scale type OD231-B made in China. In addition, three students of the Midwifery Study Program assisted this research by distributing *katuk* clear vegetables soup and Asifit to respondents.

Processing for bivariate analysis used the chi-square test for education, Fisher's exact test for work, t test for no food for nutritional status, and Mann-Whitney test for age and milk production data. This research has received research ethics from the Research Ethics and Community Service Committee of the Faculty of Medicine, Universitas Islam Al-Azhar Mataram 39/EC-4/FK-06/UNIZAR/X/20.

## Results

Table 1 shows that there are no significant differences in education and occupation between the treatment and control groups. There was also no significant difference in age and nutritional status between the treatment and control groups. Respondents' nutritional status on a normal scale.

Table 2 shows clear vegetables cooked over low heat containing alkaloids and steroids. Table

**Table 1 Characteristics of Research Subjects**

Characteristics	Groups		P
	Treatment (n=16)	Control (n=16)	
Education			
Elementary school	2	1	0.871 <sup>a</sup>
Junior high school	6	5	
Senior high school	6	8	
University	2	2	
Occupation			
Employe	3	4	0.50 <sup>b</sup>
Housewife	13	12	
Age			
Median (min–max)	21.5 (17–26)	22.5 (17–26)	0.457 <sup>c</sup>
Average±s.b.	22.62±3.033	21.94±2.79	
Nutritional status in terms of weight and height			
Median (min–max)	19.98 (16.23–28.89)	20.47 (15.63–24.65)	0.885 <sup>d</sup>
Average±s.b.	20.7±3.35	20.5 ± 2.36	

Note: <sup>a</sup>chi-square test, <sup>b</sup>Fisher's exact test, <sup>c</sup>Mann-Whitney test, <sup>d</sup>independent t test

**Table 2 Results of Phytochemical Screening of Alkaloid Compounds and Steroids of *Katuk* Leaf Vegetable Cooked on Low Fire**

Phytochemical Screening	Reactor	Observation Result	Conclusion
Alkaloid	Mayer	No yellow/white precipitate is formed	+
	Dragendorff	No orange precipitate is formed	+
Steroids/triterpenoids	Acetic acid, anhydrous, concentrated H <sub>2</sub> SO <sub>4</sub>	Formation of a brownish-blue-green ring	+

**Table 3 Effect of Giving *Katuk* Leaf Clear Vegetables on Breast Milk Production**

Breast Milk Volume Day 5	Groups		p
	Treatment	Control	
Median (min–max)	71.5 (25–336)	103.5 (50–278)	0.105*
Average±s.b.	102.44±78.7	121.31±60.258	

Note: \*Mann-Whitney test

3 shows that the treatment group that was given *katuk* leaf clear vegetables and the control group that was given Asifit was proven to increase breast milk production.

## Discussion

Lactation is a process of forming to the expulsion of breast milk.<sup>16</sup> The success of lactation is influenced by hormonal factors and characteristics of breastfeeding mothers, such as maternal age, parity, and gestational age.<sup>17</sup> The results of the analysis of the characteristics and confounding variables, including age, education, occupation, and nutritional status, showed no significant difference between breastfeeding mothers in the treatment and control groups with  $p > 0.05$ .

The results of the study (Table 3) show that the treatment group given the clear *katuk* leaves soup while the control group given Asifit proved to be able to increase breast milk production with a  $p = 0.105$  ( $p > 0.05$ ). The increase in breast milk production is due to the *katuk* leaf containing alkaloids (papaverine) and steroids (phytosterols). Other clinical trials showed that giving *katuk* leaf capsules for 15 days postpartum with a dose of 3×300 increased milk production by 66.7 mL (50.7%). Increase prolactin and oxytocin levels, and contain nutrients that are breast milk synthesis's main ingredients.<sup>15</sup>

Papaverine is a secondary metabolite

compound of *katuk* leaves. This compound can increase the expression of oxytocin and prolactin genes. It is because papaverine can dilate blood vessels and relax muscles, resulting in the circulation of the hormones prolactin and oxytocin through the bloodstream.<sup>18</sup> Papaverine acts on smooth muscle, blood vessels, and heart muscle. These compounds act on beta-adrenergic receptors by intermediary cyclic adenosine monophosphate (cAMP)—similarly, prostaglandins are a group of compounds in eicosanoids. Prostaglandins also have specific effects on the cardiac muscle, blood vessels, and smooth muscle, which can act as vasoconstrictors and vasodilators depending on where the prostaglandins are synthesized.<sup>19</sup> Papaverine and prostaglandins can have a dilating effect on large blood vessels, such as arteries, and can reduce peripheral pressure.<sup>20</sup> Research in rabbits shows papaverine can prevent vasospasm of blood vessels.<sup>21</sup>

Dopamine can inhibit the release of prolactin with inhibits cAMP and binds to dopamine (D<sub>2</sub>). Papaverine has a function in inhibiting phosphodiesterase 10A (PDE10A). PDE10A regulates cAMP/PKA signaling in both striatopallidal and striatonigral neurons. In striatopallidal neurons, inhibition of PDE10A by papaverine leads to increased phosphorylation of cAMP-dependent substrates resulting in activation of cAMP/PKA signals. It leads to the

inhibition of signal receptors dopamine (D<sub>2</sub>) and simultaneous potentiation of the adenosine signal (A<sub>2A</sub>). In striatonigral neurons, inhibition of PDE10A due to activation of cAMP/PKA signals by papaverine leads to potentiation of D1 receptor signals. PDE10A inhibition affects striatopallidal neuron signaling.<sup>22</sup>

Papaverine blocks dopamine receptors so that it can stimulate the release of prolactin. Prolactin influences hypothalamic control secretion via feedback mechanism.<sup>22</sup> Elevated serum prolactin levels increase dopamine synthesis by the hypothalamus and the concentration of dopamine in the hypothalamic-pituitary portal blood.<sup>22</sup> This explains that the higher the dose of *katuk* leaf extract, the higher the papaverine consumed. If prolactin secretion increases, it will increase dopamine secretion. Dopamine secretion causes inhibition of prolactin secretion.<sup>19</sup> In addition to papaverine, *katuk* leaves also contain sterols (phytosterols) to increase milk production.<sup>23</sup> Phytosterols and cholesterol are almost the same in the human body. Intestinal absorption is limited by ABCG5/G8 (ATP-binding cassette sub-family G members 5 and 8) and promotes biliary excretion of sterols.<sup>24</sup>

Bile salts, when in high enough concentrations, tend to form mycelium. This state is formed because each molecule of bile salts is composed of a sterol nucleus, most highly soluble in fat, and a polar group highly soluble in water. The 20–40 sterol nuclei of bile salt molecules from the micelles adhere to each other, along with digested fat, to form tiny bubbles in the middle of the micelles, with the polar groups of bile salts protruding outward to cover the surface of the micelles. Because this polar group is negatively charged, it makes all the mycelium bubbles soluble in the water of digestive juices. It remains in the form of a stable solution despite the considerable size of the micelles. Therefore, micelles can help digestion and absorption of fat.<sup>25</sup> Fat is needed for the formation of breast milk.

Androstan-17-one,3-ethyl-3-hydroxy-5 alpha, is one of the compounds in *katuk* leaves that functions as a precursor or intermediate step in synthesizing steroid hormones (progesterone, estradiol, testosterone, and glucocorticoids).<sup>25</sup> Through the action of prostaglandins and steroid hormones (glucocorticoids, progesterone, estradiol) as a result of the biosynthesis of compounds eicosanoids and steroid hormones. This hormone acts directly through an increase in

population and synthetic activity on the secretory cells of the mammary gland.<sup>26</sup> The increased concentration of steroid hormones in the bloodstream indirectly stimulates anterior and posterior pituitary gland cells to release prolactin, oxytocin, and growth hormone (GH).<sup>27</sup> These three hormones are involved in the synthesis of milk.

Sterols also have specific functions in intracellular signal transduction. Like cAMP, sterols also act as secondary messengers, conveying signals from receptors on the surface of target cell molecules in the cell. 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 oxytocin hormone.<sup>28</sup> Phytosterols can stimulate EGF-R and PRL-R so that prolactin and EGF are needed for cell proliferation and maintenance.<sup>16</sup>

## Conclusion

The results showed an effect of giving *katuk* leaf vegetables on breast milk production.

## Conflict of Interest

There are no conflicts that occur in this study.

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