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## The Effect of Katuk Leaf Decoction on Breast Milk Production Among Postpartum Mothers

Anggraini<sup>1</sup>, Anissa Ermasari<sup>1</sup>, Sunarsih<sup>1</sup>, Risa Yunani<sup>1</sup>, Rochmawati<sup>2</sup>

<sup>1</sup> Bachelor of Midwifery Program, Faculty of Health Sciences, Universitas Malahayati, Bandar Lampung City, Lampung, Indonesia

<sup>2</sup> Professional Midwifery Education Program, Universitas Gunadarma, Depok City, West Java, Indonesia

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### Abstract

Insufficient breast milk production remains a major barrier to achieving exclusive breastfeeding at both global and national levels. In Indonesia, exclusive breastfeeding coverage declined from 88.9% in 2021 to 82.2% in 2023. The use of plant-based herbal galactagogues, particularly *Sauropus androgynus* (katuk leaves), is widely practiced; however, comparative evidence against active interventions such as lactation education remains limited. This study aimed to compare the effectiveness of katuk leaf decoction and breastfeeding technique education in increasing breast milk production among postpartum mothers. A quantitative study with a quasi-experimental pretest–posttest control group design was conducted involving 32 postpartum mothers selected through purposive sampling from a population of 66, comprising 16 respondents in the intervention group (katuk leaf decoction 150 ml/day for 7 days) and 16 respondents in the control group (breastfeeding technique education). Breast milk production was assessed using a structured observation sheet based on four proxy indicators. Data were analyzed using the Wilcoxon signed-rank test for within-group comparisons and the Mann–Whitney test for between-group comparisons. The results showed that breast milk production scores increased in both groups, with a higher mean increase observed in the intervention group (from 4.44 to 6.56;  $\Delta=2.12$ ) compared with the control group (from 4.19 to 5.94;  $\Delta=1.75$ ). Within-group analysis demonstrated statistically significant improvements in both groups ( $p=0.001$ ), and between-group comparison revealed a statistically significant difference in score changes ( $p<0.05$ ). In conclusion, katuk leaf decoction demonstrated a greater increase in breast milk production compared with breastfeeding technique education; however, these findings should be interpreted cautiously due to methodological limitations, and further studies using more rigorous designs are recommended.

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#### Corresponding Author:

✉ Anggraini

Bachelor of Midwifery Program, Faculty of Health Sciences, Universitas Malahayati, Bandar Lampung, Indonesia

Email: [anggraini@malahayati.ac.id](mailto:anggraini@malahayati.ac.id)

## 1. INTRODUCTION

Breast milk is the most comprehensive source of nutrition for neonates and infants, as it contains essential bioactive components such as immunoglobulins, growth factors, and lactoferrin that cannot be replicated by any infant formula product (Cristóbal-Cañadas, Parrón-Carrillo, & Parrón-Carreño, 2025; Kariyawasam et al., 2025; Kim et al., 2025; Natal, de Paula Menezes, & de Brito Röder, 2025; Wang et al., 2025). The World Health Organization (WHO) recommends exclusive breastfeeding during the first six months of life as an evidence-based strategy to reduce infant morbidity and mortality globally (Bazzano et al., 2016). Epidemiological evidence indicates that infants who are not exclusively breastfed have a 14-fold higher risk of mortality from infectious diseases compared with those who receive exclusive breastfeeding. Beyond its health benefits, failure to achieve optimal breastfeeding practices also results in substantial economic consequences, with global estimates indicating billions of dollars in annual losses due to increased healthcare costs and decreased long-term productivity (Victora et al., 2021).

At the national level, the coverage of exclusive breastfeeding in Indonesia demonstrates a fluctuating trend (Anggraini et al., 2026). Data from the Ministry of Health of the Republic of Indonesia show an increase from 72.3% in 2020 to 88.9% in 2021, followed by a decline to 82.8% in 2022 and 82.2% in 2023 (Ministry of Health of the Republic of Indonesia, 2022). Although these figures exceed the national target of 80%, such fluctuations indicate that current achievements are not yet sustainable and remain susceptible to various inhibiting factors, particularly insufficient breast milk production. This issue is further supported by local evidence from a preliminary survey conducted at PMB Bidan Ayu Yuliarni, Campang Raya, Bandar Lampung, where 25 out of 66 breastfeeding mothers (37.8%) reported inadequate milk production to meet their infants' needs. These findings highlight the urgency of identifying effective, context-appropriate interventions to support lactation among postpartum mothers.

Various interventions have been developed to overcome barriers to breast milk production, ranging from pharmacological to non-pharmacological approaches. In the Indonesian context, where traditional plant-based medicine is deeply rooted in community practices, herbal galactagogues have gained widespread acceptance due to their accessibility, affordability, and relatively favorable safety profile (Bazzano et al., 2016). Systematic reviews and meta-analyses have demonstrated the potential of herbal galactagogues in enhancing breast milk production; however, the quality, consistency, and methodological rigor of existing evidence remain variable (Foong et al., 2020). Among the various plants utilized in Southeast Asia, *Sauropus androgynus* (katuk leaves) is the most commonly used galactagogue in Indonesia, Malaysia, and Thailand, making it a relevant candidate for further scientific investigation (Zhang et al., 2020; Anju, Rai, & Kumar, 2022; Tahoangako, Santosa, & Fakhrudin, 2024; Tanduba et al., 2025).

Phytochemically, katuk leaves contain active compounds such as polyphenols, steroids, and alkaloids that are believed to contribute to their galactagogue effect. The mechanism is thought to involve the prolactin–oxytocin hormonal pathway, where steroid compounds stimulate prolactin secretion from the anterior pituitary gland, while polyphenols enhance the milk ejection reflex through oxytocinergic activity. Additionally, the nutritional content of katuk leaves including protein ( $\pm 7\%$ ), vitamin C, iron, calcium, and magnesium supports maternal nutritional status, which is an important determinant of optimal lactation (Amanda et al., 2023). Empirical studies have reported positive effects of katuk leaves on breast milk production (Pebrianty et al., 2023; Amanda et al., 2023; Dolang et al., 2021), and international guidelines from the Academy of Breastfeeding Medicine acknowledge the potential role of herbal galactagogues as supportive

interventions under professional supervision (Brodribb, 2018). However, inconsistent findings have also been reported, such as the study by (Lestari et al., 2024), which found no significant effect, indicating variability that may be influenced by differences in dosage, preparation, and study design.

Despite the growing body of evidence, several important gaps remain. Most previous studies have primarily compared katuk leaf interventions with passive controls (no intervention or placebo), thereby limiting understanding of their relative effectiveness compared with active, evidence-based interventions such as breastfeeding technique education. Furthermore, there is a lack of studies that simultaneously evaluate these two non-pharmacological approaches within a single controlled design, resulting in limited evidence to guide clinical decision-making for healthcare providers. Therefore, the novelty of this study lies in its direct comparison between katuk leaf decoction and breastfeeding technique education as an active control, providing a more robust evaluation of their relative effectiveness. This study is expected to contribute to the development of evidence-based, contextually appropriate lactation interventions and to clarify the comparative effectiveness of herbal and educational approaches in improving breast milk production among postpartum mothers.

## 2. METHOD

This study employed a quantitative approach with an analytical experimental design using a quasi-experimental pretest–posttest control group design. The research was conducted at PMB Bidan Ayu Yuliarni, Campang Raya, Bandar Lampung City, from May to August 2025. The study population consisted of all postpartum mothers who attended the facility during the study period, totaling 66 individuals. The sample size was determined using the Lemeshow formula for proportion estimation with a 95% confidence level and 10% precision, resulting in a minimum required sample of 32 respondents. Participants were selected using purposive sampling and allocated into two groups: 16 respondents in the intervention group and 16 respondents in the control group. Inclusion criteria included postpartum mothers within 1–14 days after delivery, willingness to exclusively breastfeed during the study period, not consuming other lactation supplements or medications affecting milk production, absence of medical contraindications to breastfeeding, and having singleton, full-term infants without congenital abnormalities affecting sucking ability. Exclusion criteria comprised mothers with severe postpartum complications (e.g., eclampsia or massive hemorrhage), those undergoing pharmacological therapy affecting lactation, infants requiring neonatal intensive care, and respondents who withdrew or were uncooperative during the study.

The intervention group received katuk leaf decoction (*Sauropus androgynus*) at a dose of 150 ml per day for seven consecutive days, administered in the morning prior to breastfeeding. The decoction was prepared from 30 grams of fresh katuk leaves boiled in 300 ml of water until reduced to 150 ml and served warm. The control group received structured education on correct breastfeeding techniques, including breastfeeding positioning, proper latch-on, breastfeeding frequency, and breast care management. The educational sessions were delivered by the researcher on the first day, with reinforcement provided on the third and seventh days. Each group received only its assigned intervention. Blinding was not implemented due to the nature of the interventions, which is acknowledged as a limitation that may introduce potential bias in the study.

Breast milk production was assessed using a structured observation sheet comprising four proxy indicators: breast fullness (score 1–3), milk ejection reflex (score 1–2), breastfeeding frequency within 24 hours (score 1–2), and infant satisfaction after

feeding (score 1–2), evaluated through indicators such as urinary frequency, weight gain, and infant calmness. The total score ranged from 4 to 9, categorized as less adequate (4–5), adequate (6–7), and very adequate (8–9). The instrument was adapted from previously used tools and underwent content validity assessment by lactation experts, as well as reliability testing using Cohen’s Kappa coefficient ( $\geq 0.70$ ), indicating acceptable inter-rater reliability. Nevertheless, the use of proxy indicators rather than direct measurement of breast milk volume (e.g., test weighing or isotope methods) is recognized as a methodological limitation.

Data analysis included univariate analysis to describe respondent characteristics. Normality testing was performed using the Shapiro–Wilk test, which indicated non-normal data distribution; therefore, non-parametric tests were applied. The Wilcoxon signed-rank test was used to assess differences in breast milk production scores before and after intervention within each group, while the Mann–Whitney test was used to compare the differences (delta) between the two groups. Statistical significance was determined at  $p < 0.05$ . Additionally, effect size was calculated using the  $r$  coefficient ( $r = Z/\sqrt{N}$ ) to evaluate the magnitude of the intervention effect.

This study obtained ethical approval from the Health Research Ethics Committee of Universitas Malahayati (No. 4817/EC/KEPUNMAL/V/2025), valid from 8 May 2025 to 8 May 2026. All participants received a comprehensive explanation of the study objectives, procedures, potential benefits, and risks, and provided written informed consent prior to participation.

### 3. RESULTS AND DISCUSSION

**Table 1.** Characteristics of Postpartum Mothers at PMB Bidan Ayu Yuliarni Bandar Lampung in 2025.

Variable	n	Percentage	p (homogeneity)
Age			0.612
<20 years / >35 years	7	21.9%	
20–35 years	25	78.1%	
Parity			0.724
Primipara	14	43.7%	
Multipara	18	56.3%	
Group			
Intervention	16	50.0%	
Control	16	50.0%	
Total	32	100%	

Based on Table 1, the study involved 32 respondents evenly distributed, with 16 postpartum mothers in the intervention group and 16 in the control group. The majority of respondents were within the healthy reproductive age range of 20–35 years (78.1%), with a higher proportion of multiparous (56.3%) than primiparous (43.7%) mothers. Most respondents were in the early postpartum period, specifically days 0–14 (59.4%). Between-group homogeneity testing using chi-square showed no significant differences in the distribution of age ( $p = 0.612$ ), parity ( $p = 0.724$ ), or postpartum period ( $p = 0.531$ ) between the intervention and control groups, indicating that the two groups were comparable at baseline.

**Table 2.** Mean Breast Milk Production Scores Before and After the Intervention in the Intervention and Control Groups.

Variable	N	Mean	SD	Median	Min–Max	Δ Mean
Intervention						
Pretest	16	4.44	0.892	5	2–5	
Posttest	16	6.56	1.504	7	4–9	+2.12
Control						
Pretest	16	4.19	0.834	4	3–5	
Posttest	16	5.94	1.289	6	4–8	+1.75

**Note:** Total score range 4–9; interpretation: 4–5 = less adequate; 6–7 = adequate; 8–9 = very adequate.

Table 2 shows that the mean breast milk production score increased in both groups after the seven-day intervention period. The intervention group experienced a mean increase from 4.44 (SD=0.892) to 6.56 (SD=1.504), with a difference (*delta*) of  $\Delta=2.12$ . The control group experienced an increase from 4.19 (SD=0.834) to 5.94 (SD=1.289), with a difference of  $\Delta=1.75$ . The comparable *baseline* conditions of both groups (mean pretest difference of only 0.25) strengthen the validity of the intervention comparison.

**Table 3.** Results of the Wilcoxon Signed-Rank Test in the Intervention and Control Groups and the Mann-Whitney Test Between Groups.

Group	Negative Ranks	Positive Ranks	Ties	p-value (Wilcoxon)	Effect Size (r)
Intervention (pre vs post)	0	14	2	0.001	0.51
Control (pre vs post)	0	14	2	0.001	0.51
Delta Comparison (Mann-Whitney)				0.038	

Table 3 shows that the results of the Wilcoxon signed-rank test in the intervention group showed that of 16 respondents, 14 experienced score increases (positive ranks), 2 respondents experienced no change (ties), and none experienced a decrease (negative ranks), with  $p=0.001$  ( $p<0.05$ ). Structurally identical results were obtained in the control group (14 increases, 2 ties, 0 decreases), with  $p=0.001$ . This indicates that both interventions independently produced a significant effect on increasing breast milk production.

Comparison of delta values (pretest-posttest score difference) between the intervention group ( $\Delta=2.12$ ) and the control group ( $\Delta=1.75$ ) using the Mann-Whitney test showed a statistically significant difference ( $p=0.038$ ,  $p<0.05$ ), indicating that the effectiveness of katuk leaf decoction is significantly higher than that of breastfeeding technique education in increasing breast milk production among postpartum mothers. Calculation of effect size using the *r* coefficient from the Wilcoxon yielded  $r=0.51$  in the intervention group and  $r=0.51$  in the control group, both falling within the large effect category (large effect,  $r>0.5$  according to Cohen's criteria). These values indicate that the clinical magnitude of intervention impact was meaningful in both groups.

Based on these overall findings, it can be concluded that although both interventions produced statistically significant increases in breast milk production, katuk leaf decoction was proven more effective than breastfeeding technique education in increasing breast milk production among postpartum mothers, as demonstrated by the greater delta increase and the significant between-group difference on the Mann-Whitney.

The findings of this study demonstrate that the administration of katuk leaf decoction (*Sauropus androgynus*) for seven consecutive days resulted in a statistically significant increase in breast milk production scores ( $p=0.001$ ) with a large effect size ( $r=0.51$ ) in the intervention group. These results are consistent with previous studies that have documented the galactagogue effect of *Sauropus androgynus*. Pebrianthy et al. (2023) reported a significant effect of katuk leaf decoction on breast milk production among postpartum mothers in Padang Sidempuan ( $p=0.000$ ). Similarly, Amanda et al. (2023) demonstrated a significant increase in breast milk production scores following katuk leaf administration, and Dolang et al. (2021) reported comparable findings in different study settings. Collectively, these findings strengthen the empirical evidence supporting the use of katuk leaves as a non-pharmacological intervention to enhance lactation outcomes.

From a mechanistic perspective, the galactagogue effect of katuk leaves can be explained through biochemical pathways described in pharmacognostic literature. The steroid compounds in *Sauropus androgynus* are thought to exert estrogen-like activity, which may stimulate prolactin secretion from the anterior pituitary gland (Bunadi & Widodo, 2021). Prolactin, as the primary lactogenic hormone, promotes milk synthesis in the alveolar cells of the mammary glands. In addition, the polyphenol content (1.49 grams per 100 grams of fresh leaves) (Amanda et al., 2023) is believed to enhance the milk ejection reflex through modulation of the oxytocinergic pathway. The synergistic interaction between prolactin and oxytocin pathways provides a plausible biological explanation for the observed increase in breast milk production. This interpretation is in line with the Cochrane review by Foong et al. (2020), which reported that several herbal galactagogues have a positive effect on breast milk volume, although variability in methodological quality remains an important consideration.

Despite the overall positive findings, two respondents in the intervention group did not exhibit an increase in breast milk production scores. Further analysis indicated that these respondents belonged to at-risk age groups (<20 years or >35 years) and had varying parity status. From an endocrinological perspective, suboptimal maturation of the hypothalamic–pituitary–gonadal axis in younger mothers or declining hormonal responsiveness in older mothers may influence sensitivity to galactagogue stimulation. In addition, non-biological factors such as maternal nutritional status, psychological stress, adherence to the intervention, and family support may act as moderating variables influencing individual responses (Khusniyati & Purwati, 2024). Furthermore, the present findings are not entirely consistent with those of Lestari et al. (2024), who reported no significant effect of katuk leaf extract on breast milk production ( $p=0.17$ ). Such discrepancies may be attributed to differences in preparation methods (decoction versus extract), dosage, duration of intervention, outcome measurement techniques, and participant characteristics, highlighting the need for standardization in future studies.

In the control group, breastfeeding technique education also resulted in a statistically significant improvement in breast milk production ( $p=0.001$ ,  $r=0.51$ ), indicating that educational interventions are effective as independent non-pharmacological strategies rather than merely serving as passive controls. Proper breastfeeding techniques, including positioning, effective latch-on, and appropriate feeding frequency, enhance mechanical stimulation of the nipple, which subsequently activates neuroendocrine pathways involving prolactin and oxytocin release. The finding that approximately 80% of mothers achieved improved breastfeeding outcomes following structured education underscores the clinical relevance of this approach. Conversely, inadequate breastfeeding techniques can impair milk production by reducing effective breast emptying and disrupting the prolactin reflex, thereby emphasizing the importance of lactation education in postpartum care.

The comparative analysis between groups revealed that katuk leaf decoction produced a significantly greater increase in breast milk production compared with breastfeeding technique education ( $\Delta=2.12$  vs  $\Delta=1.75$ ;  $p=0.038$ ). These findings suggest that herbal galactagogues may provide additional benefits beyond behavioral interventions alone. According to the clinical protocol of the Academy of Breastfeeding Medicine, galactagogues may be considered as adjuvant interventions when optimal breastfeeding management alone is insufficient (Brodribb, 2018). Therefore, the results of this study support existing recommendations while also providing context-specific evidence that katuk leaves, as a locally available and affordable resource in Indonesia, can be integrated into postpartum care practices. Nevertheless, the concept of a “hierarchy of effectiveness” between interventions should be interpreted cautiously, as combining both approaches may yield more optimal outcomes. This is further supported by the observation that two respondents in the control group did not show improvement, likely due to factors such as low breastfeeding self-efficacy, psychological stress, and inconsistent application of the techniques, indicating the importance of a comprehensive, multimodal approach (Fujianty, Dewi, & Sulaeman, 2024; Puspasari, Fitria, & Rahmawati, 2024; Ramdhanian & Simamora, 2025).

Several methodological limitations of this study should be acknowledged. First, breast milk production was assessed using proxy indicators rather than direct measurement methods such as test weighing or isotope techniques, which may limit measurement accuracy. Second, the relatively small sample size ( $n=32$ ) restricts the generalizability of the findings. Third, the absence of blinding introduces the potential for performance and detection bias. Fourth, important confounding variables including maternal nutritional status, family support, sleep patterns, and psychological conditions were not fully controlled. Finally, the short duration of follow-up (seven days) precludes assessment of the long-term sustainability of breastfeeding outcomes. These limitations should be carefully considered when interpreting the findings and should inform the design of future research employing more rigorous methodologies.

#### **4. CONCLUSION**

This study concludes that both katuk leaf decoction (*Sauropus androgynus*) and breastfeeding technique education are effective in increasing breast milk production among postpartum mothers. However, katuk leaf decoction demonstrates a greater improvement compared with breastfeeding technique education when used as an active control. These findings indicate that herbal galactagogues may serve as a complementary intervention alongside lactation education in supporting optimal breastfeeding outcomes. Nevertheless, the interpretation of these results should be approached with caution due to limitations related to study design and measurement methods.

Based on these findings, katuk leaf decoction may be considered as an adjuvant intervention in postpartum care, particularly for mothers experiencing insufficient breast milk production despite receiving appropriate breastfeeding guidance, with attention to safety screening and individual response monitoring. At the policy level, the integration of locally available herbal galactagogues into breastfeeding support programs may be explored to enhance exclusive breastfeeding coverage. Further research using more rigorous designs, larger sample sizes, objective measurement methods, and longer follow-up periods is recommended to strengthen the evidence and assess the sustainability of intervention effects.

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