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Differences Between Soy Milk and Papaya Leaf Juice in Overcoming Low Milk Production in Breastfeeding Mothers at Cikeusal Health Center

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Abstract: Adequate breast milk production is essential for infant growth and development. However, many breastfeeding mothers experience insufficient milk supply. Natural interventions such as consuming soy milk and papaya leaf juice are believed to help increase breast milk production. Soy milk contains isoflavones that mimic estrogen and stimulate lactation, while papaya leaf juice contains saponins, alkaloids, and polyphenols that can enhance prolactin secretion and facilitate milk flow. This study aimed to determine the difference between the effects of soy milk and papaya leaf juice in overcoming low breast milk production among breastfeeding mothers at the Cikeusal Health Center in 2025. This quasi-experimental study involved 100 breastfeeding mothers with low milk production, divided into two groups using purposive sampling: 50 respondents received soy milk and 50 received papaya leaf juice. Each group was evaluated for changes in breast milk volume before and after the intervention. Data were analyzed using an independent sample t-test. The findings showed no significant difference between the two interventions ($t = -0.639$, $p = 0.527$). The mean increase in milk production after soy milk consumption was 27.10 ml, while papaya leaf juice increased milk production by 28.20 ml, with a difference of 1.1 ml. These results indicate that both soy milk and papaya leaf juice are effective in improving breast milk production, although their effects are statistically comparable. Both soy milk and papaya leaf juice can serve as alternative natural interventions to increase breast milk production in breastfeeding mothers. Health workers are encouraged to promote these natural options as supportive measures for mothers with low milk supply.

Keywords: breast milk; soy milk; papaya leaf juice; lactation; breastfeeding mothers

Introduction

Breastfeeding plays a crucial role in ensuring optimal infant growth and development. Breast milk is a complete and balanced source of nutrition that not only supports the physical growth of infants but also enhances immune protection, reduces the risk of infection, and strengthens the emotional bond between mother and child (Fatmawati & Aprilyanti, 2023; Ministry of Health of the Republic of Indonesia, 2021). According to the Indonesian Health Profile, the percentage of infants receiving exclusive breastfeeding has fluctuated over the past few years. In 2017, 61.33% of newborns were exclusively breastfed, increasing to 68.74%

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in 2018, and slightly decreasing to 67.74% in 2019. Regional variations remain significant, with West Nusa Tenggara having the highest coverage (86.26%) and West Papua the lowest (41.12%) (Ministry of Health of the Republic of Indonesia, 2020).

Based on data from *Susenas* (2020–2022), the percentage of exclusive breastfeeding in Banten Province was 71.7% in 2022, showing a slight increase from 2021 (71.17%) and 2020 (68.84%) (BPS, 2022). However, Serang City recorded the lowest rate of exclusive breastfeeding at only 41.13%, which indicates that a substantial proportion of mothers still experience challenges in maintaining exclusive breastfeeding practices (Banten Province Health Profile, 2022). This low percentage demonstrates the need for strategic interventions that can improve maternal knowledge, confidence, and physiological readiness to breastfeed effectively (Serang City Health Office, 2021).

Several factors contribute to the failure of mothers to provide exclusive breastfeeding. These include delayed milk production, perceptions that breast milk alone is insufficient to meet the baby's nutritional needs, and physical exhaustion due to household or occupational responsibilities (Marwiyah & Khaerawati, 2020). From a physiological perspective, insufficient milk production is influenced by the interaction of hormonal, psychological, and nutritional factors. The hormone prolactin is primarily responsible for stimulating milk synthesis, while oxytocin facilitates milk ejection. Imbalances or inadequate stimulation of these hormones can result in reduced milk output.

Efforts to increase milk production can be achieved through both pharmacological and non-pharmacological methods. Among natural approaches, soy milk and papaya leaf juice have been widely studied as galactagogues. **Soy milk**, derived from soybeans, is rich in phytoestrogens—particularly isoflavones—which mimic estrogen and enhance prolactin secretion, thereby stimulating milk production (Abdullah et al., 2023; Girsang et al., 2021). In addition, soy milk provides essential nutrients such as calcium, vitamin D, and plant-based proteins that contribute to the overall health of mothers and infants.

Papaya leaf juice contains bioactive compounds such as saponins, alkaloids, and polyphenols, which have been shown to enhance prolactin levels and facilitate the milk secretion process. According to Ikhlasiah & Winarni (2020), 90% of breastfeeding mothers who consumed papaya leaf juice experienced an increase in prolactin levels, with an average rise of 19.59 ng/ml. This elevation in prolactin is associated with improved lactation and increased milk flow. Furthermore, papaya leaf extract helps reduce the viscosity of breast milk, producing thinner milk (foremilk) that contains higher levels of lactose and protein, which are beneficial for infant digestion.

Previous studies support the potential of both soy milk and papaya leaf juice in enhancing milk production. Silaban (2023) reported that the average milk production increased from 1.08 before intervention to 1.95 after soy milk consumption, while Ikhlasiah & Winarni (2020) demonstrated significant hormonal and physiological improvements in lactating mothers consuming papaya leaf juice.

An initial survey conducted at the Cikeusal Health Center revealed that out of 15 breastfeeding mothers with infants under six months old, nine (60%) reported not exclusively breastfeeding due to low milk supply. This local data underscores the persistence of lactation insufficiency as a community health problem.

The present study is therefore conducted to compare the effectiveness of soy milk and papaya leaf juice in overcoming low milk production among breastfeeding mothers. This research is expected to contribute to the development of evidence-based, natural, and culturally acceptable interventions that can help mothers maintain exclusive breastfeeding practices. Strengthening lactation through accessible natural supplements aligns with national health objectives to improve infant nutrition and reduce infant mortality through successful exclusive breastfeeding programs.

Method

This study aimed to determine the difference between soy milk and papaya leaf juice in overcoming low breast milk production among breastfeeding mothers at the Cikeusal Health Center. The research was conducted across five administrative areas—Sukamaju Village, Sukaraja Village, Panosogan Village, Katulisan Village, and Sukamenak Village—over a three-month period, from October to December 2024.

This study employed an experimental design using a two-group post-test approach. The independent variables were the administration of soy milk and papaya leaf juice, while the dependent variable was the volume of breast milk production. The population in this study consisted of breastfeeding mothers who experienced insufficient milk production. A total of 100 respondents were selected through purposive sampling, based on inclusion criteria such as being a breastfeeding mother with an infant under six months old and having self-reported or clinically observed low milk supply. Respondents were divided equally into two groups:
Group I: 50 mothers who consumed soy milk
Group II: 50 mothers who consumed papaya leaf juice
Each intervention was administered for a predetermined duration under similar conditions, and changes in milk

production were measured before and after treatment using standardized lactation measurement procedures. Data analysis was conducted in two stages:

1. Univariate analysis, to describe the characteristics of respondents and milk production levels.
2. Bivariate analysis, to compare the effectiveness of soy milk and papaya leaf juice. The Independent Sample t-test was used for normally distributed data, and the Mann–Whitney test was applied for non-normally distributed data. All analyses were performed using SPSS version 25.

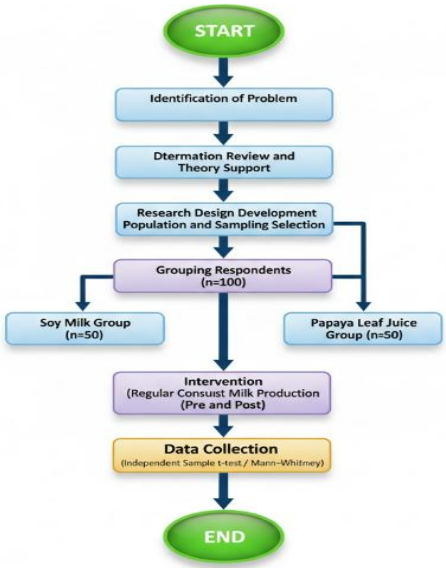

Figure 1. Flow Chart

Result and Discussion

Table 1. Average before and after the amount of breast milk expenditure In the Soy Milk Feeding Group

Variable	Mean	Median	SD	Min- Max	CI 95%
Before	231.40	222.50	48.075	175-330	208.9-253.9
After	258.50	253.00	47.836	200 - 300	236.1-253.0

Based on the data in Table 1, it is known that before the administration of soy milk, the average breast milk production was 231.40 ml, the median was 222.50, SD 48.075 (95% CI 208.90 -253.90), the minimum milk production was 175 ml and the maximum was 330 ml. Meanwhile, after giving soy milk, the average breast milk production was 258.50 ml, the median was 253.00, SD 47.836 (95% CI 236.11 -253.00) breast milk production was at least 200 ml and a maximum of 300 ml.

Table 2. Average before and after the amount of breast milk production In the Papaya Leaf Juice Group

Variable	Mean	Median	SD	Min- Max	CI 95%
Before	242.70	242.50	37,243	180 - 293	225,27 – 260,13
After	269.90	268.60	37,449	207 - 325	252,37 – 287,43

Based on the data in Table 2, it is known that before the administration of papaya leaf juice was given, the average breast milk production was 242.70 ml, the median was 242.50, SD 37.243 (95% CI 225.27 – 260.13) breast milk production was at least 180 ml and the maximum was 293 ml. Meanwhile, after the administration of papaya leaf juice, the average breast milk production was 269.90 ml, the median was 268.60, SD 37.449 (95% CI 252.37 – 287.43) breast milk production was a minimum of 207 ml and a maximum of 325 ml.

Table 3. Normality Test Results

	Kolmogorov - smirnov			Shapiro - wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Soy Milk	.200	20	.035	.920	20	.098
Papaya Leaf Juice	.081	20	.200*	.982	20	.958

Table 3 shows the results of the normality test using *Shapiro-Wilk* values of 0.098 (soy milk) and 0.958 (papaya leaf juice). Since the p-value of the Shapiro-Wilk test > 0.05, it can be concluded that the data is normally distributed. Based on these results, the statistical analysis used in this study is a *parametric test*, namely *an independent sample t test*, to draw conclusions from the hypothesis test.

Table 4. Differences in Soy Milk and Papaya Leaf Juice in Overcoming Lack of Breast Milk Production in Breastfeeding Mothers in Sukamaju Village, Cikeusal Health Center

Groups	N	Mean Difference Before and After	t	Asymp. Sig (2 – Talled
Soy Milk	50	27,10		
Papaya Leaf Juice	50	28,20	-0,639	0,527

Based on the results of the study, it was known that the administration of soy milk and papaya leaf juice was found that there was no difference in breast milk production with a t-value of -0.639 and an independent sample t test with a p value = 0.527. The increase in breast milk production before and after the administration of soy milk and papaya leaf juice was 28.20 ml, meaning that the difference in the increase in breast milk production between the two groups was 1.1 ml, which was very small so that the administration of soy milk and papaya leaf juice was found to have no difference in breast milk production.

In this study, the increase in breast milk production before soy milk administration was 27.10 ml, while after papaya leaf juice was 28.20 ml. This means that the difference in the increase in breast milk production between the two groups is 1.1 ml, which is very small so that the administration of soy milk and papaya leaf juice was found to have no difference in breast milk production

Soy milk is a soy-based product that is rich in protein, unsaturated fatty acids, and isoflavones. Isoflavones are phytoestrogen compounds that have a structure similar to estrogen, a female hormone that plays a role in regulating the reproductive cycle and milk production. Based on this phytoestrogen property, several studies state that soy consumption, including soy milk, can help increase breast milk production (Lestari, 2021).

Young papaya has long been used in traditional medicine to increase breast milk production, mainly due to the lactagogum content (a substance that stimulates breast milk production) found in papaya. Young papaya contains various active substances that can stimulate hormones that play a role in the lactation process, such as oxytocin and prolactin (Harahap & Siregar, 2022).

The administration of papaya leaf ethanol extract shows a positive impact on increasing prolactin levels (Herawati, 2024). Previous research revealed that the phytochemical components in papaya leaves have a galactopoetic effect. The alkaloids in papaya leaves can increase breast milk production, while the isoflavone content can increase the production of breast milk proteins, fats, and lactose so that papaya leaf ethanol extract plays a role in increasing the number of breast alveoli and the number of lobes (Ikhlasiah & Winarni, 2020).

Soy milk is rich in isoflavones similar to estrogen, while papaya leaf juice contains various active compounds such as saponins, alkaloids, tannins, polyphenols, and vitamins that can stimulate the production and production of breast milk (Idealistiana & Khairiah, 2023; Nababan et al., 2021; Produksi et al., 2023). Saponins and alkaloids increase the production of prolactin and facilitate the ejection of breast milk, while polyphenols support better blood circulation and body metabolism. The vitamins and minerals contained in papaya leaves also play an important role in maternal health and support the smooth production of breast milk (Fatrin et al., 2024; Harahap, 2021; Heryanto et al., 2024; Korompis et al., 2023; Puspitasari, 2018).

The researchers' assumption regarding the similarity of efficacy between soy milk and papaya leaf juice in increasing breast milk production is based on several biochemical mechanisms related to the influence of the two ingredients on hormones that play a role in the lactation process. Soy milk contains *isoflavones*, phytoestrogen compounds that have a chemical structure similar to estrogen, which can stimulate the activity of the mammary glands to increase breast milk production.

On the other hand, papaya leaves contain *saponins* that can increase *prolactin levels*, a hormone that plays a direct role in stimulating breast milk production (Kusumaningrum, 2017; Nafiâ€TMah et al., 2019; Ngadiarti et al., 2021; Puspita et al., 2021; Rofiasari et al., 2023; Widianto et al., 2020). In addition, both have an effect on the hormone *oxytocin*, which functions in the production of breast milk. The *alkaloid content* in papaya leaves is known to stimulate the contraction of smooth muscles around the breast alveoli, which facilitates the process of milk ejection, while the isoflavones in soy milk contribute to the strengthening of hormonal pathways that support the lactation process (Yenni & Angka, 2022; Yulianti & Astari, 2020; Yusika & Bunda, 2024).

Both ingredients also have *a galactopoetic* effect, namely the ability to increase the quantity and quality of breast milk produced. In addition, the *polyphenol* components in papaya leaves can increase milk protein production, while soy milk supports overall mammary gland function (Nababan et al., 2021). Based on evidence from the literature and traditional recognition, researchers assume that although the underlying mechanisms may be different, soy milk and papaya leaf juice have similar potential efficacy in supporting the lactation process in breastfeeding mothers.

Conclusion

Based on the results and discussion, it can be concluded that both soy milk and papaya leaf juice effectively increased breast milk production among breastfeeding mothers at the Cikeusal Health Center. The average increase in breast milk volume after consuming soy milk was 27.10 ml, while papaya leaf juice resulted in an average increase of 28.20 ml. Statistical analysis showed no significant difference between the two interventions ($t = -0.639$, $p = 0.527$), indicating that both treatments have comparable effects in enhancing milk production. These findings suggest that soy milk and papaya leaf juice can be used as natural and accessible alternatives to help overcome low milk supply in breastfeeding mothers, supporting public health efforts to promote exclusive breastfeeding and improve infant nutrition.

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Conflicts of Interest
The authors declare no conflict of interest.

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