



# Potential of *Moringa* Leaf Cookies to Increase Breastmilk Production in Postpartum Mothers

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## Abstract

**BACKGROUND:** Exclusive breastfeeding can be beneficial for both the baby and the mother. Efforts are needed to increase milk production so that mothers can still only breastfeed their babies. *Moringa* leaves can increase breast milk production because they contain flavonoids and polyphenols. *Moringa* leaf cookies were chosen because they are liked by many nursing mothers, can be stored for a relatively long time, and processing can lose nutrients.

**AIM:** The purpose of the study was to analyze the effectiveness of *Moringa* leaf cookies in increasing breast milk production.

**METHODS:** This was a quasi-experiment with pre-test and post-test non-equivalent control group design. The number of samples was 46 respondents on the 1<sup>st</sup> day of primiparous postpartum mothers who were divided into two into 23 intervention groups given *Moringa* leaf cookies (125 g/day) for 14 days and Vitamin A and Fe tablets and 23 control groups were given Vitamin A and Fe tablets. In this study, milk production was measured through indicators of infant weight with the right level of accuracy. The analysis used in this study is the paired t-test, independent t-test, and multivariate Test.

**RESULTS:** There was a difference before and before being given *Moringa* leaf cookies in the intervention group, while the statistical test results obtained  $p = 0.000 < 0.05$ . There was a difference in body weight in the intervention group and the control group and the results of the statistical test  $p = 0.000 < 0.05$ .

**CONCLUSION:** *Moringa* leaf cookies (125 g/day) for 14 days were effective in increasing breast milk production based on the baby's weight.

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## Introduction

Breast milk is the main nutrition recommended for a newborn up to the first 6 months of life [1]. Breast milk has proved to have immunological factors and bioavailability and increase intelligence if compared to milk formula [2], [3]. The benefits that mothers get by breastfeeding their babies are reducing bleeding and preventing chronic diseases such as breast cancer, ovarian cancer, endometriosis, diabetes, and can be used as natural contraception for the 1<sup>st</sup> month after giving birth [4], [5].

Based on UNICEF data, exclusive breastfeeding for infants under 6 months globally is currently 41%. The World Health Assembly targets 50% exclusive breastfeeding in 2025 and 75% exclusive breastfeeding in 2030 [6]. In Indonesia, exclusive breastfeeding is 68.74% even though it has reached the 2018 Strategic Plan target, Central Java Province is ranked 5<sup>th</sup> with the proportion of breastfeeding. The lowest exclusive breastfeeding in Indonesia with exclusive breastfeeding coverage of 45.21% [7].

One of the reasons mothers does not give exclusively breastfeed their babies is breast milk production insufficiency; therefore, the mother gives

additional food to the baby before the baby is 6 months old, one of the alternative foods used is formula milk [8]. An indicator of breast milk production can be done by measuring the baby's weight. Weight gain is associated with the success of the lactation process, because changes in body weight from birth weight are an intake nutrition [9]. If the baby is experiencing excessive weight loss, it can be associated with ineffective breastfeeding or insufficient milk production. Changes in body weight in infants are also a sensitive indicator, this is because body weight is used as a monitoring of nutritional adequacy in infants and infant health [10], [11].

*Moringa Oleifera* is one type of plant that has the potential to increase breast milk production [12]. *Moringa* leaves are herbal plants that contain flavonoids and polyphenols that can increase breast milk production by increasing levels of the hormones prolactin and oxytocin [13], [14].

*Moringa* leaves can be processed into cookies. *Moringa* leaf cookies are made from additional *Moringa* leaf flour, so that it can increase the production of breast milk for postpartum mothers and breastfeeding mothers because of the flavonoid and polyphenol content. In addition, the roasting process by paying attention to temperature can prevent a decrease or loss of nutritional content in it [15], [16].

## Methods

The method used on this research is quasi-experimental study with pre-test and post-tests non-equivalent control group design. The independent variables in this study were *Moringa* cookies and the dependent variable was baby's weight and the confounding variables were frequency of breastfeeding, nutrition, rest, and psychological condition.

*Moringa* leaf cookies are made at the Nutrition Laboratory Poltekkes Kemenkes Semarang with Nutritionist. *Moringa* leaf cookies are made by blending 86% wheat flour, 14% *Moringa* leaf flour, mixing with 125 g margarine, sugar, 50 g egg yolks, 25 g SKIM milk, 3 g baking soda, 0.5 g salt, and 5 ml banana essence. *Moringa* leaf cookies are made on diameter 5 cm, weight of pieces 25 g, and given for 14 days.

In this study, *Moringa* leaf cookies were processed into laboratory tests for the content of flavonoids and polyphenols. The subject in this study was 46 postpartum mothers in Semarang City Health Center. There were 23 postpartum mothers in the experimental group and 23 postpartum mothers in the control group.

### Inclusion criteria

Primiparous mothers, normal postpartum mothers on the 1<sup>st</sup> day after delivery, range of 20–35 years, baby's weight 2500–4000 g, had no anatomical and physiological abnormalities of the breast, never used contraception before, do not consume alcohol/smoking, had no chronic disease or complications were included in the study.

### Exclusion criteria

Mother who consumes pharmacological drugs, herbal drinks, or herbal medicine to increase breast milk was excluded from the study. The experimental group was given *Moringa* leaf cookies 125 g/day (5 pieces @25 g) and Vitamin A and Fe tablets for 14 days. The control group was given normal postpartum care Vitamin A and Fe tablets. In each group, the measurement of baby's weight was performed 3 times, the 1<sup>st</sup> day or before intervention, 7<sup>th</sup> day, and 14<sup>th</sup> day using digital baby scale that had previously been calibrated.

Data were analyzed using univariate, bivariate, and multivariate analysis. Paired t-test was performed for find out the difference before and after getting the intervention. Independent t-test performed for find out the difference between experimental and control group. Linear regression to determine the causal relationship between confounding variables on infant weight.

The ethical clearance of this research has been study permission from Health Ethics Committee of The

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## Results

Table 1 shows that in the experiment group before given the intervention of *Moringa* leaf cookies, the baby's weight mean was 3206.96 g and after the 7<sup>th</sup> day (Post 1), there was an increase in the average (mean) to 3390.96 g while after being given treatment for 14 days (Post 2), there was an increase in the mean difference baby's weight to 3756.70 g. Based on the results of the statistical paired t-test,  $p = 0.000 (<0.05)$ , so it can be concluded that there was a difference mean after being given intervention of *Moringa* leaf cookies and normal postpartum midwifery care in the experiment group.

**Table 1: The differences in breast milk production based on baby's weight indicators before and after treatment in the intervention group and control group**

Variable	Group	
	Intervention Mean $\pm$ SD	Control Mean $\pm$ SD
Baby's Weight		
Pre	3206.96 $\pm$ 363.01	3071.87 $\pm$ 238.54
Post 1	3390.96 $\pm$ 351.01	3127.74 $\pm$ 240.59
p-value	<0.001	<0.001
Post 2	3756.70 $\pm$ 339.70	3275.09 $\pm$ 235.80
p-value	<0.001	<0.001
Pre	3206.96 $\pm$ 363.01	3071.87 $\pm$ 238.54
Post 2	3756.70 $\pm$ 339.70	3275.09 $\pm$ 235.80
p-value	<0.001	<0.001

In the control group before given intervention, the mean of baby's weight was 3071.87 g and on the 7<sup>th</sup> day (Post 1), there was an increase to 3127.74 g and after 14<sup>th</sup> day (Post 2), there was an increase in the baby's weight to 3275.09 g. Based on the results of the statistic paired t-test, it was found  $p = 0.000 (<0.05)$  so it could be concluded that there was a difference after being given treatment in the form of normal postpartum midwifery care in the control group.

Based on Table 2, there was no significant difference of baby's weight before intervention between experiment and control group with  $p = 0.144 > 0.05$ .

**Table 2: The difference of in baby's weight I the experiment group and control group**

Intervention	Group	Statistic	p-value*
Pre	Experiment	1.491	0.144
	Control		
Post 1	Experiment	2.966	0.005
	Control		
Post 2	Experiment	5.591	<0.001
	Control		
$\Delta$ Pre-Post 1	Experiment	10.380	<0.001
$\Delta$ Post 1-Post 2	Experiment	27.221	<0.001
	Control		
$\Delta$ Pre-Post 2	Experiment	18.521	<0.001
	Control		

\*Independent T-Test

The difference of baby's weight between experiment group and control group can be seen in the

baby's weight on the 7<sup>th</sup> day and the baby's weight on the 15<sup>th</sup> day with  $p < 0.05$ . Hence, it can be concluded that there was a significant effect of *Moringa* leaf cookies on baby's weight.

## Discussion

### ***The differences in breast milk production based on baby's weight indicators before and after the treatment in the intervention group and control group***

In the experiment group, which was given treatment by giving *Moringa* leaf cookies and normal postpartum midwifery care in the form of giving Vitamin A 24 h after giving birth and Fe tablets for 14 days, there was a difference mean in baby's weight before and after intervention. This is because *Moringa* leaf cookies given to postpartum mothers for 14 days contain laktagogums, namely, flavonoids and polyphenols. In addition to containing laktagogum, *Moringa* leaf cookies contain protein, potassium, and manganese nutrients which can also increase breast milk production. This is supported by previous research conducted by Aliyanto and Rosmadewi (2019) that giving *Moringa* leaves in vegetable preparations can increase breast milk production when compared to those who do not consume *Moringa* leaves [17]. This is because *Moringa* leaves have a laktagogum effect in the form of flavonoids and polyphenols [17]. Another study using flavonoid and polyphenolic content to increase breast milk production has been carried out through the combination of fenugreek seed flour and banana blossom, this study proves that the flavonoid and polyphenolic content in these cookies can increase breast milk production based on breast milk volume indicators [18].

In the control group, only giving postpartum midwifery care in the form of Vitamin A 24 h after delivery and Fe tablets for 14 days can increase milk production. This is in line with research conducted by Rahmadani, et al. (2020) that mothers who consume Vitamin A will have sufficient milk production for babies [19]. In the control group, only giving postpartum midwifery care in the form of Vitamin A 24 h after delivery and Fe tablets for 14 days can increase milk production. This is in line with research conducted by Rahmadani, et al. (2020) that mothers who consume Vitamin A will have sufficient milk production for babies [19].

### ***The differences in baby's weight in the intervention group and the control group***

*Moringa* leaf cookies and postpartum midwifery care were more effective in increasing breast milk production based on baby's weight indicators because the five pieces of *Moringa* leaf cookies consumed by

respondents for 14 days for postpartum mothers at the Semarang City Health Center contained flavonoids and polyphenols. The flavonoid content in 100 g of *Moringa* leaf cookies is 0.1626% and the polyphenol content in 100 g of *Moringa* leaf cookies is 0.3635%.

Flavonoid and polyphenols are compounds that can stimulate the hormones prolactin and oxytocin which are breastfeeding hormones. Both of these contents can increase milk production through an increase in the hormone prolactin, when the hormone prolactin increases, milk secretion will take place optimally so that it can increase milk production, it can stimulate the growth of the baby and baby's weight. The content of polyphenols is known to make breast milk flow profusely, because polyphenols can increase the hormone oxytocin which plays a role in encouraging the secretion of milk (milk let down). The role of oxytocin in the mammary glands is to encourage contraction of myopic cells from the alveolus out into the milk ducts, so that the alveolus becomes empty and stimulates further milk synthesis [18]. In addition, the content of flavonoids and polyphenols is also known as antioxidants that can neutralize free radicals so that they can prevent oxidative damage and produce significant oxidative damage protection. These compounds can play a role in synthesizing steroid hormones that act directly on the secretory cells of the mammary glands by increasing their population and synthesis activity, so that the increased concentration of steroid hormones in the bloodstream will indirectly stimulate anterior and posterior pituitary gland cells to release prolactin hormone, growth hormone, and oxytocin hormone which can increase breast milk production [14].

Laboratorium test result showed that *Moringa* leaf cookies also contain 10.33% protein, 56.77 mg potassium, and mangan which also have galactagogue effect. Mangan and potassium can stimulate the production prolactin and oxytocin hormone. Mangan can stimulated pituitary gland in producing prolactin, which increase breast milk production, and potassium may stimulate oxytocin production which is needed for breast milk ejection [20].

Breastfeeding mothers need 510 mg of potassium a day, while in five pieces of 25 g of *Moringa* leaf cookies contain 56.775 mg of potassium so that by consuming five pieces of *Moringa* leaf cookies has supplied 11.1% potassium for breastfeeding mothers [20].

## Conclusion

Based on the result of this study, there were a significant effects of *Moringa oleifera* on baby's weight. Giving *Moringa* leaf cookies as much as five pieces/day for 14 days are effective to increase the baby's weight which is an indicator of breast milk production.

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