



BOHARI BOHARI <bohms@gmail.com>

[WJST] Manuscript Decision ID

1 pesan

Walailak Journal of Science and Technology <journal.wu@gmail.com>

22 Februari 2021 10.16

Kepada: Ade Devriany <adedevriany.gizi@gmail.com>, Emmy Kardinasari <Emmy.kardinasari@gmail.com>, Harindra <Harinda.babel@gmail.com>, Bohari <bohms@gmail.com>

Dear Professor Ade Devriany, Emmy Kardinasari, Harindra, Bohari:

We have reached a decision regarding your submission to Walailak Journal of Science and Technology (WJST), "The Effect of Back Rolling Massage Method With Green Coconut Oil Extract Towards Breastmilk Production on Post Partum Mother in Pangkalpinang City, Indonesia". Please revise the manuscript carefully. The manuscript should be resubmitted along with point-by-point explanation according to reviewers' comments. If you disagree with any of the comments, please state your reasons. **All corrections are mandatory and must be differentiated with red colour and submit it.**

Our decision is to: Resubmit for review

We request that you send a revised manuscript within 30 days, otherwise it may be considered withdrawn.

PS. Please submit in Microsoft Word version with WJST template, the references should be in WJST format, please recheck. Thank you very much for your kind helps.

STEP for upload revised version: Submissions > My Queue > My Assigned > Review > Revisions > Upload fileAuthor Guidelines: <https://wjst.wu.ac.th/index.php/wjst/about/submissions#authorGuidelines>

2019 SCImago Journal Rank (SJR): 0.154

Walailak Journal of Science and Technology,
Walailak University, Nakhon Si Thammarat 80161, Thailand
<https://wjst.wu.ac.th>

Reviewer B:
Recommendation: Revisions Required

Originality of the work

Good

Experimental design and methodology

Good

Adequacy of the discussion

Adequate

Technical accuracy

Good

Suitability of references

Adequate

Use of Tables and Figures

Good

Standard of English

Good

Clarity and conciseness

Good

Referee's Comments-----

Reviewer C:
Recommendation: Resubmit

Originality of the work

Poor

Experimental design and methodology

Poor

Adequacy of the discussion

Poor

Technical accuracy

Poor

Suitability of references

Adequate

Use of Tables and Figures

Poor

Standard of English

Poor

Clarity and conciseness

Poor

Referee's Comments-----

Reviewer F:
Recommendation: Revisions Required

Originality of the work

Adequate

Experimental design and methodology

Adequate

Adequacy of the discussion

Poor

Technical accuracy

Poor

Suitability of references

Adequate

Use of Tables and Figures

Adequate

Standard of English

Adequate

Clarity and conciseness

Poor

Referee's Comments-----

Reviewer H:
Recommendation: Resubmit for Review

Originality of the work

Good

Experimental design and methodology

Good

Adequacy of the discussion

Poor

Technical accuracy

Adequate

Suitability of references

Adequate

Use of Tables and Figures

Good

Standard of English

Poor

Clarity and conciseness

Poor

Referee's Comments

In this paper, the author failed to give a detailed analysis. Obviously, the author has not done sufficient work on this topic. The purpose and significance of the study are not clearly stated. Besides, the results presented in this study were not vividly compared with the findings of previous studies. Thus, the author failed to give a comprehensive analysis in the discussion. Therefore, this manuscript requires major revisions to be accepted for publication

Walailak Journal of Science and Technology (WJST)

<https://wjst.wu.ac.th>

2019 SJR (SCOPUS): 0.154

7 lampiran

K-11145-Article Text-44418-2-2-20200714.docx

70K



F-11145-Article Text-48467-1-4-20201021.docx

78K



H-Reviewed Article Text-48467-1-4-20201021.docx

81K



C-Feedback 11145-Article Text-48467-1-4-20201021.docx

77K



B-11145-Article Text-48467-1-4-20201021.docx

78K



K-WJST Template 2021.docx

48K



K-WJST form - Responses the Reviewer's Comment(s) 2021.docx

48K

The Effect of Back Rolling Massage Method With Green Coconut Oil Extract Towards Breastmilk Production on Post Partum Mother in Pangkalpinang City, Indonesia

Running title

The Effect of Back Rolling Massage and Breastmilk Production on Post Partum Mother

Abstract

To identify the effect of back rolling massage with green coconut oil extract towards breastmilk production on postpartum mother. The type of this research was Quasi-Experimental Research with Static-Group Comparison. The intervention group was the mothers that were given back rolling massage with green coconut oil extract or virgin coconut oil [VCO]. The control group was postpartum mothers that were given back rolling massage without green coconut oil extract. The samples in this research were 24 samples consisted of 2 sample groups such as 12 samples in the intervention group and 12 samples in the control group. The average breastmilk production of the group with VCO extract in day 4 is 46,9 ml while the group without VCO extract is 42,9% until it shows no significant difference towards breastmilk production on day 4 with p-value = 0,794. On day 7 shows that the VCO extract group has breastmilk production 87,3 ml compared to the group without VCO only 49,2 ml until there is a significant difference with p-value = 0,046. The antioxidant analysis shows that VCO extract contained alkaloids and saponin. Back rolling massage with green coconut oil extract is effective in increasing breastmilk production at day 7.

Keywords: back rolling massage, green coconut oil extract, VCO, mother breastmilk

Introduction

Breast Milk (ASI) is the best food for growing and developing for babies. In addition to the complete nutritional content of breast milk, the baby will get a comprehensive sensory stimulation (tactile, smell, hearing, warmth and affection) from his mother [1]. Coverage of exclusive breastfeeding around the world is only around 36% during the 2007-2016 period. Meanwhile, coverage of exclusive breastfeeding in Indonesia was 54.3% in 2016. The duration of exclusive breastfeeding for infants had not been reached 6 months and only lasts for 2 months[2]. Many things cause the failure of exclusive breastfeeding, one of which is the lack of confidence in mothers who feel that the milk they have cannot meet the nutritional needs of their babies [3].

In conditions that are full of worry and lack of confidence because they feel that their milk cannot meet their baby's needs, the mother needs help and support to be able to maintain milk production. This is because due to lack of confidence and anxiety will cause inhibition of the hormone oxytocin. This oxytocin hormone has an impact on the release of the hormone prolactin as a hormone stimulating milk production in mothers during breastfeeding. Various alternatives can be done to increase milk production in mothers giving birth. Some research results reveal that in addition to consuming foods that are high in protein, one of the efforts that can be done to increase milk production is by doing massage to stimulate the hormone prolactin and oxytocin in the mother [4].

Various alternatives can be done to increase milk production in mothers who have just given birth. Some research results reveal that in addition to consuming foods that are high in protein, one of the efforts that can be done to increase milk production is by doing massage to stimulate the hormone prolactin and oxytocin in the mother. Badrus research results (2018) which provide *woolwich massage* and *back rolling massage* prove to be able to produce increased milk production in mothers. There are 80% of mothers who experience increased milk production after being given back rolling massage and 60% of mothers who have

Commented [pr1]: If these two words are the same product, please clarify more in this paper.

Commented [pr2]: Please correct all numbers of this paper from comma to full stop (eg. 46,9 to 46.9)

Commented [pr3]: ml?

Commented [pr4]: please use only one word in this paper and the researcher should explain more that there are the same or different.

Commented [pr5]: ??? what is the this abbreviation come from (full world)?

increased milk production after being given a *Woolwich massage* [5]. From Desmawati's research (2008), it was found that postpartum mothers who were treated with a combination intervention of areola massage and *back rolling massage* had 5.146 times the opportunity to express breastmilk less than 12 hours postpartum [6].

In addition to using the *back rolling massage* method to increase breastmilk expenditure, the combination of the back rolling massage method with *Virgin Coconut Oil (VCO)* is thought to further increase milk production and expenditure. VCO is known to have natural antioxidant potential and can increase the ability of the body's defense system against oxidative stress. Coconut oil is the main source of lauric fatty acids [7] and is a component of fatty acids in breast milk. The wealth of fatty acid components in VCO makes this oil capable of being a basic ingredient for the production of fatty acids similar to breast milk [8].

This study aims to identify phytochemical compounds and antioxidant activity from extracts of green coconut oil (*Cocos nucifera*) used in *back rolling massage* in post partum mothers. In addition, the study also aimed to analyze the effect of the *back rolling massage* method by using green coconut oil extract on breast milk production in post-partum mothers in Pangkalpinang City.

Materials and methods

This research is a Quasi Experimental study with a Static-Group Comparison research design. The variable to be examined is the Effect of *Back Rolling Massage* with Green Coconut Oil Extract on Breast Milk Production in Postpartum Mothers. The intervention group was mothers who were given back rolling massage with green coconut oil extract on the first day of post partum to day 3, then milk production would be measured on days 4 and 7. The control group was post partum mothers who were given *back rolling massage* without extract green coconut oil, where observations of breast milk expenditure will be made on days 4 and 7. The sample size in this study is 24 samples consisting of 2 sample groups, namely 12 samples in the intervention group and 12 samples in the observation group.

The intervention of *back rolling massage* with extracts of green coconut oil (*Cocos nucifera*) in the intervention group was carried out twice a day for 3 days, while the control group was only given the intervention of back rolling massage with olive oil for 3 days. Mothers will be given back rolling massage by skilled workers who have been certified as *Certified Baby and Mom Therapist (CBMT)*. Measurement of the volume of milk production on the fourth and seventh day is done through the removal of breast milk using an electric breast pump in the group of mothers who are given intervention and control groups. Analysis of the data in this study is to use statistical tests T-test for normally distributed data and Mann Whitney test for data that are not normally distributed.

PLEASE ADD MORE INFORMATION OF THIS STUDY INTERVENTION STEP BY STEP.

Results and discussion

Phytochemical Identification of VCO Extract from Green Coconut Fruit.

Table 1 shows that the VCO produced by green coconut used contains alkaloids and saponins. Meanwhile, other bioactive compounds such as flavonoids, phenols or tannins, and steroids or terpenoids were not found positive test results. The tests used in this test were three times, indicated by 3 test tubes in each test.

Table 1. Phytochemicals Identification VCO Extract from Green Coconut Fruit

Type of Phytochemicals Compound	Result
Alkaloids	+
Phenol/Tanin	-
Flavonoid	-
Saponin	+
Steroid/Terpenoid	-

Commented [pr6]:

Commented [pr7]: What is the theory or scholarly paper support this number of sample size? The researcher must mention the theory applied to support this number and you must clarify or explain the general characteristics of these samples (age? Marital status, education, gravity, types of birth (C/S, N/D)?). The intervention group and control group do not different significantly.....

Commented [pr8]: Control group

Commented [pr9]: Please explain about breast milk measurement that each postpartum mothers nurse their babies by suction from their breast or electric breast pump method. The did both methods or they did only electronic breast pump.
If they did both methods that the researcher must explain time to nurse babies and time to do electronic breast pump. The two groups must not different of methods, time and so on.
If they did only the electronic breast pump, the researcher must explain more about issue of Babies Rights that this study is the problems to promote human breast feeding. Furthermore, the searcher must explain more about the strategy to promote BF by real breast after intervention or 7 days.

Antioxidant Activity Test of VCO Extract from Green Coconut Fruit.

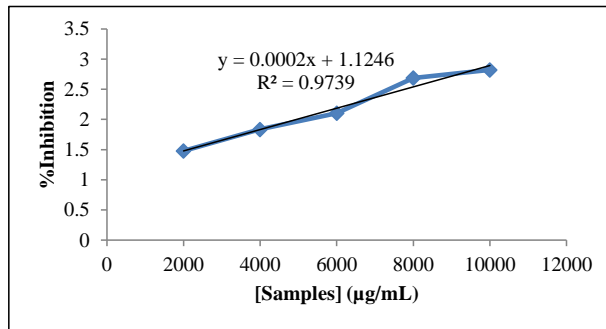


Figure 1. The Test of Antioxidant Activity of VCO Extract from Green Coconut Fruit

Antioxidant activity tends to increase with the addition of VCO concentrations. It's just that the inhibitory activity that occurs is not significantly able to inhibit the work of DPPH. The VCO used in this study was the VCO extracted by the heating method (Figure 1).

Breast Milk Production in Post Partum Mother in Pangkal Pinang City.

Table 2 shows that there was no effect of *back rolling massage* with green coconut extract (*Cocos nucifera*) on the production of breast milk on the 4th day in post partum mothers, as indicated by $p > 0.05$ ($p = 0.794$). Meanwhile on the 7th day, there was a significant difference in the production of breast milk with a value of $p < 0.05$ ($p = 0.046$) where mothers who received VCO extract during the treatment had greater milk production, which was 87.3 ml.

Table 2. Breastmilk Production on Post Partum Mother in Pangkalpinang City

Variable	Breastmilk Production (in ml/day)			p Value
	N	Mean	SD	
Day 4				
With VCO Extract	12	46.9	26.8	0,794*
Without VCO Extract	12	42.9	39.3	
Day 7				
With VCO Extract	12	87.3	51.5	0,046**
Without VCO Extract	12	49.2	35.3	

Description:

* p-value used Mann Whitney test

** p-value used t-independent test

Breast milk production increased significantly in respondents who were massaged using VCO compared to non-VCO. Differences in postpartum maternal milk production in the experimental and control groups can occur due to factors from the mother that can affect milk production. Decreased milk production in postpartum mothers in the control group can be caused by factors in the mother herself such as fatigue, mental calm and mind. To produce good milk, the mental condition and mind of the mother must also be calm [9]. Psychological conditions of mothers who are depressed, sad, and tense can inhibit the work of oxytocin so that it can affect the mother's milk production [10].

On the 7th day, based on the results of the t-independence test analysis, obtained $p\text{-value} = 0.046$ ($p\text{-value} < 0.05$) so that it can be concluded that there is an influence that the *Back Rolling Massage* method with green coconut oil extracts on breast milk production in mothers post partum in the City of Pangkalpinang. In line with other studies, this study also showed that there was a significant influence on

Commented [pr10]: Significant? Please check.

Commented [pr11]: Discussion?

Commented [pr12]: This paper did not present the general characteristics of sample groups but the researcher add this paragraph to support your study, it is not reasonable. Please revise and reorganize this paper.

the administration of back rolling massage and woolwich massage on the excretion of breast milk with a p value of 0.005 (<0.05) [11]. Other results show that there is a relationship between back massage and breast milk production in post partum mothers (p-value = 0.026, p-value <0.05) [12].

Back rolling massage is one solution to overcome the smooth production of breast milk. *Back rolling massage* is massage along the spine (*vertebrae*) to the fifth-sixth costae bone and is an attempt to stimulate the hormone prolactin and oxytocin after giving birth. *Back rolling massage* is done to stimulate the let down reflex [13]. *Back rolling massage* is an action that can affect the prolactin hormone which functions as a stimulus for breast milk production in mothers during breastfeeding. This action can also relax the mother and facilitate the flow of nerves and breast milk in both breasts [14]. From a study conducted by Desmawati (2008), it was found that postpartum mothers who were given a combination intervention of areola massage with *back rolling massage* had a 5.146 times chance of expending their milk with less than 12 hours postpartum [6]. Potential alkaloids as anti-inflammatory agents can be used as a basis for VCO applications in *back rolling massage* therapy. Coconut oil has been consumed almost in all over Indonesia and is a safe food raw material to be consumed. The green coconut fruit itself is known of owning various phytochemical compound either in its skin, shell, and the fruit flesh tends to have the potency of beneficial phytochemical content for human [15].

Beside alkaloid, another phytochemical component that can be found in VCO extraction result is saponin. The group of this phytochemical compound has important function as anti bacterial component and anti-fungi or mushroom [16]. Saponin has bitter taste which is the key of its protective function towards microorganism that harms human [17]. The presence of this component in VCO can give benefits if applied as topical oil for therapy of back rolling massage

Conclusions

The average of breastmilk production at day 4 until day 7 experiences increase. VCO usage in back rolling massage produces more average breastmilk production at the 4 in the amount of 46,7 ml. VCO usage in back rolling massage produces more average breastmilk production at day 7 in the amount of 87,3 ml. Back rolling massage method with green coconut oil extract (*Cocos nucifera*) is effective in increasing breastmilk production at day 7.

Acknowledgements

Thank you to Drg. Harindra, MKM as the Director of the Poltekkes Kemenkes Pangkalpinang which has supported this research

References

- [1] R. E. Hariani, D. I. Amareta, and A. L. Suryana, "Pola Pemberian Asi Dan Makanan Pendamping Asi Terhadap Grafik Pertumbuhan Pada Kartu Menuju Sehat (KMS)," *J. Ilm. Inov.*, vol. 16, no. 1, Jun. 2016, doi: 10.25047/jii.v16i1.5.
- [2] A. Devriany, Novidiyanto, and Bohari, "Determinants of Exclusive Breastfeeding Duration on Infants in Girimaya Community Health Center Pangkalpinang City," *Indian J. Public Health Res. Dev.*, vol. 10, no. 10, p. 614, 2019, doi: 10.5958/0976-5506.2019.02880.8.
- [3] K. Zhang, L. Tang, H. Wang, L.-Q. Qiu, C. W. Binns, and A. H. Lee, "Why Do Mothers of Young Infants Choose to Formula Feed in China? Perceptions of Mothers and Hospital Staff," *Int. J. Environ. Res. Public Health*, vol. 12, no. 5, pp. 4520–4532, May 2015, doi: 10.3390/ijerph120504520.
- [4] J. A. Lothian, "The Birth of a Breastfeeding Baby and Mother," *J. Perinat. Educ.*, vol. 14, no. 1, pp. 42–45, 2005, doi: 10.1624/105812405X23667.
- [5] A. R. Badrus, "Perbedaan Massage Woolwich Dan Massage Rolling (Punggung) Terhadap Peningkatan Produksi Asi Pada Ibu Postpartum," *J-HESTECH J. Health Educ. Sci. Technol.*, vol. 1, no. 1, pp. 43–49, Aug. 2018, doi: 10.25139/htc.v1i1.1081.

Commented [pr13]: The researcher must check and correct reference; furthermore, you must change the research title from Bahasa to English.

- [6] D. Desmawati, "Determinant of Breastmilk Excretion Speed Post Sectio Caesarea," *Kesmas Natl. Public Health J.*, vol. 7, no. 8, Art. no. 8, Mar. 2013, doi: 10.21109/kesmas.v7i8.22.
- [7] H. Novarianto and M. Tulalo, "Kandungan Asam Laurat pada Berbagai Varietas kelapa Sebagai Bahan Baku VCO," *J. Penelit. Tanam. Ind.*, vol. 13, no. 1, pp. 15–25, 2007.
- [8] S. Karouw, "Pemanfaatan Stearin Sawit Dan Minyak Kelapa Untuk Formulasi Asam Lemak Mirip ASL," *Perspekt. Balai Penelit. Tanam. Palma*, vol. 13, no. 2, pp. 8–15, 2014.
- [9] E. S. Mezzacappa, R. M. Kelsey, and E. S. Katkin, "Breast feeding, bottle feeding, and maternal autonomic responses to stress," *J. Psychosom. Res.*, vol. 58, no. 4, pp. 351–365, Apr. 2005, doi: 10.1016/j.jpsychores.2004.11.004.
- [10] A. M. Stuebe, K. Grewen, and S. Meltzer-Brody, "Association Between Maternal Mood and Oxytocin Response to Breastfeeding," *J. Womens Health*, vol. 22, no. 4, pp. 352–361, Apr. 2013, doi: 10.1089/jwh.2012.3768.
- [11] A. Rif'an and Wagiyono, "Pemberian Back Rolling Massage Dan Woolwich Massage Terhadap Kecepatan Ekskresi ASI Pada Ibu Post Partum Dengan Sectio Caesarea Di Rsud Ambarawa," *Karya Ilm.*, vol. 6, no. 1, Art. no. 1, 2017, Accessed: Apr. 06, 2020. [Online]. Available: <http://ejournal.stikestelogorejo.ac.id/index.php/ilmukeperawatan/article/view/647>.
- [12] R. F. Zamzara, D. Ernawati, and A. Susanti, "Pengaruh Pijat Oksitosin Terhadap Waktu Pengeluaran Kolostrum Ibu Post Partum Sectio Caesaria," *J. Ilm. Kesehat.*, vol. 8, no. 2, pp. 229–241, 2015.
- [13] E. Stillerman, *Prenatal Massage - E-Book: A Textbook of Pregnancy, Labor, and Postpartum Bodywork*. Elsevier Health Sciences, 2007.
- [14] E. F. A. Shanti, "Efektifitas Produksi ASI Pada Ibu Post Partum Dengan Massage Rolling (Punggung)," *Midwifery J. J. Kebidanan UM Mataram*, vol. 3, no. 1, Art. no. 1, Jan. 2018, doi: 10.31764/mj.v3i1.152.
- [15] A. A. Kibria, Kamrunnessa, and M. M. Rahman, "Extraction and Evaluation of Phytochemicals from Green Coconut (Cocos nucifera) Shell," *Malays. J. Halal Res. J. MJHR*, vol. 1, no. 2, pp. 19–22, 2018, Accessed: Apr. 06, 2020. [Online]. Available: <https://ideas.repec.org/a/zib/zbmjhr/v1y2018i2p19-22.html>.
- [16] L. Yang, X. Liu, X. Zhuang, X. Feng, L. Zhong, and T. Ma, "Antifungal Effects of Saponin Extract from Rhizomes of Dioscorea panthaica Prain et Burk against Candida albicans," *Evidence-Based Complementary and Alternative Medicine*, 2018. <https://www.hindawi.com/journals/ecam/2018/6095307/> (accessed Apr. 06, 2020).
- [17] G. R. Waller and K. Yamasaki, Eds., *Saponins Used in Food and Agriculture*. Springer US, 1996.

[Trends in Sciences] Volume 18 (2021) Proofreading Request ID 11145

2 pesan

Trends in Sciences <journal.wu@gmail.com>

6 November 2021 21.31

Kepada: Ade Devriany <adedevriany.gizi@gmail.com>

Cc: Emmy Kardinisari <Emmy.kardinisari@gmail.com>, Harindra <Harinda.babel@gmail.com>, Bohari <bohmks@gmail.com>

Dear Professor Ade Devriany,

Please inspect this proof version of your article and answer the following queries;

Please inspect this copy-edited version of your article.-

- Please give "Highlights" of the paper (For example).3-5 bullet points<https://tis.wu.ac.th/index.php/tis/article/view/11>
- Please give "Graphical Abstract" (if available).
- Please sign the "TiS Consent to Publish and Copyright Transfer" in the attached file.
- Please promptly respond to these queries rapidly, otherwise this paper will be published later this year.

Trends in Sciences

- If there are any minor changes, please let us know by or .- Please revise your paper in the attached file. the list of changes in the word filethe list of corrections in a reply mail

- , possibly within 48 hours.Please return it as soon as you can

PS. Walailak Journal of Science and Technology (WJST) has been renamed as Trends in Sciences (TiS). The TiS was launched in October 2021. Please visit our website at [.https://tis.wu.ac.th](https://tis.wu.ac.th)

We apologize for any inconvenience this may cause you. Thank you in advance for your cooperation.

Yours sincerely,<https://tis.wu.ac.th>

2020 SJR (SCOPUS): 0.146

2 lampiran **TiS Consent to Publish and Copyright Transfer.pdf**
168K **11145-TiS Template (Revise Version) typesetted.docx**
65K

Ade Devriany <adedevriany.gizi@gmail.com>

9 November 2021 06.17

Kepada: Trends in Sciences <journal.wu@gmail.com>

Dear Editor

I attach my final paper, highlights, and copyright form.

Thank you

Ade

[Kutipan teks disembunyikan]

--

Best Regards

Ade Devriany

Nutrition, Health Polytechnic of the Ministry of Health Pangkalpinang, Pangkalpinang City, Indonesia

3 lampiran



11145-TiS Template (Revise Version) typesetted.docx

56K



Highlights paper 11145.docx

14K



TiS Consent to Publish and Copyright Transfer.pdf

282K

Highlights paper 11145-TiS

1. Alkaloid and Saponin in VCO can give benefits if applied as topical oil for therapy of back rolling massage
2. Breast milk production increased significantly in respondents who were massaged using VCO compared to non-VCO
3. Back rolling massage with green coconut oil extract is effective in increasing breastmilk production at day 7

Thank you

Ade



BOHARI BOHARI <bohmk@gmail.com>

[WJST] Manuscript Decision ID

1 pesan

Walailak Journal of Science and Technology <journal.wu@gmail.com>

22 Mei 2021 21.57

Kepada: Ade Devriany <adedevriany.gizi@gmail.com>, Emmy Kardinasari <Emmy.kardinasari@gmail.com>, Harindra <Harinda.babel@gmail.com>, Bohari <bohmk@gmail.com>

Dear Professor Ade Devriany, Emmy Kardinasari, Harindra, Bohari:

We have reached a decision regarding your submission to Walailak Journal of Science and Technology (WJST), "The Effect of Back Rolling Massage Method With Green Coconut Oil Extract Towards Breastmilk Production on Post Partum Mother in Pangkalpinang City, Indonesia". The reviewers have no further comment. We are pleased to inform that your manuscript is accepted and scheduled to publish in Walailak Journal of Science and Technology (WJST) in Volume 18, 2021.

Thank you for submitting your work to this journal.

Regards,
Managing Editor
Walailak Journal of Science and Technology

2019 SCImago Journal Rank (SJR): 0.154

Walailak Journal of Science and Technology,
Walailak University, Nakhon Si Thammarat 80161, Thailand
<https://wjst.wu.ac.th>

Walailak Journal of Science and Technology (WJST)

<https://wjst.wu.ac.th>

2019 SJR (SCOPUS): 0.154