Available online at
www.heca-analitika.com/malacca_pharmaceutics

Malacca Pharmaceutics

Vol. 4, No. 2, 2026

The Effectiveness of Cabbage Leaf (*Brassica oleracea*) Compress in Breast Engorgement with Insights from Other Natural Anti-Inflammatory Agents: A Narrative Review

Giska Putri [1], Muhammad Rasyid Ridha [1,*], Lucky Nadia [1], and Fitrina Syawalani Idwar [1]

[1] Department of Medical Education, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia; giskaasyaa@gmail.com (G.P); muhammadrasyid123890@gmail.com (M.R.R.); luckynadia1307@gmail.com (L.N.); Syawalaniidwaraldrs@gmail.com (F.S.I.)

* Correspondence: muhammadrasyid123890@gmail.com

Article History

Received 10 April 2026
Revised 23 August 2026
Accepted 7 September 2026
Available Online 26 September 2026

Keywords:
Breast engorgement
Cabbage leaf
Lactation
Non-pharmacological therapy
Postpartum care

Abstract

Breast engorgement is a common problem among lactating women that can cause pain, swelling, breast firmness, and discomfort, potentially interfering with successful breastfeeding. Cabbage leaf (*Brassica oleracea*) compresses have been widely used as a simple non-pharmacological intervention; however, their clinical effectiveness and underlying anti-inflammatory mechanisms require further synthesis. This narrative review aimed to evaluate the effectiveness of cabbage leaf compresses in managing breast engorgement and to explore the biological mechanisms that may support their therapeutic effects. A structured literature search was conducted using PubMed, Scopus, ScienceDirect, and the Cochrane Library. Of 128 initially identified records, 18 studies were included in the qualitative synthesis after duplicate removal, screening, and eligibility assessment. Overall, the evidence indicates that cabbage leaf application can reduce breast pain, swelling, firmness, and discomfort in lactating women, with several comparative studies reporting outcomes comparable to conventional cold or gel-pack therapy. Mechanistic evidence further suggests that cabbage-derived bioactive compounds, including flavonoids, polyphenols, glucosinolates, isothiocyanates, and sulforaphane, may exert anti-inflammatory and antioxidant effects through suppression of pro-inflammatory cytokines, oxidative stress, and nuclear factor kappa-B signaling. Despite these promising findings, considerable heterogeneity in study design, intervention protocols, and outcome assessment limits the strength of the current evidence. Cabbage leaf compresses therefore represent a practical, accessible, and potentially effective non-pharmacological option for managing breast engorgement, although further well-designed randomized controlled trials with standardized clinical and biomarker-based outcomes are warranted.

1. Introduction

Breast milk contains a wide range of complete nutrients that are essential for an infant's growth and development. In Indonesia, efforts to increase the coverage of exclusive breastfeeding continue to be promoted through maternal and child health programs [1]. UNICEF and WHO have reported an increase in the rate of exclusive breastfeeding, from around 52% in 2017 to 66.4% in 2024 among infants under six months of age. Despite this improvement, the figure still falls below national targets as well as WHO recommendations. However, breastfeeding mothers face several challenges, with breast inflammation being one of the most common.

Breast engorgement is a painful condition that not only causes significant discomfort for lactating women but may also interfere with successful breastfeeding [2]. If left untreated, it can lead to complications such as cracked nipples, mastitis, and breast abscess, which may ultimately result in early cessation of breastfeeding [3]. Additionally, breast engorgement negatively affects maternal well-being and may disrupt infant feeding patterns, thereby impacting both maternal and neonatal outcomes.

Various approaches have been used to manage breast engorgement, including both pharmacological and non-pharmacological options. Pharmacological treatments such as analgesics and anti-inflammatory agents may provide symptomatic relief but are often associated with safety concerns and potential side effects, especially during breastfeeding. Meanwhile, non-pharmacological methods, such as warm compresses, cold compresses, massage, and alternative therapies, are commonly used due to their safety and accessibility, although their effectiveness remains inconsistent across studies [4].

Among the non-pharmacological interventions, cabbage leaf (*Brassica oleracea*) compress has gained attention as a simple, low-cost, and easily accessible treatment option [5, 6]. Previous studies have demonstrated that cabbage leaf application can significantly reduce breast engorgement symptoms, including pain and swelling, particularly when combined with proper lactation management. Furthermore, cabbage leaves are considered safe, easy to apply, and do not require specialized skills, making them a practical intervention for postpartum women [7].

Cabbage (*Brassica oleracea*) is rich in various bioactive compounds that contribute to its anti-inflammatory properties. Phytochemical screening has identified the presence of flavonoids, saponins, tannins, and anthocyanins in cabbage leaves, all of which are known to exhibit anti-inflammatory activity [8]. Among these compounds, anthocyanins, particularly cyanidin derivatives, have been shown to play a significant role in modulating inflammatory responses by reducing the production of inflammatory mediators [9].

Cabbage also contains glucosinolates, which are enzymatically converted into biologically active compounds such as isothiocyanates, including sulforaphane (SFN) [10–12]. Sulforaphane is one of the most extensively studied phytochemicals in cruciferous vegetables and is widely recognized for its potent anti-inflammatory and antioxidant effects. Sulforaphane has been shown to suppress the expression of key inflammatory mediators such as tumor necrosis factor-α (TNF-α), interleukin-1β (IL-1β), and IL-6, as well as inflammatory enzymes like cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS) [13]. Additionally, it inhibits the activation of nuclear factor kappa-B (NF-κB), a major transcription factor that regulates inflammatory gene expression. By downregulating these pathways, cabbage-derived compounds can effectively reduce inflammatory responses in tissues.

In the context of breast engorgement, the use of cabbage (*Brassica oleracea*) represents a biologically plausible and promising therapeutic approach. The presence of bioactive compounds such as flavonoids, anthocyanins, and glucosinolate-derived isothiocyanates, particularly sulforaphane, contributes to its anti-inflammatory and antioxidant effects. These compounds are capable of suppressing pro-inflammatory mediators, reducing oxidative stress, and enhancing endogenous antioxidant defense systems through mechanisms such as NF-κB inhibition. Furthermore, the topical application of cabbage leaves has been shown to facilitate the improvement of local circulation and reduce pain in engorged breast tissue. Despite the promising mechanisms and clinical findings, the current body of evidence remains fragmented and varies in methodological quality, highlighting the need for a comprehensive evaluation. Therefore, this narrative review aims to synthesize evidence on the anti-inflammatory potential of cabbage (*Brassica oleracea*) in reducing breast engorgement.

2. Materials and Methods

2.1. Search Strategy

This review was conducted following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The literature search was performed on March 10, 2026, using several electronic databases, including PubMed, Scopus, ScienceDirect, and the Cochrane Library. The search terms used were combinations of “Brassica oleracea” or “cabbage leaf” paired with “breast engorgement”, “breast pain”, or “breast inflammation”, combined with “compress” or “topical therapy”, and “anti-inflammatory” or “herbal therapy”. Boolean operators “AND” and “OR” were applied to combine specific terms and broaden the search between related keywords. Titles and abstracts of all identified articles were initially screened, and studies that did not meet the objectives of this review were excluded. Full-text articles were subsequently assessed for eligibility. To ensure comprehensive coverage, reference lists of relevant studies were also manually screened.

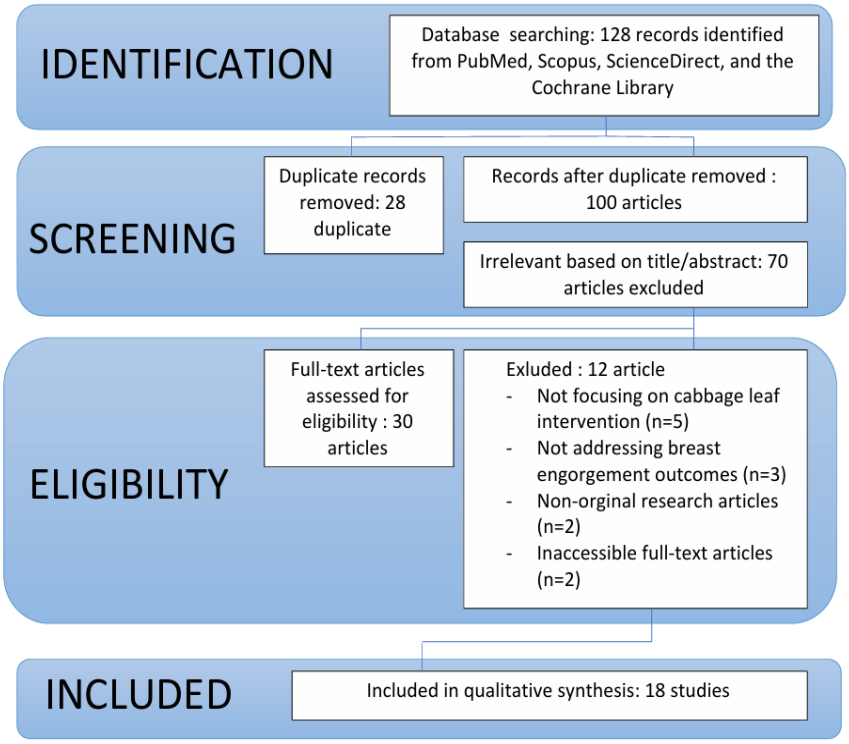

Figure 1. Flow diagram of the search strategy of this study.

Table 1. Literature search.

Keyword	Total of Articles
((("cabbage leaf"[Title/Abstract]) OR (Brassica oleracea[Title/Abstract])) AND ("breast engorgement"[Title/Abstract]))	28
((("cabbage leaf"[Title/Abstract]) OR (Brassica oleracea[Title/Abstract])) AND ("breast pain"[Title/Abstract] OR "breast swelling"[Title/Abstract]))	24
(((Brassica oleracea[Title/Abstract]) AND ("anti-inflammatory"[Title/Abstract]))	36
((("cabbage"[Title/Abstract]) OR (Brassica[Title/Abstract])) AND (flavonoid OR glucosinolate OR sulforaphane)))	40
Total Articles	128

2.2. Inclusion and Exclusion Criteria

The inclusion criteria were as follows: (1) original research articles published in the English language; (2) studies involving postpartum or breastfeeding women experiencing breast engorgement; (3) studies evaluating the use of cabbage leaf (*Brassica oleracea*) as a compress or topical therapy; (4) studies reporting clinical outcomes such as reduction in pain, swelling, or breast hardness, as well as studies providing insights into anti-inflammatory mechanisms; and (5) articles with accessible full text. Meanwhile, the exclusion criteria included: (1) review articles, systematic reviews, meta-analyses, editorials, and conference abstracts; (2) studies not specifically investigating cabbage leaf intervention; (3) studies involving non-human subjects unless used to support mechanistic anti-inflammatory evidence; (4) articles with incomplete data; and (5) duplicate publications. An illustration of the study selection process based on PRISMA guidelines is presented in Figure 1.

3. Results and Discussion

3.1. Data Selection

The literature search was conducted using predefined combinations of keywords related to cabbage leaf intervention, *Brassica oleracea*, breast engorgement, breast pain or swelling, anti-inflammatory activity, and relevant bioactive compounds. As summarized in Table 1, the database searches initially identified a total of 128 records across PubMed, Scopus, ScienceDirect, and the Cochrane Library. The individual search strategies retrieved 28, 24, 36, and 40 articles, respectively.

After removing 28 duplicate records, 100 articles remained for title and abstract screening. During this stage, 70 articles were excluded because they were not relevant to the objectives of the review, leaving 30 articles for full-text assessment. Of these, 12 articles were excluded for the following reasons: not focusing on cabbage leaf intervention (n = 5), not addressing breast engorgement outcomes (n = 3), being non-original

research articles (n = 2), and having inaccessible full texts (n = 2). Ultimately, 18 studies met the eligibility criteria and were included in the qualitative synthesis of this systematic review.

This narrative review synthesizes findings from 18 studies evaluating the effectiveness of cabbage leaf (*Brassica oleracea*) compresses in managing breast engorgement, while integrating mechanistic evidence from plant-based anti-inflammatory research [3, 14]. The characteristics of the included studies, including study design, population, intervention, comparator, and principal findings, are summarized in Table 2. Overall, the findings indicate that cabbage leaf application provides consistent symptomatic relief, particularly in reducing breast pain, swelling, breast firmness, and discomfort among lactating women [15, 16]. Although variations in outcomes were observed across studies, the general trend supports its clinical utility as a simple and accessible non pharmacological intervention [5, 16]. The integration of clinical outcomes and molecular evidence further strengthens the biological plausibility of cabbage-derived compounds in reducing inflammation-related symptoms [10, 17].

From a clinical perspective, multiple studies consistently report a reduction in breast pain, tenderness, and swelling following cabbage leaf application [15, 18]. These findings are particularly important because pain is one of the primary reasons for early discontinuation of breastfeeding [3, 19]. Randomized and comparative studies have demonstrated that cabbage leaves provide similar effectiveness to cold gel packs in reducing breast engorgement symptoms [20]. This suggests that cabbage leaves can be considered a clinically comparable alternative to conventional cold compress therapy [5, 21]. In addition, their low cost and accessibility enhance their applicability in community and low-resource settings [16].

However, evidence from systematic reviews indicates that the strength of clinical evidence remains limited due to heterogeneity in study design and sample size [3, 5]. While improvements in pain scores are consistently reported, the reduction in objective swelling measurements is less consistent across studies [5, 20]. This suggests that cabbage leaf compresses may be more effective in alleviating subjective symptoms rather than directly resolving underlying edema [3, 19]. Such discrepancies highlight the need for more standardized outcome measurements in future studies [16]. Therefore, careful interpretation is required when translating these findings into clinical recommendations [22].

The therapeutic effects of cabbage leaf compresses can be explained through both physical and biochemical mechanisms [10, 14]. The cooling effect of chilled cabbage leaves contributes to vasoconstriction, which reduces local blood flow and decreases tissue edema [15, 18]. This physical mechanism is supported by studies demonstrating rapid reduction in pain following cold application [16, 20]. However, the presence of bioactive compounds in cabbage suggests that additional biochemical effects may also contribute to the observed outcomes [14]. The combination of physical cooling and phytochemical activity likely produces a synergistic therapeutic effect [10, 23].

At the molecular level, cabbage contains bioactive compounds such as flavonoids, anthocyanins, and glucosinolate-derived isothiocyanates, including sulforaphane [10]. These compounds have been shown to suppress pro-inflammatory cytokines such as TNF-α, IL-1β, and IL-6, which play a central role in inflammatory processes [23]. Experimental studies demonstrate that these compounds also inhibit inflammatory enzymes such as COX-2 and inducible nitric oxide synthase (iNOS) [24]. Such mechanisms are highly relevant in breast engorgement, where inflammation results from milk stasis and vascular congestion [19]. Therefore, the anti-inflammatory properties of cabbage provide a strong biological basis for its clinical use [14, 25].

One of the key pathways involved in inflammation is the activation of nuclear factor kappa-B (NF-κB), which regulates the expression of inflammatory genes [19]. Studies have shown that flavonoids and isothiocyanates inhibit NF-κB activation, thereby reducing cytokine production and inflammatory signaling [19]. This inhibition plays an important role in limiting tissue inflammation and reducing pain [23]. In the context of breast engorgement, suppression of NF-κB may help reduce the inflammatory cascade triggered by milk accumulation [19]. These findings support the mechanistic plausibility of cabbage leaf therapy as an anti-inflammatory intervention [16].

In addition to anti-inflammatory effects, cabbage-derived compounds also exhibit strong antioxidant activity [23, 26]. Oxidative stress is known to exacerbate inflammation by increasing the production of reactive oxygen species (ROS) [20, 23]. Antioxidants present in cabbage help neutralize ROS and reduce oxidative damage in tissues [26]. This contributes to the overall reduction of inflammatory responses and tissue injury [10, 20]. Therefore, the dual anti-inflammatory and antioxidant properties of cabbage enhance its therapeutic potential [17, 23].

Table 2. Characteristics of included studies.

Ref.	Study Design	Sample/Population	Intervention / Comparator	Key Findings
[3]	Systematic review (Cochrane)	Lactating women	Cabbage leaves and other interventions / Standard care	Cabbage leaves may reduce breast pain and discomfort, although evidence was limited by small samples and methodological heterogeneity.
[18]	RCT	Postpartum women	Chilled cabbage leaves / Gel packs	Both interventions reduced pain and breast hardness, with no significant between-group difference.
[15]	Clinical trial	Breastfeeding mothers	Cabbage leaves / Routine care	Reduced breast engorgement severity, pain, and breast firmness, particularly after repeated applications.
[27]	Controlled trial	Primiparous mothers	Cold cabbage compress / Standard care	Significantly reduced breast tension, pain, and discomfort compared with control.
[20]	RCT	Postpartum mothers	Cabbage leaves / Gel packs	Both interventions reduced pain and engorgement, with no significant difference between groups.
[16]	Quasi-experimental	Lactating mothers	Cabbage compress / No treatment	Significantly reduced pain intensity and breast swelling compared with control.
[5]	Meta-analysis	Multiple studies	Cabbage therapy / Various comparators	Showed a moderate effect on pain reduction, although heterogeneity remained high for swelling outcomes.
[21]	Clinical study	Postpartum women	Cold cabbage leaves / Control	Improved pain, breast tenderness, swelling, comfort, and satisfaction.
[25]	Experimental	Breastfeeding mothers	Cabbage leaves / Control	Reduced pain, edema, and breast firmness.
[17]	Experimental (mechanistic)	In vitro/in vivo	Sulforaphane / Control	Suppressed TNF-α, IL-6, IL-1β, and NF-κB signaling, supporting an anti-inflammatory mechanism.
[24]	Experimental (animal)	Rodent model	Isothiocyanates / Control	Reduced oxidative stress markers and inflammatory mediators.
[28]	Experimental (cell)	Macrophage cells	Flavonoids / LPS-induced inflammation	Reduced TNF-α and IL-1β production and inhibited inflammatory signaling pathways.
[23]	Experimental	Laboratory model	Plant flavonoids / Control	Demonstrated anti-inflammatory and antioxidant effects through reduced cytokine production and oxidative stress.
[14]	Not specified	Brassica plants	Glucosinolates / —	Glucosinolate-derived compounds contributed to anti-inflammatory activity through enzymatic and oxidative pathways.
[26]	Review	Brassica vegetables	Antioxidants / —	Reported antioxidant properties that may indirectly support anti-inflammatory effects.
[10]	Review	Brassica compounds	Polyphenols / —	Polyphenols were associated with regulation of oxidative stress and inflammatory mediators.
[22]	Review	Breastfeeding women	Pain-management strategies / —	Highlighted cabbage leaves as a non-pharmacological approach for breastfeeding-related pain.
[19]	Clinical review	Lactating women	Breast-care interventions / —	Described inflammatory processes in breast engorgement and the potential role of local cabbage-leaf therapy.

Despite these promising findings, several limitations must be acknowledged [3, 5]. The included studies show considerable heterogeneity in design, intervention protocols, and outcome measurements [20, 21]. Many studies rely on subjective pain scales without incorporating objective biomarkers of inflammation [15]. Additionally, variations in cabbage leaf preparation, including temperature and duration of application, may influence outcomes [18, 20]. These limitations reduce the comparability of results and highlight the need for standardized methodologies [3, 5].

Furthermore, much of the mechanistic evidence supporting the anti-inflammatory effects of cabbage is derived from in vitro and experimental studies [24]. The direct translation of these findings into clinical outcomes remains limited [10, 14]. Clinical studies rarely measure inflammatory biomarkers such as TNF-α or oxidative stress markers [21]. Future research should incorporate biomarker-based assessments to strengthen the link between clinical and molecular findings [10]. Such approaches would improve the overall quality and reliability of evidence [3, 5].

From a clinical perspective, cabbage leaf compresses represent a safe, practical, and non-invasive intervention for managing breast engorgement. Their ease of use and affordability make them suitable for widespread

implementation [16, 21]. They may serve as an effective first-line or adjunctive therapy alongside breastfeeding support and proper lactation [3, 22]. This is particularly relevant in settings with limited access to pharmacological treatments [5]. Therefore, cabbage leaf therapy holds practical value in improving maternal comfort and breastfeeding outcomes [20].

4. Conclusions

Generally, the evaluation of cabbage leaves (*Brassica oleracea*) in reducing breast engorgement demonstrates consistent therapeutic potential supported by both clinical and biochemical evidence. Several studies indicate that the application of cabbage leaves can effectively reduce pain, swelling, and discomfort in lactating women, with outcomes comparable to standard non-pharmacological interventions. The anti-inflammatory activity is largely attributed to bioactive compounds such as flavonoids, polyphenols, and glucosinolates, which contribute to the modulation of inflammatory pathways and local tissue response. In addition, cabbage leaves offer practical advantages including accessibility, low cost, and minimal side effects, making them a feasible option in both clinical and community settings. Despite these findings, variations in study design, intervention protocols, and outcome measurements highlight the need for further standardized and high-quality randomized controlled trials to strengthen the evidence base and optimize clinical application.

Author Contributions: Conceptualization, M.R.R. and G.P.; methodology, M.R.R. and F.S.I.; software, M.R.R.; validation, G.P., L.N., and F.S.I.; formal analysis, M.R.R.; investigation, M.R.R. and G.P.; resources, F.S.I.; data curation, M.R.R.; writing—original draft preparation, M.R.R.; writing—review and editing, G.P. and F.S.I.; visualization, G.P.; supervision, G.P. and F.S.I.; project administration, M.R.R.; funding acquisition, L.N. All authors have read and agreed to the published version of the manuscript.

Funding: This study does not receive external funding.

Ethical Clearance: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments: The authors would like to thank the Faculty of Medicine, Universitas Syiah Kuala, for providing academic support and resources that contributed to the completion of this study. Appreciation is also extended to all parties who provided valuable insights and constructive discussions during the research process.

Conflicts of Interest: All the authors declare no conflicts of interest.

References

1. Syahri, I. M., Laksono, A. D., Fitria, M., Rohmah, N., Masruroh, M., and Ipa, M. (2024). Exclusive Breastfeeding among Indonesian Working Mothers: Does Early Initiation of Breastfeeding Matter?, *BMC Public Health*, Vol. 24, No. 1, 1225. doi:10.1186/s12889-024-18619-2.
2. Huda, M. H., Chipojola, R., Lin, Y. M., Lee, G. T., Shyu, M.-L., and Kuo, S.-Y. (2022). The Influence of Breastfeeding Educational Interventions on Breast Engorgement and Exclusive Breastfeeding: A Systematic Review and Meta-Analysis, *Journal of Human Lactation*, Vol. 38, No. 1, 156–170. doi:10.1177/08903344211029279.
3. Mangesi, L., and Muzonzini, G. (2008). Treatments for Breast Engorgement during Lactation, L. Mangesi (Ed.), *Cochrane Database of Systematic Reviews*, John Wiley & Sons, Ltd, Chichester, UK. doi:10.1002/14651858.CD006946.
4. Mangesi, L., and Zakarija-Grkovic, I. (2016). Treatments for Breast Engorgement during Lactation, *Cochrane Database of Systematic Reviews*, No. 6, CD006946. doi:10.1002/14651858.CD006946.pub3.
5. Ozkaya, M., and Korukcu, O. (2023). Effect of Cold Cabbage Leaf Application on Breast Engorgement and Pain in the Postpartum Period: A Systematic Review and Meta-Analysis, *Health Care for Women International*, Vol. 44, No. 3, 328–344. doi:10.1080/07399332.2022.2090567.
6. Christena, P., Rani, V. E., Pushpa, S., and Banusri, J. (2024). Cold Cabbage Application and Postnatal Mothers' Perceptions of Breast Engorgement: A Mixed Method Study, *Bioinformation*, Vol. 20, No. 12, 2034–2039. doi:10.6026/9732063002002034.
7. Napisah, P., Widiasih, R., Maryati, I., Hermayanti, Y., and Natasya, W. (2021). The Effectiveness of Cabbage Leaf Compress and the Education of Lactation Management in Reducing Breast Engorgement in Postpartum, *Open Access Macedonian Journal of Medical Sciences*, Vol. 9, No. T6, 106–110. doi:10.3889/oamjms.2021.7318.
8. Kasanah, U., and Sari, D. E. M. (2026). Formulasi Dan Uji Parameter Fisik Krim Ekstrak Etanol Daun Kubis Alternatif Krim Herbal Anti Inflamasi Pada Ibu Menyusui, *Cendekia Journal of Pharmacy*, Vol. 10, No. 1, 57–69. doi:10.31596/cjp.v10i1.413.
9. Li, X., Wang, F., Ta, N., and Huang, J. (2025). The Compositions, Characteristics, Health Benefits and Applications of Anthocyanins in Brassica Crops, *Frontiers in Plant Science*, Vol. 16. doi:10.3389/fpls.2025.1544099.
10. Medrano-Padial, C., Medina, S., García-Viguera, C., and Domínguez-Perles, R. (2026). Bioaccessible Sulforaphane Attenuates Oxidative Stress-Driven Parainflammation in Intestinal Epithelial Cells, *Food & Function*, Vol. 17, No. 5, 2550–2559. doi:10.1039/D5FO03038B.
11. Wu, X., Huang, H., Childs, H., Wu, Y., Yu, L., and Pehrsson, P. R. (2021). Glucosinolates in Brassica Vegetables: Characterization and Factors That Influence Distribution, Content, and Intake, *Annual Review of Food Science and Technology*, Vol. 12, No. 1, 485–511. doi:10.1146/annurev-food-070620-025744.
12. Habtemariam, S. (2024). Anti-Inflammatory Therapeutic Mechanisms of Isothiocyanates: Insights from Sulforaphane, *Biomedicines*, Vol. 12, No. 6, 1169. doi:10.3390/biomedicines12061169.
13. Shao, D., Shen, W., Miao, Y., Gao, Z., Pan, M., Wei, Q., Yan, Z., Zhao, X., and Ma, B. (2023). Sulforaphane Prevents LPS-Induced Inflammation by Regulating the Nrf2-Mediated Autophagy Pathway in Goat Mammary Epithelial Cells and a Mouse Model of Mastitis, *Journal of Animal Science and Biotechnology*, Vol. 14, No. 1, 61. doi:10.1186/s40104-023-00858-9.
14. Gantait, A., Masih, S. A., Addesso, R., Maxton, A., and Sofo, A. (2024). Glucosinolates Mediated Regulation of Enzymatic Activity in Response to Oxidative Stress in Brassica Spp., *Plants*, Vol. 13, No. 23, 3422. doi:10.3390/plants13233422.

15. Je, H. G., Kim, J. W., Jung, S. H., and Lee, J. W. (2008). Minimally Invasive Surgical Release of Entrapped Mapping Catheter in the Mitral Valve, *Circulation Journal*, Vol. 72, No. 8, 1378–1380. doi:10.1253/circj.72.1378.

16. Wong, B. B., Chan, Y. H., Leow, M. Q. H., Lu, Y., Chong, Y. S., Koh, S. S. L., and He, H.-G. (2017). Application of Cabbage Leaves Compared to Gel Packs for Mothers with Breast Engorgement: Randomised Controlled Trial, *International Journal of Nursing Studies*, Vol. 76, 92–99. doi:10.1016/j.ijnurstu.2017.08.014.

17. Yunusoğlu, O., Koyuncu, E., and Kalfa, İ. (2025). Sulforaphane in the Therapeutic Targeting of CNS Disorders: Current Evidence and Perspectives, *Experimed*, Vol. 15, No. 3, 201–216. doi:10.26650/experimed.1721403.

18. Herman, L. A., and O'Neill, S. (1995). Breastfeeding after Radionuclide Administration, *Journal of Human Lactation*, Vol. 11, No. 3, 223–227. doi:10.1177/089033449501100328.

19. Alyamani, O. M. (2025). Mothers' and Healthcare Providers' Attitudes Towards the Use of Cabbage Leaves and Fenugreek in During Lactation: A Scope Review, *Haya: The Saudi Journal of Life Sciences*, Vol. 10, No. 9, 408–413. doi:10.36348/sjls.2025.v10i09.004.

20. Rofi'ah, S., Putri Rahayu, I., and Nikmawati, N. (2020). Kompres Kubis Dan Sirih Merah Efektif Menurunkan Derajat Pembengkakan Payudara Ibu Postpartum, *Jurnal Jendela Inovasi Daerah*, Vol. 3, No. 1, 1–15. doi:10.56354/jendelainovasi.v3i1.67.

21. Amirudin, S. H., Triwidiyantari, D., and Yulia, D. (2024). The Effect Of Cold Cabbage Leaf Compresses On Reducing Pain Intensity And Breast Swelling In Postpartum Mothers, *JKM (Jurnal Kebidanan Malahayati)*, Vol. 10, No. 8, 817–822. doi:10.33024/jkm.v10i8.16862.

22. Fonseca, M. L. A., Cossi, M. S., Dantas, A. C., Bezerra, H. de S., and Araújo, M. G. de. (2025). Strategies for Managing Pain Related to Breastfeeding: An Integrative Literature Review, *Revista de Pesquisa Cuidado é Fundamental Online*, Vol. 17, e13519. doi:10.9789/2175-5361.rpcfo.v17.13519.

23. Ahmed, S., Ahmed, N., Rungatscher, A., Linardi, D., Kulsoom, B., Innamorati, G., Meo, S. A., Gebrie, M. A., Mani, R., Merigo, F., Guzzo, F., and Faggian, G. (2020). Cocoa Flavonoids Reduce Inflammation and Oxidative Stress in a Myocardial Ischemia-Reperfusion Experimental Model, *Antioxidants*, Vol. 9, No. 2, 167. doi:10.3390/antiox9020167.

24. Zhao, J., Zhang, X., Li, F., Lei, X., Ge, L., Li, H., Zhao, N., and Ming, J. (2024). The Effects of Interventions with Glucosinolates and Their Metabolites in Cruciferous Vegetables on Inflammatory Bowel Disease: A Review, *Foods*, Vol. 13, No. 21, 3507. doi:10.3390/foods13213507.

25. Dewi, M. M., Kurniawati, E. Y., and Rochkmana, M. J. (2024). Cabbage Leaf Compress (Brassica Oleracea): A Natural Remedy for Reducing Breast Engorgement Pain in Postpartum, *Agribiohealth (Journal of Agriculture, Biology & Health Sciences)*, Vol. 1, No. 1, 6–10. doi:10.65318/agribiohealth.v1i1.2.

26. Rokayya, S., Li, C.-J., Zhao, Y., Li, Y., and Sun, C.-H. (2013). Cabbage (Brassica Oleracea L. Var. Capitata) Phytochemicals with Antioxidant and Anti-Inflammatory Potential, *Asian Pacific Journal of Cancer Prevention*, Vol. 14, No. 11, 6657–6662. doi:10.7314/apjcp.2013.14.11.6657.

27. Lim, A.-R., Song, J.-A., Hur, M.-H., Lee, M.-K., and Lee, M. S. (2015). Cabbage Compression Early Breast Care on Breast Engorgement in Primiparous Women after Cesarean Birth: A Controlled Clinical Trial, *International Journal of Clinical and Experimental Medicine*, Vol. 8, No. 11, 21335–21342.

28. Peng, Y., Hu, M., Lu, Q., Tian, Y., He, W., Chen, L., Wang, K., and Pan, S. (2019). Flavonoids Derived from Exocarpium Citri Grandis Inhibit LPS-Induced Inflammatory Response via Suppressing MAPK and NF-KB Signalling Pathways, *Food and Agricultural Immunology*, Vol. 30, No. 1, 564–580. doi:10.1080/09540105.2018.1550056.