

Physicochemical Quality of Coffee Soap Based on Variations in Soap Manufacturing Methods and Roasting Type

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Abstract

Background: The demand for natural, environmentally friendly, and sustainable cosmetic products continues to increase along with growing consumer awareness of the negative impacts of synthetic chemicals. Coffee is one of the natural ingredients with potential application in soap formulation, as it contains bioactive compounds beneficial for skin health.

Aims: This study aimed to analyze and compare the physicochemical quality of coffee soap based on variations in manufacturing methods (cold process and hot process) and type of coffee roasting (light, medium, and dark).

Methods: The research was conducted at the Laboratory of Mathematics and Natural Sciences, University of Bengkulu, and the Laboratory of the Faculty of Agricultural Technology, Gadjah Mada University, using a two-factor Completely Randomized Design (CRD). The quality parameters observed were moisture content, pH, free fatty acids, free alkali and caffeine. Data were analyzed using Two-Way ANOVA.

Result: soap making method and the type of coffee roasting had a significant effect on the quality of water content, pH, free fatty acids, and caffeine with a significance value ($p < 0.05$), but had no significant effect on the quality of free alkali ($p > 0.05$) that is 0.136.

Conclusion: The combination of the cold process and medium roasting level is recommended as it provides the best balance between the physical and chemical quality of coffee soap. This study contributes to the development of coffee soap as a high-quality and competitive natural cosmetic product.

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INTRODUCTION

Soap is one of the cosmetic products that remains essential and widely used to this da. Several types of health soaps are made from natural ingredients, one of which is coffee, known for its antioxidant properties ([Adrin et al., 2022](#)). Coffee is a natural ingredient with great potential for use in soap formulation because it contains various bioactive compounds such as caffeine, polyphenols, saponins, and chlorogenic acids ([Blanco-Llamero et al., 2024](#)). These compounds exhibit antioxidant and anti-inflammatory activities and serve as natural exfoliants that help remove dead skin cells, soften the skin, and maintain overall skin health ([Grigolon et al., 2023](#)).

Coffee has been reported to possess anti-aging, anticancer, and anti-cellulite properties ([Aher et al., 2023](#)). It is also claimed to help reduce dark spots or acne scars, brighten the skin, and improve its texture ([Rajendra et al., 2022](#)). The coffee granules in soap or skincare products act as exfoliators, while caffeine enhances local blood circulation, helping the skin appear firmer ([Ubaque et al., 2024](#)). In addition, the distinctive aroma of coffee serves as an added value that increases the appeal of the soap ([dos Santos et al., 2024](#)).

The bioactive quality of coffee is influenced by the roasting level. During the roasting process, both physical (color, mass, and volume) and chemical (formation of volatile compounds, degradation of chlorogenic acids, and changes in caffeine content) transformations occur, which affect the stability and antioxidant activity of coffee (Grzelczyk et al., 2022). Therefore, variations in roasting levels may influence the quality of coffee soap produced, particularly in terms of bioactive compound content and physicochemical characteristics (Machado et al., 2023).

Commonly used methods for solid soap production include the cold process, hot process, melt-and-pour, and rebatching. However, the melt-and-pour and rebatching methods are not original soap formulations but rather techniques for remelting and recasting pre-made soap (Uslu, 2025). Thus, the most widely used methods in industrial soap production are the cold and hot processes. The cold process generally retains more bioactive compounds because it involves minimal heating, though it requires a longer curing time (Jirarat et al., 2024). Conversely, the hot process allows the soap to be used more quickly, but high temperatures may reduce the stability of active compounds. Hence, the soap-making method plays a crucial role in determining the final product quality (Melliyanti et al., 2023). These variations affect the texture, color, stability, pH, hardness, foam formation, and bioactive compound retention of solid soap (Alcantara et al., 2025).

Based on these considerations, this study was conducted to compare the physicochemical quality of coffee soap produced using different soap-making methods (cold and hot process) in product from various coffee roasting levels (light, medium, and dark) that has not been done before.

METHOD

This study was carried out at the Laboratory of Universitas Pat Petulai, the Mathematics and Natural Sciences Laboratory of Universitas Bengkulu, and the Laboratory of the Faculty of Agricultural Technology at Universitas Gadjah Mada.

The equipment used in this study included a digital scale, rubber gloves, mask, face shield, measuring cup, hand blender, soap mold, spatula, spoon, basin, graduated cylinder, slow cooker, and cover cloth (Grassino et al., 2024). The materials used were Robusta coffee powder with three roasting levels (light, medium, and dark), olive oil, coconut oil, palm oil, sodium hydroxide (NaOH), and distilled water.

The samples used in this study were solid soaps with the addition of coffee powder. The research employed a Completely Randomized Design (CRD) with two factors: the soap-making method (cold and hot process) and the coffee roasting level (light, medium, and dark). The hypothesis to be tested concerns the differences in the physicochemical qualities of cold and hot coffee soaps, depending on the type of coffee roast used as raw material, using a factorial (2 x 3) experimental design. The soap-making method consisted of two factors: cold and hot processes, which were the first factor, and the second factor, coffee roasting type, which consisted of three levels (light, medium, and dark).

Table 1. Combination of Soap Making Method Treatment with Roasting Type

Soap Manufacturing Methods	Type of roasting		
	Light	Medium	Dark
Hot Process (H)	HL	HM	HD
Cold Proces (C)	CL	CM	CD

The first stage was the coffee roasting process. Before roasting, the roasting machine was prepared and preheated until the drum temperature reached 150°C. Then, 1 kg of green coffee beans was weighed and placed into the roasting machine. The beans were roasted to produce three roasting levels: light roast for 15 minutes, medium roast for 20 minutes, and dark roast for 25 minutes. Each roasting treatment was repeated three times for consistency.

The next stage was the production of natural coffee soap using the cold process method. The preparation involved 300 g of olive oil, 300 g of coconut oil, and 300 g of palm oil. Simultaneously, a NaOH (lye) solution was prepared by dissolving 131 g of NaOH in 342 g of distilled water, heated to a temperature of 70°C ± 5°C. The oils and lye solution were then mixed using a hand blender for 3 minutes until the mixture reached trace (a thickened consistency). After that, 20 g of coffee powder was added and stirred for 2 minutes. The soap mixture was poured into molds and allowed to solidify

for 24 hours. The solidified soap was not immediately tested but was cured for 7 weeks by air-drying in a well-ventilated area.

The hot process method followed similar preparation steps using 300 g of olive oil, 300 g of coconut oil, and 300 g of palm oil. At the same time, a NaOH solution was prepared from 131 g of NaOH and 342 g of distilled water, heated to $70^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The oils and lye were mixed using a hand blender for 3 minutes until the mixture thickened. Then, 20 g of coffee powder was added and stirred for 2 minutes. The mixture was heated in a slow cooker for 2 hours, poured into molds, and left to solidify for 24 hours. The hardened soap was then cured for 4 weeks by air-drying in a well-ventilated space. The differences between the cold process and hot process soap-making methods are illustrated in Figure 1.

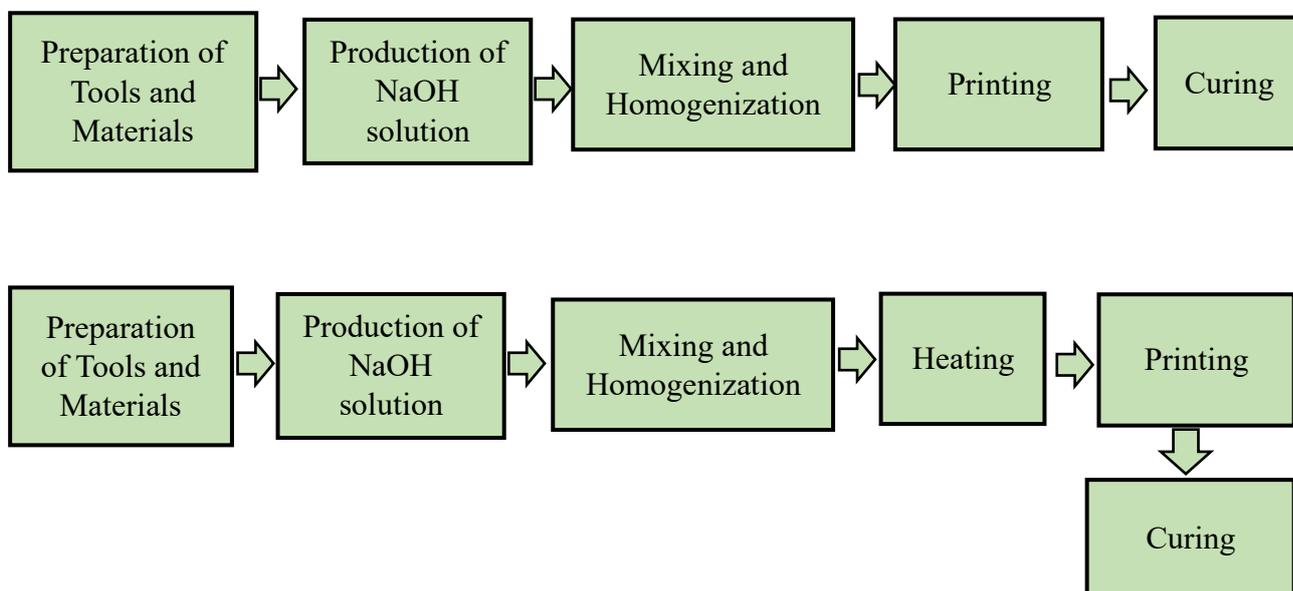


Figure 1. Flow diagram of the soap-making process using the cold process (top) and hot process (bottom).

The data from the physicochemical parameter tests were analyzed using the Two-Way ANOVA method with the assistance of SPSS software.

RESULTS AND DISCUSSION

Results

This study examined the physicochemical quality of coffee soap based on parameters including moisture content, pH, free fatty acids, free alkali, and caffeine content. The physicochemical data of the soap produced using hot and cold processes with light, medium, and dark roasting levels are presented in Table 1.

Table 2. Physicochemical Quality of Coffee Soap

Physicochemical	Coffee soap product					
	HL	HM	HD	CL	CM	CD
Moisture content (%)	14.61 ^{bc}	10.72 ^a	14.30 ^{bc}	13.07 ^b	15.04 ^c	13.15 ^b
pH	10.28 ^a	10.51 ^b	10.60 ^b	10.16 ^a	10.67 ^b	10.29 ^a
Free Fatty Acid (%)	1.22 ^d	0.66 ^a	0.76 ^b	1.02 ^c	1.01 ^c	0.79 ^b
Alkali Free (%)	0,25	0,26	0,34	0,37	0,36	0,39
Caffeine (%)	0.20 ^c	0.24 ^d	0.23 ^d	0.17 ^a	0.19 ^b	0.19 ^b

The results of the analysis using ANOVA showed that the interaction between the soap making method and the type of coffee roasting had a significant effect on the quality of moisture

content, pH, free fatty acids, and caffeine with a significance value ($p < 0.05$), but had no significant effect on the quality of free alkali ($p > 0.05$) that is 0.136.

Discussion :

The moisture content produced through the cold process and hot process methods still meets the quality requirements for solid soap. The moisture content of coffee soap ranged from 10.72% to 15.04%, indicating variations influenced by the manufacturing method and type of coffee roasting. The lowest moisture content was found in the HM treatment (10.72%), while the highest was found in the CM (15.04%). In general, the hot process method tends to produce lower moisture content than the cold process. This is because the hot process involves heating during the saponification process, which accelerates the reaction and increases water evaporation, resulting in a lower final water content in the soap. Conversely, in the cold process, the reaction occurs without intensive heating, so more water is retained in the soap matrix until the curing stage is complete. The duration and temperature of heating can also affect the water content of the soap. Heating that isn't long enough or at a low temperature will result in the water not evaporating completely (Wayan et al., 2019). Heat treatment caused greater water evaporation and more intensive drying/curing. According to (Nova et al., 2025), soaps produced by the hot process have a lower initial moisture content than those made using the cold process because heating accelerates evaporation. Similarly, during curing, water loss occurs as moisture gradually evaporates (Soni et al., 2024). Furthermore, the type of coffee roasting also contributes to variations in moisture content. Coffee with higher roast levels (medium-dark) generally experiences a decrease in water content during the roasting process due to water evaporation at high temperatures. However, when applied to soap formulations, the interaction between the chemical composition of the roasted coffee (e.g., fiber content, oils, and pore structure of the coffee grounds) and the manufacturing method can affect the soap's ability to bind or release water.

The pH value of coffee soap ranged from 10.16 to 10.67, indicating that all treatments were within the pH range of solid soap in general (pH 9–11). The highest pH values were found in the CM (10.67) and HD (10.60) treatments, while the lowest value was found in the CL (10.16) treatments. These differences may be related to mixing temperature or curing conditions that affect residual base–acid reactions. This is in accordance with the explanation in the book *Scientific Soapmaking* which states that temperature and reaction kinetics greatly influence the perfection of saponification and the pH stability of soap. The variation in pH between hot-process and cold-process coffee soaps is believed to be influenced by mixing temperature and curing temperature, which affect the rate of saponification and residual reactions between alkali and fatty acids. In the hot process, higher temperatures (70–90 °C) accelerate saponification, allowing free alkali (NaOH) to react more quickly to form soap, resulting in more stable pH values. Conversely, in the cold process, the reaction proceeds more slowly and continues during curing, leading to a gradual decrease in pH as free alkali is reduced and ionized fatty acids form. This phenomenon is consistent with the findings that higher processing temperatures accelerate the reduction of free alkali and promote faster pH stabilization in soap.

Free fatty acid (FFA) levels in coffee are influenced by the intensity of heat treatment during the Free Fatty Acid (FFA) content of coffee soap ranges from 0.66% to 1.22%. The highest value was found in the HL treatment (1.22%), while the lowest was found in the HM treatment (0.66%). In the hot process, heating accelerates the reaction kinetics, resulting in a faster and more complete conversion of triglycerides into soap and glycerol. This generally results in a lower FFA content because fewer fatty acids remain unreacted. Conversely, in the cold process, the reaction is slower and highly dependent on the curing stage. If the curing process is not optimal or there is an imbalance in the alkali ratio, some fatty acids may remain in free form, increasing the FFA value. This difference in values indicates that the soap-making method (hot and cold process) and the type of coffee roasting (light, medium, dark) influence the amount of free fatty acids remaining in the final product. Table 2 show that The difference in free fatty acid levels in soap is due to the saponification reaction. Saponification is a thermal reaction that is influenced by temperature and time. Higher temperatures (such as in the hot process) accelerate the reaction process between fatty acids/triglycerides and alkali bases so that there are fewer free/unsaponified fatty acids left in the final product. The

decrease in FFA levels with increasing roasting level indicates that heat treatment plays a role in suppressing the presence of free fatty acids through thermal degradation, oxidation, or the involvement of fatty acids in further thermal reactions. The soap-making method affects the free fatty acid content. The hot process method produces lower FFA levels than the cold process due to the saponification reaction, which occurs more quickly and more completely at high temperatures. Heating accelerates the conversion of free fatty acids into more stable compounds, thus minimizing FFA residue. Conversely, processes at lower temperatures, such as the cold process, occur more slowly and potentially leave higher levels of FFA. Previous literature shows that in the cold saponification process, the amount of unsaponified fatty acids in soap can remain high because the saponification reaction takes place at a low temperature and is less 'complete', while increasing the temperature in the hot process accelerates the saponification reaction so that the potential for remaining free fatty acids (FFA) can be lower in the final product. The use of the hot process method is more recommended to produce products with lower FFA content and better stability.

The free alkali content of coffee soap is in the range of 0.25%–0.39%. The lowest value was found in the HL treatment (0.25%), while the highest value was in the CD treatment (0.39%). Ideally, free alkali should remain minimal to ensure the soap is safe for skin application. Variations in free alkali content are influenced by the processing method used. In hot processes, free alkali content tends to be lower than in cold processes. This is because the saponification reaction occurs more quickly and completely at high temperatures, allowing the alkali to react more optimally with the fatty acids to form soap and glycerol. Heating also increases diffusion and homogeneity of the reaction, minimizing residual unreacted alkali. Conversely, in cold processes, the saponification reaction occurs at low temperatures and requires a relatively long curing time. This condition has the potential to cause reaction imperfections in the initial stages, especially if the mixing is not homogeneous or the alkali-to-oil ratio is incorrectly calculated. As a result, free alkali may still remain in the final product, especially before the curing process is complete. The higher the concentration of NaOH (alkali) in cold process soap, the higher the free alkali content measured in the product. This indicates that the reaction is not fully completed if the alkali-to-oil ratio is not adjusted correctly in the low-temperature process. The saponification reaction occurs more slowly in the cold process so that NaOH can react longer/leave alkali residue on the initial surface of the soap. Analyzed the kinetics of the saponification reaction between oil and NaOH (alkali) and showed that parameters such as NaOH concentration and reaction time affect the free alkali content of soap, this strengthens the concept that the saponification reaction requires the right time and conditions to reduce the free alkali residue.

The caffeine content of coffee soap ranges from 0.17% to 0.24%. The highest value was found in the HM treatment (0.24%), while the lowest value was found in the CL treatment (0.17%). Differences in superscript letters in Table 2 indicate significant differences ($p < 0.05$) between treatments, thus concluding that the soap-making method and coffee roasting type significantly influence the caffeine content in coffee soap. A consistent trend was observed in which the hot process retained slightly more caffeine than the cold process. Explained that although their research was not on soap, heating could enhance extraction efficiency or preserve caffeine content at relatively higher levels compared to cooler conditions. The roast level of coffee affects the caffeine content of coffee soap through changes in the cell structure of the bean, the thermal stability of caffeine, and the interaction of caffeine with the coffee matrix, which ultimately determines the amount of caffeine available and extracted into the soap product. The difference in coffee soap making methods affects the caffeine content because the temperature and reaction dynamics in the hot process increase the diffusion, extraction, and homogeneity of caffeine in the soap matrix, while in the cold process the release and distribution of caffeine is slower and is highly dependent on the curing process. Research shows that the higher the extraction temperature, the more caffeine is successfully extracted from coffee due to the increased solubility and diffusion of active compounds such as caffeine at higher temperatures ([Cordoba et al., 2019](#)). The hot process method, which involves heating, allows for optimal release of caffeine from the coffee matrix into the soap phase, resulting in slightly higher values compared to the cold process ([Kim, 2025](#)). Thus, variations in caffeine content in coffee soap are influenced by a combination of the thermal stability of caffeine and changes in the material's structure due to the degree of roasting and the conditions of the saponification process. Caffeine is relatively heat-resistant compared to other components, so it is likely to remain present after

roasting and even after additional heating (hot processing), as long as the temperature does not significantly exceed its degradation threshold ([Ali et al., 2025](#)).

Implications :

The findings of this study indicate that the combination of soap-making method and coffee roasting level is a key factor in determining the physicochemical characteristics of coffee soap. Practically, these results provide a scientific basis for natural cosmetic manufacturers to optimize production processes in order to obtain products with stable moisture content, appropriate pH, and preserved bioactive compounds. Furthermore, the evidence regarding the influence of roasting level on caffeine content and soap stability can support the development of functional products, such as exfoliating soaps or soaps with enhanced antioxidant potential.

Research contribution :

This study contributes to the scientific literature by providing a comprehensive analysis of the interaction between saponification methods (cold and hot processes) and coffee roasting levels on the physicochemical quality of solid soap. It enriches existing knowledge on the utilization of coffee as an active cosmetic ingredient by demonstrating how processing variables influence key quality parameters. Additionally, the study offers a formulation reference that can support the development of more standardized and competitive coffee-based natural soap products.

Limitations :

This study has several limitations. First, the analysis was limited to physicochemical parameters and did not include biological activity assessments such as antioxidant or antibacterial tests, which are important to evaluate the functional performance of coffee soap. Second, only one coffee variety (Robusta) was used, limiting the generalizability of the findings to other coffee types. Third, long-term storage stability and dermatological safety evaluations were not conducted, so the product performance under real usage conditions requires further investigation.

Suggestions :

Future research is recommended to evaluate the biological activities of coffee soap, including antioxidant, antibacterial, and skin irritation tests, to strengthen functional claims. Further studies may also explore different coffee varieties, coffee powder concentrations, and combinations with other natural active ingredients to enhance product quality and added value. In addition, storage stability testing and consumer preference analysis are suggested to support the commercialization potential of coffee-based natural soap products.

CONCLUSION

The interaction between the soap-making method and coffee roasting level significantly affected the physicochemical characteristics of coffee soap, particularly moisture content, pH, free fatty acids (FFA), and caffeine content ($p < 0.05$). However, no significant effect was observed on free alkali content ($p > 0.05$; $p = 0.136$). The hot process generally produced soap with lower moisture content and lower FFA levels due to accelerated and more complete saponification reactions at higher temperatures. Meanwhile, the cold process tended to retain higher moisture and slightly higher FFA values, influenced by slower reaction kinetics and dependence on curing time. Variations in roasting level also contributed to differences in physicochemical properties, especially caffeine content, where medium roasting combined with the hot process showed the highest caffeine retention. Overall, the combination of the cold process and medium roasting level provided a balanced physicochemical profile, meeting general solid soap quality standards and demonstrating potential for the development of value-added natural cosmetic products based on coffee.

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AUTHOR CONTRIBUTION STATEMENT

SW conducted the experiments and collected the data. FY conceived and designed the study, interpreted the results, and contributed to the drafting and revision of the manuscript. UA served as the proofreader, ensuring clarity, consistency, and linguistic accuracy throughout the final manuscript.

REFERENCES

- Adrin, P., Dewi, R., Ginting, Z., Saponifikasi, R., & Organik, S. B. (2022). *Pemanfaatan Ampas Bubuk Kopi Sebagai Scrub Alami Dalam Pembuatan Sabun Batang Organik*. 5(Desember), 1–13. <https://doi.org/10.29103/Cejs.V2i5.5962>
- Aher, S. B., Shinde, P. S., Bhor, S. B., Ovhal, A. K., Kute, S. B., Kardile, G. N., Bafana, Y., St, A. B., & Ct, R. A. (2023). *Formulation And Evaluation Of Coffee Soap With Antioxidant*. 12(08), 2480–2485. <https://doi.org/10.24327/Ijcar.2023.2485.1544>
- Alcantara, G. M. R. N., Martins, L. C., Gomes, W. P. C., Dresch, D., Rocha, F. R. P., & Melchert, W. R. (2025). Effect Of Roasting On Chemical Composition Of Coffee. *Food Chemistry*, 477, 143169. <https://doi.org/10.1016/j.foodchem.2025.143169>
- Ali, M., Yousef, M., Khalil, M., Ruan, Z., Salama, M. A., Rizk, A., Kamel, R. M., Alquh, H., Abdelkarim, D. O., & Younis, M. (2025). Modulating Bioactive Compounds And Antioxidant Potential In Coffee Beans: Impact Of Roasting On Amino Acids, Phenolics, Proteins, And Caffeine. *International Journal Of Food Science And Technology*, 60(2), Vvaf189. <https://doi.org/10.1093/ijfood/vvaf189>
- Blanco-Llamero, C., Macário, H. F., Guedes, B. N., Fathi, F., Oliveira, M. B. P. P., & Souto, E. B. (2024). Bioactives In Nutricosmetics: A Focus On Caffeine From Tea To Coffee. In *Cosmetics* (Vol. 11, Issue 5, P. 149). <https://doi.org/10.3390/cosmetics11050149>
- Cordoba, N., Pataquiva, L., Osorio, C., Leonardo, F., Moreno, M., & Ruiz, R. Y. (2019). Effect Of Grinding , Extraction Time And Type Of Coffee On The Physicochemical And Flavour Characteristics Of Cold Brew Coffee. *Scientific Reports*, December 2018, 1–13. <https://doi.org/10.1038/s41598-019-44886-w>
- Dos Santos, É. M., De Macedo, L. M., Ataide, J. A., Delafiori, J., De Oliveira Guarnieri, J. P., Rosa, P. C. P., Ruiz, A. L. T. G., Lancellotti, M., Jozala, A. F., Catharino, R. R., Camargo, G. A., Paiva-Santos, A. C., & Mazzola, P. G. (2024). Antioxidant, Antimicrobial And Healing Properties Of An Extract From Coffee Pulp For The Development Of A Phytocosmetic. *Scientific Reports*, 14(1), 4453. <https://doi.org/10.1038/s41598-024-54797-0>
- Grassino, A. N., Jerković, I., Pedisić, S., & Dent, M. (2024). Hydrodistillation Fractions Of Coffee (Green And Roasted) And Coffee By-Product (Silver Skin And Spent Grounds) As A Source Of Bioactive Compounds. *Sustainable Chemistry And Pharmacy*, 39, 101592. <https://doi.org/10.1016/j.scp.2024.101592>
- Grigolon, G., Nowak, K., Poigny, S., Hubert, J., Kotland, A., Waldschütz, L., & Wandrey, F. (2023). From Coffee Waste To Active Ingredient For Cosmetic Applications. In *International Journal Of Molecular Sciences* (Vol. 24, Issue 10, P. 8516). <https://doi.org/10.3390/ijms24108516>
- Grzelczyk, J., Fiurasek, P., Kakkar, A., & Budryn, G. (2022). Evaluation Of The Thermal Stability Of Bioactive Compounds In Coffee Beans And Their Fractions Modified In The Roasting Process. *Food Chemistry*, 387, 132888. <https://doi.org/10.1016/j.foodchem.2022.132888>
- Jirarat, W., Kaewsalud, T., Yakul, K., Rachtanapun, P., & Chaiyaso, T. (2024). Sustainable Valorization Of Coffee Silverskin: Extraction Of Phenolic Compounds And Proteins For Enzymatic Production Of Bioactive Peptides. In *Foods* (Vol. 13, Issue 8, P. 1230). <https://doi.org/10.3390/foods13081230>

- Kim, D. H. (2025). *A Study On The Possibility Of Chatgpt Application For Optimal Coffee Bean Roast Process Development To Focus On The Best Customer Flavor*. 12(3), 1–33. <https://doi.org/10.17148/IARJSET.2025.12301A>
- Machado, M., Espírito Santo, L., Machado, S., Lobo, J. C., Costa, A. S. G., Oliveira, M. B. P. P., Ferreira, H., & Alves, R. C. (2023). Bioactive Potential And Chemical Composition Of Coffee By-Products: From Pulp To Silverskin. *Foods (Basel, Switzerland)*, 12(12). <https://doi.org/10.3390/Foods12122354>
- Mellyanti, S. N., Afandi, F. A., Giriwono, P. E., & Herawati, D. (2023). A Meta Analysis: The Effects Of Types, Roasting Degrees And Origins On Antioxidant Properties Of Coffee. *International Journal Of Food Science And Technology*, 58(6), 2857–2865. <https://doi.org/10.1111/Ijfs.16431>
- Nova, J. F., Smrity, S. Z., Hasan, M., Tariquzzaman, M., Hossain, M. A. A., Islam, M. T., Islam, M. R., Akter, S., Rahi, M. S., Joy, M. T. R., & Kowser, Z. (2025). Comprehensive Evaluation Of Physico-Chemical, Antioxidant, And Antimicrobial Properties In Commercial Soaps: A Study On Bar Soaps And Liquid Hand Wash. *Heliyon*, 11(4), E41614. <https://doi.org/10.1016/J.Heliyon.2024.E41614>
- Rajendra, J. N., Ravindra, J. D., Pramod, J. R., & Patil, S. (2022). *Formulation And Evaluation Of Transparent Skin Brightening C Offee Soap*. 7(3), 669–680. <https://doi.org/10.35629/7781-0703669680>
- Soni, H., Bhattu, M., Verma, M., Kaur, M., Al-Kahtani, A. A., Hussain, I., Nath, A., & Ubaidullah, M. (2024). Journal Of King Saud University - Science From Kitchen To Cosmetics: Study On The Physicochemical And Antioxidant Properties Of Waste Cooking Oil-Derived Soap. *Journal Of King Saud University - Science*, 36(10), 103483. <https://doi.org/10.1016/J.Jksus.2024.103483>
- Ubaque, L. V. R., Mejía, P. T. F., Rojas, C. Y. B., Duran, D. S. Q., & Moreno, A. A. (2024). *Visi Ó N Electr Ó Nica Handmade Coffee Soap Jabón Artesanal De Café*. 18(1), 156–166. <https://doi.org/10.14483/22484728.21671>
- Uslu, N. (2025). Editorial: Coffee And Coffee By-Products: Innovative Approaches Fostering Nutritional, Sensory And Chemical Quality. *Frontiers In Nutrition, Volume 11-2024*. <https://doi.org/10.3389/Fnut.2024.1542109>
- Wayan, N., Kartika, T., Putra, G. P. G., Wrasati, L. P., Pertanian, F. T., Udayana, U., & Bukit, K. (2019). *Pengaruh Suhu Pemanasan Dan Konsentrasi Carbopol Terhadap Karakteristik Sabun Cair Cuci Tangan*. 7(3), 429–440. <https://doi.org/10.24843/JRMA.2019.V07.I03.P10>