Review

Utilization of date fruit as a source of natural sweetener: a potential sugar substitute in food products

Livya Destiny Putri

Faculty of Agricultural Technology, Hasanuddin University, Makassar 90245, Indonesia

Abstract

The escalating prevalence of non-communicable diseases linked to excessive sugar consumption necessitates the adoption of healthier, natural sweeteners. Date fruit (*Phoenix dactylifera* L.) presents a significant innovation as a nutrient-dense alternative due to its rich concentration of intrinsic sugars, fiber, and bioactive compounds. This review aims to evaluate recent advancements in date-derived sweeteners, specifically focusing on the physicochemical transformations and nutritional outcomes of sugar substitution across various food matrices. The methodology involved a systematic literature search in Google Scholar and Scopus for peer-reviewed articles published until July 2025, utilizing targeted keywords and specific inclusion criteria regarding extraction processes and applications. Results indicate that dates possess a sugar concentration of 50%–80% on a dry matter basis with a low glycemic index (GI) of 43.7, which is significantly lower than refined sucrose. Application data shows that while date puree effectively modulates blood glucose in calorie-dense products like ice cream, date extracts improve viscosity and facilitate mineral delivery in dairy and beverage formulations. Consequently, the efficacy of the substitution is fundamentally governed by the processing form puree versus extract and the specific requirements of the food matrix. In conclusion, dates serve as a potent functional substitute for refined sucrose, bridging the gap between sensory appeal and metabolic health while supporting sustainable food processing through the valorization of by-products.

Article History
Received October 15, 2025
Accepted December 3, 2025
Published December 12, 2025

Keywords
Phoenix dactylifera,
Sugar Substitute,
Glicemic Index.

1. Introduction

The escalating prevalence of non-communicable diseases linked to excessive sugar consumption poses a formidable challenge to global public health. High sugar intake is a primary driver in the pathogenesis of obesity, type 2 diabetes mellitus (T2DM), and cardiovascular disease (1). These added sugars are predominantly derived from ultra-processed products including soft drinks, fast food, and calorie-dense, nutrient-poor snacks which induce postprandial glucose spikes, trigger insulin resistance, and exacerbate metabolic risks. Furthermore, unutilized glucose is sequestered as adipose tissue; its accumulation around visceral organs contributes to hypertension, chronic inflammation, and atherosclerosis. In the Indonesian context, the 2018 Ministry of Health report highlighted that the highest prevalence of diabetes mellitus among individuals aged ≥15 years in Sulawesi occurred in Central Sulawesi (3.7%), North Sulawesi (3.6%), and South Sulawesi (3.4%). Within the latter, the highest rates were concentrated in Pinrang Regency (2.8%), Makassar (2.5%), North Toraja (2.3%), and Palopo (2.1%). Epidemiological data further indicate significant demographic disparities, with higher prevalence observed among women and urban residents. Notably, 2021 records from the Andalas Community Health Center in Makassar

* Correspondence : **Lyvya Destiny Putri** livyabittikaka@gmail.com

documented 508 patient visits, with 113 cases diagnosed in June alone (2). Consequently, global health authorities and governments have intensified initiatives to promote the adoption of healthier sweeteners as viable sugar substitutes.

The incorporation of dates as a natural sweetening agent constitutes a significant innovation that aligns with the increasing consumer demand for natural, nutrient-dense, and low-glycemic dietary alternatives. Dates are characterized by a substantial concentration of intrinsic sugars namely glucose, fructose, and sucrose which impart a favorable sensory profile while conferring essential bioactive compounds, including dietary fiber, vitamins, minerals, and antioxidants (3). Replacing refined sucrose with dates in food formulations yields two primary advantages: it maintains high organoleptic acceptance and substantially augments the nutritional density of the final product (4). Moreover, dates exhibit a lower glycemic index (GI) compared to refined sugar, thereby serving as a more physiological alternative for individuals predisposed to diabetes or those seeking to regulate blood glucose homeostasis.

Within the food industry, dates are processed into various derivatives, including date paste, syrup, and crystalline sugar. These versatile sweeteners are increasingly incorporated into a broad spectrum of products, ranging from bakery goods and confectionery to beverages, snacks, and sauces. Beyond their sweetening properties, the intrinsic dietary fiber in dates attenuates glucose absorption, prolongs satiety, and promotes gastrointestinal health (5). Consequently, the utilization of dates as a natural sweetener aligns with rising market demand for low-sugar alternatives that maintain high palatability and nutritional density. Dates impart a distinct, rich flavor profile, thereby enhancing sensory appeal without necessitating refined sugar additives. This shift has catalyzed industry innovation, positioning dates as a functional ingredient in various formulations, such as functional chocolates, granolas, and herbal infusions (6).

Although the nutritional benefits of *Phoenix dactylifera* (dates) as a raw material are well-documented, a significant empirical gap persists regarding the quantitative sugar profiles of diverse food matrices following date-based reformulation. While existing literature such as Irmawati et al. (2023) highlights that date-derived sugars possess distinct metabolic properties facilitating rapid absorption (7), and Sabil et al. (2023) established that these fruits predominantly comprise reducing sugars (20%–70% dry mass), there remains a scarcity of rigorous, post-formulation analytical data and standardized sensory evaluation metrics (8). Furthermore, although Safitri and Us (2023) identified that glucose concentrations increase in tandem with fruit maturity, the resulting glycemic impact on specific processed food products remains insufficiently synthesized (9). To address these limitations, the present review evaluates recent advancements in date-derived sweeteners, specifically focusing on the physicochemical transformations and nutritional outcomes of sugar substitution. By critically analyzing sugar content and metabolic implications across various product categories, this review aims to establish a comprehensive framework for the development of low-glycemic, nutrient-dense functional foods that align with both global health initiatives and regional dietary requirements.

2. Materials and Methods

The search for articles (original research and review papers) was performed using the Google Scholar and Scopus electronic databases for literature published until July 2025. To ensure a comprehensive overview of the subject, the search strategy utilized specific

keywords and Boolean operators. The primary keywords used were: “Date fruit as a natural sweetener”, “*Phoenix dactylifera* sugar substitute”, “Date syrup extraction and characterization”, “Functional properties of date-based sweeteners”, “Application of date fruit in food products”. Articles were initially screened by title and abstract. Inclusion criteria focused on peer-reviewed studies discussing the extraction processes, nutritional profiles, and the impact of date fruit substitution on the sensory and physicochemical properties of food matrices. All included references were manually selected and reviewed by the authors to ensure scientific rigor and relevance to the study’s objectives.

3. Results and Discussion

3.1. Dates (Phoenix dactylifera)

The fruit of the date palm (*Phoenix dactylifera*) is indigenous to arid and semi-arid regions, particularly across the Middle East and North Africa, with a cultivation history spanning over six millennia. Characterized as a nutrient-dense food source, dates contain a high concentration of intrinsic sugars primarily glucose, fructose, and sucrose which facilitate rapid energy replenishment (10). On a 100 g basis, the nutritional profile of dates comprises approximately 88.78 g of carbohydrates, 7.1 g of dietary fiber, 2.81 g of protein, 35 mg of calcium, 1.02 mg of iron, and 0.4 g of vitamin C (11). The taxonomic classification of P. dactylifera is as follows:

Kingdom : Plantae
Sub-kingdom : Tracheobionta
Phylum : Magnoliophyta
Sub-phylum : Spermatophyta
Class : Liliopsida
Sub-class : Arecidae
Order : Arecales
Family : Arecaceae
Genus : Phoenix
Spesies : *Phoenix dactylifera* L.

The date palm (Phoenix dactylifera) is a dioecious monocotyledon, characterized by the presence of unisexual reproductive organs on distinct male and female individuals. This species is renowned for its remarkable longevity, with documented lifespans potentially reaching 5,000 years. Furthermore, specific cultivars exhibit significant physiological resilience in xeric environments, rendering them highly adaptable to extreme arid and hyper-arid conditions. The morphological characteristics of the date palm are illustrated in Figure 1.

Figure 1. Dates palm (12).

Morphologically, the fruit of the date palm (*Phoenix dactylifera*) comprises three distinct anatomical layers: the endocarp, the mesocarp, and the exocarp (the outer skin, collectively forming the pericarp). The reproductive structures are characterized by pale yellow flowers that emerge from the leaf axils, featuring fused sepals, three carpels, and three petals. The fruit is classified as a drupe containing a single lignified seed. Propagation is typically achieved through in vitro tissue culture or sexual reproduction via seeds, with the latter facilitating significant genotypic diversity. Dates are prized for their soft texture and high palatability, and they are commercially available in both fresh and dehydrated forms (12).

From a biochemical perspective, the fruit pulp contains approximately 70% intrinsic sugars predominantly glucose, sucrose, and fructose which serve as a rapid energy substrate. Additionally, dates provide dietary fibre, essential proteins, and a negligible lipid fraction. The micronutrient profile is exceptionally dense, encompassing vitamins such as riboflavin, thiamine, biotin, folate, and ascorbic acid, which support metabolic homeostasis. The mineral composition is similarly robust, including high concentrations of iron, calcium, magnesium, and potassium, among others. Notably, a 100 g serving can fulfil up to 15% of the Recommended Dietary Allowance (RDA) for selenium, copper, potassium, and magnesium, underscoring the fruit's status as a potent functional food for promoting systemic health (13).

3.2. Natural sweetener potential of dates

Phoenix dactylifera (dates) possess significant potential as a primary natural sweetening agent within the modern food industry. The saccharide profile of dates predominantly comprising glucose, fructose, and sucrose can reach concentrations of 50%–80% on a dry matter basis, rendering them an exceptionally potent alternative to refined sweeteners. These saccharides exhibit high bioavailability, facilitating rapid systemic absorption and immediate metabolic energy mobilization (14). Beyond their caloric density, dates are enriched with dietary fiber, B-complex vitamins, and essential minerals including potassium, magnesium, and iron alongside bioactive phytochemicals such as polyphenols, which confer substantial health-promoting properties. This nutritional synergy enables dates to function not merely as flavor enhancers but as functional ingredients that significantly augment the nutritional density of processed food formulations (15). The chemical structures of the predominant bioactive compounds identified in dates are illustrated in Figure 2.

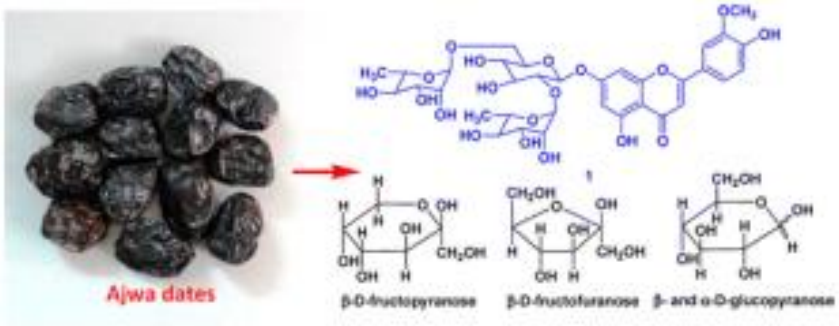

Figure 2. Chemical structure of bioactive compounds in dates (13).

The integration of *Phoenix dactylifera* (dates) as a functional substitute for refined sucrose or non-nutritive sweeteners offers multifaceted physiological and environmental advantages. Owing to a lower glycemic index (GI) relative to conventional sugars, the dietary

inclusion of dates may mitigate the incidence of metabolic dysregulation, including obesity and type 2 diabetes mellitus. Furthermore, the intrinsic dietary fiber content attenuates glucose absorption into the systemic circulation, thereby promoting postprandial glycemic stability. This shift toward date-derived sweetening agents aligns with the burgeoning consumer demand for clean-label, minimally processed, and sustainable dietary alternatives (16). Contingent upon the target formulation, dates are incorporated as extracts, pastes, or other derivatives across various food matrices ranging from bakery and confectionery products to dairy, beverages, and infant nutrition. Empirical evidence indicates that date inclusion not only elevates sweetness but also imparts a distinctive aromatic profile that ensures high consumer acceptability without compromising the textural or organoleptic integrity of the matrix. Moreover, replacing refined sugar with dates reduces the dependency on industrial sucrose production, which is characterized by a substantial ecological footprint. Notably, the valorisation of date by-products specifically the conversion of seeds into functional flours or livestock feed optimizes resource-use efficiency and facilitates a circular economy within the food processing sector (4).

3.3. Extraction process

Maceration constitutes a primary technique for the extraction of date palm derivatives, involving the immersion of comminated biomass in a solvent at ambient temperatures for a defined duration. This isothermal approach facilitates the leaching of soluble constituents specifically saccharides, flavonoids, and polyphenols while bypassing the deleterious effects of excessive thermal treatment. Consequently, maceration preserves thermolabile bioactive compounds, such as vitamins, which are prone to degradation at elevated temperatures. Ethanol (96% v/v) is frequently utilized as the menstruum due to its intermediate polarity, which effectively solubilizes a broad spectrum of semi-polar to polar compounds while maintaining safety standards for food-grade applications. Following the extraction period, the resultant mixture is clarified via filtration to isolate the solute-rich supernatant from the solid residues. To enhance the nutrient density, the extract is concentrated through low-temperature evaporation typically utilizing a water bath for approximately 10 days to yield a high-viscosity concentrate. Ethanol is particularly advantageous in this context due to its volatility, low boiling point, and inherent antimicrobial properties at concentrations exceeding 20%. In the study by Liandhajani and Ratih (2024), this methodology yielded 254.47 g of concentrated date extract, providing a robust, natural sweetening agent for diverse food formulations (17).

3.4. Date fruit applications in food systems

Qomariah and Juwita (2024) indicate that the sweetness intensity of dates (Phoenix dactylifera) exceeds that of both sucrose (granulated sugar) and honey (14). Despite this high total saccharide concentration, the glycemic index (GI) of dates remains significantly lower than that of refined sugar (Table 1). This superior palatability is attributed to an intrinsic sugar profile comprising fructose, glucose, and sucrose, which confers a complex and distinctive organoleptic character. Consequently, dates are increasingly utilized as a functional alternative to synthetic sweeteners across a broad spectrum of food and beverage matrices, including juices, dairy products, and infusions. Crucially, the physiological advantage of dates extends beyond their sensory appeal; unlike the acute postprandial glycemic excursions induced by refined sugar, dates facilitate a more gradual release of glucose into the systemic

circulation (18). This metabolic stability is particularly beneficial for individuals with diabetes mellitus or those predisposed to metabolic syndrome. Furthermore, this mechanism supports sustained energy homeostasis and mitigates the fatigue typically associated with rapid glycemic fluctuations. Ultimately, the synergistic combination of high palatability, favorable metabolic outcomes, and comprehensive nutritional density positions dates as a superior alternative to conventional sweeteners for reducing refined sugar dependency without compromising sensory quality.

Table 1. Comparison of the Glycemic Index of Dates with Other Sweeteners

Sweetener	Glycemic Index
Dates	43.7 (Low) (19)
Sugar	58 (High) (20)
Honey	25 (Low) (20)

The application of dates fruit as sweetener are shown in the Table 2. A primary finding is the distinct metabolic outcome associated with the use of date puree compared to extracts. In ice cream formulations, the incorporation of date puree contributes to the modulation of blood glucose through a low glycemic index, despite the inherent sugar concentration typical of frozen desserts (21). This benefit is scientifically attributed to the retention of the whole-fruit matrix in puree form, which preserves dietary fibers and complex polyphenols. These components effectively slow gastric emptying and retard glucose absorption, a physiological advantage that might be diminished if a refined extract were used instead.

Table 2. Application of Dates as A Sweetener in Various Food Products

Product Category	Date Application	Sugar Content	Nutritional and Functional Benefits	Ref.
Ice Cream	Date Puree	28.05 %	Modulates blood glucose via low glycemic index	(21)
Fruitghurt Beverage	Date Extract	40 %	Improves organoleptic quality, viscosity, syneresis, and protein content.	(22)
Callistemon Leaf Herbal Tea (*Melaleuca viminalis*)	Date Extract	3.92 %	Supports gastrointestinal health through fiber and phytochemical synergy	(4)
Fruit Juice	Date Extract	±20.00 %	Mitigates anemia by facilitating iron-mediated hemoglobin synthesis.	(23)
Pasteurized Cow's Milk	Date Extract	9.6 %	Enhances sensory acceptance and serves as a natural sucrose substitute	(24)

Conversely, the use of date extract in herbal tea and fruit juice highlights a different functional trajectory. In the context of Callistemon leaf herbal tea, the extract provides a synergistic effect with the tea's phytochemicals to support gastrointestinal health. This suggests that the soluble fibers and bioactive compounds within the extract are sufficient to yield therapeutic outcomes even at minimal inclusion levels. Similarly, the application in fruit juice facilitates iron-mediated hemoglobin synthesis to mitigate anemia, likely due to the presence of bioavailable iron and ascorbic acid within the extract that enhances mineral

absorption (4). The wide variation in sugar content across the categories ranging from the high levels found in fruitghurt to the low concentrations in herbal tea reflects specific technological requirements of each food system. The peak sugar concentration observed in fruitghurt beverages suggests that date extract serves a dual role: as a primary fermentable substrate for lactic acid bacteria and as a natural stabilizer (22). The corresponding improvements in viscosity and reduction in syneresis indicate that date-derived sugars and pectin interact with the milk protein network, enhancing the structural integrity of the fermented matrix. In dairy applications such as pasteurized milk, date extract functions as a strategic substitute for refined sucrose, enhancing sensory acceptance. This indicates that the flavor profile of dates effectively masks off-notes from heat treatment while providing a "clean label" alternative (25). The lower sugar concentration in milk compared to fruitghurt suggests that when the goal is sensory enhancement rather than structural modification or fermentation support, lower inclusion rates are optimal. The data illustrates that the efficacy of date fruit as a functional ingredient is highly dependent on the food matrix. While puree is superior for glycemic control in fat-rich matrices like ice cream, extract form is highly effective for mineral delivery in beverages and structural stabilization in fermented dairy. These findings advocate for a tailored approach in functional food design, where the processing form of *Phoenix dactylifera* is matched to the specific physiological and technological needs of the product (14).

4. Conclusions

The present review underscores the multifaceted potential of date fruit (*Phoenix dactylifera* L.) as a potent natural substitute for refined sucrose in modern food systems. The findings confirm that dates provide a superior nutritional profile compared to traditional sweeteners, characterized by a lower glycemic index (GI) of 43.7 and a high concentration of bioactive compounds, including dietary fiber, polyphenols, and essential minerals. A critical takeaway from this analysis is that the efficacy of date-based substitution is fundamentally governed by the processing form (puree vs. extract) and the specific requirements of the food matrix. While date puree is optimal for maintaining postprandial glycemic stability in calorie-dense matrices like ice cream due to its retained fiber content, date extracts serve a vital dual role in dairy and beverages as both a natural sweetener and a structural stabilizer. Specifically, the extract enhances the viscosity and protein integrity of fermented products like fruitghurt while facilitating therapeutic mineral delivery in functional juices. By bridging the gap between sensory appeal and metabolic health, the utilization of date derivatives addresses the escalating global challenge of sugar-related non-communicable diseases. Furthermore, the valorization of date by-products aligns with circular economy principles, offering a sustainable alternative to the high ecological footprint of industrial sucrose production. Future research should focus on standardizing sensory evaluation metrics and conducting longitudinal clinical trials to further validate the long-term metabolic benefits of date-formulated functional foods in diverse human populations.

Acknowledgements

Not applicable.

Author Contributions

L.D.P. conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing original draft preparation, review, editing, visualization, and supervision.

Funding

This research received no any external funding.

Institutional Review Board Statement

Not applicable.

Data Availability Statement

Available data are presented in the manuscript

Conflicts of Interest

Author declared no conflict of interest.

References

1. Choirunnisa'Nur Fitriyah NH. Konsumsi Gula dan Kebiasaan Merokok dengan Kejadian Diabetes Melitus di Puskesmas Gading Surabaya. JIK (Jurnal Ilmu Kesehatan). 2022;6(2):469.
2. Ridhani MA, Aini N. Potensi penambahan berbagai jenis gula terhadap sifat sensori dan fisikokimia roti manis. Pas Food Technol J. 2021;8(3):61–8.
3. Simorangkir AR, Asmeriyani A. Konsumsi jus kurma terhadap peningkatan kadar trombosit pada pasien demam berdarah dengue di wilayah Kota Jambi. J Akad Baiturrahim Jambi [Internet]. 2022;11(1):42–8. Available from: https://doi.org/10.36565/jab.v11i1.437
4. Fadilla HN, Wiratara PRW, Sutrisno E. Pengaruh suhu perebusan dan penambahan ekstrak kurma sukari terhadap aktivitas antioksidan teh herbal daun kalistemon (Melaleuca viminalis). JITIPARI (Jurnal Ilm Teknol Dan Ind Pangan UNISRI) [Internet]. 2022;7(1):12–9. Available from: https://doi.org/10.33061/jitipari.v7i1.5739
5. Fauziyah K, Silviana E, Kusma I. Development Of High Fiber And Low Sugar Date Cookies With Substitution of Bran Flour And Kepok Banana Flour. J Teknol Pangan dan Gizi. 2022;23(1):96–103.
6. Adawiyah A, Apriningrum N, Elvandari M. Nama : Awaliyatul Adawiyah Judul : Analisis Uji Organoleptik dalam Pembuatan Yoghurt dari Tiga Jenis Susu Kurma yang Berbeda. Innov J Soc Sci Res [Internet]. 2024 Aug 30;4(5 SE-Articles):265–77. Available from: https://doi.org/10.31004/innovative.v4i5.13892
7. Irmawati E, Wiji RN, Harianti R. Efektivitas Jus Kurma dan Sari Kacang Hijau terhadap Peningkatan Kadar Hemoglobin Ibu Hamil. Nutr J Gizi, Pangan dan Apl [Internet]. 2023;7(1):11–24. Available from: https://doi.org/10.21580/ns.2023.7.1.9714
8. Sabil S, Amin M, Risal M, Rusman RFY. Karakteristik organoleptik susu dengan

penambahan sari Kurma (Phoenix dactilyfera L.) pada level berbeda. J Ilmu Dan Ind Peternak [Internet]. 2023;9(1):31–41. Available from: https://doi.org/10.24252/jiip.v9i1.31945
9. Safitri ME, Us H. Pengaruh pemberian kurma terhadap peningkatan kadar hemoglobin ibu nifas di Wilayah Kerja PMB Salabiah, S. SiT Kecamatan Banda Sakti Lhokseumawe. J Healthc Technol Med [Internet]. 2023;9(1):464–75. Available from: https://doi.org/10.33143/jhtm.v9i1.2838
10. Al-Karmadi A, Okoh AI. An Overview of Date (Phoenix dactylifera) Fruits as an Important Global Food Resource [Internet]. Vol. 13, Foods. 2024. p. 1024. Available from: https://doi.org/10.3390/foods13071024
11. Rahandayani DS, Pitriawati D, Bherty CP, Febiola S. Literature review: efektifitas konsumsi kurma untuk meningkatkan hemoglobin pada anemia ibu hamil. J Ilmu Kebidanan dan Kesehat (Journal Midwifery Sci Heal. 2022;13(1):44–8.
12. MUNI LL. Faktor Berbuahnya Pohon Kurma (Phoenix dactylifera) Di Kampus 2 UIN Sunan Gunung Djati Bandung. BIO Educ Учредители Univ Majalengka. 2020;5(1).
13. Royani I, Mappaware NA, Hamsah M, Latief S, Syahril E. Potensi kurma ajwa (Phoenix dactilifera l.) bagi kesehatan reproduksi wanita dalam literatur islam dan penelitian ilmiah terkini: literatur review. UMI Med J [Internet]. 2022;7(2):152–65. Available from: https://doi.org/10.33096/umj.v7i2.222
14. Qomariah S, Darmadi D, Juwita S, Saniya S, Donalizarti D. Pemeriksaan Hemoglobidan Edukasi Anemia Dengan endekatan Komplementer Pada Remaja Putri. J Pengabdi Masy Pemberdayaan, Inov dan Perubahan. 2024;4(6).
15. Haery R, Fattah N, Syamsu RF, Mokhtar S, Nurmadilla N, Pratama AA. Pengaruh Pemberian Kurma terhadap Glukosa Darah Setelah Berbuka Puasa pada Mahasiswa Fakultas Kedokteran UMI. Fakumi Med J J Mhs Kedokt [Internet]. 2022;2(6):408–14. Available from: https://doi.org/10.33096/fmj.v2i6.19
16. Nairfana I, Sale DA. Pengaruh Suhu Dan Lama Pengeringan Terhadap Mutu Organoleptik, Kadar Air Dan Rendemen Gula Kurma. J Inov Teknol Pangan. 2024;1(1):43–52.
17. Liandhajani Liandhajani, Ratih Hardianti. Formulasi Sediaan Granul Effervescent dari Ekstrak Buah Kurma Ajwa (Phoenix Dactylifera L.) sebagai Sumber Karbohidrat. OBAT J Ris Ilmu Farm dan Kesehat [Internet]. 2024 Aug 20;2(5 SE-Articles):231–47. Available from: https://doi.org/10.61132/obat.v2i5.688
18. Fitrasyah SI, Ariani MK, Tarabu O, Wulandari S, Wulandari NA. osialisasi Bolu Kukus Berbasis Tepung Kulit Pisang Ambon dan Buah Kurma sebagai Makanan Selingan Alternatif di Kelurahan Lambara, Kota Palu. J Dedikatif Kesehat Masy. 2022;3(1):18–25.
19. Chaerunnisa S, Amalia L, Hutami R. Karakteristik Kimia dan Sensori Bandrek Instan Pasta dengan Penambahan Sari Kurma Sukari (Phoenix dactylifera . L) dan Ekstrak. Karimah Tauhid. 2024;3(3):2616–37.
20. Situmorang PR, Zalukhu B, Napitupulu DS. Journal of Indonesian Medical Laboratory and Science. J Indones Med Lab Sci. 2023;4(2):136–47.
21. Rizqiati H, Arifan F, Nurwantoro N, Susanti S, Pramesthi RW, Sentosa R. Pengaruh substitusi gula dengan puree kurma (Phoenix Dactylifera L.) terhadap sifat kimia, mikrobiologi dan hedonik es krim kefir. 2021; Available from: https://jurnal.usk.ac.id/agripet/article/view/18419
22. Arisanti D, Islamiyah S. Efektivitas Penambahan Ekstrak Kurma Terhadap Karakteristik Gizi Fruitghurt. J Technopreneur [Internet]. 2020 Nov 24;8:135–9. Available from:

https://doi.org/10.30869/jtech.v8i2.598
23. Qomariah S, Juwita S. Pemeriksaan Hemoglobi dan Edukasi Anemia Dengan Pendekatan Komplementer Pada Remaja Putri. J Pengabdi Masy Pemberdayaan, Inovasi, dan Perubahan. 2024;4(6).
24. Ainiyyah A, Rismaya R. Pengaruh Penambahan Kurma Sukari (Phoenix Dactylifera L.) Terhadap Mutu Sensori Dan Kadar Gula Pada Susu Sapi Pasteurisasi. Pros Semin Nas Sains dan Teknol. 2022;495–504.
25. Ainiyyah A, Rismaya R. Pengaruh Penambahan Kurma Sukari (Phoenix dactylifera L.) Terhadap Mutu Sensori dan Kadar Gula pada Susu Sapi Pasteurisasi. Pros Semin Nas Sains dan Teknol. 2020;495–504.