



Phytochemical Analysis And Cosmetic Production By Species Of *Rosa And H. Rosa Sinensis*

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ABSTRACT

The extensive review discusses the value of *rosa and H. rosa sinensis*, phytochemical properties and richness for production of cosmetic. Rosa species, including *Rosa indica* L., are highly regarded for their cosmetic value (Fayaz et al., 2024). The genus contains various phytochemicals that contribute to its pharmacological activities, which could be beneficial in cosmetic formulations. These activities include anti-inflammatory, antioxidant, and anti-proliferative properties, which are desirable in skincare products. *Hibiscus rosa-sinensis*, on the other hand, contains numerous chemical compounds that could be valuable in cosmetic production. The plant's flowers contain riboflavin, thiamine, quercetin, niacin, and ascorbic acid, among other compounds (Amtaghri et al., 2024). These phytochemicals contribute to the plant's antioxidant and anti-inflammatory properties, which are highly sought after in cosmetic formulations. Interestingly, carbon quantum dots (CQDs) derived from *Hibiscus rosa-sinensis* leaves have shown potential for biomedical applications, including wound healing and anti-inflammatory properties (Yalshetti et al., 2024). This suggests that extracts from the plant could be incorporated into cosmetic products aimed at skin repair and soothing.

While the provided papers do not directly address cosmetic production using these plants, they states their rich phytochemical profiles and beneficial properties indicate potential for use in skincare and cosmetic formulations. Further research is needed to explore specific applications and formulations for cosmetic production using *Rosa* and *Hibiscus rosa-sinensis* extracts.

Keywords: *Rosa, H. Rosa sinensis, phytotherapy, cosmetic formulation, pharmacological study*

Introduction

Rosa is a significant plant genus in the Rosaceae family, comprising around 200 species of primarily shrubs. In India, there are 37 species of Rosa, mostly found in the Western Himalayan region (Fayaz et al., 2024). The genus is widely valued for its beauty, nutritional, therapeutic, ornamental, and cosmetic properties. Rose hips, in particular, are used in various food and drink products (Fayaz et al., 2024). Hibiscus rosa-sinensis, also known as China rose, belongs to the Malvaceae family and is distinct from the Rosa genus. It is an economically important ornamental plant, making up 30% of the floriculture market (Kim et al., 2012). H. rosa-sinensis has been extensively used in traditional medicine for treating various conditions, including wounds, inflammation, fever, coughs, diabetes, and infections (Missoum, 2018). Interestingly, while both Rosa and H. rosa-sinensis have medicinal properties, their chemical compositions differ. Rosa species are known for their high vitamin C content and the presence of GOPO, a galactolipid with anti-inflammatory properties (Fan et al., 2014). In contrast, H. rosa-sinensis contains a wide range of phytochemicals, including flavonoids, tannins, terpenoids, saponins, and alkaloids, which contribute to its diverse medicinal effects (Missoum, 2018; Yasmin et al., 2023). In conclusion, while Rosa and H. rosa-sinensis are distinct genera with different botanical classifications, both have significant ornamental and medicinal value. Their unique phytochemical profiles contribute to their various pharmacological activities, making them subjects of interest in traditional medicine and modern research.

Importance of cosmetic production from natural sources

Natural sources like rose and hibiscus have gained significant importance in cosmetic production due to their numerous beneficial properties and consumer demand for safer, environmentally friendly products. Roselle (*Hibiscus sabdariffa* L.) extracts have shown promising potential for cosmetic and pharmaceutical applications. Water extracts from Roselle leaves and callus cells demonstrated strong anti-melanogenic effects, skin barrier enhancement, and antioxidant activity (Cho et al., 2023). The extracts also exhibited different effects on human skin cells, with some up-regulated genes functioning in angiogenesis, oxidation-reduction processes, and glycolysis, while others were involved in healing radiation-injured skin cells (Cho et al., 2023). The cosmetic industry is increasingly turning to botanical extracts as a source of new active ingredients to meet consumer demands and international regulations (A, 2023). Essential oils and their components are particularly popular due to their fragrant nature and beneficial properties such as anti-inflammatory, antimicrobial, and antioxidant effects (A, 2023). Natural products, including those derived from plants, are considered a rich source of cosmeceuticals, possessing both therapeutic and beautification potential (Mahesh et al., 2019). The use of natural ingredients in cosmetics has a long history, dating back to ancient civilizations (Mcmullen & Dell'Acqua, 2023). This historical perspective has contributed to the current revolution in natural ingredient-based cosmetic products. Moreover, the development of plant cell culture technology has opened up new possibilities for producing high-quality natural products with stronger activities than traditional plant extracts (Georgiev et al., 2018). This approach offers a sustainable and efficient method for obtaining active cosmetic ingredients. In conclusion, the importance of cosmetic production from natural sources like rose and hibiscus lies in their ability to provide safe, effective, and environmentally friendly alternatives to synthetic ingredients. These natural sources offer a wide range of beneficial properties, including anti-aging, antioxidant, and skin-protective effects, making them valuable assets in the cosmetic industry's pursuit of innovative and sustainable product.

Phytochemical composition

Rosa species and Hibiscus rosa-sinensis contain a diverse array of phytochemicals that contribute to their medicinal properties and potential therapeutic applications. Rosa species are rich in phenolic compounds, including flavonoids, tannins, and phenolic acids (Mármol et al., 2017; Shameh et al., 2019). Specifically, chlorogenic acid and gallic acid were identified as the main phenolic constituents in Rosa fruits (Shameh et al., 2019). Other compounds found in Rosa species include ascorbic acid, carotenoids, and healthy fatty acids (Mármol et al., 2017; Shameh et al., 2019). The phytochemical composition varies among different Rosa species and plant parts. For instance, Rosa acicularis contains ellagic acid

derivatives, ellagitannins, gallotannins, catechins, catechin oligomers, hydroxycinnamates, and flavonoid glycosides of kaempferol, quercetin, and dihydroquercetin (Olennikov et al., 2021). *Hibiscus rosa-sinensis*, on the other hand, contains flavonoids, tannins, terpenoids, saponins, and alkaloids as its main bioactive compounds (Amtaghri et al., 2024; Missoum, 2018). Interestingly, different parts of the plant contain varying phytochemicals. The roots contain glycosides, tannins, phytosterols, fixed oils, fats, flavonoids, saponins, gums, and mucilages. The leaves contain alkaloids, glycosides, reducing sugars, fat, resin, and sterols. The flowers contain riboflavin, thiamine, apigenidine, oxalic acid, citric acid, quercetin, niacin, pelargonidine, and ascorbic acid (Amtaghri et al., 2024). It is worth noting that the phytochemical composition can vary depending on factors such as growing conditions, plant parts, and extraction methods. For example, a study on *H. rosa-sinensis* flowers isolated a series of five phthalates using column chromatography (Yasmin et al., 2023). Additionally, the essential oil and hydrolate extract of *Rosa brunonii* flowers contained different compositions of volatile compounds, with eugenol and geraniol being major constituents in both (Verma et al., 2016). In conclusion, both *Rosa* species and *Hibiscus rosa-sinensis* possess a wide range of phytochemicals, contributing to their diverse pharmacological activities. The variation in phytochemical composition among different species and plant parts highlights the importance of further research to fully understand their potential therapeutic applications and to develop targeted treatments based on specific compounds.

Phytochemical analysis and results of *H. rosa sinensis* and *rosa*

Phytochemical analysis of *Rosa* and *Hibiscus rosa-sinensis* species reveals a rich composition of bioactive compounds with potential medicinal properties.

Rosa species contain high levels of antioxidants, phenolics, flavonoids, carotenoids, and ascorbic acid (Shameh et al., 2019). Specifically, chlorogenic acid and gallic acid were identified as the main phenolic constituents in *Rosa* fruits. Other compounds found in significant amounts include apigenin, rutin, quercetin, p-coumaric acid, cinnamic acid, caffeic acid, and ascorbic acid (Shameh et al., 2019). Additionally, *Rosa* species contain healthy fatty acids that contribute to their therapeutic potential (Mármol et al., 2017).

Hibiscus rosa-sinensis contains a wide range of phytochemicals, including flavonoids, tannins, terpenoids, saponins, alkaloids, glycosides, reducing sugars, fat, resin, and sterols (Amtaghri et al., 2024; Missoum, 2018). The flowers specifically contain riboflavin, thiamine, apigenidine, oxalic acid, citric acid, quercetin, niacin, pelargonidine, and ascorbic acid (Amtaghri et al., 2024). Interestingly, a series of five phthalates were isolated from the ethyl acetate fraction of *H. rosa-sinensis* flowers (Yasmin et al., 2023).

Both *Rosa* and *Hibiscus rosa-sinensis* exhibit significant pharmacological activities due to their phytochemical composition. *Rosa* species demonstrate potential in treating various disorders related to oxidative stress (Mármol et al., 2017). *H. rosa-sinensis* shows a wide range of beneficial effects, including hypotensive, anti-pyritic, anti-inflammatory, anti-cancer, antioxidant, anti-bacterial, anti-diabetic, and wound healing activity (Amtaghri et al., 2024; Missoum, 2018). However, it's important to note that while *H. rosa-sinensis* extract showed beneficial effects in diabetic pregnant rats, it may have deleterious effects on cardiac and reproductive functions in healthy individuals (Afiune et al., 2017).

Both *Rosa* and *Hibiscus rosa-sinensis* are rich sources of phytochemicals with diverse medicinal properties. However, further research is needed to isolate specific compounds and explore their mechanisms of action, as well as to investigate potential toxicity and side effects (Afiune et al., 2017; Missoum, 2018).

Biological activities relevant to cosmetic applications

Hibiscus rosa-sinensis and Rosa species exhibit several biological activities relevant to cosmetic applications: Antioxidant properties of both plants make them valuable for anti-aging skincare products. H. rosa-sinensis extract showed protective effects against oxidative stress induced by benzoyl peroxide and UV radiation in mouse skin (Sharma & Sultana, 2004). Similarly, Rosa species demonstrated antioxidant activity that could be beneficial for skin protection (Fayaz et al., 2024). Anti-inflammatory effects are crucial for soothing and calming skincare formulations. H. rosa-sinensis-derived carbon quantum dots exhibited anti-inflammatory properties by inhibiting protein denaturation and regulating inflammatory cytokines (Yalshetti et al., 2024). Rosa species also showed anti-inflammatory activity (Fayaz et al., 2024). Wound healing potential is important for skin repair and regeneration products. Carbon quantum dots from H. rosa-sinensis leaves promoted cell proliferation in vitro, indicating potential for wound healing applications (Yalshetti et al., 2024). Antimicrobial activity is useful for preserving cosmetic formulations and treating acne. H. rosa-sinensis-derived carbon quantum dots demonstrated antibacterial effects against certain pathogens (Yalshetti et al., 2024). Cobalt oxide and magnesium oxide nanoparticles synthesized using H. rosa-sinensis leaf extract also showed antimicrobial activity (Kainat et al., 2021). Hair growth-promoting effects make H. rosa-sinensis a potential ingredient for hair care products (Amtaghri et al., 2024). Additionally, its anti-hyperlipidemic properties could be beneficial for improving skin health (Amtaghri et al., 2024). In conclusion, both H. rosa-sinensis and Rosa species possess multiple biological activities relevant to cosmetic applications, including antioxidant, anti-inflammatory, wound healing, antimicrobial, and hair growth-promoting effects. These properties make them promising ingredients for various skincare and haircare formulations.

Formulation of rosa and rosa sinensis as a cosmetic product

Hibiscus rosa-sinensis and Rosa species exhibit several biological activities relevant to cosmetic applications: Antioxidant properties of both plants make them valuable for anti-aging skincare products. H. rosa-sinensis extract showed protective effects against oxidative stress induced by benzoyl peroxide and UV radiation in mouse skin (Sharma & Sultana, 2004). Similarly, Rosa species demonstrated antioxidant activity that could be beneficial for skin protection (Fayaz et al., 2024). Anti-inflammatory effects are crucial for soothing and calming skincare formulations. H. rosa-sinensis-derived carbon quantum dots exhibited anti-inflammatory properties by inhibiting protein denaturation and regulating inflammatory cytokines (Yalshetti et al., 2024). Rosa species also showed anti-inflammatory activity (Fayaz et al., 2024). Wound healing potential is important for skin repair and regeneration products. Carbon quantum dots from H. rosa-sinensis leaves promoted cell proliferation in vitro, indicating potential for wound healing applications (Yalshetti et al., 2024). Antimicrobial activity is useful for preserving cosmetic formulations and treating acne. H. rosa-sinensis-derived carbon quantum dots demonstrated antibacterial effects against certain pathogens (Yalshetti et al., 2024). Cobalt oxide and magnesium oxide nanoparticles synthesized using H. rosa-sinensis leaf extract also showed antimicrobial activity (Kainat et al., 2021). Hair growth-promoting effects make H. rosa-sinensis a potential ingredient for hair care products (Amtaghri et al., 2024). Additionally, its anti-hyperlipidemic properties could be beneficial for improving skin health (Amtaghri et al., 2024). Both H. rosa-sinensis and Rosa species possess multiple biological activities relevant to cosmetic applications, including antioxidant, anti-inflammatory, wound healing, antimicrobial, and hair growth-promoting effects. These properties make them promising ingredients for various skincare and haircare formulations.

Toxicological studies

Toxicological studies on Hibiscus rosa-sinensis have shown promising results for its potential use in cosmetic production, with most extracts demonstrating low toxicity at higher doses.

Several studies have reported that extracts from various parts of H. rosa-sinensis are generally safe. Higher doses of extracts from the plant have been found to be non-toxic in toxicological studies (Amtaghri et al., 2024). Histological analysis of most extracts from all parts of this plant did not show any signs of

toxicity at higher doses (Missoum, 2018). However, it's important to note that some extracts did alter biochemical and hematological parameters, indicating the need for further research to fully understand their effects (Missoum, 2018).

H. rosa-sinensis extracts appear to have low toxicity and potential for use in cosmetics, more comprehensive toxicological studies are needed to isolate specific phytochemicals and explore their mechanisms of action. This is particularly important for ensuring the safety of cosmetic products derived from this plant. The generally positive safety profile, combined with the plant's various beneficial properties, makes *H. rosa-sinensis* a promising candidate for cosmetic applications, but careful consideration and further research are necessary before widespread use in cosmetic production.

Future perspectives and challenges

The *Rosa* and *Hibiscus rosa-sinensis* species have shown significant potential for cosmetic applications due to their diverse phytochemical compositions and pharmacological activities. However, several challenges and future aspects need to be addressed for their effective use in cosmetic production:

1. Both *Rosa* and *H. rosa-sinensis* contain a wide range of bioactive compounds, including flavonoids, tannins, terpenoids, saponins, and alkaloids, which contribute to their various pharmacological activities (Fayaz et al., 2024; Missoum, 2018). These compounds offer potential for developing natural cosmetic products with anti-inflammatory, antioxidant, and antimicrobial properties. However, further research is needed to isolate specific phytochemicals and explore their mechanisms of action for targeted cosmetic applications (Missoum, 2018).
2. The antimicrobial properties of *H. rosa-sinensis* extracts and silver nanoparticles synthesized using its petal extracts present an interesting avenue for developing natural preservatives in cosmetics (Nawab et al., 2024; Nayak et al., 2015). However, the challenge lies in ensuring the stability and efficacy of these natural preservatives in various cosmetic formulations.
3. The antioxidant and anti-inflammatory properties of both species (Fayaz et al., 2024; Missoum, 2018; Sharma & Sultana, 2004) make them promising candidates for anti-aging and skin-protective cosmetic products. Future research should focus on optimizing extraction methods and formulations to maximize these benefits while ensuring product stability and safety.

Rosa and *H. rosa-sinensis* exhibits great potential for cosmetic applications, the key challenge is isolating of specific bioactive compounds, looking after for their stability in formulations, even through carrying out the safety and efficiency for production. Future research should focus on addressing these challenges to fully harness the potential of these plants in the cosmetic industry.

Conclusion

Hibiscus rosa-sinensis contains bioactive compounds like flavonoids, tannins, terpenoids, saponins, and alkaloids that have various beneficial effects, including antioxidant properties (Missoum, 2018). These compounds could potentially be utilized in cosmetic formulations. *Rosa damascena*, commonly known as Damask rose, is widely used in the essential oil industry. The byproducts from rose oil production, specifically distilled rose petals, can be further processed to concentrate polyphenols and antioxidants. These concentrated extracts could find applications in the cosmetic industry (Dushkova et al., 2023). *Rosa* species, particularly rose hips, have been traditionally used for medicinal purposes due to their antioxidant effects. Their phytochemical composition includes ascorbic acid, phenolic compounds, and healthy fatty acids, which could be beneficial in cosmetic products (Mármol et al., 2017). In references, while there is no direct mention of cosmetic production from these plants, it states their rich phytochemical profiles and antioxidant properties suggest potential applications in the cosmetic industry. Further research is needed to explore specific cosmetic formulations and their efficacy using extracts from *Hibiscus rosa-sinensis* and *Rosa* species.

Reference

- [1]. V. P. Kapoor, Herbal cosmetics for skin and hair Care natural product Radiance.4(2005) 306-314.
- [2]. B.J kukreja, V. Dodwad, Herbal mouthwashes –A gift of nature, international journal of pharma and Bio sciences, 3 (2012) 46-52.
- [3]. PK. Chattopadhyay. Herbal Cosmetics and Ayurvedic medicines, national institute of industrial research. I (2005) 45-50.
- [4]. Medscape <http://emedicine.medscape.com/article/835209> - overview assessed on 8 January,2015.
- [5]. B.H. Ali N.A. Wabel, G. blunden, photochemistry pharmacological and toxicological aspects of a hibiscus sabdariffa L: a review phyto ether Res . 19 (2005) 369-375.
- [6]. Riya patil, Akshada deshमुख, formulation and Evaluation of lip balm prepared by using various herbal entities, may, 2023, IJIRT; vol 9, Issue 12,ISSN: 2349-6002.
- [7]. P.P. Sharma, –Cosmetics-Formulation, manufacturing and quality control||, fourth ed. (2008). Vandana Publications Pvt. Ltd., India.
- [8]. Church D, Elsayed S, Reid O, Winston B, Lindsay R. Burn wound infections. Clinical Microbiology Rev, 2006; 403-34.
- [9]. Song JJ, Salcido R. Use of Honey in Wound Care: An Update. Advances in Skin and Wound Care, 2011; 40-44.
- [10]. Anh Tran, Melanie Pratt, and Joel De Koven, Acute Allergic Contact Dermatitis of the Lips from Peppermint Oil in a Lip Balm, CASE REPORT, Dermatitis, (March/April), 2010; 21(2): 111-112.
- [11]. Alessandra Ribeiro Fernandes, Michelli Ferrera Dario, Stability evaluation of organic Lip Balm, Brazilian Journal of Pharmaceutical Sciences vol. 49, n. 2, apr./jun., 2013.
- [12]. Regupathi T, Chitra K, Ruckmani K, Lalitha KG, Mohan Kumar,2016, Formulation and Evaluation of Herbal Hair Gel for Hair Growth Potential. J of Pharmacol & Clin Res ,2(2): 555581. DOI: 10.19080/JPCR.2017.02.555581
- [13]. Khristi, V., & Patel, V. H, 2016, Therapeutic Potential of Hibiscus Rosa Sinensis: A Review, International Journal of Nutrition and Dietetics, 4(2), 105-123.
- [14]. Puligundla, P, Lim, S, A Review of Extraction Techniques and Food Applications of Flaxseed Mucilage. Foods 2022, 11, 1677. <https://doi.org/10.3390/foods11121677>
- [15]. I. Khokhar and I. Ahmad,1992, Studies in medicinal plants of Pakistan: a new cyclopeptide alkaloids from the flowers of Hibiscus rosa sinensis, Science International (Lahore) 4(2), 147-150
- [16]. V. M. Jadhav, R. M. Thorat, V. J. Kadam and N. S. Sathe, 2009, Traditional medicinal uses of Hibiscus rosa-sinensis, J. Pharm. Res. 2(8) ,1220-1222.
- [17]. Soni, R.P., Katoch, M., Kumar, A. and Verma, P., 2016, Flaxseed—Composition and its health benefits, Res. Environ. Life Sci, 9, 310-316.
- [18]. Chaurasiya, N.I.D.H.I. and Chakraborty, G., 2014, Formulation and evaluation of herbal hydro gel from Hibiscus rosa-sinensis. Int J Curr Pharm Res, 6(1), 14-16.
- [19]. Manjula, D., Jenita, J.J.L., Premakumari, K.B. and Shanaz, B, 2018, Formulation and evaluation of flaxseed hair gel: a natural hair tamer, International Journal of Research in Pharmacy and Chemistry, 8(3), 487-491.
- [20]. Praveen S, Vinod M, Karnakumar V, Chandrashekhar B and Sreenivasa Rao,2011, Development and evaluation of antidandruff hair gel;1(4),936- 949
- [21]. Bhaskar, A., Nithya, V. and Vidhya, V.G., 2011, Phytochemical screening and in vitro antioxidant activities of the ethanolic extract of Hibiscus rosa sinensis L, Annals of Biological Research, 2(5), 653-661.
- [22]. Hanaa, M.H., Ismail, H.A., Mahmoud, M.E. and Ibrahim, H.M, 2017, Antioxidant activity and phytochemical analysis of flaxseeds (Linum usitatissimum L.), Minia journal of agricultural research and development, 37(1), 129-140.
- [23]. Ramakrishna S and Gopikrishna U. V, 2022, Formulation and Evaluation of Herbal Hair Gel,Sch Int J TraditComplement Med, 5(2), 28-32.
- [24]. Gaur K, Kori ML, Nema RK, 2009, Investigation of immunomodulatory potential of hydro-alcoholic extracts of Euphorbia neriifolia Linn. and Hibiscus rosa-sinensis Linn, International Journal of Medical Sciences, 2(1), 61-65.
- [25]. Upadhyay SM, Upadhyay P, Ghosh AK, Singh V, Dixit VK,2011, Effect of ethanolic extract of Hibiscus rosa-sinensis L., flowers on hair growth in female Wistar rats, Der Pharmacia Lettre 3 (4), 258- 263
- [26]. Kaur P and Guleri TK,2013, Topical Gel, A recent approach for novel drug delivery, Asian J Biomed PharmaSci ,3(17),1-5
- [27]. Daun, J.K., Barthet, V.J., Chornick, T.L. and Duguid, S., 2003, Structure, composition, and variety development of flaxseed. Flaxseed in human nutrition, (Ed. 2), 1-40.
- [28]. Singh KK, Mridula D, Jagbir Rehal and Barnwal P, 2011, Flaxseed. A Potential Source of Food, Feed and Fiber, Critical Reviews in Food Science and Nutrition,51(3),210-222.
- [29]. Goyal A, Sharma V, Upadhyay N and Gill S,2014, Flax and flaxseed oil an ancient medicine and modern functional food, J Food Sci Technol ,59(9),1633-16

- [30]. Che Rose, L., Syahirah Rusdi, N. N., Asari, A., Effendy Abd Wahid, M., Suhaimi, H. ,2020, Potential hair growth of crude extract from *Hibiscus rosa-sinensis* Linn. Arch Pharma Pract 11(4),139.
- [31]. Shaikh, J. R., & Patil, M,2020, Qualitative tests for preliminary phytochemical screening: An overview,International Journal of Chemical Studies, 8(2), 603–608. <https://doi.org/10.22271/chemi.2020.v8.i2i.8834>
- [32]. Kianitalaei A, Feyzabadi Z, Hamed S, Qaraaty M. *Althaea Officinalis* in Traditional Medicine and modern phytotherapy. J. Adv. Pharm. Edu. Res. 2019; 9(S2): 154-161.
- [33]. Ahmad M S, Shawky A, Ghobashy M O, Felifel R H A. Effect of Some medicinal plants on life cycle of Citrus Brown Mites (*Eutetranychus orientalis*). Int. J. Pharm. Res. Allied Sci. 2017; 6(1): 53-58.
- [34]. Benzineb E, Kambouche N, Hamiani A, Bellahouel S, Zitouni H, Toumi H. Phenolics Compounds and Biological Activity of Leaves of *Anabasis Articulata*, an Algerian Medicinal Plant. Int.J. Pharm. Res. Allied Sci. 2019; 8(4): 1-5.
- [35]. Adhirajan, N., Kumar, T.R., Shanmugansundaram, N., Babu, M. In vivo and in vitro evolution of hair growth potential of *Hibiscus rosa-sinensis* Linn. Journal of Ethnopharmacology 2003; 88: 235-239.
- [36]. Anita Gnana Kumari, A.V., Palavesam, A., Anbu Jeba Sunilson, J., Anandarajagopal, K., Vignesh M., Parkavi, J. Preliminary phytochemical and antiulcer studies of *Hibiscus rosa sinensis* Linn. root extracts. International Journal Green Pharmacy 2010; 4:41-43.
- [37]. [Nade, V.S., Kanhere, S.V., Kawale, L.A., Yadav, A.V. Cognitive enhancing and antioxidant activity of ethyl acetate soluble fraction of the methanol extract of *Hibiscus rosa sinensis* in scopolamine-induced amnesia. Indian Journal of Pharmacology 2011; 43(2):137–142.
- [38]. Nivsarkar, M., Patel, M., Padh, H., Bapu, C., Shrivastava, N. Blastocyst implantation failure in mice due to “nonreceptive endometrium”: endometrial alterations by *Hibiscus rosa-sinensis* leaf extract. Contraception 2005; 71(3): 227-230.
- [39]. Shen, H.M., Chen, C., Jiang, J.Y., Zheng, Y.L., Cai, W.F., Wang, B., Ling, Z., Tang, L., Wang, Y.H., Shi, G.G. The N-butyl alcohol extract from *Hibiscus rosa-sinensis* L. flowers enhances healing potential on rat excisional wounds. Journal of Ethnopharmacology 2017; 198: 291-301.
- [40]. Sawada M., Terada N., Tangiguchi H., Tateishi R., Mori Y. Cyclosporin A stimulates hair growth in nude mice. Lab Invest, 1987; 56: 684-686
- [41]. Takeo Mitsui. New Cosmetics Science. Amsterdam: Elsevier Science, 1997.
- [42]. Upadhyay, S., Ghosh, A.K., Singh, V. Hair Growth Promotant Activity of Petroleum Ether Root Extract of *Glycyrrhiza Glabra* L (Fabaceae) in Female Rats. Tropical Journal of Pharmaceutical Research 2012; 11(5): 753-758.
- [43]. Gopalan C, Sastri BVR, Balasubramanian SC, Rao BSN, Deosthale YG, Pant KC. Nutritive value of Indian foods. Hyderabad, India: National Institute of Nutrition, Indian Council of Medical Research; c2010.
- [44]. Gupta SC, Kapoor UK. Fundamentals of applied statistics. 4th ed. Chand and Son; c2018. p. 51-85.
- [45]. Hegde AS, Gupta S, Sharma S, Srivatsan V, Kumari P. Edible rose flowers: A doorway to gastronomic and nutraceutical research. Food Research International. 2022;162:111977.
- [46]. Islam M. Value addition to watermelon rind through jam preparation. [Doctoral dissertation]. Dept. of Horticulture; c2017.
- [47]. Jat R, Mahawer LN, Bairwa HL, Meena RH, Pilania S, Singh M. Sensory evaluation and microbial analysis of rose petal jam. Journal of Pharmacognosy and Phytochemistry. 2018;7(5):617-620.
- [48]. Montalvo-González E, Villagrán Z, González-Torres S, Iñiguez-Muñoz LE, Isiordia-Espinoza MA, Ruvalcaba-Gómez JM, et al. Physiological effects and human health benefits of *Hibiscus sabdariffa*: A review of clinical trials. Pharmaceuticals. 2022;15(4):464.
- [49]. Ochelle PO, Torkuma ST, Swande PI. Quality evaluation of jam produced from fresh and dried roselle calyces (*Hibiscus sabdariffa*). Applied Sciences Research Periodicals. 2024;2(1):74-95.
- [50]. Parvez GM, Shakib U, Khokon M, Sanzia M. A short review on a nutritional fruit: guava. Open Access: Toxicology and Research. 2018;1:1-8.

[51]. Rangre NR, Jain PK, Pandey SK, Bishen BP, Kumar B. Effect of different fruit pulp ratios on sensory parameters and economics for mixed fruit jam. International Journal of Chemical Studies. 2017;5(4):1748-1752.

[52]. Verma T, Gupta A. Plant-based anti-cancerous superfoods, boosting immunity: A coherent critique. International Journal of Current Microbiology and Applied Sciences. 2020;9(5):1886-1894.

