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Comparative evaluation of lipsticks developed using isolated pigments of *Capsicum annuum* and *Lycopersicon esculentum* fruits and various natural bases

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Abstract: Cosmetics have lured mankind from time immemorial. Colourant cosmetics have secured a respectable space at the dressing table or salon for their various benefits. *Capsicum* is widely cultivated across the globe for its pungent principle, capsaicin or capsanthin. However, the bright colour pigments are often neglected due to its pungency. Lycopersicon (tomatoes) also are rich in red colour because of the pigment lycopene. Objective of the current study was to integrate red pigments isolated from capsicum and lycopersicon fruits into lipstick. Major challenge was to nullify the pungency of the capsicum oleoresin. Lipstick bases were formulated using various combinations of waxes and fats. The capsicum oleoresin was treated with NaOH 10% w/v to nullify the pungency. Lycopene rich extract was obtained from dried tomatoes and later incorporated into the lipsticks bases. The formulated sticks were evaluated and compared against the marketed lipsticks. Our findings reveal that both the lycopene and capsicum oleoresin rich extracts can be conveniently incorporated into the lipsticks and can prove to be a better natural and vegan substitute for synthetic carcinogenic dyes.

Introduction

Lipsticks are one of the most favourite make-up tools in any woman's handbag. Around 5,000 years ago, men and women in the ancient Sumerian and Indus Valley may have been the first to create and use lipstick (Sarah, 2006). The beeswax, colour pigment and fat made up the first lipsticks, which were used in the form of sticks from beginning in the middle of 1920. Nowadays, with some modifications these formulations are made easy to apply and can mask deformities of lips. Besides enhancing the appearance of the lips, it can prevent moisture loss and flaking or peeling in cold conditions. Durability, shelf-life, ease of application, compact size, free from grittiness and cost-effectiveness make lipsticks the preferred choice among other cosmetics (Batista et al., 2016; Kothari et al., 2018; Jain et al., 2022; Hussain et al., 2022).

Carcinogenicity of synthetic pigments as well as demand for vegan products have intensified in recent years, thus forcing researchers across the globe to migrate towards herbal colourants (Mahantesh et al., 2020; Pandit et al., 2020). To add, stringent regulatory norms for synthetically derived products have also provoked research on natural drugs.

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Globally, the usage of herbs is widespread and encompasses both health and cosmetic treatments. *Lycopersicon esculentum* (Miller) (synonym: *Solanum lycopersicum* Linn.) i.e., tomatoes and *Capsicum annuum* Linn (red chillies) both belong to the Solanaceae family. Owing to the increased production of chillies and tomatoes in South Asian countries, besides catering to needs of the food industry it can very efficiently meet the demands of cosmetic industries for supply of red pigment. At times, several farmers need to dispose-off their produced tomatoes due to poor shelf-life. Moreover, such degrading tomatoes occupy a large stockpile not only in the fields but in the market as well. Tomato fruit has some medicinal applications as it helps to control oxidative stress, cancer and it involves inhibition of atherosclerosis. It is also involved in preservation of eye fitness, inhibition of lipid peroxidation and cardiovascular diseases. It is also used as an antibacterial, antiviral, anticarcinogenic and antiasthmatic agent (Raiola et al., 2014; Dawid, 2016). Lycopene, which is the major carotenoid present in tomato fruits and gives them their deep red colour, is present in tomatoes in significant amounts. The carotenoids and chlorophyll pigment families are the two principal types present in tomatoes (Mallick, 2021). *Capsicum* fruits are used in treatment of parasitic infections, wound healing, sore throat, toothache, coughs, appetite stimulator and rheumatism. It is also proven to act as an immunomodulatory, antioxidant, antimicrobial, antiseptic and anticancer agent (Batiha et al., 2020). Capsicum is widely used to add pungent taste in many culinary formulations (Zhang et al., 2021).

Both the fruits contain reddish pigment in abundance and can serve as raw material development of economically viable cosmetic products. Furthermore, both pigments being adequately lipophilic can easily be employed in waxy formulation such as lipsticks or rouges. Foremost challenge is to destroy the pungency of the capsicum, which can be taken care of by treatment with an alkali. The cosmetics sector is overflowing with brands today. Yet, the industry is still expanding, and there is room for new herbal products that can offer high-quality products that will meet consumers' needs. The objective of the current endeavour, which took the value of natural materials, was to develop and evaluate lipsticks that only contained natural ingredients.

Materials and Methods

Chemicals and reagents

Beeswax, white soft paraffin, coconut oil, carnauba wax, mango butter and kokum butter were purchased from AAK Kamani Private Limited. Whereas markers Lycopene and Capsanthin were made available from Yucca Enterprises and Anchrom Pvt LTD, Mumbai. All the solvents used for study are of laboratory grade.

Plant material

Tomatoes and red chillies were purchased from the local market of Pune region, Maharashtra, India.

Separation of colouring pigments

Lycopene from tomato fruits: Lycopene is the major colouring pigment present in the tomato. The weighed amount of tomatoes were cut and then dried in a hot air oven at 60^0C for 6 hrs. The dried coarse powder was further extracted with hexane by the hot extraction method. The hexane extract was further concentrated and dried. The extract was packed in an airtight glass container for formulation of lipsticks.

Capsanthin from red pepper fruits: Dried ripe fruit powder of *Capsicum annum* was extracted with acetone using hot extraction method. The acetone extract was concentrated and dried. The extract was treated with alkali to separate the pungent principles. The pungent free extract which contains capsanthin was dried and used for the formulation of lipsticks as the colour was bright red and could easily be incorporated into base used for lipsticks.

Optimisation of lipstick formula

Lipsticks were prepared by Pour moulding method using hard wax (molten beeswax), soft waxes (white soft paraffin, kokum butter, mango butter) and antioxidant agent (α-tocopherol). Initially, lipsticks were formulated using various proportions of beeswax, white soft paraffin, kokum butter and mango butter which were considered as control. Then three formulations for each colouring pigment were prepared. The proportion of beeswax and white soft paraffin (2: 1.5), beeswax and kokum butter (2: 1.5) and beeswax and Mango butter (2: 1.25) were found to be effective to formulate lipsticks. These lipstick batches were named as L1, L2, L3 for lycopene and C1, C2, C3 for capsanthin respectively. The optimised formulations with each colouring pigment are listed in Table 1. These lipstick formulations were further subjected to evaluation study i.e., colour, odour and texture, size and dimensions, melting point, breaking point, water resistance and smudge test (lemon juice and coca cola).

Evaluation of Formulated lipsticks

Colour, odour and texture

Formulated lipsticks were checked for colour, odour and glossy or smooth texture. Colour was observed by placing the lipsticks on white background and observing under fluorescent white light. Also colour on the applied

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area was observed by applying a thin uniform coat on white paper sheet. Odour was recorded by directly sniffing the lipsticks as well as on the applied area (Pimple et al., 2021; Sudheer et al., 2022).

Table 1. Formulation of lipstick by using Control (CO), Lycopene (L) and Capsanthin (C)

Sr. No.	Ingredients	Quantity								
		CO1	CO2	CO3	L1	L2	L3	C1	C2	C3
1	Bees Wax	19g	19g	19.5g	19g	19g	19.5g	19g	19g	19.5g
2	White soft paraffin	14.2g	-	-	14.2g	-	-	14.2g	-	-
3	Kokum Butter	-	14.2g	-	-	14.2g	-	-	14.2g	-
4	Mango Butter	-	-	13.8g	-	-	13.8g	-	-	13.8g
5	Lycopene	-	-	-	1.6g	2g	4g	-	-	-
6	Capsanthin	-	-	-	-	-	-	2.75g	2.75g	2.75g
7	Rose oil	1ml	1ml	1ml	1ml	1ml	1ml	1ml	1ml	1ml

Size and dimensions

Length and diameter of lipsticks were measured using a vernier calliper (Pimple et al., 2021).

Melting Point

It was performed using a digital melting point apparatus. The lipsticks were separately grated and added in a narrow tube and the tube was placed in silicone oil for recording melting range (Pimple et al., 2021; Sudheer et al., 2022).

Breaking Point (Load in gm)

This test was carried out to find out the value of maximum load that lipstick can withstand before it breaks. This test indicates the strength of lipstick. Load in the form of water was added dropwise to a beaker suspended with copper wire to the centre of lipstick, until the lipstick breaks. Later, the water in the beaker was weighed to determine the specific load at which the lipstick deforms or breaks (Jamdade et al., 2020; Pimple et al., 2021).

Water resistance of the applied area

It was recorded by applying a thin uniform coat over a tissue paper and by adding 5-6 drops of water with the help of pipette. Prevention of wettability of the paper was considered as water resistance (Pimple et al., 2021; Venkatachalam et al., 2023).

Smudge Test on applied area

It was recorded by applying a thin uniform coat over a tissue paper and by adding 5-6 drops of fresh lemon juice and Coca cola separately with the help of pipette and results were recorded (Pimple et al., 2021; Venkatachalam et al., 2023).

Results and discussion

The cosmetics products are used to enhance the appearance of the human body. There is an extensive and broad variety of herbal cosmetics products to gratify human beauty. Lip colouring has been a tradition since the prehistoric era. When consumed, the dyes that contribute to lipstick's colour can cause nausea, rashes, allergies, drying of the lips and are carcinogenic in humans. In contrast to synthetic medications, the use of herbal drugs or herbal formulations on human skin is considered to be safe (Rasheed et al., 2020; Tirunagari et al., 2020). To solve this problem, the current research was designed to create herbal lipsticks in various colour shades using colour pigments. Powder of *Capsicum annuum* (Family: Solanaceae) and *Lycopersicon esculemtun* (Family: Lycopersicae) used to separate colour pigments given in Figure 1. The yield obtained for acetone (50-60^{0}C) extract of *Capsicum annuum* and hexane (60-70^{0}C) extract of *Lycopersicon esculentum* was found to be 6.2 gm and 160 mg % w/w respectively.

The texture of all lipstick formulations is smooth as shown in Figure 2. Further these formulations were tested and documented for quality characteristics of applied area colour, odour, texture, size and dimension, colour of applied area breaking point (load in gm), melting point (^{0}C), water resistance test, smudge test using lemon juice and smudge test using Coca cola. Depending on dye concentration, the lipsticks were found in a range between reddish-to-reddish maroon colour. All the lipsticks with different colour pigments were made by employing the same moulds. Vernier callipers were used to measure lipsticks dimensions. The width and length of formulated lipsticks were found to be 1cm and 3.4 cm respectively. The propensity of lipstick consistency to spread on a surface and consistency of various colour shades depending upon the concentration of extract on the applied area are assessed using a stroke test. The development of a protective layer from the lipstick was then visually examined for all the formulations as shown in Figure 3 and it was shown to be consistently smooth. All formulations have a rose-like scent because rose oil was used as one of the additives. Also, it is helpful to

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eliminate the odour of other additives. The findings obtained from breaking and melting points of all these

Table 2. Evaluation parameters of formulated Control (CO), Lycopene (L), Capsanthin (C) lipsticks and marketed formulation

Sr. No.	Parameter	CO1	CO2	CO3	L1	L2	L3	C1	C2	C3	Marketed formulation
1	Color	Daisy White	Creamy White	White	Metallic orange	Rust orange	Cidar orange	Bright Red	Red	Red	Dark Red
2	Odour	Rose like	Rose like	Rose like	Rose like	Rose like	Rose like	Rose like	Rose like	Rose like	Rose like
3	Texture	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
4	Size and dimension	L=3.4cm W=1cm	L=3.4cm W=1cm	L=3.4cm W=1cm	L=3.4cm W=1cm	L=3.4cm W=1cm	L=3.4cm W=1cm	L=3.4cm W=1c	L=3.4cm W=1cm	L=3.4cm W=1cm	L=3.4cm W=1cm
5	Colour of applied area	-	-	-	Light Metallic orange	Rust orange	Cidar orange	Light Bright Red	Light Red	Light Red	Dark Red
6	Breaking point (Load in gm)	Above 100	Above 100	Above 100	Above 100	Above 100	Above 100	Above 100	Above 100	Above 100	Above 100
7	Melting Point (^{0}C)	53-54	51-53	50-52	53-54	51-53	50-52	53-54	51-53	50-52	51-53
8	Water resistance	-	-	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	Smudge Test using lemon juice	-	-	-	No	No	No	No	No	No	No
10	Smudge Test using lemon juice	-	-	-	No	No	No	No	No	No	No

Figure 1. Powder of crude drugs: Capsicum annuum (C) and Lycopersicon esculemtun (L)

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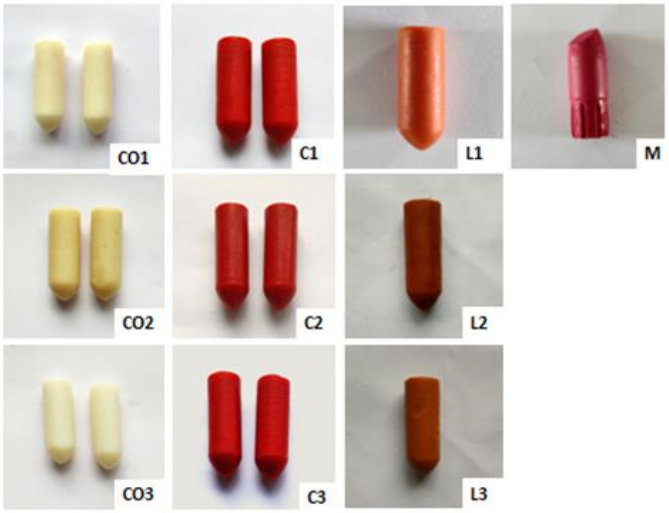

Figure 2. Different formulations of Lipstick: Control (CO1, CO2 and CO3), Capsanthin (C1, C2 and C3), Lycopene (L1, L2 and L3) and marketed formulation (M)

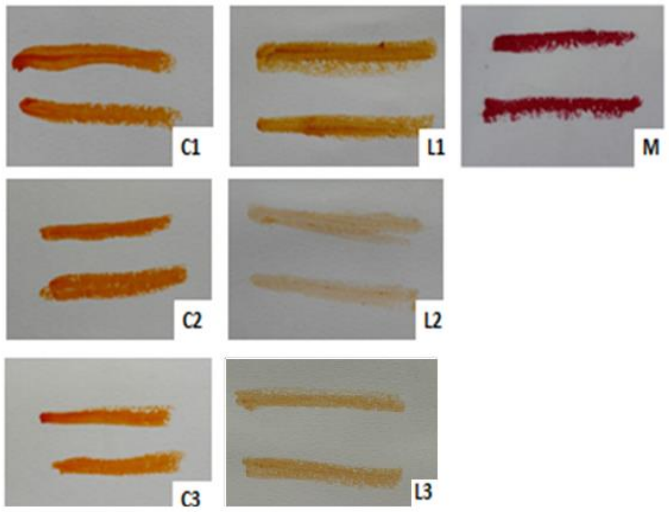

Figure 3. Stroke test of lipstick formulations: containing Capsanthin (C1, C2 and C3), Lycopene (L1, L2, and L3) and Marketed formulation (M)

Figure 4. Water resistance test of lipstick formulations: containing Capsanthin (C1, C2 and C3), Lycopene (L1, L2 and L3), and Marketed formulation (M)

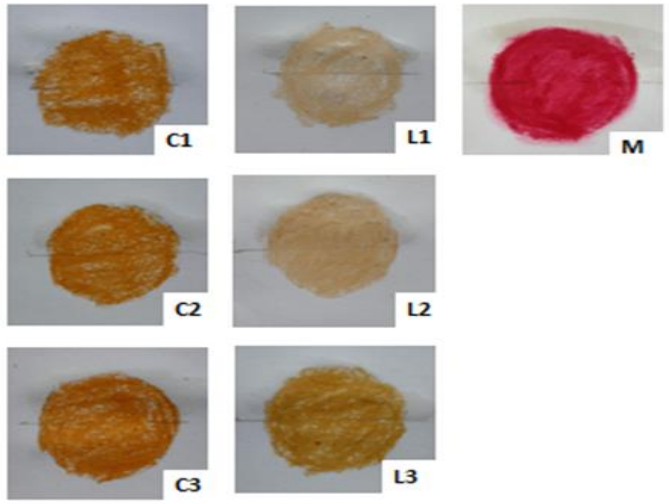

Figure 5. Smudge Test using lemon juice of lipstick formulations: containing Capsanthin (C1, C2 and C3), Lycopene (L1, L2 and L3) and Marketed formulation (M)

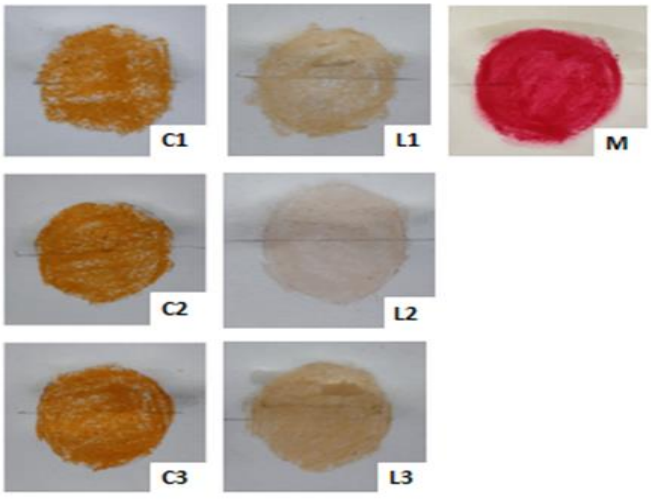

Figure 6. Smudge test using Coca cola of lipstick formulations: containing Capsanthin (C1, C2 and C3), Lycopene (L1, L2 and L3) and Marketed formulation (M)

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lipstick formulations were found to be poor as given in Table 2. Thus, it necessitates execution of a softening agent that can provide softness to all lipstick formulations without distressing its coating ability. Prevention of formulation on applied area to wettability was studied by using a water resistance test that revealed that all lipstick formulations were resistant to water as shown in Figure 4. While there are other "smudge-proof" lipsticks on the market, they are often matte and risk drying out lips. Beeswax gives the lipstick structure, and it is best to use wax with a high melting point to avoid the colour smearing around the lip area which is tested by adding up lemon juice and coca cola on applied lipsticks shown in Figure 5 and 6.

Several cosmetics have been formulated using natural components. Lipophilic nature of lipsticks limits the use of natural dyes as most of them are hydrophilic. Earlier reports suggested the use of lipophilic plant pigments in lipsticks (Pimple et al., 2021). The safety, compatibility and efficacy of the natural dyes used in present lipstick formulations makes them more suitable candidates in colourant cosmetics than their synthetic counterparts. As a result of studies, it was determined that these formulations of herbal lipsticks offer women a superior option with few negative impacts and it also retains the maximum topical effect on lips.

Conclusion

We conclude that the lipsticks using capsicum oleoresin and lycopene rich extracts can be conveniently incorporated into lipsticks. Moreover, lipsticks developed using lycopene rich extract and *Capsicum* oleoresin can prove to have a promising future as far as economically viable, safe and vegan cosmetics production is concerned. Scope exists in standardisation of the lipsticks with respect to quantitative analysis of lycopene and capsaicin.

Conflict of interest statement

The authors declare that in this work there is no known conflict of interest.

References

Batiha, G. E. S., Alqahtani, A., Ojo, O. A., Shaheen, H. M., Wasef, L., Elzeiny, M., & Hetta, H. F. (2020). Biological properties, bioactive constituents, and pharmacokinetics of some Capsicum spp. and capsaicinoids. *International Journal of Molecular Sciences*, *21*(15), 5179. https://doi.org/10.3390/ijms21155179

Batista, É. F., Augusto, A. dosS., & Pereira-Filho, E. R. (2016). Chemometric evaluation of Cd, Co, Cr, Cu, Ni (inductively coupled plasma optical emission spectrometry) and Pb (graphite furnace atomic absorption spectrometry) concentrations in lipstick samples intended to be used by adults and children. *Talanta*, *150*, 206–212. https://doi.org/10.1016/j.talanta.2015.12.011

Dawid, J. (2016). The role of tomato products for human health (Solanum lycopersicum)-a review. *Journal of Health and, Medicine and Nursing*, *33*(2015), 66-74.

Hussain, F., Pathan, S., Sahu, K., & Gupta, B. K. (2022). Herbs as cosmetics for natural care: A review. *GSC Biological and Pharmaceutical Sciences*, *19*(2), 316-322. https://doi.org/10.30574/gscbps.2022.19.2.0202

Jain, S., Jain, S., Pillai, S., Mandloi, R. S., & Namdev, N. (2022). Formulation and Evaluation of Herbal Lipstick by using Beet root extract. *Research Journal of Pharmacognosy and Phytochemistry*, *14*(1), 23-25.

Jamdade, K., Kostha, A., Jain, N., Dwivedi, S., Malviya, S., & Kharia, A. (2020). Formulation and Evaluation of Herbal Lipstick Using Beta Vulgaris and Punica Granatum Extract. *International Journal of Pharmacy & Life Sciences*, *11*(4), 6575-6579.

Kothari, R., Shukla, B., Gautam, D., Bagaria, M., & Sharma, A. (2018). Formulation and evaluation of herbal lipstick from natural edible coloring matter. *International Journal of Theoretical & Applied Sciences*, *10*(1), 17-20.

Mahanthesh, M. C., Manjappa, A. S., Shinde, M. V., Sherikar, A. S., Disouza, J. I., Namrata, B. U., & Ajija, W. C. (2020). Design, development and assessment of herbal lipstick from natural pigments. *International Journal of Pharmaceutical Sciences Review and Research*, *61*, 59-64.

Mallick, P. K. (2021). Medicinal values of tomato (Lycopersicon esculentum Mill.–Solanaceae). *International Journal of Applied Sciences and Biotechnology*, *9*(3), 166-168.

Pimple, B.P., Mekhe, A.R., Joshi, A.A., Malwadkar, S.S., & Pimple, K.B. (2021). Formulation and Evaluation of Lipsticks from the Dyes Of Root Barks of *Alkana tinctoria*. *Bulletin of Environment, Pharmacology and Life Sciences*, 10 (5), 140-145.

Raiola, A., Rigano, M. M., Calafiore, R., Frusciante, L., & Barone, A. (2014). Enhancing the health-promoting effects of tomato fruit for biofortified food. *Mediators of Inflammation*, *2014*, 1-16. https://doi.org/10.1155/2014/139873

Rasheed, N., Rahman, S. A., & Hafsa, S. (2020). Formulation and evaluation of herbal lipsticks. *Research Journal of Pharmacy and Technology*, *13*(4), 1693-1700.

Sarah, S. (2006). Reading Our Lips: The History of Lipstick Regulation in Western Seats of Power. *Food and Drug Law Journal, Digital Access to Scholarship at Harvard*, *62*(1), 165–225. http://nrs.harvard.edu/urn-3:HUL.InstRepos:10018966

Sudheer, K.K., Tripathy, B.R., Jenita, J.J.L., Bonepally, C.S.R., Iswariya, V.T., & Reddy, K.T.K. (2022). Formulation & evaluation of herbal lipstick from *Citrullus Lanatus* & *Curcuma longa*. *Neuroquantology*, *20*(12), 1048-1054. https://doi.org/10.14704/NQ.2022.20.12.NQ77086

Tirunagari, M., Nerella, N., Koneru, A., Baig, A.N., & Begum, A. (2020). Formulation and Evaluation of Medicated Lipstick using Natural Coloring Agent. *Research J. Topical and Cosmetic Sci*., *11*(1), 20-23. https://doi.org/10.5958/2321-5844.2020.00005.9

Venkatachalam, H., Parameswaran, C. R., & Palaniswamy, R. (2023). Formulation and evaluation of herbal lipstick from pigment of Nyctanthes arbor-tristis. *Indian Journal of Natural Products and Resources (IJNPR)[Formerly Natural Product Radiance (NPR)]*, *13*(4), 574-578.

Verma, S., Tripathi, D., & Tiwari, R.K. (2017). Formulation and Evaluation of Natural Lipsticks Prepared from *Bixa Orellana* Seeds and *Daucus Carota* Root Extract and their Comparative Study. *Journal of Pharmaceutical Science and Bioscientific Research*, *7*(1), 131-135.

Zhang, D., Sun, X., Battino, M., Wei, X., Shi, J., Zhao, L., & Zou, X. (2021). A comparative overview on chili pepper (capsicum genus) and sichuan pepper (zanthoxylum genus): From pungent spices to pharma-foods. *Trends in Food Science & Technology*, *117*, 148-162. https://doi.org/10.1016/j.tifs.2021.03.004.

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