

Exploring the Cosmetic Benefits of Moringa Powder: A Natural Solution for Skin and Hair Care

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ABSTRACT:

Moringa powder, derived from the leaves of the Moringa oleifera tree, which is grown in tropical and subtropical regions. Traditionally moringa oleifera tree is also known as “Miracle Tree”. Moringa has emerged as a powerful natural ingredient and having high nutritional value in the cosmetic industry, celebrated for its extensive benefits to skin and hair care. Rich in vitamins, Beta-carotene, antioxidants, and essential fatty acids. [1] Moringa powder has gained attention for its ability to rejuvenate and protect the skin, while also promoting healthy, strength and shine hair growth. Moringa also contains anti-inflammatory properties. This abstract explores the various cosmetic application of Moringa powder, including its role in combating skin aging, enhancing hydration, soften skin, brighten skin, reduce wrinkles, nourishes skin and providing protection against environmental damage. Furthermore, its potent antimicrobial properties make it effective in treating acne and scalp conditions. The versatility of moringa powder in formulations, whether as a facial mask, exfoliants, or hair treatment, underscores its potential as a natural, sustainable solution for maintaining and enhancing skin and hair health. As consumers increasingly seek eco-friendly and plant-based beauty product, moringa powder stands out as a holistic alternative in the ever-evolving landscape of cosmetic care. Evaluations included products stability, efficacy in skin and hair improvement, and consumer acceptance. In addition, successive integration between the agricultural crop and cosmetic industries are evidenced and significance to horticulture. This review explores the use of moringa across disciplines for its cosmetic value and deals with cultivations, nutrition, and benefits for skin and hair care. [15]

INTRODUCTION:

Moringa is also commonly called as “Drum Stick”. Moringa powder give its effectiveness as cosmetical as well as medicinal purpose. Moringa was first discovered around 2000 BCE in northern India. The modern use of moringa powder in cosmetic product began in the late 20th and early 21st centuries. As scientific research began to validate the traditional uses of moringa, particularly its high content of vitamins, mineral, essential fatty acids, and anti-oxidants. The shift toward the natural and sustainable ingredients in beauty product also played a significant role in popularizing moringa powder. Moringa oleifera is a fast growing and rich in nutrients. Moringa can be harvested multiple times in a year, providing a steady and sustainable source of raw materials. This high yield supports a consistent supply chain for the cosmetic industry. Moringa is valued for its nutrients and micronutrients which are found in the greater quantities in the plant’s leaves. Moringa oil has been used traditionally in various culture

for skin care, hair care and other cosmetic purpose. For example, in Egypt moringa oil was used in beauty ritual and as a base for perfumes, moisturizing and anti-oxidants properties. Moringa family consist 14 species the best and most widely known and utilized species is moringa oleifera. Moringa oleifera is primary species used for its nutritional, medicinal and cosmetic benefits. Moringa oleifera is a single-family and single-genus perennial plant. Moringa oleifera Lam belong to the Moringaceae family.[1] In addition, allied species of moringa that are also of interest in cosmetic applications are Moringa peregrina, Moringa stenopetala, Moringa concanensis, and Moringa drouhardii.[2] Moringa plant consist active components such as phenols, saponin, tannins, and flavonoids. Microscopically, the upper and lower surface of leaves are covered with epidermal cells that may have a waxy cuticle. These cells are typically rectangular or polygonal. Moringa leaves also may have glandular and non-glandular trichomes (hair like structure) on their surface. Furthermore, the seed coat is often observed under a microscope to study its structure. It may compose of multiple layers including an outer epidermal layer. The texture of the seed coat can be rough or smooth depending on the species and maturity. Moringa oil is extracted from the seeds, contains oil bodies or oleosomes. Under a microscope, these appears as spherical structure within the seed cells, filled with oil. Moringa powder can be found in the various cosmetic product, including scrubs face masks soap and lotion for skin care. Whereas, products like shampoo, hair serum, conditioner and oil for hair care. For hair care, moringa powder is often hailed as a potent solution for hair growth and scalp health. The presence of zinc iron and essential amino acids in moringa helps nourish hair follicles and improves scalp circulation, which in turn encourages stronger and healthier hair growth. Additionally, moringa's antimicrobial properties can aid in preventing scalp infections that lead to dandruff and hair thinning. The processing of the moringa leaves into powder, seeds into oil and flowers into extracts creates value at different stages of the supply chain. This value addition benefits farmers, processors, and manufacturers, making it an economically viable crop. Different part of the moringa plant can be used for various cosmetic purpose. Which are, moringa oil which is extracted from the seeds of moringa which are rich in anti-oxidants, vitamins (especially A, C and E), and fatty acids. It is used in skincare for its moisturizing, anti-aging and nourishing properties. It can help improve skin texture, reduce the appearance of fine lines and provide a protective barrier against environmental damage. Moringa leaf powder is packed with vitamins, minerals, and amino acids. Moringa leaf powders are commonly used in face masks and scrubs for its detoxifying and rejuvenating effects. It can help brighten the skin, reduce inflammation, and improve overall complexion. Moringa seed extract is often used in formulation aimed at acne, sensitive, pore treatment and skin healing. Its antibacterial and anti-inflammation properties can help in reducing blemishes and promoting a clearer complexion. Moringa pods which is also known as drumsticks, are rich in the nutrients, including vitamins and amino acids, extracts from the pods are sometimes used in cosmetic formulations for their nourishing and revitalizing effects on the skin. This drumstick contains high medicinal values and properties. Moringa bark has been traditionally used for its astringent properties. In modern cosmetic, bark extracts may be used in products designed to tighten and firm the skin. Moringa bark and roots are though less commonly used in cosmetics compared to other parts of moringa tree Moringa flower are rich in antioxidants and can be used in skin care products for their soothing and anti-aging benefits. They may help calm irritated skin and promote a healthy, radiant appearance. Moringa root powder has potential cosmetic applications due to its antimicrobial properties. It can be incorporated into skincare products aimed at treating acne or other skin conditions. Each part of the moringa plant is contributes unique benefits, making it a versatile ingredient in various cosmetic and

personal care products. Moringa oil are little expensive for large use so, some company might use a less expensive plant oil or extract that mimics some properties of moringa but lacks its full range of benefits. This can be problematic because the purported benefits of moringa such as, its anti-oxidant, anti-inflammatory and moisturizing properties might be absent or diminished in the substitute. Adulteration involves intentionally mixing moringa with other substances, which could be harmful or reduce the product's effectiveness, efficacy, safety, trust towards the consumer and quality of the product. To avoid this issues or problem, always review the ingredients list for authenticity and quality, choose products from established brands with a history of transparency and quality and look for certifications like organic or fair trade can provide assurance of ingredient authenticity and ethical sourcing. Furthermore, in global market demands, the increasing consumer preference for natural, organic and sustainable beauty products has driven demand for moringa based cosmetics. Consumer are more inclined towards products that offers health benefits while being environmentally friendly and moringa fits well within this trend. The global natural cosmetics market has been expanding rapidly and moringa's inclusion in this market adds substantial value. [11,12]

GEOGRAPHIC DISTRIBUTION, COLLECTION AND CULTIVATION:

Moringa is a versatile plant with plant with a wide geographic distribution, due to its adaptability to various climates, areas, humidity, temperatures, altitudes and soil conditions. Moringa is widely distributed all over the world by its nutritional benefits, medicinal benefits, and by its adaptability in any condition for growing purpose. [2] Moringa is native to the Indian subcontinent region. It has been cultivated here for thousands of the years and is an integral part of traditional medicine and cuisine. Moringa also grows naturally in Pakistan, where it is used for its nutritional and medicinal properties. Furthermore, Moringa is also cultivated in many tropical and subtropical region around the world due to its resilience and adaptability. Such country like, Moringa widely grown in many African countries, including Ethiopia, Kenya, Uganda, Nigeria and South Africa. In these regions, it is valued for its nutritional benefits and use in traditional medicine. In South America, Moringa is cultivated in countries like Brazil, and Colombia, where it thrives in the tropical climate. In Caribbean, countries such as Haiti, Jamaica, and Trinidad and Tobago have seen an increase in moringa cultivation, driven by its health benefits. Next in Southeast Asia, in Philippines moringa is known as "Malunggay" and is a staple in Filipino cuisine and traditional medicine. Whereas in Thailand and Indonesia, moringa is cultivated in these countries and is used both in local dishes and as a health supplement. In Middle East, Yemen and Saudi Arabia, Moringa is cultivated in arid region of the Middle East, where it is valued for its drought tolerance and nutrient rich leaves. Moringa is also grown in parts of Northern Australia, where the climate supports its growth. It is often used in both culinary and medicinal applications. In the United States, Moringa is cultivated in states with warm climates, such as Florida, Texas, and California. [1,2] It is grown both commercially and in private gardens. Moringa prefers warm, tropical, or subtropical climates but can also grow in temperature regions with adequate sunlight and also it can grow in a variety of soil type but prefers wee drained, sandy, or loamy soils. It is drought-tolerant but grows best with regular rainfall. The plant's wide adaptability and rapid growth make it suitable for cultivation. Cultivation and collection of the moringa involves several key steps and particles to ensure optimal and harvest. Steps involves such as, climate and soil requirements in which moringa thrives in warm, tropical to subtropical climates. It can tolerance temperatures ranging from 25°C to 35°C (77°F to 95°F) and it is sensitive to frost. It can also grow in semi-arid condition. Moringa prefers well drained, sandy, or loamy

soils with a pH range of 6.0 to 7.5. It can tolerate slightly alkaline or saline condition but performs poorly in heavy clay soil or waterlogged conditions. Furthermore, moringa is commonly propagated from the seeds. Seeds should be sown directly into the soil or started in nursery beds. They have a high germination rate but should be planted in warm conditions. In some regions, moringa is propagated from cuttings. This method is used to clone trees with desirable traits and can speed up the establishment of new plants. In addition, planting of moringa trees should be spaced 2 to 4 meters apart to allow for their full growth and to facilitate easy maintenance and harvesting. Moringa plant seed should be planted about 1 to 2 cm (0.5 to 1 inch) deep. [1,2] If using cuttings, they should be planted about 15 cm (6 inches) deep. Moringa is drought tolerance but benefits from regular watering, especially during dry periods. Avoid waterlogging, as it can lead to root rot. Generally, moringa requires minimal fertilization. A balanced, low-nitrogen fertilizer or compost can be applied to improve the growth. Regular pruning is necessary to promote bushier growth and easier harvesting. It also helps to control the size of the tree and encourages new leaf production. Moringa can be affected by the pests like aphids, caterpillars, and spider mites. Regular inspection and organic pest control methods are recommended. Here it should be observed the disease such as, fungal in which powdery mildew and root rot. Good soil drainage and proper spacing can help to prevent these issues. Furthermore, the collection and the harvesting of the moringa plant can be done in different methods for different parts of moringa plant. Such as leaves can be harvested once the tree reaches about 6 to 8 months old. They are typically harvested every 6 to 8 weeks, by using clean, sharp scissors or pruning shears to harvest leaves. It's best to pick the young, tender leaves as they are more nutritious and flavourful. Pods are harvested when they are still green and tender, typically for 6 to 8 months after flowering. They should be harvested before they turn in to brown and dry out. They are cut from the tree using pruning shears. Handle them should done in carefully manner to avoid damaging the tree. Seeds are collected from the mature pods that have dried in the tree. The pods should be allowed to dry completely before harvesting and pods are split to open to extract out the seed, and the seeds can be stored in the cool, and dry place until they are ready for planting or processing. Moringa root can be harvested when the tree is at least 1 year old. They are typically harvested for the medicinal or culinary uses. It should be carefully dig up the roots with a shade or shovel, being mindful not to damage the surrounding soil or remaining roots. Leaves can be used as fresh or dried for storage. Dried leave is often ground into powder for use in supplements or cosmetics. Pods can be consumed fresh or dried. Fresh pods are used in culinary dishes, while dried pods are often used for their seeds. Seeds can be cleaned, dried, and stored for future planting or oil extraction. Effective cultivation and collection practices ensure a healthy, productive moringa crop, maximizing the plant's nutritional and economic benefits. [5]

TABLE 1.1: PHYTOCONSTITUENTS TABLE:

Moringa powder, derived from the different parts of moringa oleifera tree, which contains various types of phytoconstituents that are beneficial in cosmetic formulations. [4,7,13]

Phytoconstituent	Functions/benefits
Vitamins (A, E and C).	Antioxidants, brighten the skin, & promotes collagen production.
Saponin	Gentle cleansing without stripping the skin of its natural oils.
Tannins.	Useful in the production like pore-tightening sticks or anti-blemish balms.
Flavonoids.	It maintains the integrity of the skin and reduces sign of aging, making it

	ideal for anti-aging balms.
Phenolic acids.	Ideal for the use in products designed for sensitive skin or area prone to irritation.

COSMETIC USES OF MORINGA POWDER:

Moringa powder have multiple benefits for skin care such as, moringa powder can be used in the DIY or commercial face mask. It helps to purify the skin, reduce inflammation, and provides a natural glow. The antioxidants in moringa helps to combat free radicals, which can slow down the aging process. Moringa powder can be added to facial cleansers to help remove dirt and impurities while nourishing the skin with essential vitamins and minerals. When moringa is combined with other natural exfoliants like sugar or oatmeal, moringa powder helps to gently exfoliate the skin, removing the dead cell and promoting a smooth, radiant complexion. Moringa powder can be infused into creams and lotion to provide deep hydration, its high content of vitamins A and E helps to improves the skin elasticity and reduce the appearance of fine lines and wrinkles. [4,9] Furthermore, moringa powder can also be used in hair masks to nourish the scalp and strengthen hair. Its rich content of amino acids and vitamins promotes hair growth, reduces dandruff and adds shines on the hair. Moringa powder can be incorporated into shampoo and conditioner to cleanse the scalp, reduce hair fall and enhance overall hair health. Moringa powder can also be used in lips and keep them soft and moisturised. The antioxidants and fatty acids in moringa project the lips from environmental damage.[14] Moringa powder can be added to the lotion and body butters to nourish and hydrate the skin. Its anti-inflammatory properties make it ideal for soothing dry or irritated skin. Next in the body scrub, moringa powder can be included in body scrub to exfoliate the skin, remove impurities, and leave the skin feeling soft and refreshed. [3,4]

ADVERSED EFFECT OF MORINGA POWDER:

While moringa powder is generally considered safe and beneficial for cosmetic use, there are some potential adverse effects to be aware of, especially for individuals with sensitive skin or allergies. Some individuals may be allergic to moringa or its components. This can result in skin irritation, redness, itching or a rash when applied topically. It's advisable to perform a patch test before using a product containing moringa powder, especially for people with sensitive skin or a history of allergies. Moringa powder might cause contact dermatitis in sensitive individual, characterized by itching, redness and inflammation. Discontinue use immediately if any signs of dermatitis occur and consult a dermatologist. [8] Although rare, some individuals may experience increased photosensitivity after using products containing moringa powder, leading to a higher risk of sunburn. Use sunscreen and limit sun exposure when using moringa based products on exposed skin. Moringa powder is generally non-comedogenic, but when mixed with other ingredients that may be comedogenic, it could contribute to acne or clogged pores in some individual. Ensure that the formulation is suitable for acne pore skin, especially when using moringa powder in conjunction with other ingredients. If moringa powder is used in products applies near the eyes such as eye creams or masks, it may cause irritation if it gets into the eyes. Avoid direct contact with the eyes and rinse thoroughly with water if contact occurs. Moringa powder may react with certain other ingredients in cosmetic formulation, potentially leading to irritation or reduced effectiveness of the product. [6] Ensure that moringa powder is compatible with other ingredients in the formulation and that it has been tested for safety in combination. If moringa powder is not processed or stored properly, it could be contaminated with bacteria, or with other pathogens, which could lead to

infections or adverse skin reaction. Use high quality, well sourced moringa powder that has been processed and stores correctly to minimize the risk of contamination. In products like scrubs or mask, overuse of moringa powder can lead to excessive exfoliation, resulting in skin dryness, irritation, or sensitivity. [5,6]

TABLE 1.2: MARKETED FORMULATION OF MORINGA POWDER:

Type	Brand Name	Company Name	Dose	Prize
Moringa Oil.	Kiehl’s Moringa Oil.	Kiehl’s.	30ml	₹3,000
Moringa Face Mask.	The Body Shop Moringa Mask.	The Body Shop.	75ml	₹2,295
Moringa Body Lotion.	Mamaearth Moringa Body Lotion.	Honasa Consumer Pvt. Ltd.	200ml	₹399
Moringa Shampoo.	Boutique Bio Moringa Fresh Growth Shampoo.	Biotique.	200ml	₹199
Moringa Facial Serum.	Morpheus Moringa Facial Serum.	Morpheus.	30ml	₹1,200

Moringa Soap	Rustic Art Moringa Soap	Rustic Art	100gm	₹150
Moringa Face Cream	Organic Harvest Moringa Face Cream	Organic Harvest	50gm	₹399
Moringa Hand Cream	Khadi Natural Moringa Hand Cream	Khadi Natural	50gm	₹210

HOME MADE REMEDIES:

Certainly, moringa is versatile plant with numerous beneficial properties for the skin and hair. There are few simple, homemade remedies using moringa powder that can be prepared and use in routine. Such as, in Moringa face mask, ingredients that are needed are 1 tablespoon moringa powder and 2 tablespoons plain yogurt (or honey for a different variant), mix it well until it forms into smooth paste. Apply the paste to face and neck, avoiding the eye area. Leave it for 15-20 minutes, then rinse off with lukewarm water and dry the face. This mask helps in nourish and revitalize the skin, providing a glow and improving skin texture. Next for Moringa face cleanser, here the ingredient includes 1 tablespoon moringa powder, 1 tablespoon aloe vera gel and 1 tablespoon rose water, mix all the ingredient well and apply the mixture in the face, gently message in circular motions. Rinse off with lukewarm water and follow up with moisturizer. This cleanser helps to remove the impurities and dirt while nourishing the skin with vitamins and minerals. Moringa hair conditioner can be made by ingredient including 1 tablespoon moringa powder and 2 tablespoon coconut oil is been heated until it gets warm but not hot. Mix the powder well and apply the mixture in hair, focusing on the ends and any dry areas. Leave it for 30 to 60 minutes and then rinse it with warm water. This conditioner helps to hydrate and strengthen hair, reducing dryness and frizz. Furthermore, for moringa scrub, 1 tablespoon of moringa powder, 1 tablespoon of ground oatmeal and 1 tablespoon honey, mix all the ingredient well and apply in the face and neck and gently message the mixture onto the damp skin in circular motions. Rinse it with warm water and dry the face. This scrub exfoliates the dead skin cells, promoting a smoother and brighter complexion.

CONCLUSION:

Moringa powder has emerged as a powerful and versatile ingredient in the cosmetic industry, it is celebrated for its extensive benefits to skin and hair care. Its rich content of vitamins, anti-oxidants, essential fatty acid and phytoconstituents like saponins, tannins, flavonoids, and phenolic acid make it ideal for various formulation aimed at rejuvenating and protecting the skin and promoting health hair growth. The Anti- inflammatory, anti-microbial and anti-aging properties of moringa powder further enhance its efficacy, making it a potent solution for combating skin issues such as acne, fine-lines, wrinkles and environmental damage, while also improving scalp health and hair strength. [3] Moringa's adaptability to diverse climates and its ability to be harvest multiple times a year have made it a sustainable and economically viable crop. Its cultivation spans various regions globally, from tropical and subtropical areas to arid regions, reflecting its global significance. Despite its relatively higher cost, moringa's extensive benefits, including environmental sustainability and alignment with the growing consumer demand for natural and organic beauty products, make it a sought-after ingredient in the cosmetic market. However, issues such as adulteration and quality control remain challenges that must be addressed to ensure consumer trust and product efficacy. Overall, moringa powder represents a holistic, plant-based solution that bridges the gap between traditional knowledge and modern cosmetic science, offering a promising future for natural beauty products. [10,9]

REFERENCE:

1. Karima Gharsallah, Leila Rezig, Muhammad Shahid Riaz Rajoka, Hafiza Mahreen Mehwish, M.Abbas Ali, Sook Chin Chew, Moringa oleifera: Processing, phytochemical composition, and industrial applications, South African Journal of Botany, Volume 160, 2023, Pages 180-193, ISSN 0254-6299, <https://doi.org/10.1016/j.sajb.2023.07.008>.
2. Leone, Alessandro, Alberto Spada, Alberto Battezzati, Alberto Schiraldi, Junior Aristil, and Simona Bertoli. 2015. "Cultivation, Genetic, Ethnopharmacology, Phytochemistry and Pharmacology of Moringa oleifera Leaves: An Overview" International Journal of Molecular Sciences 16, no. 6: 12791-12835. <https://doi.org/10.3390/ijms160612791>
3. Garg, P., Pundir, S., Ali, A. et al. Exploring the potential of Moringa oleifera Lam in skin disorders and cosmetics: nutritional analysis, phytochemistry, geographical distribution, ethnomedicinal uses, dermatological studies and cosmetic formulations. Naunyn-Schmiedeberg's Arch Pharmacol 397, 3635–3662 (2024). <https://doi.org/10.1007/s00210-023-02862-2>
4. Jezierska A, Sykuła A. Antioxidant properties of Moringa oleifera and Withania somnifera extracts and their use in cosmetics for men. Biotechnology and Food Science. 2023;85(1).
5. Mayuree Kanlayavattanakul, Nattaya Lourith, Moringa leaf: An innovative source of antioxidative phenolics for cosmeceutical products, Scientia Horticulturae, Volume 295, 2022, 110894, ISSN 0304-4238, <https://doi.org/10.1016/j.scienta.2022.110894>. (<https://www.sciencedirect.com/science/article/pii/S0304423822000206>)
6. Olufunsho Awodele, Ibrahim Adekunle Oreagba, Saidi Odoma, Jaime A. Teixeira da Silva, Vincent Oluseye Osunkalu, Toxicological evaluation of the aqueous leaf extract of Moringa oleifera Lam. (Moringaceae), Journal of Ethnopharmacology, Volume 139, Issue 2, 2012, Pages 330-336, ISSN 03788741, <https://doi.org/10.1016/j.jep.2011.10.008>. (<https://www.sciencedirect.com/science/article/pii/S0378874111007355>)

7. Tran TP, Tran TT, Pham TL, Phan TK. Potential use of Polyphenol-Enriched Extract from *Moringa oleifera* Leaves as an Active Ingredient in Sunscreen. *Natural and Life Sciences Communications*. 2024;23(2):e20240.
8. Savitri AK, Fitriyati N, Mustika AA. Formulation of the body scrub cream containing moringa seed powder (*Moringa oleifera*) and its examination dermal acute irritation. *GEOMATE Journal*. 2019 Oct 28;17(62):244-9.
9. Talreja S, Tiwari D, Bharti A. Formulation and evaluation of herbal soap by using moringa oleifera as main active constituents. *European Chemical Bulletin*. 2023;12:2121-41.
10. Garg P, Pundir S, Ali A, Panja S, Chellappan DK, Dua K, Kulshrestha S, Negi P. Exploring the potential of *Moringa oleifera* Lam in skin disorders and cosmetics: nutritional analysis, phytochemistry, geographical distribution, ethnomedicinal uses, dermatological studies and cosmetic formulations. *Naunyn-Schmiedeberg's Archives of Pharmacology*. 2024 Jun;397(6):3635-62.
11. Kessler JC, Martins IM, Manrique YA, Rodrigues AE, Barreiro MF, Dias MM. Advancements in conventional and supercritical CO₂ extraction of *Moringa oleifera* bioactives for cosmetic applications: A review. *The Journal of Supercritical Fluids*. 2024 Aug 22:106388.
12. Ali A, Akhtar N, Chowdhary F. Original paper Enhancement of human skin facial revitalization by moringa leaf extract cream. *Advances in Dermatology and Allergology/Postępy Dermatologii i Alergologii*. 2014;31(2):71-76. doi:10.5114/pdia.2014.40945.
13. Nizioł-Łukaszewska Z, Furman-Toczek D, Bujak T, Wasilewski T, Hordyjewicz-Baran Z. *Moringa oleifera* L. extracts as bioactive ingredients that increase safety of body wash cosmetics. *Dermatology research and practice*. 2020;2020(1):8197902.
14. Al-Reza SM, Khan S, Nahar K, Alauddin J, Islam S. Estimation of phytoconstituents and screening of antibacterial and antioxidant activity of different extracts from *Moringa oleifera*. *International Journal of Biological and Pharmaceutical Sciences Archive*. 2022;4:1-7.
15. Baldisserotto A, Buso P, Radice M, Dissette V, Lampronti I, Gambari R, Manfredini S, Vertuani S. *Moringa oleifera* leaf extracts as multifunctional ingredients for “natural and organic” sunscreens and photoprotective preparations. *Molecules*. 2018 Mar 15;23(3):664.