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Harnessing The Power Of Natural Allies On Skin, *Oryza Sativa* And *Muscovite*: "A Scientific Review"

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ABSTRACT:
The skin is a complex organ with vital protective functions and a diverse range of layers, including the stratum corneum, epidermis, dermis, and subcutaneous tissues. Its primary role involves maintaining homeostasis and protecting internal systems from environmental stressors. Skin pH and microbiome play crucial roles in its health, influencing conditions like dermatitis and acne. Natural substances such as rice water (*Oryza sativa*) and mica (muscovite) have been traditionally used for skin care, but their scientific evaluation remains limited. Rice Water (*Oryza sativa*): Rice water, a by-product of rice cultivation, has been used historically across Asia for its skin benefits. It contains starch, proteins, vitamins, and bioactive compounds such as γ-oryzanol and flavonoids. Methods for preparing rice water include boiling, soaking, and fermentation. Scientific studies have demonstrated rice water's potential in antioxidant activity, UV protection, anti-inflammatory effects, and skin barrier enhancement. It shows promise in treating acne, aging, and pigmentation issues due to its rich nutritional profile and ability to soothe and protect the skin. Muscovite (Mica): Mica, a mineral used since ancient times, is integral to cosmetic formulations. It exists in natural and synthetic forms, with synthetic mica offering advantages in purity and consistency. Mica's primary use in cosmetics includes providing a shimmering effect and enhancing the texture and appearance of products. Its properties include non-irritation, anti-inflammatory effects, and UV protection when combined with other minerals like titanium dioxide. Mica's optical effects, including interference colours and chameleon shifts, are valuable in creating diverse cosmetic finishes.

Keywords: Environmental stressors, Micro biome, Homeostasis, Vital, Shimmering.

INTRODUCTION:

SKIN, is the extensive and wide-reaching organ, which intimately interacts with the environment. Skin contains quaternary layers: (1) Stratum Corneum, (2) Epidermis, (3) Dermis, (4) Subcutaneous tissues. Stratum corneum is the mechanical barrier primary layer of skin which is formed by multiple action of lipids consisting of ceramides, cholesterol, and fatty acids in approximately equal molar ratio of 1:1:1[16]. Skin is associated with its derivatives such as Hair follicles, nails, oil glands, apocrine glands, makes up an integumentary system. The vital role of skin is to protect several functions, organs, and, systems inside human body. Although skin plays several role such as maintaining homeostasis, sensation characteristics as a barrier organ for survival of human body [1]. Face is connected with sensory innervation to skin. Facial skin is attached to the three branches or trigeminal nerve and, the fifth cranial nerve. These branches guides over forehead, upper lid and upper dorsum of nose[2].Skin possess both viscoelastic and anisotropic properties[3]. The Stratum corneum's 'acid mantle' plays a role in forming permeability barriers and providing cutaneous antimicrobial defence. The pH of the skin varies sharply across the stratum corneum, which is thought to be crucial in regulating enzyme activities and skin renewal. If the pH of skin is too acidic (less than 5.5) it may become irritated, red and painful to touch. If skin contains alkaline pH (more than 5.5) its cause's dry and sensitive effect [25]. Many endogenous factors influence skin pH, including skin moisture, sweat, sebum, anatomical site, genetic susceptibility, and age. Furthermore, external factors such as detergents, cosmetic product use, occlusive dressing, and topical medicines can all have an effect on skin pH. pH changes have been linked to the etiology of skin illnesses such as irritating contact dermatitis[eczema] and atopic dermatitis, ichthyosis, acne vulgaris[acne],and candida albicans infections, psoriasis, Rosaceae, due to hormonal changes, microbial infections, pruritus, erythema, pain and discomfort, scaling and flaking of skin, and pustules or lesions [24]. As a results, the use of skin cleansing agents, particularly synthetic detergents with a pH of around 5.5, may be beneficial in the prevention and treatment of certain skin conditions. Research indicates that the surface pH of human skin is around 5.4-5.9, according to widely accepted literature. The pH and buffering capacity of skin surface are determined by stratum corneum and secretions from sebaceous and sweat glands. [4]. Flushing out or removal of certain necessary microbiota also permits skin damage. Also upset of microbiome[5] on skin can create inflammation, irritation, dry patchy skin, dermatitis. Particular skin environment can be equalise or can be further

maintained by protecting skin microbiome by using cleansers with specific pH[5].Also carbonylation of stratum corneum protein is involved in yellowing of the skin and transparency loss of skin[16].A natural[6, 7], herbal, traditional[6], ancient, multipurpose[7] ingredient, RICE water is used for skin nourishing ,cleansing, beautifying, hydrating, protecting[7], activating, anti-aging[7], And its other myriad uses in various countries of World. Especially Korea, Japan, China, and India utilizes rice water for the betterment of skin as well as for hair [7]. Inclusion of rice water in skincare product has been increased as it is affordable, easy to process, sustainable, non-toxic [7].

Figure 1: Rice cultivated in paddy fields. [53] **Figure 2: Rice grain.** [54]

Oryza sativa commonly known as rice, is a staple food for approximately half of the world's population, providing nearly all daily calories, particularly in Asia. Rice water is typically ingested after soaking or boiling rice, but often lost during meal preparation worldwide.

Scientific studies on rice water's skin benefits are limited, and cosmetic producers often exaggerates their claims. The usage of rice water as bath component, particularly among Asian women, has become a practice without scientific support [6]. Major component of the rice grain as active constituent, is starch containing Amylose and Amylopectin, has been recommended to be added in bath water to get rid of dermatological conditions. Hence, starch is a biodegradable polymer it is included as safe application ingredient in pharmaceutical industry. Also starch is an anti-inflammatory agent therefore, in a recent work, starch base nanocapsules with an anti-inflammatory drug examined in mouse model subcutaneously, demonstrated synergistic anti-inflammatory with starch.[6] Women and other several cosmetic companies are said to be more skin conscious than man. In today's era range of mineral products that are especially skin-friendly has been flooded in market of cosmetics, which are suitable for all skin types. Therefore products prepare from mineral based substances are called mineral skincare products. These are blended with Herbo-metallic compound compound called MICA. The products are blended with mica powder which allows skin to breathe [8]. These are naturally occurring group of silica minerals but distributed broadly in different rocks species. Mica occurs in several shapes such as flakes, sheets, or scrapes [9]. Flakes of mica are similar like mini mirrors, and larger particles have larger reflection angle. Finely milled mica powder or particles create metallic shine, but larger flakes will create shine as glittering or shimmering agent [10]. This use of mineral is from pre-historic times. As its origin is from earth, it contains traces of heavy metals. In relation of testing of such heavy metals, FDA regulates the sample. Those examination within cosmetic or sample do not pose any risk to human health [9]. It is a key ingredient in pigment used as colouring agent that provides brilliant sparkle and pearlescent in colour cosmetics [11]. Synthetic mica is used for various application like pearl mica pigments, filter, paints, and nanocomposite material besides this.

Figure 3: Rock of Mica. [11]

Figure 4: Particle difference in mica element. [10]

ORYZA SATIVA [RICE]-

PLANT AND ITS CHEMISTRY:

Biological Source:

Seed of rice species belongs to genus *Oryza. Oryza sativa* (Asian rice), *Oryza glaberrima* are the two species (African rice) [7]. Myriad species of rice are there such as, White rice, Red rice, Brown rice [34], Black rice, Parboiled rice, Wild rice, Basmati rice, Jasmine rice[28], Arborio rice, Valencia rice, Long grain rice, Short grain rice, Sticky rice, Black japonica, Risotto rice.[27]

Figure 5: Varieties of rice.

Geographical Source:

China, India, Indonesia, Bangladesh, Vietnam, Thailand, Myanmar, Pakistan, Korea, Italy, North America, Philippines, Korea, Japan now produces majority of the world's rice. In spite of this, Asian farmers still produce 87% of the world's rice. [7]

Morphology of Rice plant:

Rice is one of the world's third major food crops, and also the staple diet of probably half of the world's population. Rice output is to be predicted to reach 650 million tonnes in the world, with a total area under cultivation of 156 million hectares. Asia is the one country leading producer of rice, accounting around 90% of global output. [7]

Table 1: Morphology of *Oryza sativa.* [7]

Name	Rice
Kingdom	Plantae
Division	Magnoliophyte
Class	Liliopsida
Order	Poales
Family	*Graminae (Poaceae)*
Tribe	Oryzeae
Genus	*Oryza*
Species	*Sativa*

Chemical Constituents:

Rice have abundant source of carbohydrates, but has limited amount of proteins and fats, have the higher vitamin B complex like thiamine, riboflavin, and niacin. Starch contains constituents

Such as amylose and amylopectin, majorly. Rice grain is made up of 12%water, 75-80% carbohydrate, 7% protein with all essential amino acids. Rice have high biological value (74%) and protein efficiency ratio (2.02-2.04) due to presence of a greater lysine concentration (about 4%). Inorganic elements such as calcium, magnesium, phosphorus, and residues of iron, copper, zinc, and manganese are present [7, 45]. Rice is considered to be as queen of cereals due to its highly nutritious values and easiness of digestion. Starch, glucose, sucrose, and dextrin make around 80% of carbohydrate in newly picked rice grains [7].

Oryza L. (rice) contains several bioactive compounds, such as γ-oryzanol, phenolic acids, anthocyanins, proanthocyanidins, flavonoids, carotenoids, and phytosterols[12]. Red rice (Oryza sativa) is a special rice cultivar in Thailand that has high procyanidin content in seed coats [17].

Table 2: Determination content of rice. [7]

Determination	**Rice**
Moisture content (%)	11.74 ± 0.74
Protein (%)	7.50 ± 0.20
Lipids (%)	0.36 ± 0.01
Ashes (%)	0.24 ± 0.01

Total dietary fibres (%)	1.06 ± 0.22

METHODS FOR PREPARATION OF RICE WATER:

Water prepared by the boiling process (RWB): 400g of paddy rice or simple rice with whole grains were boiled in 1L of deionized water for 30 min. rice water was filtered through cotton gaze and frozen at -22°F (−30°C) [6].
Water prepared with the intact grain (RWM): 400g of paddy rice whole grains were mixed with 1L of deionized and left to shake, at room temperature, for 24 hours. Rice water was then filtered through cotton gaze and frozen at -22°F (-30°C) until used [6].
Water prepared with the crushed grain (RWS): 400g of paddy rice grains were grinded into smaller pieces using kitchen robot, for 10 s , mixed with 10 L of deionized water and left to shake, at room temperature, for 24 h. Rice water was then filtered through cotton gaze and frozen at -22°F (-30°C) until used [6].
Rice water prepared through fermentation: 400g of rice left soaked overnight, it is allowed to ferment until its appearance turn cloudy. Where rice produces slight sour taste after fermentation. The fermented product is rich in antioxidants, mineral, vitamin B (cobalamin or cyanocobalamin), vitamin E (tocopherol or α- tocopherol), traces of *pitera,* chemical produced by *Saccharomycopsis fibuligera* yeast during fermentation process. Presence of phenolic and flavonoids compound is obtained which can help to reduce free radical damage caused by environment. [7] Certain macronutrients, micronutrients, nutritional, value of rice gives a fine texture to skin. [36]
Water prepared by extraction: ¼th cup of rice was rinsed and washed and water filled with ¾ th cup. And the rice are kept water filled for 2 hours, after that water is strained and stored in glass container. Water is kept for fermentation for 1-2 days. Bacterial growth present in fermented water possess beneficial effects. [29] Also for storage, fermented water is dried by storing at 4°C in refrigerator, and kept in glass container. [29]

METHODOLOGIES FOR ASSESMENT OF RICE WATER:
Physical characterization: The pH value is to be noted using combined glass electrode by pH meter where it ranges 3-5 pH when it is fermented, and 5-6 pH when it is without fermentation. This particular pH have benefits for skin and hair. Conductivity test is carried out using conductivity meter and turbidimetry test is carried out during infra-red turbidimeter. [6]
Dry residue assay: 5ml of rice water is weighed in porcelain capsule with treated sea sand. All the content is dried in oven at 102 ± 2°C for 2h. Before drying and after drying weighs are noted, where both the weighing should not differ more than 0.5 mg. [6]
Carbohydrates determination by phenol sulphuric method: Concentrated sulphuric acid (5ml) is added rapidly to 1ml of rice water and 1ml of 5% phenol is added. The change in colour solution is measured for which the result is proportional to the amount of sugars present in sample. [6]
Total protein by Kjeldahl method: This method is carried out by mineralisation and distillation. Where copper catalyst and anti- foaming agent (silicon) are introduced in Kjeldahl flask and is placed on heating device until, the liquid is completely clear. [6]
Analysis of fat by rose Gottlieb method: 15ml of rice water is placed in empty ampoule and weighed. 2ml ammonium hydroxide is added and mixed, 10ml of ethyl alcohol is added and mixed thoroughly, 20 ml of ethyl ether is added and stirred for 1min and 25 ml of petroleum ether is mixed and stirred for 30s. Mixture is left ideally until clear separation of the ethereal form aqueous layers. [6]

IN VITRO STUDIES:
Cell viability: this study is assessed after 24 h of incubation of spontaneously HaCaT cells that is Immortalised Human Keratinocyte cell line with different dilutions of rice water. Then these cells are seeded in sterile tissue well culture plates. Cells were incubated at 37°C and 5% CO_2. Negative control was culture medium and positive control sodium dodecyl sulphate (SDS) at 1 mg/ml. after exposition, MIT assay is performed. The relative cell viability (%) compared to control cells is calculated for the MIT assay using the following equation: [6]

$$\% \text{ cell viability} = \frac{\text{Abs sample}}{\text{Abs control}} \times 100$$

Enzymatic Inhibition Assay: Fluorometric assays for HNE inhibition activity is carried out in assay buffer of each concentration of tested inhibitors. After certain minutes of incubation, the reaction is initiated by addition of fluorogenic substrate to final concentration. Controls are performed using enzymes alone, substrate alone, enzyme with DMSO and positive control. [6]
Antimicrobial Activity: The antimicrobial activity is screened against *Pseudomonas aeruginosa, Staphylococcus aureus, Candida albicans, Aspergillus brasiliensis, and Escherichia coli.* The microorganism inoculum is prepared from broth culture and suspension is adjusted to turbidity. Then, Mueller-Hinton agar was poured into petri dishes and inoculated with suspension containing microorganisms. Sterile paper discs are loaded with rice water. After incubation, the mean of inhibition zone diameters is calculated. Each assay is performed in triplicate. [6]
Anti-ageing test: the extraction technique was implied on B16F10 melanoma cells and melanogenesis was tested. This test was tested in species of Jasmine rice water extract. [28]

PHARMACOLOGICAL ACTION:

Anti-oxidant activity of Rice [12]: Rice water shows action of inhibition of elastase, which is the compound that causes damage to elastin in your skin leads to premature ageing. [7] Also enhance skin texture and elasticity by keeping it hydrated for more time.[35]

Table 3: anti-oxidant characteristics of rice. [12]

Variety	Constituents	Effect
Brown [34], black,& white rice of Thailand	Contains anthocyanins, phenols, flavonoids, tocopherols, DPPH	The highest content of total phenolic, flavonoid, and α-tocopherol was found in black rice, followed by brown rice, and pigmented rice varieties had the highest antioxidant activity
Thai rice	Treated using DPPH method	There is a positive effect between correlation of zinc and antioxidant activity.
Red rice[17]	Treated using DPPH method	Antioxidant test results shows that red rice have more efficiency than black rice. Red rice water extract also contains wound healing promotion effects. [39]

Anti-ultraviolet potential: Testing the sun protection factor (SPF) of black sticky rice extract revealed that raising the concentration increases the SPF. Black glutinous rice contains anthocyanins. Anthocyanins are derivative of flavonoids, therefore flavonoids have shielding action against UV Radiation. Because flavonoids have ability to transfer electron to free radicals scavengers [31], activate antioxidant enzymes, and inhibit oxidation. Anthocyanins also produce defensive action against Reactive Oxygen Species (ROS) [12, 30]. Rice water also helps to tighten open pores [18]. Also acts as cooling agent and soothing agent against sunburn, inflammation, redness, and itching[7,31].UV induced skin DNA damage initiated ROS gene expression changes which involves inflammatory action responses to pre-mature skin ageing called photo ageing, therefore black rice water extract resists photo ageing.[14, 30, 32]

Antimicrobial action: As a result of invitro studies, rice water inhibits growth of certain microbes *Salmonella typhimurium* entry and replication in mouse small intestinal epithelial cells in vitro. Therefore it was revealed that inhibition of growth of gram $^{-ve}$ and gram $^{+ve}$ microorganisms. Rice water protects against infection, prebiotic effect, and microbial action. [12].

Steroidal activity: The compounds present in rice or rice straws are mostly steroidal which are useful to make raw materials for nutraceuticals, pharmaceutical, for cosmetic industry, for food industry, and for many other sources. Such phytosterols are also well known for anti- cancer activity. [13]

Boosts skin barrier health: Rice starch water contains power of healing and maintenance of skin natural barrier. It repairs skin combat constant aggressors, as well as prevent disorders like atopic dermatitis and environmental damage. [7, 31]

Oily skin mattification: Rice water have pore tightening and tonic effect when used on oily skin [7, 18, 35]

Dry skin: skin irritation [33] or drying caused by surfactant Sodium Lauryl Sulphate (SLS) used in soap and shampoos for personal care products, is moistened by rice water and rice starch, eventually utilizing it for twice a day. [31, 37]

Anti-Acne property: Rice water possess astringent and smoothening property for sensitive, acne, rashes and pimple skin and act as a natural acerbic. [7, 18]

Anti-ageing agent: Rice water restores skin texture and elasticity, especially for dry and dehydrated skin, as rice is rich in Vitamin A, Vitamin C, Vitamin E, flavonoids and phenolic compounds and also contains ferulic acid and all Antoine, all necessary for skin function[7]. Red rice contains high concentration of anti-ageing properties for skin lightening, skin hydration, and skin elasticity for cosmetics [17, 18, 31]. Yeast prepared from rice ensures smoothening of skin. [40]

Enhancement of Complexion: One key function of rice water is to give brighter, whitens, and glowers the skin [18, 38], and to even the skin tone. Skin brightens enzymes present in rice water are known to fade dark spots, blemishes, and brighten up complexion for clear and smooth texture [7, 18].

MUSCOVITE [MICA]-

MICA is also known as Nature's Glitter [43] also the fragment of Chiaroscuro cosmetic art (which is the art used in contrasting and highlighting human attire) [47], stands in major category of Ayurvedic drug belonging to herbo-metallic and phylo-silicate mineral includes monoclinic tendency towards pseudohexagonal crystals [44]. Muscovite material with its Nominal Composition is- $KAL_3Si_3O_{11}.H_2O$ and it contains an Isoelectric point (IEP) -1 [48]. Minerals are the, major sector of cosmetic industry since long time, mainly leading cosmetic product includes *Abhraka* (Mica), *Suvarna* (Gold) *mouktik* (Pearl), *Yashad* (Zinc). Mica soothes all three *doshas* (*vata, pitta, kapha*) and deals with facial skin issues. Mica rejuvenates skin tissue into formation of new tissue in skin called (*vrushya*). Also maintains (ayushya) long term elasticity of skin. Mica or (*Abhraka*) is (*balya)* is used to increase epidermal skin

layer thickness. Mica being *snigdha* that is smug or greasy it is used in *vata* dominating skin types. Mica being cold *(sheet)* in nature gives an excellent effect of anti-inflammatory drug on skin. Mica is an ingredient applied to almost all skin types. Basically, mostly used as cosmetic ingredient as it reflects light and gives smooth and shiny effect on skin, also smooth feathery effect to the skin. Mica fills skin edge and fine lines which would further results to convert in early wrinkle free look to skin. Hence, the best organic, mineral choice for skin shimmering cosmetic is Mica in the present times. Few words in Sanskrit phrase which denotes that Mica is compared to Amrut, for having properties of skin remedies and medicinal values [19].

बल्यंपिग्धंरुपिदमकफं दीपनंशीतवीययम् तत्तद्योगैः सकलगदह्रद्व्योमसूतेन्द्रबन्धि | [19]

SYNTHESIS OF MICA:

Natural mica is produced by 3 kinds of production. The top mica production nations are includes India, China, and Finland. Other countries such as United States of America, Europe, and Australia are responsible for the inclusion of mica in cosmetic products [49].

Firstly, melting growth occurs in igneous rocks such as pegmatites, resulting in muscovite, biotite, and phlogopite formations. Secondly, type is called contact metamorphism, which includes biotite and phlogopite in metamorphic, which includes biotite and phlogopite in metamorphic rocks like gneiss and hornfels. Final or thirdly, is alteration or hydrothermal alteration, which occurs when hot subsurface water causes illite to weather in rock. [20]

The synthetic methods of mica are considered by 3 corresponding situations of production:

1) The hydrothermal alteration corresponding to the hydrothermal reaction synthesis.
2) The corresponding contact metamorphism to solid phase reaction synthesis.
3) The melt growth corresponding to melting method synthesis.[20]

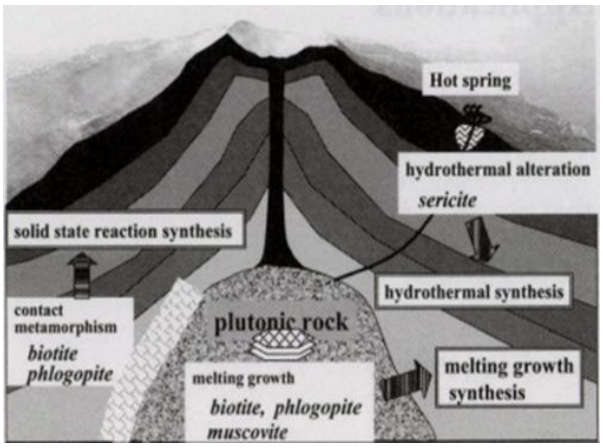

Figure 6: Mica generation environment. [20]

Describing synthetic mica manufactured using the melting process, synthetic mica is created by melting industrial ingredients such as Silica Sand (SiO_2), Magnesium Oxide (MgO), Aluminium Oxide (Al_2O_3), Potassium Silicofluoride (K_2SiF_6), and Sodium Silicofluoride (Na_2SiF_6). These materials are heated, melted, cooled, and crystallized. This approach increases yield by utilizing a reactive system with high density. Furthermore, melting the source material ensures homogeneity in the reaction system. It can produce high purity crystals. The melting procedure produces fluorine-type mica, as it is created under normal pressure. [20]

The synthesis of mica results in a pure crystal free of transition elements and heavy metals. The pure crystal is translucent and colourless. In contrast, even a small amount of metal can affect the colour and function of mica. To create swelling mica-like smectite, change the interlayer ion from K^+ to Na^+ or Li^+. Mica synthesis holds value in the industry due to its unique characteristics. [20]

The melting approach produces larger crystals of synthetic mica compared to other procedure. Melting can yield certain types of synthetic mica, such as: 1) fluoro-phlogopite 2) Na tetrasilisic mica. [20]

Mica plays an exclusive role as Extender pigment for cosmetic:

Synthetic mica is mostly used as an extender in cosmetics. Synthetic mica is commonly used in cosmetics, particularly in makeup. Two impacts are required to achieve attractive skin. 'Effect of cover' conceals blemishes and wrinkles, while 'No darkening lustre' reveals healthy skin. Synthetic mica exhibits two such phenomena. [20]

Make-up cosmetics include foundation, cheek colour, eye shadow, lipstick, nail polish, and so on. The foundation is referred to as base make-up cosmetics, and other as point make-up cosmetics. Because of the high level of touch with the skin, it is cosmetics with a strong material influence. Because make-up products are applied directly to the skin, they must be comfortable and attachable. Cosmetics containing fluoro-phlogopite have a clear and transparent lustre without the darkening effect of natural mica, which contains transition elements. Additionally, fluoro-phlogopite acts as an extender pigment and is a key component of make-up. [20]

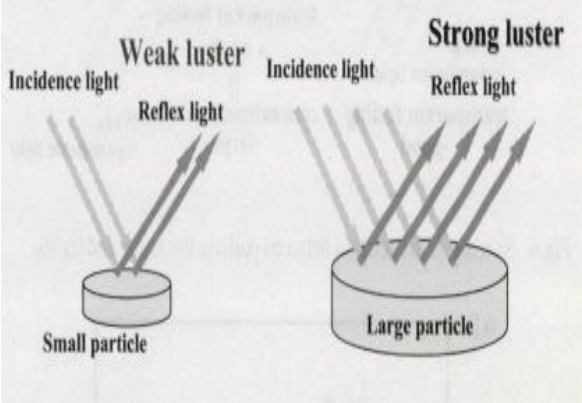

Figure 7: Relation between particle size and lights. [20]

This figure illustrates that how the size and shape of cosmetic particle affect their character. Large particles reflect light and have rough lustre, while foundations with large particles have strong lustre, appears oily, leave a negative impression. These particles are commonly used in eye shadows.
This figure denotes the scheme of relation between particle size and lights. [20]

KEY DIFFERENCES: NATURAL v/s SYNTHETIC MICA POWDER: [21]
Muscovite, which is valued for its sparkling appearance, is mined to produce natural mica. Synthetic mica, on the other hand, is derived from natural minerals but manufactured in lab. The end product is the mineral known as fluorophlogopite, which has same shimmering look as genuine mica. The primary distinctions between natural and manufactured mica includes: [21]
Colour purity: Because synthetic mica is purer, bolder, more uniform colours can be achieved [21]. Mica can be white, silver, gold, or metallic, even depending on its colour opacity and exact mineral composition and impurities present. [42]
Particle size: The texture of synthetic mica is smoother. As a result, it is a popular ingredient in make-up such as eyeshadow lipstick. [21]
Hardness and drop stability of mica is similar to talc but lightness is low. These are main factor considered in powdered compressibility [51].
Mining: Because of environmental concerns and mining procedures, some people choose synthetic mica in compared to genuine mica. Because natural mica is mined in impoverished places, so there are concerns about child labour abuses. [21]

MATERIALS AND METHODS TO EXAMINE MICA POWDER:
Anti-Microbial Assays: Two microbial strains Gram^{+ve} and Gram^{-ve}, from that *Staphylococcus aureus* and *Pseudomonas aeruginosa* were chosen respectively. Another in extra one fungal species is used called *Candida albicans*, these three were kept in culture collection in lab. Mica powder is well diffused in agar dilution assay. In result these culture plates shows indication of inhibition of growth of colonies of bacteria.
Cytotoxicity Bioassay: None of the mica powder causes cytotoxic or chemogenic effect which leads to damage to skin. Also the ingredient is water soluble. [22]

IS MICA SAFE?
Mica, according to US Food and Drug Administration (FDA) listed mica as safe ingredient for utilisation of colouring products, cosmetics, and personal care products, also lists mica as a colour additive exempt from certification.
The Cosmetic Ingredient Review (CIR) expert's panel, is a group that evaluates skincare safety and ingredients of cosmetic. [27]

SPECIAL EFFECT IN MICA POWDER:
Optical special effects is shown by mica powder when on applied on surface. As mica is reflective, the colour of reflection come into play. These effects are created by applying metal
Oxide coatings in different thicknesses. This means reflected colour is seen is very different from colour of mica powder itself. Three colours are there: [10]
1) Interference colour.
2) Duo colour.
3) Chameleon shift or colour shift mica powder.

Figure 8: Interference colour of mica. [10]

1) **Interference colour:** These are visibly white powder. These are usually appear colourless or white when applied to light surface. When on dark surface application, these gives greater reflection. Some brands of these powder have opacity, while other brands have more sheer or translucent

Figure 9: Duo colours of mica. [10

2) Duo colours: These mica powders reflects two different shifts, sometimes one reflects other. Other times powder is white and reflection shown as two different colour at once, depending on the angle of light relation to the eye. In this particular colours sheer duo or high-coverage ones is there. [10]

Figure 10: Colour shift of Mica. [10

3) Chameleon or colour shift mica powder: These colours can appear to be an entire range of colours. These mica colours depends on size of granule or mica flakes and also from a viewing angle. These colours are often used in nail art. As these synthetic mica powder appears to be blue, violet, purple, amber colour or depending upon the angle of the light. [10]

ADVANTAGES OF MICA IN COSMETICS:

The utilization of mica in cosmetics or make-up is very prevalent, because of the abundant benefits for both consumers and manufacturers, some of the advantages are mentioned below:

1. The primary advantage is that, it does not cause any irritation to the sensitive skin, like some other mineral ingredient. [9]
2. It contains anti-inflammatory properties, therefore it increases its property good and rich according to health wise. [9]
3. Mica is used as an additional ingredient to provide shimmery effect, and produces youthful glow when applied onto skin. [9]
4. On the reflection of light, radiation, texture enhancement, oil absorption and mattifying, [42] mica diverts attention away from fine aged lines and wrinkles. [9]
5. Manufacturers of make-up or cosmetics, uses mica as formulation thickener and fillers. It also helps in blending of their ingredients perfectly. Also mica is added for helping powders to easily flow and relieves powder or any product form clumping or clotting due to the presence of role of minerals. It also produces power make-up products. [8]
6. In the ground state, mica is a homogeneous ingredient which gives an excellent mix to another product, and this ensures the cosmetics manufacturing process is quite smoother. [8]

7. It is also used as an adhesive ingredient for product. Due to presence of natural minerals in it, it is quite easy for skin products to apply evenly, and this in turns, enables to make bind perfectly to skin. [8]
8. Appropriate for all skin types- natural range of mica deals a cure for various skin related problems like pimples, acne, dryness, clogged pores, fine lines, etc. cosmetic mica powder contains inert and inorganic property, is mixed with ingredient to inhibit the promotion of microbial growth. These particles of mica are finely grounded to the size of ≤150µm [23] and refined makes granules and allows the element to clog the pores. This property helps skin surface to provide flawless and clear skin. [8]
9. Finer application- These products ranges lighter and different texture as they contains flat microscopic crystals that blend filter layer on skin which allows skin to breathe even with make-up. The range of cosmetics guarantees glowing and natural look. [8]
10. Declining of harmfulness- The demand for these product have increased tremendously because they do not contain any harmful preservatives like dyes, parabens, fillers, and oil. [8]
11. Protection against UV rays or radiation of sun- addition of mica with Titanium Dioxide and Zinc Oxide in beauty cosmetics give synergistic effect and works as protecting shield or as a harmful UV rays protectant from sun. [8, 50]
12. Mica is used as Binder and Buffer, due to its clay mineral property, as this plays role in skin cell activation, so it is used as oil base [52].
13. Mica on the basis of animal free concern: it is friendly, cruelty/animal testing free
On the basis of natural and organic concern: it is mineral-based beauty ingredient.
On the basis of Eco-friendly concern: it is plastic free, recyclable, zero-waste, biodegradable, green.
On the basis of cleanliness concern: it is paraben-free, non-toxic, sulphate-free. [41]

CONCLUSION:

Comparative Analysis of both the ingredient gives synergistic effect. This review emphasizes the benefits of both *Oryza sativa* (rice) develops rice water and Muscovite commonly known as mica in skin care. Rice water is recognized for its multifaceted roles, from enhancing skin hydration and elasticity to offering antioxidant and anti-aging properties. Mica, whether natural or synthetic, is valued for its aesthetic properties, including its ability to reflect light and impart a youthful glow while being gentle on the skin.

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