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Moringa butter: ancient botanical in modern form

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ABSTRACT

Moringa butter is derived from the oil of the seeds of *Moringa oleifera*, a tree native to India. Moringa butter may infer certain skin benefits, when incorporated into hair and skin care products. Clinical data indicate that moringa butter enhances skin barrier recovery from barrier damage as well as increases skin hydration. The increase in skin hydration was also correlated with consumer perception of skin moisture.

On Earth Day 2008, as is the annual tradition, the US National Institutes of Health hosted a mystery plant contest. The clues for the mystery plant included:

> *...[it] has important medicinal properties but is not endangered. In fact, perhaps like no other single species, this plant has the potential to help reverse multiple major environmental problems and provide for many unmet human needs.*[1]

What was this mystery plant with over 100 different names in multiple languages around the world? *Moringa oleifera* – "the miracle tree" whose leaves alone contain seven times the vitamin C of oranges, four times the vitamin A of carrots, four times the calcium of milk, more iron than spinach, three times the potassium of bananas, and twice the protein of yogurt.[2,3] In addition, this vitamin-rich plant contains a variety of amino acids, as well as antioxidants and trace elements.[4]

The positive attributes of the moringa tree do not end with its nutritional benefits. In fact, the seed oil from *Moringa oleifera* has the highest oxidative stability of any vegetable oil available. Moringa oil also imparts several favourable aesthetic properties, such as providing a rich, cushiony, non-greasy skin-feel with low odour and colour to cosmetic and personal care formulations.[4]

Ancient history of moringa seed oil

Moringa oleifera (Fig. 1) is a flowering tree native to the foothills of the Himalayas in northern India. It is cultivated in many parts of the world including Africa, tropical Americas, Sri Lanka, Malaysia, and the Philippines.[4] Not surprisingly, the moringa tree is known by many names. In Senegal it is known as nebeday (the tree that never dies) because it is able to survive disasters such as fire and it grows quickly (up to 12 metres per year). In the Philippines the moringa tree is known as a mother's best friend because moringa leaves are used to increase the amount of a mother's milk, or are boiled and fed to children. In India, the moringa tree is called the drumstick tree due to the elongated shape of its seed pods.[2] The moringa tree is also known by various other names throughout Africa, Asia, South and Central America, and the Caribbean.[5]

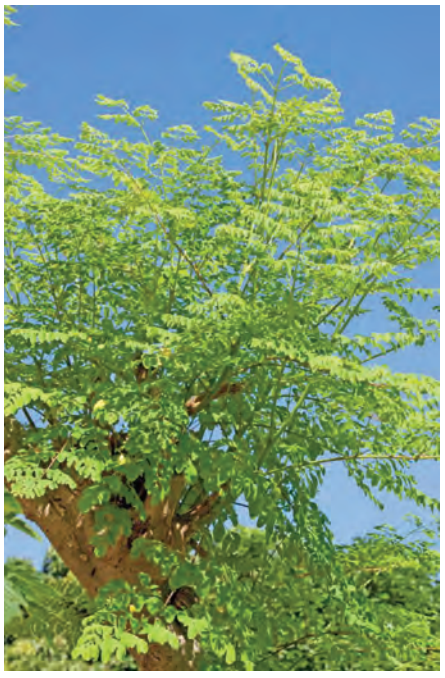

Figure 1: *Moringa oleifera tree (above) and the seeds below.*

The use of moringa oil, by ancient Egyptians has been recorded in hieroglyphs. In fact, Egyptologists have documented various applications and formulas containing moringa oil for topical pastes and perfumes.[6] Some of the historical uses of the moringa plant are shown in Table 1.[2,7,8]

This profile undoubtedly accounts for the historical therapeutic applications of the moringa plant.

Composition and physiochemical properties of moringa oil

Moringa seeds yield up to 40% oil by cold extraction. The resulting oil contains almost 70% oleic triglycerides, which is comparable to other triglyceride oils such as olive or canola. However, moringa oil has a lower iodine value of ~70 g/100 g compared to ~84 g/100 g for olive oil and ~118 g/100 g for canola oil.[4,9] Iodine value is one indication of how readily the oil will become rancid due to oxidation. Another indicator of oxidative stability is the "Oil Stability Index" or OSI. Properly prepared commercially available moringa oil[1] has an unexpectedly high OSI of ~133 hours, compared to similarly treated vegetable oils which have typical OSI values of ~30 hours. Moringa oil is also unique in its low free fatty acid content. Free fatty acids can be irritating to the skin. Moringa oil has an acid value of less than 1 mg KOH/g.[4]

Unsaponifiable substances, which

include tocopherols and sterols, generally range from 0.7%-1.1% in vegetable oils.[5] The sterol portion in moringa oil has a high content of beta-sitosterol.[4,10] Beta-sitosterol is known for its anti-inflammatory effect and its restorative properties which help to support the skin hydrolipid barrier.[4,11] This may be why moringa oil is increasingly used and valued in cosmetics such as anti-age creams, soaps, liquid soaps, body washes, deodorants, and face creams.[13]

An uncommon butter

Butters of vegetable oils are increasingly common to the cosmetic industry. They are typically made by partially hydrogenating common vegetable oils. In contrast, moringa butter is made by interesterifying moringa oil and fully hydrogenated moringa oil, thus preserving the natural cis configuration of each double bond. The result is a butter with no trans fats. Moringa butter is also odourless and less greasy, tacky, and glossy than most butters, notably shea, and can contribute to strength in stick systems. It is also extremely oxidatively stable with an even lower iodine value. The acid value also remains less than 1 mg KOH/g. Moringa butter is easy to work with because of its melting point of 50˚C to 55˚C.

In order to test the potential benefit of moringa butter in a formulation, small clinical studies were carried out investigating moringa butter's benefit on skin barrier recovery and skin hydration, as well as consumer perception of various product attributes. The clinical results show that the moringa butter is indeed beneficial to the skin.[13]

Skin barrier recovery

A simple lotion formulation with and without 2% moringa butter (Floralipids Moringa Butter, INCI: Moringa Oil/Hydrogenated Moringa Oil Esters, Floratech, Chandler, AZ) was tested against the same lotion formulation containing 5% petrolatum (positive control because of its known occlusion properties) in order to ascertain the benefits on skin barrier recovery due to damage by a known skin irritant, sodium lauryl sulfate (SLS). Transepidermal water loss (TEWL) was used to measure the recovery of the skin barrier in a double-blind, randomised, *in vivo* clinical study. TEWL was determined using a Tewameter TM300 (Courage+Khazaka, Cologne, Germany) on normal, untreated forearm skin (baseline). The forearms were then exposed to a 0.3% solution (w/w) of SLS for approximately 18 hours under occlusion using 19 mm Hill Top Chambers (Hill Top Research, Cincinnati, Ohio). TEWL measurements were again made 30 minutes following chamber removal and the percentage increase from baseline was determined. The forearms were then treated hourly with the above mentioned lotion formulations, followed by additional TEWL measurements an hour after each application. The percentage barrier recovery was then determined relative to the baseline values. The results show that after two applications, the formulation containing 2% moringa butter resulted in 67% barrier recovery compared to the formulation without which only resulted in 21% barrier recovery, $p<0.05$ (Fig. 2). There was no statistically significant difference between the 2% moringa butter formula and the 5% petrolatum formula (positive control, which resulted in 79% barrier recovery).

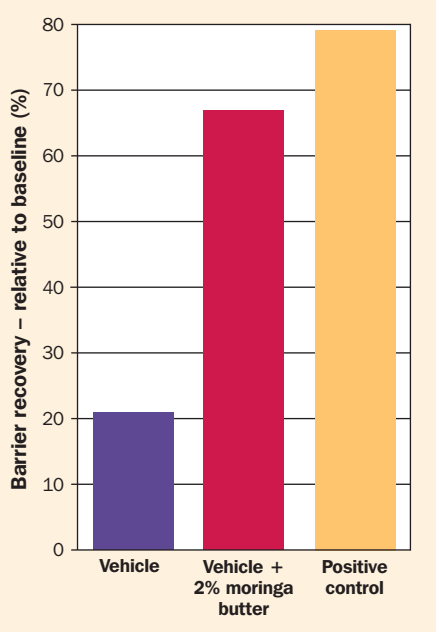

Figure 2: *Average percentage barrier recovery (TEWL).*

Skin hydration

Various butters (moringa, shea, olive, and cocoa) were incorporated into anhydrous stick formulations at 10% and tested for skin hydration using a Corneometer CM 825 (Courage+Khazaka, Cologne, Germany) in a double-blind, randomised, vehicle controlled, *in vivo* clinical study. The results show that after one application of the test articles, the formulation containing 10% moringa butter increased skin hydration at every time point up to four hours, far better than any of the other butter-containing test articles, $p<0.05$ (Fig. 3). The anhydrous stick containing the moringa butter produced a peak skin hydration increase of 55%, which was more than double the skin hydration produced by any of the other test articles.

Consumer perception

A double-blind, randomised comparative study using two anhydrous stick formulations containing 10% moringa butter and 10% shea butter, respectively, was conducted by 31 female consumers for various product aesthetics including such attributes as absorbency, spreadability, moisturisation, and non-greasiness. In all cases the formulation containing 10% moringa butter was preferred over the formulation containing 10% shea butter (Fig. 4). In terms of "overall" preference, the formula containing the 10% moringa butter was preferred five to one over the formula containing the 10% shea butter.

Conclusion

Moringa butter is derived from the seed oil of *Moringa oleifera*, a tree native to the Himalayan region of northern India. The moringa tree's various parts have been used for centuries for their natural healing benefits. Clinical results show that the moringa butter is indeed beneficial to the skin. In addition, a consumer panel was able to perceive differences in important product attributes when comparing a formulation containing moringa butter with the same formulation containing another marketed butter.[13] Moringa butter can be included within formulations in the same manner as other butters, with much enhanced formulation capabilities, such as enhanced aesthetic and increased product stability. Moringa butter is truly a modern day miracle from pre-antiquity. PC

Table 1: Medicinal uses for the moringa tree.

Plant part	Medicinal applications
Roots	Anti-inflammatory, blood circulatory stimulator, and laxative
Bark	Eye and spleen diseases, delirium, tumors, and ulcers
Leaves	Soothing agent for sores, headaches, eye and ear infections, and as a laxative
Rubber	Astringent for healing tooth decay
Flowers	Treat inflammation, muscular pain, and tumors
Seeds	Antibiotic
Pods	Hypertensive effect
Oil	Included in paste for topical oral and skin treatments

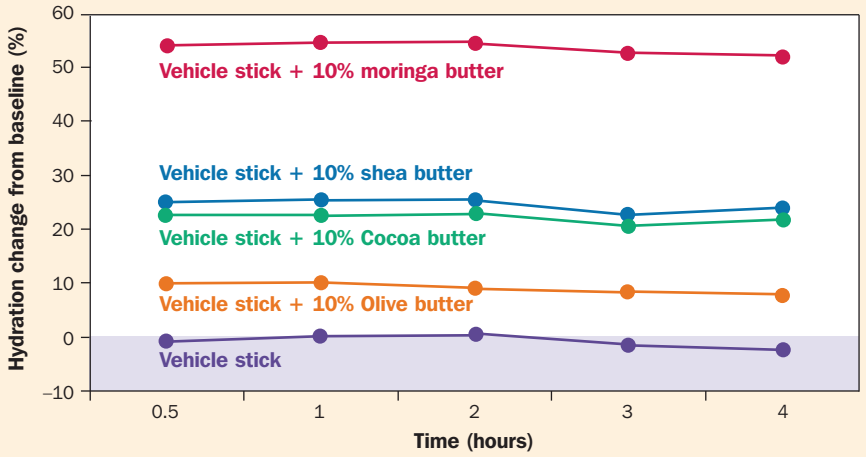

Figure 3: *Average percentage change in skin hydration.*

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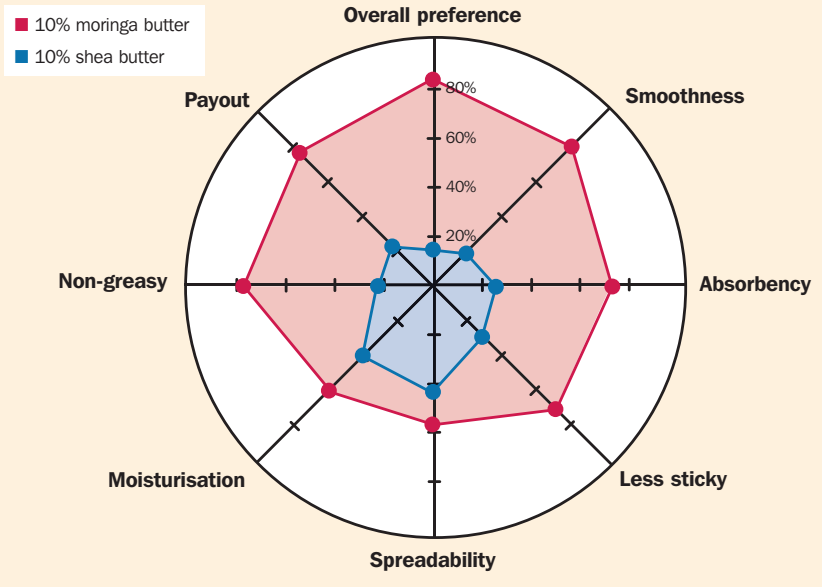

Figure 4: *Average percentage consumer preference.*