

Comparison of Marula and Argan Oil

By: Ashton Kaidi, MD, FACS

Plant and Vegetable oil and medicinal use

Drawings, dating back to 10,000 years, found in ancient caves in Zimbabwe, Africa confirm the use of plant and vegetable oils as a source of nutrition and healing. Many of them come from unique geographical locations including Africa, Morocco, and South America. Plant and vegetable oils have been used for a variety of anti-aging, healing and medicinal uses. Several studies have also shown plant and essential oils to be beneficial in promoting skin and wound healing (1-3)

Athar and Vermaak (4,5) did an extensive review of plant derived oil and their benefit as skin care products. These benefits included enhanced skin moisture, reduction in skin inflammation, anti-aging, skin healing, improved elasticity and skin softness. Not all oils are created equal and only a few have exceptional benefits. Table 1 is a list of the leading skin care products on the market using oil as their main ingredient. Marula and Argan oil are most popular in cosmetic settings and warrant further discussion and comparison.

Table 1. List of cosmetic facial oil companies and their oil ingredient

Main Oil in cosmetic products	Leading facial oil Companies
Marula Oil	Marula by John Paul Selects, marula.com
Argan Oil	Josie Maran Cosmetics, joosiemarancosmetics.com Moroccan Oil for hair
Hazel seed oil	Clarins, Clarinsusa.com
Blend (sesame, olive, almond, jojoba)	Bobbi Brown Cosmetics Bobbibrowncosmetics.com

Marula Oil vs. Argan Oil

Argan oil is a plant oil produced from the kernels of the argan tree (*Argania spinosa* L.) that is endemic to Morocco. World-wide, it's gaining reputation as a high-end ingredient in personal-care products. Argan oil has become increasingly popular for cosmetic use. It is sometimes mixed with pomegranate seed oil due to enhance its antioxidant property. Argan oil is also sold without additives as a natural skincare and hair care product.

In Africa, Marula oil (*Sclerocarya birrea*) is known as the "miracle oil". Marula tree plays a major role in the local economy of towns throughout Africa. Every part of the

marula tree has been incorporated in various foods, furniture manufacturing, medicinal and cosmetic industries (table 2). It is a precious commodity in Africa. The marula fruit contains four times the amount of vitamin C as a grapefruit. African women apply marula to their skin as a moisturizer and also to promote better scars. It is also popular in reducing stretch marks. Africans have higher tendencies to form thick or keloid scars and marula oil is one of the earliest discovered scar remedy. Marula oil has been more extensively studied and has been shown to have multiple medical benefits (6).

Table 2. Biological and Medical Properties of Marula

Biological Activities	Plant part and extracting solvent
Antidiabetic properties	Stem-bark aqueous extract, methylene chloride / methanol extract, and cold dichloromethane: methanol (1:1) and water extract
Antagonistic effect on caffeine-induced calcium	Crude decoction, aqueous, ethanolic, and chloroformic extracts
Antiplasmodial and antimalarial activities	Stem-bark aqueous and methanol extracts aqueous leaf, stem bark, and fruit extracts
Antioxidant activity	Leaves methanol extract, 50% aqueous methanol of the peel and pulp of the fruits Extracts from kernel oil cake, methanolic extracts from leaves, roots, barks, and kernel oil cake Methanolic and acetone extracts of fruits Aqueous methanolic extracts of fruits
Antibacterial activity	Bark and leaves, oil
Antifungal activity	Methanolic extract of leaves and roots
Anti-inflammatory properties	Stem-bark aqueous and methanol extracts, stem-bark aqueous extract, oil
Analgesic activity	Stem-bark aqueous extract

1. Marula vs. Argan: Fatty Acid Composition and Comparison

What are FA? FA are essential for maintaining a healthy skin. The power generators in our skin cells (mitochondrias) use FA as fuel to produce energy for skin repair and regeneration. Without them our skin would quickly age and deteriorate. FA have different chemical composition. Some are saturated (thicker oils with good skin barrier function) and some unsaturated (lighter oils). Some are essential (we cannot produce them and need to consume them) and some are non-essential. FA are the fingerprints of cosmetic oils and give us a lot of information about them. They tell us about absorbability, healing benefits, oil stability, anti-aging benefits and skin hydration potential. Vegetable oils contain higher concentrations of about 30 different fatty acids. Table 3 lists the concentration of different FA contained in marula versus Argan oil. Table 4 lists the common benefits and action of different fatty acids contained in these oils.

Table 3. Fatty Acid Composition of Marula and Argan Oil

Vegetable Oil	Oleic (O-9) Non-essential FA, mono-unsaturated	Linoleic (O-6) Essential FA, polyunsaturated	Linolenic(O-3) Essential FA, Polyunsaturated	Stearic Non-Essential, Saturated	Palmitic Non-Essential, Saturated
Marula	65-70%	8%	1%	10%	15-18%
Argan	43%	30%	<1%	4-7%	11-12%

Table 4: Common Fatty Acids and Their Action

Oleic (Omega 9)	Non-essential Mono- Unsaturated	<ol style="list-style-type: none"> 1. Increase skin penetration 2. Carrier function to drive nutrients deep 3. Emollient/Moisturizer 4. Soothing improves skin softness 5. Prolongs shelf life/very stable 6. Anti-oxidant 	Very stable, prolongs shelf life of products	Marula (70%), Olive, Almond,
Linoleic (Omega 6)	Essential, polyunsaturated	<ol style="list-style-type: none"> 1. Anti-inflammatory 2. Anti-acne, healing 	Low stability, oxidizes quickly	Sunflower, Safflower Evening Primrose, Tamanu, Kukui, Grapeseed,
Linolenic (Alpha form, Omega 3)	Essential, Polyunsaturated	<ol style="list-style-type: none"> 1. Alpha form (skin), anti-inflammatory, 2. UV protection, healing <p>Gamma form (Omega 6) for internal use, heart..</p>	Low stability	Kukui, Flaxseed oil, Abyssinian, Baobab
Palmitic	Non-essential, Saturated	<ol style="list-style-type: none"> 1. Skin barrier function, 2. prevents moisture loss 	Stable, increases shelf life, thick, reduced rancidity	Baobab oil,
Eurici (omega 9)	Non-essential, Monounsaturated	<ol style="list-style-type: none"> 1. Moisturizer, 2. increases skin penetration 	Stable, longer shelf life	Abyssinian, Mustard oil, Wallflower
Stearic	Non-essential, Saturated	<ol style="list-style-type: none"> 1. Skin Barrier function, 2. prevents moisture loss 	Thick, low penetration	Marula

Summary of FA comparison Marula vs. Argan:

Marula is light, non-greasy and fast-absorbing oil. Its rapid absorption is due to its high content of oleic acid (70%). Argan oil has a lower concentration of oleic acid (40%) and can leave a more greasy/oily feel on the skin and hair. Oils that have a higher concentration of Oleic acid penetrate the skin easier and can be good carrier oils. Oleic acid's ability to go deeper into the skin allows it to deliver key nutrients deeper into the skin.

Human skin serves as an efficient barrier. It prevents penetration of harmful germs, toxins and protect against water loss. The outer skin layer (known as stratum corneum) has a unique structure of dead cells tightly bound to lipids, waxes and glycoproteins. The cuticle of hair has a similar structure. It is hard for many products and oils to penetrate this tough and dense layer. Studies have shown that higher levels of Oleic acid (omega 9 FA) changes and softens this tough layer to allow easier penetration (7). It transforms the hard waxy layer to a softer and more fluid state allowing nutrients to go deeper.

Oleic acid is one of most potent natural moisturizers and it is excellent for dry and chapped skin. Oleic acid has also been to contain high levels of anti-oxidants and is excellent as for anti-aging. Oleic acid can also help with improving skin elasticity. African women have used marula oil to reduce stretch marks associated with pregnancy. Oleic acid is also one of the most stable cosmetic oils on the market. It has a much longer shelf-life than argan and grapeseed oil. Marula oil can retain its quality for up to 3 years (compared to a few months for others) and consumers have a longer time to use it.

Higher levels of Palmitic and Stearic fatty acid in Marula oil results in better skin moisture retention and longer lasting hydration. Palmitic and stearic acid concentrations are higher in marula oil (in fact not only higher than Argan but also most other oils on the market). Palmitic acid is a component of the skin (stratum corneum) and together with ceramides and cholesterol protects the skin against penetrating substances from the outside or water loss. It forms a proactive layer on the skin trapping in moisture and prolonging skin hydration. Marula oil keeps the skin better hydrated and requires less frequent application.

Like Oleic acid, Palmitic acids protect against oxidative changes. This leads to a longer shelf life and more stability in cosmetic products. It leads to less rancidity.

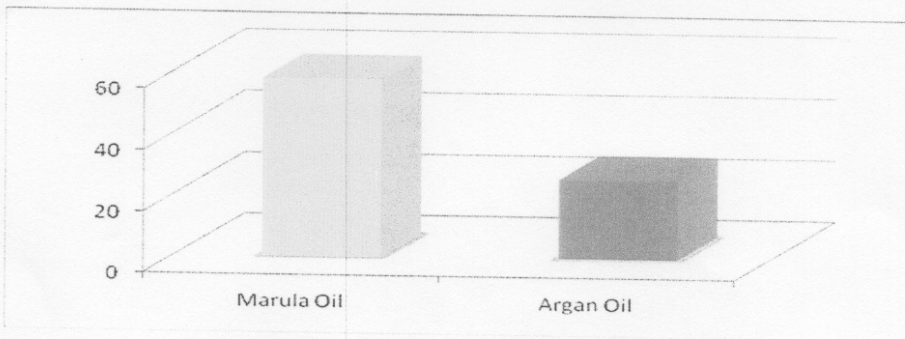
2. Marula vs. Argan: Anti-oxidant and Anti-aging comparison

A major cause of premature skin aging includes free radicals which come from various sources, including sun exposure, stress, poor nutrition and make-up. Marula oil contains a variety of antioxidants that effectively reduce the skin damage caused by these free radicals. Among them include the Vitamin E and Phenolic compounds.

Marula oil contains tocopherols and tochtotrienols collectively considered a good source of natural vitamin E. There are 4 types of tocopherols and tochtotrienols (alpha, beta, gamma, and delta). The antioxidant activity is highest with the alpha isomer and lowest with delta. Marula oil contains high levels of the alpha and beta derivatives. Marula oil also contains high levels of flavinoids that are also potent antioxidants.

Phenolic compounds are among the most important and potent naturally occurring antioxidants found in plant-based products. These include polyphenols, phenolic acids, flavinoids, and carotenoids. In addition to their anti-aging benefits on skin, phenolic compounds have been linked pharmacologically to reducing the risk of cardiovascular diseases, carcinogenesis and inflammatory conditions. Phenolic compounds are present in high concentrations in marula oil.

Although both vitamin E and phenolic compounds are also found in Argan oil, independent lab. ORAC testing is an indirect method of measuring the amount of antioxidant in cosmetic products. It is a patented test performed by an independent lab in Brunswick, MA. Samples of Marula and Argan oil were submitted for testing and Marula oil was more powerful at fighting free radicals that cause premature aging.



ORAC_{sc} testing (Brunswick Lab, MA) for total antioxidant power

Studies have shown that skin epidermis suffers from fatty acid imbalance with aging and sun damage. A NIH sponsored study (9) has shown that the level of Palmitic and Stearic fatty acids decrease with aging. Sun and UV exposure leads to a reduction in Oleic FA. Marula oil provides a higher dose of these fatty acids to the skin and help reverse damage and skin deterioration.

In summary, Marula oil contains powerful antioxidants. Testing has shown Marula to have a more powerful free radical fighting capability, making it a more powerful as anti-aging oil.

3. Skin Inflammation and Soothing Comparison

Any form of skin trauma, including sunburn, leads to an inflammatory cascade. These include release of prostaglandins, serotonin, kinins and histamine leading to skin swelling, redness and irritation. Marula oil has anti-inflammatory ingredients that lead to

a reduction of inflammation. These properties are believed to be due to inhibition of histamine and prostaglandin release by sterol and phenolic compounds contained in marula.

Marula oil also contains higher levels of phytosterols. Phytosterols are a group of natural plant derived compound with a structure similar to cholesterol (without the harmful side effects). In the medical settings, oral preparations are frequently used to lower bad cholesterol and prevent coronary disease. One of the most potent and important phytosterol is Beta-sitosterol. It has tremendous anti-inflammatory and soothing benefits. Marathon runners apply B-sitosterol to their skin after the race to reduce pain and swelling. Furthermore, B-sitosterol has been shown to reduce hair loss by preventing the transformation of beneficial testosterone to DHT. Of the 287mg/100gm of phytosterol found in Marula, 60% are in the form of B-Sisterol. Not only does Argan contain less phytosterol (142mg-220mg/100gm), it only has traces of B-sitosterol. This gives the edge to Marula as a superior soothing and calming oil for traumatized skin.

I undertook a clinical study to evaluate the efficacy of Marula oil in treating post cancer radiation induced skin trauma (8).

This clinical study included 24 women with breast cancer operation who needed chest wall radiation as part of their treatment. The radiation therapy frequently leads to severe skin trauma, including redness and inflammation. It releases a tremendous amount of free radicals and can be compared to very severe sunburn. In some cases it even leads to skin break down.

The study was conducted using 24 patients with radiation induced skin damage. They were divided them into 2 equal groups. One group was treated with an Aloe based moisturizer, while the second group was treated with marula oil. The marula oil group did significantly better. The redness resolved more quickly. The oil was also very soothing to the skin and provided better hydration (8). No clinical studies have been done on Argan and skin inflammation.

In Summary, one can assume that both oil have anti-inflammatory benefits. However, only marula oil has been clinically tested on skin. Studies have also shown that marula oil has analgesic properties explaining the soothing nature of it (6). It is excellent for use on sunburned and radiated skin. It is also very soothing and is ideal for post chemical peel application to reduce skin inflammation and promote healing. It could also be used for irritating and inflammatory skin and scalp conditions.

4. Antimicrobial properties and Comparison

Studies have shown that marula oil possess significant antimicrobial activity against gram positive micro-organisms, including Staphylococcus aureus (6). The antibacterial properties can be related to due to phenolic compounds and high oxidative stability of oleic acid.

Linoleic acid found in higher concentrations in Argan oil can lead to a reduction in bacteria causing acne. However, my review of literature failed to reveal any protection from Argan oil against Staph bacteria.

In Summary, it can be concluded that both oils can be used on all skin types, including the acne prone. Both lead to better skin hygiene and possess antimicrobial properties. However, Marula provides better protection against Staph bacteria and has fewer problems with rancidity.

Marula vs. Argan Summary and conclusions

- 1) Marula has more than twice the level of omega 9 fatty acid when compared to Argan oil and is absorbed easier.** This means it penetrates the epidermis layer of the skin easier (and probably cuticle of hair). The outer layer of skin (stratum corneum) is made up of dead cells, fats and glycoproteins. This is a very hard layer to penetrate. Studies have shown that omega 9 makes this layer softer, fluid and more penetrable. It penetrates deeper.
- 2) The higher Omega 9 in Marula means less greasy residue on skin and hair.** Argan has 50% less omega 9 fatty acid and will have a harder time penetrating skin/hair. Marula oil does not leave a greasy residue on skin or hair.
- 3) Marula oil is good carrier oil and drives nutrients deeper into skin (and probably hair).** This is also due to higher levels of omega 9 fatty acid and easier penetration.
- 4) Marula oil traps in moisture and provides for a longer lasting hydration than Argan.** Marula has higher levels of palmitic and stearic acid which is the same fatty acid in the outer layer of human skin (stratum corneum). It protects our skin against water loss and dehydration. You can go all day with less frequent application.
- 5) Marula oil is more powerful at fighting free radicals and better anti aging.** Independent lab (Brunswick lab MA) testing has demonstrated Marula oil to have a higher antioxidant power. One can translate this to better anti-aging capability.
- 6) Marula oil has been shown to have antimicrobial properties.** It is more versatile for use on all skin types and leads to better skin hygiene.
- 7) Clinical studies have shown Marula oil to be very soothing and anti-inflammatory.** This can be great for irritating skin, scalp and hair conditions. In a study on skin radiation post cancer, Marula oil has been shown to reduce redness and irritation. It is also excellent for sun burned skin or as healing oil for post chemical peels. It can also be useful for harsh hair treatments that lead to scalp inflammation or irritation.

8) Marula oil also contains higher levels of phytosterol and most important, beta-sitosterol which provides soothing and anti-inflammatory benefits. Marathon runners use it on their skin after run to reduce swelling and inflammation. It has also been linked to hair loss prevention.

Table 5 summarizes the claims with Marula based on fatty acid composition, scientific literature and clinical studies.

Table 5. Marula oil claims

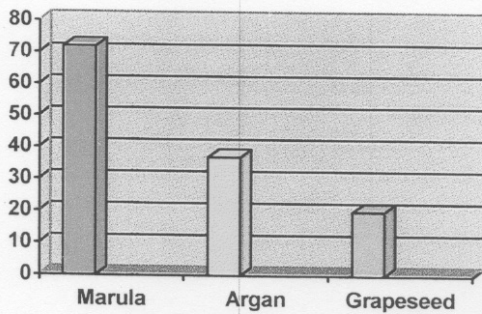
More powerful moisturizer
Better absorption by skin (and probably hair)
Prolonged Hydration
Less greasy
Soothing
Reduce redness and inflammation
Higher Anti-oxidant
More stable and Longer shelf life

To further enhance the efficacy of our skin and hair care products, we have incorporated a combination of oil with complimentary fatty acid profile where indicated. Additional use of peptides, stem cell and glycan technology provides products with maximal benefit. Marula oil is very special and superior in many ways to Argan oil as discussed. Further testing will broaden the claims for this unique oil.

References

1. A. Suggs, P. Oyetakin-White, and E. Baron. Effects of Botanicals on Inflammation and skin aging: analyzing the evidence. *Inflammation and Allergy*, 13:168-176. 2014
2. SA Pai, SA Gagangras, A Kulkarni, et al. Potential of Ozonated Sesame oil to augment wound healing in rats. *Indian J. Pharm Sci.* 76 (1): 87-92. 2014
3. C. Jones, The efficacy of lavender oil on peritoneal trauma: a review of the evidence. *Complement the Clin Pract* 17(4): 215-20. 2011
4. M. Athar, S.M Nassiri. Taxonomic Perspective of plant species yielding vegetable oils in cosmetic and skin care products, *African Journal of Biotechnology*, vol 4(1) PP 36-44, 2005
5. I. Vermaak, et al, African seed oils of commercial importance-cosmetic applications. *South African J of Botany*. 77: 920-933. 2011
6. AA Mariod and SI Abdelwahab. *Sclerocarya birrea* (Marula), An African Tree of Nutritional and Medicinal Uses: A Review. *Food Reviews International*, 28:375-388, 2012
7. N. Dayan, P Batheja, et al. Oleic Acid-induced skin penetration effects of a lamellar delivery system. *Cosmetics and Toiletries*. 122(9): 73-82
8. A. Kaidi. Marula oil (*Sclerocarya birrea*): A novel treatment for post-mastectomy radiation-induced skin damage. Presented at the 2012 Annual Scientific Meeting of the Southern California Chapter of the American College of Surgeons, Santa Barbara, CA Jan 21, 2012.
9. EJ Kim, M Kim, XJ Jin, et al. Skin Aging and Photoaging Alter Fatty Acids Composition, Including 11,14,17-eicosatrienoic Acid, in the Epidermis of Human Skin. *J Korean Med Sci*. Jun 2010; 25(6): 980-983.

Level of Oleic Acid in leading facial oil
Marula Argan Grapeseed



Marula Oil is absorbed quickly, goes deeper and is less greasy

Ingredients	Marula	Argan
Omega 9 (Oleic) FA	70%	40%
Palmitic Fatty Acid	16%	11%
Stearic FA	10%	7%
Total Phytosterol (anti-inflammatory)	287mg/100gm	Between 140-220, maybe we can use a mid range number of 180
Beta Sitosterol (this is the most important phytosterol for anti-inflammation and soothing benefits) used by marathon runners to calm skin after run	172mg/100gm	Trace amounts lets say less than 10
Antioxidnt	50%-300% higher	
Shelf Life(more stable and doesn not go rancid)	3 years	1-1 ½ years

Ingredients	Benefits	Marula	Argan
Omega 9 (Oleic) acid	Rapid absorption, less greasy	★★★★	★★
Antioxidant	Anti-aging, fights free-radicals	★★★★	★
Palmitic and Stearic Fatty Acids	Traps in Moisture, prolonged skin hydration	★★★★	★★
Beta Sitosterol (polysterol)	Anti-inflammatory, soothing to skin Used by marathon runners to reduce pain and inflammation	★★★★	★

Marula oil: edges out other oils at reducing skin inflammation, great for sunburn

When it comes to reducing skin burns, redness and irritation, there are few natural products as powerful as marula oil. With summer around the corner, beach goers may want to carry some in their travel bags.

I was introduced to marula oil about 5 years ago by a couple who live full time in the bush in Kenya. They claimed that the oil is locally known as the miracle oil because of its healing and anti-aging benefits. As a plastic surgeon, I am presented with products all the time and I was initially skeptical. All of that changed one summer night. One sunny day, I spent too much time by the pool and my sunscreen had washed off (I should know better). That night I was feeling miserable. My shoulders were burning, red and very sensitive. It was hard to sleep. Then I remembered the bottle of Marula oil and decided to use. I was amazed at how soothing it was. It almost had an analgesic, numbing effect. It reduced the irritation and allowed me to finally fall sleep. The next morning I was on a mission to find out what was in this magical oil.

Skin trauma, including prolonged sun exposure and sunburn, leads to releases histamine, prostaglandins, and kinins which lead to skin swelling, redness and irritation. Marula oil contains powerful ingredients like sterols, phenolic compounds and phytosterols that can reduce skin irritation and inflammation.

Phytosterols are a group of natural plant derived compound with a structure similar to cholesterol (without the harmful side effects). Oral preparations are frequently used to reduce the risk of coronary artery disease by competing with and lowering bad cholesterol. One of the most potent and important phytosterol is Beta-sitosterol. It has tremendous anti-inflammatory and soothing benefits. Marathon runners apply B-sitosterol to their skin after the race to reduce pain and swelling. Furthermore, B-sitosterol has been shown to reduce hair loss by preventing the transformation of beneficial testosterone to DHT. Sixty percent of the phytosterol found in Marula oil is the B-sitosterol form. In comparison, other oils, such as Argan, only contain trace amounts of this important ingredient. Marula oil is special and has a superior soothing and calming effect on traumatized and sunburn skin.

Marula Oil also contains potent anti-oxidants, such as vitamin E and flavinoids that fight free radicals released by sun exposure. Free radicals can cause premature aging. I sent samples of Marula oil to an outside lab for anti-oxidant level testing, including comparison samples of Argan oil. The lab confirmed that the levels of antioxidants in marula were much higher.

I also did a clinical study to evaluate the efficacy of Marula oil in treating post cancer radiation induced skin trauma. The radiation therapy frequently leads to severe skin trauma, including redness and inflammation. It releases a tremendous amount of

free radicals and can be compared to very severe sunburn. In some cases it even leads to skin break down.

My clinical study included 24 women with breast cancer operation who needed chest wall radiation as part of their treatment. They were divided them into 2 equal groups. One group was treated with an Aloe based moisturizer, while the second group was treated with marula oil. The marula oil group did significantly better. The redness resolved more quickly. The oil was also very soothing to the skin and provided better hydration.

In Summary, Marula oil is excellent for use on sunburned and radiated skin. It is also very soothing and can be ideal for post chemical peel application to reduce skin inflammation and promote healing. It could also be used for irritating and inflammatory skin and scalp conditions.

Marul Oil for Stretch Mark

Used for centuries by African women during pregnancy to avoid stretch marks, marula oil is known as the “miracle oil.”

Stretch marks are caused by tearing of the deeper layers of the skin known as the dermis. Stretch marks are often the result of the rapid stretching of the skin associated with weight gain or pregnancy. In some people, the skin elasticity cannot keep up with the rapid stretching. This leads to “scar-like” lines known as striae or more commonly stretch marks.

How does marula oil prevent and treat those unsightly stretch marks? Marula oil provides an excellent balance of moisture and fatty acids to keep the skin hydrated and moist. With higher levels of Omega 9 and Omega 6 fatty acids, it improves skin elasticity during pregnancy and helps reduce skin tearing. Good fatty acid balance is important in the overall health of your skin. They can improve skin elasticity.

Marula oil has higher levels of oleic (twice that of Argan oil) and as a result is able to penetrate more rapidly and more deeply. It also has higher levels of Stearic and palmitic acid that help trap in moisture. This allows for longer lasting moisture and elasticity. Improved elasticity can preempt the formation of stretch marks. You can also massage the oil into already existing stretch marks to help improve their appearance.

Our marula oil is 100% organic and has no chemicals or preservatives. It has a very subtle smell, making it perfect for pregnant women.