

Argan Oil: Miracle Ingredient?

This natural material, harvested from the kernels of the argan tree, is rich in essential fatty acids and other important nutrients, which can play a key role in the development of effective skin care products.

Nadim A. Shaath, Ph.D. • *Alpha Reseach & Development, Ltd. and Shaath & Meadows Consultation, White Plains, NY*

ARGAN OIL is sold in Morocco as a luxury item and is of increasing interest to cosmetics companies in Europe. The oil is now widely available in specialty shops and occasionally in supermarkets. Argan oil is an extract from the kernels of the argan tree (*Argania spinosa*) and is valued for its nutritive, cosmetic, and numerous medicinal properties. Because the argan tree is chiefly found in, and is endemic to, the Sous Valley in southwestern Morocco, argan oil is also often called Moroccan oil. However, *A. Spinosa* is also endemic to the Algerian Tindouf region.¹

Argania spinosa is a relict evergreen angiosperm species that has existed since the Tertiary Age (65 million to 1.8 million years ago), once covering North Africa but now endangered and under protection of UNESCO.² *A. spinosa* is the sole remaining species of the genus *Argania*. Due to its deep root system, *A. spinosa* is extremely well adapted to drought and other semi-desert conditions, growing wild and helping to protect against soil erosion and the northern advance of the Sahara into southwestern Morocco.

The root system of *A. spinosa*, extends deeply within the ground, and may occupy a subterranean volume five times that of the upper part of the tree. *A. spinosa* spontaneously loses its leaves during droughts, thereby preventing moisture loss via evaporation (transpiration).³

The tree grows to a height of 8 to 10 meters and can live up to 200 years. The trees are thorny with gnarled trunks and produce small, 2- to 4cm long, oval leaves with rounded apices. Blossoms appear in April, producing small, pale yellow-green flowers with five petals. The resulting fruits take more than a year to mature (they ripen in June to July of the following year) and are 2 to 4cm long by 1.5 to 3m across. The ripened fruit has a thick, bitter peel and a fragrant but unpleasant-tasting pulp. This encloses a hard nut, which usually contains one small, oil-rich seed. *A. spinosa* trees each yield an average of 8kg of fruit per year.⁴ Due to its limited and very specific growing areas and the low oil yield per



The Argan tree is loaded with nuts, ready for harvest.

tree (it usually requires the total perennial yield of kernels from at least eight argan trees to produce approximately 1L of argan oil), argan oil is one of the rarest oils in the world.

Processing & Uses

In some parts of Morocco, argan oil replaces the olive as a source of forage, oil, timber and fuel in Berber society. Traditionally, argan oil would be produced as needed in a family, from a store of the kernels, which will keep for 20 years when left unopened. The oil from unroasted seeds is traditionally used as a treatment for skin diseases, and has sparked quite a bit of interest among European cosmetics manufacturers.

The oil used in cosmetic and culinary products available for sale today is usually directly harvested and machine-processed. The most labor-intensive part of oil-extraction is removing the pulp, which is used to feed animals.

The seeds are then processed by mechanical dry-pressing, which has become increasingly important for argan oil production for sale, as this allows faster, and direct extraction, and the oil produced can be stored for 12 to 18 months after pressing.⁵

Economic Impact & Fair Trade

The *A. spinosa* range shrank approximately 50% during the past 100 years, due to charcoal-making, grazing and competing cultivation, leading to its being placed under protection in 1999 as a World Heritage of Humanity. The UNESCO-protected area in Morocco, (Arganeraie Biosphere Reserve), consists of more than 2,560,000 hectares and is bordered by the Atlas Mountains and the Atlantic Ocean.

Argan oil production is a traditional income-generating activity with a significant historical socio-economic impact. According to the Moroccan Department of Water and Forests, argan oil currently provides income for 3 million people in the southern part of the Kingdom of Morocco, involving a total of 20 million work-days a year.

The vast majority of the production of argan oil passes through women's cooperatives through programs that focus on improving the working conditions of rural women and generating additional income which helps support the entire community as a whole via sharing the profits from these economic activities among the local women of the Berber tribe. The Union des Cooperatives des Femmes de l'Arganeraie (UCFA) is the largest union of cooperatives for argan in Morocco.⁶

Chemical Components

Argan oil contains tocopherols (vitamin E), sterols (phytosterols), polyphenols, ferulic acid, carotenoids, squalene and fatty acids. Depending on extraction method, argan oil may be more resistant to oxidation than olive oil. Chemical analysis reveals a composition of the following fatty acids:

- 44% Oleic acid;
- 30% Alpha-linolenic acid;
- 12% Palmitic acid;
- 6% Stearidonic acid;
- 5% Linoleic acid; and
- 3% Myristic acid .

This data indicates that argan oil contains 80% unsaturated fatty acids and is rich in essential fatty acids (EFAs) and the precursor of vitamin E, linoleic acid, making it rich in antioxidants, therefore a valuable resource in combating cell damage and early signs of aging, via its action as an anti-free radical agent.

Essential fatty acids cannot be synthesized by humans and must be obtained through diet or skin absorption. EFAs are structural components of cell membranes and are necessary for regulating healthy skin and premature aging. They perform vital roles in sebum production, and are prostaglandin precursors. EFAs have antioxidant properties and form a thin, impermeable film that prevents skin moisture loss.

Carotenoids are a class of plant-derived lipid-soluble pigments which protect eyes and skin from UV radiation and free radical damage, help maintain our immune systems, promote healthy skin and inhibit cancer cell proliferation. The carotenoids found in argan oil are xanthophylls (e.g., neoxanthin,

violaxanthin and zeaxanthin), which function as antioxidants and are converted to vitamin A during digestion and stored in the liver.⁷ The photoquenching abilities of violaxanthin, zeaxanthin and antheraxanthin make them strong candidates for additives to photoprotective topical applications.⁸

Polyphenols are found in a wide variety of plants and are also known as secondary plant metabolites. They are known to have antiseptic, antioxidant, anti-inflammatory, anti-allergenic and anti-aging properties. Ferulic acid is the most abundant phenolic compound found in argan oil.⁹ This antioxidant helps prevent damage caused by ultraviolet light. Ferulic acid is often added as an ingredient in anti-aging supplements.¹⁰ Ferulic acid may improve the stability of vitamin C. The addition of ferulic acid to the combination of vitamins C and E appears to increase protection from UV-induced skin damage, as it strongly absorbs UV, thereby reducing UV-induced degradation of vitamins C and E. A recently published study supports such claims and found that the addition of 0.5% ferulic acid to a solution of 15% L-ascorbic acid (vitamin C) and 1% α -tocopherol (vitamin E) stabilized the formulation and, more notably, doubled photoprotection to skin from fourfold to eightfold thus making the topically applied formulation a much better skin-protective agent.¹¹

Squalene is a lipid-soluble, nutrient-rich antioxidant oil with the unique ability to anchor itself to cell membranes. It deactivates singlet oxygen, the free radical that is generated by exposure to the UV radiation.¹² Squalene is involved in cell growth and development as it is a precursor of cholesterol, vitamin D, and all the steroid hormones in the human body. It penetrates more deeply and readily than most other oils. Human sebum, the skin's own moisturizer, is 25% squalene, making externally-derived squalene highly compatible with skin lipids. Squalene has been shown to positively affect mature and rosacea skin.¹³ It is a natural bactericide, antioxidant, and healing agent, and has been effective in the treatment of dermatitis and skin cancer. First-press argan oil contains 3,100 mg/kg squalene (much higher in quantity than olive oil).¹⁴



Collecting argan oil is a labor intensive process.

Argan oil has many cosmetic uses.



Sterols (phytosterols) are a class of lipid-like compounds that inhibit skin aging by improving skin metabolism and reducing inflammation. They promote excellent moisture retention and rapidly penetrate the skin. The chemical structures of plant sterols and human sterols are very similar, therefore phytosterols are highly compatible with human sterols in the skin where they are the main components of its outermost layer and play a fundamental role in aiding and maintaining optimal skin barrier function. Moreover, schottenol and spinasterol, two of the families of human sterols noted for their anticancer properties and rarely found in vegetable oils are found in argan oil.^{15,16} Out of the 1,300mg/kg to 2,300mg/kg of sterols found in first-press argan oil, schottenol and spinasterol comprise 78% to 93%.¹⁷

Vitamin E (tocopherols) is a family of powerful antioxidant lipid-soluble vitamins and excellent free-radical scavengers thus protecting essential fatty acid and vitamin A levels in the body. First-press argan oil contains 600 to 700mg/kg vitamin E of which 500mg/kg are tocopherol.¹⁸ Vitamin E accumulates in the epidermis and forms a barrier against moisture evaporation from the skin, prevents cellular aging due to oxidation, aids in bringing nourishment to cells, decreases inflammation, and strengthens capillary walls. They significantly help in the reduction of scarring from wounds and the appearance of stretch marks. The percentage distributions of the tocopherols within the 600 to 700mg/kg vitamin E fraction of argan oil are:¹⁷

- 4-9% α -Tocopherol;
- 0.1-0.3% β -Tocopherol;

- 80-91% γ -Tocopherol; and
- 5-10.2% δ -Tocopherol.

Health Benefits

The high concentration of unsaturated fatty acids make argan oil a powerful ally in combating cholesterol and arteriosclerosis. A 2004 study found that rats fed a diet containing argan oil had significantly lower blood pressure than those that did not.¹⁹ Argan oil's putative anti-neoplastic (anti-cancer) properties may be due to the antioxidant properties of its components.

Many argan oil components are also important in healing and/or inhibiting degeneration. Argan oil carotenoids and phytosterols are also anti-inflammatory agents, with the carotenoids demonstrating anti-arthritis effects. The use of argan oil on facial skin has a long tradition in northern Africa. Argan oil's skin-moisturizing properties correct dryness and improve skin elasticity. The anti-free radical activities of the vitamins E, squalene and the argan oil carotenoids, EFAs, and polyphenols (most notably ferulic acid and its highly synergistic effects with vitamins C and E and β -carotene) have been demonstrated. Squalene, vitamin E and the argan EFAs, phytosterols and polyphenols are also proven emollients with the added advantage that they are rapidly absorbed transcutaneously; i.e., excellent candidates for topical applications. The combined anti-free radical, emollient properties and rapid absorption properties of these substances make them highly effective ingredients in topical photoprotective applications.

Argan oil hydrates hair by forming a non-evaporating layer around the hair thereby sealing in moisture. This layer will retain the moisture until it is washed out, making it a very powerful and long-lasting moisturizer. The moisture retained in the hair naturally gives hair an attractive and healthy glow, providing instant shine, smoothness and frizz control and also helps strengthen the hair shaft by promoting elasticity, thus preventing any form of hair brittleness from occurring. The argan oil seal also helps protect the hair cuticle against damage caused by harsh products as well as excessive heat from styling irons and environmental abuses. Moreover, damaged hair can easily be repaired by daily application of argan oil, as the assorted vitamins and minerals in it are highly effective in revitalizing hair. The molecules in Moroccan argan oil are small enough to penetrate the cortex of the hair. So while the oil gives hair the appearance of shine, it is also repairing, rejuvenating and moisturizing from inside the hair shaft. It is packed with antioxidants and vitamins E and F that the hair and skin are designed to absorb those elements. Furthermore, people suffering from hair loss can naturally prevent it by using argan oil, as it can help prolong hair follicle life and stimulate hair growth by increasing the production of keratin, an essential hair protein. The same emollient and nutritive qualities which make argan oil an excellent hair treatment also make it an excellent regimen for treating brittle nails.

Conclusions

Argan oil contains many components which obviously have significant health benefits. Some of its more unusual properties are the large quantities of γ -tocopherol and argan phytosterols (schottenol and spinasterol, which, as mentioned previously, are rarely found in plant products) as compared with other plant oils. A great many of its components have antioxidant, i.e., anti-free radical properties. Argan oil has been shown to positively affect cardiovascular health, wound healing, and diabetes. It has also exhibited anti-inflammatory, antiseptic, and anti-aging properties.

Given the excellent emollient and photoprotective antioxidant qualities of argan oil components and the ease of transcutaneous absorption of these components, argan oil is an excellent ingredient for sun care, especially for protection from the infrared (IRA) rays, as well as for skin and hair care cosmetic applications. ●

References

1. J.F. Morton and G.L. Voss (1987). "The argan tree (*Argania sideroxyylon*, Sapotataceae), a desert source of edible oil". *Economic Botany* 41 (2): 221-233.
2. "Biosphere Reserve Information/Morocco/ARGANERAIE [last updated 06/24/2002]". UNESCO <http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=MOR+01>
3. Z. Charrouf and D. Guillame (1999). "Ethnoeconomical, ethnomedical, and phytochemical of *Argania Spinosa* (L.) Skeels". *Journal of Ethnopharmacology* 67: 7-14.
4. A. Nerd, E. Etesholaa, N. Borowyc and Y. Mizrahi (1994). "Growth and oil production of argan in the Negev Desert of Israel". *Industrial Crops and Products*

- 2 (2): 89-95.
5. Z. Charrouf and D. Guillame (2002). "Chemistry of the secondary metabolites of *Argania Spinosa* (L.) Skeels". *Current Topics in Phytochemistry* 5: 99-102.
6. www.cooperative-argan.com
7. Z. Charrouf, J.M. Wieruzeski, S. Fkih-Tétouani, Y. Leroy, M. Charrouf, and B. Fournet (1992). "Triterpenoid saponins from *Argania spinosa*". *Phytochemistry* 31: 2079-2086.
8. K.K. Niyogi, O. Björkman, and A.R. Grossman (1997). "The roles of specific xanthophylls in photoprotection". *Proceedings of the National Academy of Sciences, USA* 94: 14162-14167.
9. F. Khallouki, C. Younos, R. Soulimani, T. Oster, Z. Charrouf, B. Spiegelhalter, H. Bartsch, and R. W. Owen (2003). "Consumption of argan oil (Morocco) with its unique profile of fatty acids, tocopherols, squalene, sterols and phenolic compounds should confer valuable cancer chemopreventive effects. *European Journal of Cancer Prevention* 12 (1): 67-75.
10. E. Graf (1992). "Antioxidant potential of ferulic acid". *Free Radical Biology and Medicine* 13 (4): 435-448.
11. F. H. Lin, J.Y. Lin, R.D. Gupta, J.A. Tournas, J.A. Burch, M.A. Selim, N.A. Monteiro-Riviere, J.M. Grichnik, J. Zielinski, and S.R. Pinnell (2005). "Ferulic acid stabilizes a solution of vitamins C and E and doubles its photoprotection of skin". *Journal of Investigative Dermatology* 125 (4): 826-832.
12. H. Kamimura, N. Koga, K. Oguri, and H. Yoshimura (1992). "Enhanced elimination of theophylline, Phenobarbital, and strychnine from the bodies of rats and mice by squalene treatment". *Journal of Pharmacology-biodynamics* 15: 215-221.
13. Argan Oils, <http://www.arganoils.com/arganoil.html>
14. "A Great Source of Natural Gamma-Tocopherol, Unsaturated Fatty Acids, Squalene and Sterols" Antanais Corporation (Suisse) S.A. FDA Docket <http://www.fda.gov/ohrms/dockets/dockets/95s0316/95s-0316-rpt0255-05-Argan-Oil-vol174.pdf>
15. M. Arizawa, A.D. Kinghorn, G.A. Cordell, C.H. Phoebe, and N.R. Fansworth (1985). "Plants anticancer agents XXXVI: schottenol glucoside from *Baccharis cordofo* and *Ipomopsis aggregata*". *Planta Medica* 6:544-545.
16. I.M. Villaseñor and P. Domingo (2000). "Anticarcinogenicity potential of spinasterol isolated from squash flowers". *Teratogenesis, Carcinogenesis, and Mutagenesis* 20:99-105.
17. Ardiansyah, Y. Ohsaki, H. Shirakawa, T. Koseki, M. Komai (2008). "Novel effects of a single administration of ferulic acid on the regulation of blood pressure and the hepatic lipid metabolic profile in stroke-prone spontaneously hypertensive rats". *Journal of Agricultural and Food Chemistry* 56(8):2825-30.
18. F. Khallouki, C. Younos, R. Soulimani, T. Oster, Z. Charrouf, B. Spiegelhalter, H. Bartsch, and R.W. Owen (2003). "Consumption of argan oil (Morocco) with its unique profile of fatty acids, squalene, sterols, tocopherols, and phenolic antioxidants should confer valuable cancer chemopreventive effects". *European Journal of Cancer Previews* 12: 67-75.
19. M. Cherki, H. Berrougui, A. Drissi, A. Adlouni, and A. Khalil (2006). "Argan oil: which benefits on cardiovascular diseases?" *Pharmacological Research* 54(1):1-5.

Acknowledgement & Contact Information

I would like to acknowledge Moustafa El Kouni, without his tireless efforts and insight, this paper would not have been written.

More info: Nadim Shaath, alpharnd@aol.com