

Natural Cosmetic Ingredients

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John Woodruff

Natural must be the most overworked and ill-defined term in cosmetic marketing. This feature is going to focus on ingredients that are truly natural and active materials that have been extracted from any part of land and marine plants. First however it will look at emulsifiers that are derived from natural materials and which enable natural certification to be claimed.

An example of a naturally derived emulsifier is Emulium Mellifera from **Gattefossé** that was awarded a gold medal at the In-Cosmetics Innovation Zone Best Ingredient Awards 2014.

Described as a sensorial emulsifier [INCI: Polyglyceryl-6 distearate, jojoba esters, polyglyceryl-3 beeswax, cetyl alcohol] it is said to adapt to the environment. In cold or dry conditions, it creates a soft, comfortable film of protection on the skin and in hot and humid conditions, it stabilises the sensory properties, leaving the skin less heavy and less greasy with a lower perceptible film. Emulium Mellifera forms oil-in-water (o/w) emulsions and is said to be particularly well-suited to low viscosity formulations. It is Ecocert and COSMOS compliant, shows significant moisturising properties and is pH stable from pH4 to pH10.

Polyglyceryl esters feature strongly as emulsifiers for products aiming for natural certification. Another example is Theomulse Cocoa [INCI: Cocoa glucoside, theobroma cacao (cocoa) seed butter, polyglyceryl-9 oleate, glyceryl stearate] from **Gilas**. It is said to be very mild making it suitable for very delicate skin. Used at from 4% to 8% it may be used as a self-emulsifying base and it adds structure and viscosity to emulsions. NatraGem E145 [INCI: Polyglyceryl-4 laurate/succinate] from **Croda** is a naturally derived high HLB oil-in-water emulsifier for creating creams and lotions using natural ingredients. Croda has developed a number of emulsifying systems built around NatraGem E145 to emulsify high and low polarity oils and to provide low viscosity lotions through to non-pourable creams.

Other polyglyceryl esters from **Croda** include Arlacel 1689 [INCI: Polyglyceryl-3 polyricinoleate, sorbitan oleate] that is particularly suited for the production of sprayable water-in-oil (w/o) emulsions containing inorganic sunscreens. Cithrol PG32IS INCI: [Polyglyceryl-3 diisostearate] is recommended for producing w/o creams and lotions and will give soft creams with a light skin feel even with high levels of inorganic sunscreens. Cithrol PG2IIS [INCI: Polyglyceryl-2 isostearate] is a liquid w/o emulsifier to give a light skin feel to milks and soft creams. Cithrol PG23IS [INCI: Polyglyceryl-2 triisostearate] has similar properties and Cithrol PG24IS [INCI: Polyglyceryl-2 tetraisostearate] is a rich emollient used for wetting pigments in lipsticks and high SPF lip products based on inorganic sunscreens.

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Polyglyceryl esters overcome the problem of avoiding EO and PEG-based emulsifiers, which are contraindicated for cosmetics claiming to be natural. **BASF** produces Dehymuls PGPH [INCI: Polyglyceryl-2 dipolyhydroxystearate]. **Clariant** has Hostacerin DGI [INCI: Polyglyceryl-2 sesquiisostearate]; **Ikeda** supplies Salacos DG-158 [INCI: Polyglyceryl-2 sesquicaprylate] and **Dr, Straetmans** suggests Dermofeel G-2L [INCI: Polyglyceryl-2 laurate]. All these esters may be used as w/o emulsifiers or co-emulsifiers and in many cases the suppliers can offer different polyglyceryl di- and tri- esters and prepared blends to impart special effects to the emulsion.

Tego Care 450 from **Evonik** is Polyglyceryl-3 methylglucose distearate that is said to form o/w stable emulsions with all common oils including polar oils and fats used for skin care products, Also from Evonik, Isolan PDI is Diisostearyl polyglyceryl-3 dimer dilinoleate, which is suitable for the formulation of cosmetic w/o creams and lotions that show high stability towards heat and freezing stress between -25 °C and +50 °C. A little different is Tegosoft PC 41 [INCI: Polyglyceryl-4 caprate] from Evonik that is described as a hydrophilic emollient with excellent solubilising properties. It is used as a PEG-free re-fatting agent in body washes, liquid soaps and bath oils and as an emulsifier for self-emulsifying oil formulations such as oil bath concentrates, which spontaneously emulsify on addition to the bath water.

There is an abundance of natural oils available to the cosmetic formulator and it appears that every seed can be pressed into yielding an oil that has a history of use in folklore. Many are rich in oil-soluble vitamins and essential fatty acids. Most have also been used in food preparation. While sweet almond, avocado and sesame seed oils remain firm favourites argane, kukui and macadamia oils are also very popular. More unusual is **Seaton's** Italian Tomato Seed Oil, which is a clear, light yellow liquid rich in linoleic acid and deeply moisturising to skin. There are so many different oils to choose from that **Seatons** has produced a selection guide that describes 38 different natural oils. For each oil it gives a brief physical description, typical refractive index and viscosity values; its skin feel properties and a guide to the products that would most benefit from incorporating the oil and why.

Another good source of information about natural oils is Oils of Nature, a book first published in 2005 that went out of print in January 2104 when all rights to the book reverted to the authors. Since it is the belief of the authors that the need for this information is as great as it was in the days it was written they want all interested people to have it as a resource free

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of charge. It covers over 60 plant and animal derived oils giving both common (USA) names and INCI names, their fatty acid profiles and useful information like iodine value, carbon number and melting point where applicable [Ref 1].

Laboratories Expanscience has added three new oils to its range. Lupin Oil [INCI: *Lupinus albus* seed oil] that is rich in carotenoids and vitamin E; this very stable oil has strong anti-oxidant and anti-radical properties. Virgin Prunus Oil [INCI: *Prunus domestica* seed extract] is derived by cold pressing the kernels of Ente plums and is rich in oleic acid and with a high tocopherol content. Andiroba Oil [INCI: *Carapa guaianensis* seed oil] is traditionally used by the populations of the Amazon forest to repel insects and for its soothing and healing properties.

Oils from the Amazon continue to fascinate cosmetic marketeers, Cupuaçu is a butter extracted from kernels and is rich in phytosterols that, because of its structural closeness to cholesterol, it is said to regulate the balance and activity of the lipids of the stratum corneum. It is available as Chemyforest Cupuaçu FG [INCI: *Theobroma grandiflorum* (Cupuaçu) seed butter] from **Chemyunion**. Kahai Oil [INCI: *Caryodendron orinocense* nut oil] from **Infinity Ingredients** is extracted by cold pressing the nuts of the Cacay tree. It has a high penetration capability, a dry skin feel, and a mild nutty scent, which quickly fades. Kahai Oil contains 50% more vitamin E and twice the linoleic acid content of argan oil and it has three times more retinol than rose hip oil, which ensures that it softens and repairs damaged skin.

ActiveShine Amazon 3R from **Chemyunion** is described as a composition of triacylglycerols [INCI: *Orbignya speciosa* (Babassu palm) kernel oil, *Astrocaryum murumuru* (Palm) seed butter] from Brazilian rainforest palms. It is offered as a natural sensory modifier for hair and a vegetable alternative to silicon. Blends of natural oils are also available from **Elementis**; for example Fancor Abyssinian Oil is a blend of *Limnanthes alba* (Meadowfoam) seed oil and *Butyrospermum parkii* (Shea butter) extract. It is said to be moisturising to the skin and to provide natural lustre, lubricity and an emollient feeling to hair care products. It also provides excellent pigment wetting and is a very efficient pigment dispersant, which leaves behind an elegant cushioning skin feel.

Crops yielding natural oils are also grown in Britain and **Northstar Lipids** has produced a number under its UK Origins range, which includes the best and most functional oils that Britain can offer, all of which are processed as close to the point of origin as possible. Examples are Crambe Oil [INCI: *Crambe abyssinica*]; Camelina Oil from *Camelina sativa*,

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Echium Oil and Optimega Oat Oil that is said to impart a luxurious skin feel making it ideal for massage oil and for inclusion in hand and nail creams.

Herbiotech Aroma S.A. is a Tunisian company founded in 2011 by for the preparation and development of 100% natural extracts and ingredients for food, perfumery, cosmetics and pharmaceuticals. It has developed three materials for cosmetic application; Herbiol Oleaster from wild olives, Herbiol Alep from Aleppo pine oil and Herbiol Lentiscus from lentisk oil. Lentisk oil is obtained from the fruits of *Pistacia lentiscus*, which is extracted by Herbiotech using water at a maximum temperature of 40C, during which the oil is never in contact with air. It is then rapidly separated from water to retain maximum cosmetic activity. Typically it has a linoleic acid content of 21.75% and is recommended for its soothing, anti-inflammatory and anti-oxidant properties. Herbiotech has undertaken some interesting UV absorbance studies with all three oils and found absorbance values between SPF6 and SPF8 for cold pressed Lentisk berries oil, which makes for interesting possibilities in skin care.

From the Far East **E.U.K.** supplies hydro-glycolic extracts of various plants used in Ayurvedic, Thai, Indonesian and Chinese medicine. In its brochure the local, English and Latin names are given where possible with details of the plants habitat, the part used to prepare the extract and its use in medicine and cosmetics. As an example Andawali extract is from *Menispermum crispum*, a plant native to Asia. The stem is registered in the Thai Pharmacopoeia for use in hospital to treat diabetes and for cosmetics it has strong antioxidant and anti-free radical properties. Another example is Kaffir Lime extract of the leaves of *Citrus hystrix*; a tree found in South East Asia and widely used to supply lime fruit and leaves as flavouring ingredients. For cosmetics the leaves are used to provide an extract with astringent and antiseptic properties.

The activity of many botanicals used in cosmetics is because of their antioxidant properties. **E.U.K.** offers bioflavonoids from *Citrus dulcis* and *Citrus limonum*; polyphenols from green tea (*Camellia sinensis*); O.P.C. from grape (*Vitis vinefera*) seed; lycopene from tomato (*Solanum lycopersicum*) and ascorbic acid from acerola (*Malpighia punicifolia*) fruit. According to E.U.K. bioflavonoids are best known for their antioxidant activity and studies on fibroblast have shown that topical application of bioflavonoids is more effective in fighting free-radicals than vitamin C or vitamin E and they can stimulate protein synthesis. The major active ingredients in tea are caffeine, theophylline and polyphenols. Many natural

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anti-oxidants are phenolic in nature and they inhibit oxidation of lipids and may delay lipid oxidation by inhibiting the activity of lipoxygenase.

O.P.C. stands for procyanidin oligomers, which are isolated from grape seed, and due to their molecular structure procyanidins will capture free radicals, protect cellular structures and help fight the ageing process. Lycopene is a red carotenoid pigment found in high concentration in tomatoes and experiment has shown that it exhibits significant bioactivity as an antioxidant and oxygen-quenching agent. Topical application helps protect the skin from solar radiation. Finally, Acerola fruits contain a high level of ascorbic acid and the anti-oxidant and anti-free radical properties of the Acerola extract promote synthesis of collagen and provide protection against oxidising agents, which make it an attractive active substance for anti-ageing creams.

Although there are no recognised natural UV absorbers there are natural materials that can boost the effects of those that are recognised. An example is Melscreen Buriti FG [INCI: *Mauritia flexuosa* fruit oil] from **Chemyunion**, It is an oil extraction from Buriti pulp that is a rich source of carotenoids and tocopherols It is shown to reduce the erythema measured through its anti-inflammatory activity and increase the elasticity and moisture content of skin exposed to solar radiation. It is also shown to boost SPF values and 5% Melscreen Buriti FG increased the results of a standard formula from 14.2 to 16.1, an increase of 15%.

As well as antioxidant properties cosmetic formulators are also interested in natural materials with antimicrobial activity, which were described in the July issue of SPC [Ref 2] and those that may be used as chelating agents. EDTA and its salts are the most commonly used chelating agents used to bind ferric, ferrous and other metallic ions that can cause problems within cosmetic products. Cosphaderm PA from **Cosphatec** is a 50% solution of phytic acid, which has similar chelating properties to EDTA.

Plant extracts are available to satisfy most cosmetic requirements. Cellulite is a painful accumulation of fat in adipose tissue; Adipo-Trap from **Phenbiox** is a slimming, re-shaping and anti-cellulite active ingredient derived from sundew (*Drosera Ramentacea*) leaves. Sundew is a carnivorous plant characterised by a phytocomplex with two main molecular peculiarities: the adhesive polysaccharide secretion of the trap and secondary metabolites with anti-inflammatory and bio-active properties. In-vitro and in-vivo tests show that the hydrolysed extract from Phenbiox breaks down these fatty deposits, which can then be transported away by the body's own waste system.

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Southern Cross Botanicals is a leading producer of certified natural ingredients derived from Australian native plants for the cosmetic and pharmaceutical manufacturing industries. It offers Superox-C, an extract of *Terminalia ferdinandiana* fruit, also known as the Kakadu Plum, which is the world's richest source of vitamin C. Southern Cross claims that it fights oxidative stress to reduce the appearance of wrinkles, improve skin radiance, and boost skin luminosity. A second material is Lime Pearl, an extract of *Microcitrus Australasica* fruit, also known as Caviar Lime that is naturally rich in Alpha Hydroxy-Acids (AHAs) that gently improve skin exfoliation to give a smoother, brighter, more even skin complexion. Also from Southern Cross is Tazman Pepper, an extract of *Tasmannia lanceolata* fruit, a purple-black berry that thrives in the mountains of Australia. Tazman Pepper contains polygodial, a powerful anti-inflammatory ingredient that reduces vasodilation and oedema to soothe the skin. It also has a high antioxidant level to protect against free radicals.

Examples of ingredients obtained by fermentation and enzyme biocatalysis are to found in the portfolio of ingredients offered by **Solabia**. It includes a wide range of natural and naturally derived active ingredients such as Bioecolia, a prebiotic glycan [INCI: alpha-glucan oligosaccharide] obtained by enzymatic biocatalysis. It is said to provide antimicrobial benefits to human skin by selective stimulation of the beneficial saprophytic flora and the release of antimicrobial peptides by keratinocytes.to the detriment of opportunistic, undesirable flora.

Another material from **Solabia** offering protection against unwelcome skin flora is Teflose, a polysaccharide obtained by bacterial fermentation. It is a mixture of glucose, rhamnose and glucuronic acid in a solution of propanediol and water that prevents the adhesion of undesirable bacteria on the skin surface thereby helping to regulate body odour and limiting the onset of blemishes while soothing the skin.. Fermentation and enzyme biocatalysis are considered to meet the principals of "Green Chemistry" and more materials produced by these methods were described in the August issue of SPC [Ref 3]

Hydrosativum P is hydrolysed pea (*Pisum sativum*) protein from **Croda** that is substantive to both skin and hair and like other hydrolysed proteins it has a powerful moisturising action. Trials by Croda show that it improves skin elasticity and has a skin soothing effect making it suitable for anti-ageing skin care. It may also be added to hair treatments where it is shown to protect hair during styling using ceramic tongs and to smooth the hair cuticle if added to shampoos and conditioner products.

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Extracting active ingredients from plants must be the fastest growing section of cosmetic science with many new ones launched at every major ingredient exhibition. At In-Cosmetics 2014 **Greentech** launched Cernilys [INCI: Cedrus atlantica bark extract] composed mainly of polysaccharides and polyphenols that decrease red and blue tones in the eye area to decrease dark circles. Greentech also launched Probiophyt Fresh, a lactobacillus ferment extract that decreases under-arm odour by inhibiting the multiplication of the bacteria that break down lipids released through perspiration.

Pacifique Sud added Monoi De Tahiti Edelweiss to its range of coconut oils that have absorbed natural aromas from gardenia and other flowers. Pacifique Sud also offered aqueous-glycolic extracts of pineapple and papaya and of the vivid blue flowers of *Ageratum conyzoides*, which is traditionally used for its soothing, analgesic and anti-inflammatory properties. **Naturalis** showed Anacryn, an extract of *Eclipta Prostrata* that is said to stimulate hair growth and also two polyglycerol-6 esters, one from olive oil, the other from shea butter, that are effective o/w emulsifiers.

Introduced by **Silab**, Cohesium is an aqueous extract of *Ophiopogon japonicus* that is claimed to be a skin repairing and moisturising active ingredient. It is said to stimulate the natural synthesis of skin lipids and increase the level of its natural moisturising factors to maintain an effective epidermal barrier and improve skin moisture levels. **Berkem** showed its range of Polynektars, which are active ingredients extracted from strawberry, bilberry, quince and oregano. These are claimed to improve skin radiance, soothe inflammation and to lessen the appearance of age spots.

Finding materials of natural origin to replace those from animal or petrochemical sources is an important part of cosmetic formulation. **Koa** suggests Phytolatun as a substitute for petrolatum. It is a mixture of hydrogenated soybean oil, soybean lipid and phytosterols, hydrogenated olive oil, hydrogenated jojoba oil and tocopheryl acetate. **Bionat Consult** offers Polyte Extra as a vegetal substitute for lanolin. Described as an anhydrous paste made of mixed natural vegetable butters and olive oil copolymer, particularly rich in Omega 6 its INCI name is *Butyrospermum parkii* (Shea) butter, *Olea Europea* fruit oil/glyceryl oleate copolymer.

Returning to emulsifiers approved by the main certification bodies for “Natural” cosmetics **Seppic** have launched a combination of hydroxystearyl alcohol and hydroxystearyl glucoside under the trade name Simulgreen 18-2. It is claimed that 3% Simulgreen 18-2 will form

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stable o/w emulsions with 20% oil phase provided a stabilising polymer is present. The recommended polymers are Simulgel SMS88 and Solagum AX. Also from Seppic Sepiclear G7 is a non-ionic, 100% bio-based surfactant produced from sugar and castor oil and its proposed INCI name is heptyl glucoside. It is a concentrated non-foaming solubiliser and hydrotrope that can be used as a co-emulsifier in o/w emulsions and microemulsions. Seppic is also well-known for its Montanov range of “Green” emulsifiers, amongst which is Montanov L, a combination of C14-22 alcohols and C12-20 alkyl glucoside, which promotes liquid crystal structures and will emulsify the majority of oils used in cosmetics.

Sucrose esters are being increasingly used in cosmetics for their “naturalness” and because they promote liquid crystal formations. **Sisterna** was at the forefront of marketing these materials and offers eight different sucrose esters and advises which of these PEG-free non-ionic emulsifiers best suit different applications. **Alfacos** also produces sucrose esters, the latest one to join the range is Sucramuls163 [INCI: Glyceryl stearate, cetyl alcohol, sucrose stearate, sucrose tristearate] that gives a luxurious skin-feel and increased stability.

Obtaining “natural” certification is not easy but to claim “organic” is even more difficult as a high percentage of the formula must be certified organic. One way to do this is to replace some or even all the water in the product with a certified fruit juice. An example is Bioextract 100 Mela from Phenbiox, which is *Pyrus malus* (Apple) fruit extract without any added water. Its preservative system conforms to COSMOS standards and its organic contribution to a formula is 98.2%. Also apples are rich in vitamins A and D, soluble fibres, natural sugars, organic acids and mineral salts so the extract claims moisturising, toning and skin smoothing properties.

It is understood that all the materials described in this feature comply with accepted natural definitions by the major certification bodies but those interested are strongly advised to check their status before use. To illustrate the difficulties of compliance Rahn has published its portfolio of natural ingredients and their status with the Soil Association, COSMOS, Ecocert and NaTrue, not all are universally accepted [Ref 4].

Ref 1 O’Lenick A J, Steinberg D, Klein K, La Vay C., Oils of Nature; electronic version available from tony@siltechpersonalcare.com

Ref 2 Woodruff J, Preserving the faith; SPC July 2014 Vol87 No 7; 38-40

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Ref 3 Woodruff J, Easy being green; SPC Aug. 2014 Vol 87 No 8: 43-47

Ref 4 Rahn, Natural Cosmetic List, UK and Ireland, available from Rahn (UK) Ltd.

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www.creative-developments.co.uk