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PERSONAL CARE

INGREDIENTS • FORMULATION • MANUFACTURE

Natural hair conditioning: a green approach

Texture and functionality of natural emulsifiers

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Natural hair conditioning: a green approach

Today's formulators face challenges posed by a consumer market which has become increasingly conscious of social, economic, technical and ethical issues regarding all aspects of modern life, including those relating to the use and manufacture of finished goods such as cosmetics. The expectations regarding environmental compatibility, sustainability, origins and safety of products are well known within the industry. If we combine this with quality assurance requirements such as traceability and consistency, while also ensuring compliance with international regulations and legislation, whether this actually refers to ingredients or to finished products, developing new personal care formulations in our modern times is by all accounts no mean feat. All this has stimulated in recent years a mounting quest for alternatives to synthetic or mineral ingredients which can be responsibly extracted, derived or manufactured from natural sources. This trend is not simply market or 'marketing' driven but is based on research showing the superior compatibility, safety and performance of selected materials of natural origin such as fatty acids and derivatives, vegetable unsaponifiables and triglycerides, natural waxes, plant extracts, etc. When used in cosmetic application, such ingredients have greater affinity with skin and hair than most synthetic counterparts and are capable of superior integration with their metabolism. They can therefore better contribute to conditioning, replenishing and protecting both skin and hair while respecting the natural conditions required for maintaining them in a healthy state.

Additionally more and more consumers follow the global green trend and are aware of the impact the products they buy have on their personal wellbeing and on the environment. However, although



they increasingly want personal care products based on alternative ingredients that are as green as possible, they are not willing to sacrifice product performance or convenience going forward.

The demand for vegetable based ingredients is nowhere else as pressing or as important as in the field of hair care formulations where the search for alternatives to well-known conditioning ingredients such as silicones, quaternised compounds and synthetic polymers is a major issue. Such alternatives should satisfy criteria of natural origin, sustainability and efficacy while avoiding

recognised problems caused by the traditional conditioning agents mentioned above such as long-term build up, limited or no biodegradability and poor integration with the substrate.

Leading the research for effective and reliable alternatives to synthetic ingredients based on decades of experience in oleochemicals and particularly in the development, manufacture and application of natural ingredients such as natural waxes, vegetable oils, natural butters, fatty acid esters and derivatives, Natura-tec is currently producing several vegetable based alternatives to synthetic conditioning and protecting ingredients, two of which have particular interest in hair care products.

Silicone-free natural hair care

Natura-tec Plantsil, an ester complex from olive origin, is a unique sensorial agent designed to be used as a vegetable based alternative to silicone. It mimics perfectly the feel of silicones thanks to its balanced formulation of natural derived ingredients. It is a highly stable, almost odourless transparent fluid oil. It imparts a light and soft touch and leaves a dry after feel on skin and hair with an appealing elegant touch.

The sensorial profile of this ingredient is very close to silicones.

It provides a silky touch and smoothness to skin and hair without oily residue. Furthermore, thanks to its excellent penetration and fast spreading properties, it can mimic perfectly the volatile feel of cyclomethicone (Fig. 1).

A cosmetic emollient of universal use, the olive ester complex restores suppleness and elasticity to skin and hair. It is rapidly absorbed, leaving a soft sensation with a unique powdery finish. It imparts a long lasting silky feel giving a velvety touch in skin and hair care applications.

Most interestingly, in

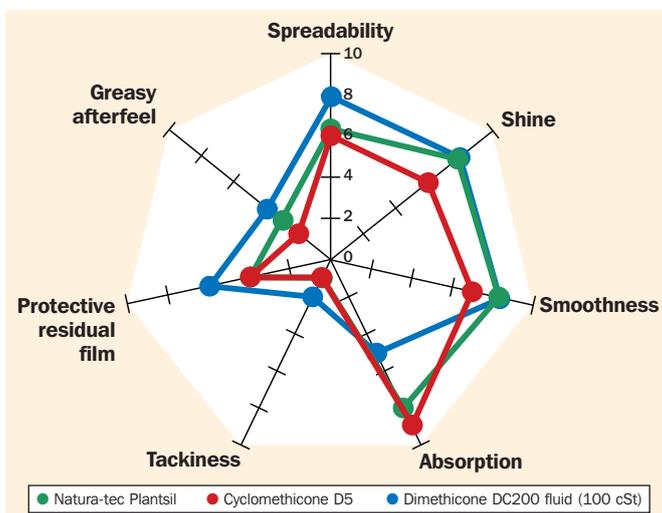


Figure 1: Sensory representation of Natura-tec Plantsil.

shampoo formulations it has been shown that Natura-tec Plantsil's behaviour on hair is very similar to actual silicone. Laboratory evaluations confirm the compatibility with common surfactants and co-surfactants and it is recommended as an ideal conditioning agent to replace silicones in hair care products (Fig. 2).

All-natural hair conditioning

Natura-tec Abysoft, a triglyceride ester of phytosterols, is an MPE or Multifunctional Performance Enhancing active that combines the benefits of Crambe abyssinica oil with the bio-availability of phytosterols.

Based on long chain triglycerides the ingredient presents a unique molecular structure. It contains long chain fatty acids and is concentrated in C22:1 fatty acids, making it highly resistant to oxidation. Due to its high molecular weight, it is also more stable against heat.

This triglyceride ester is non-irritant and acts directly on skin and hair forming a thin

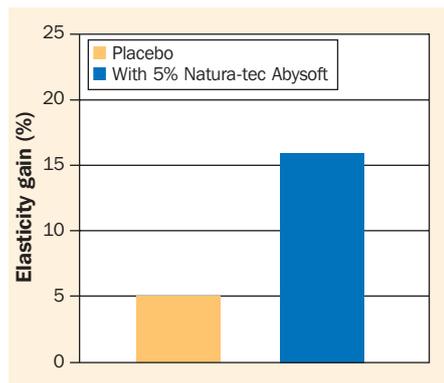


Figure 3: Effect on hair elasticity. After 12 washings/treatments improves hair elasticity by +191%. Natura-tec Abysoft improves the resistance of hair to traction.

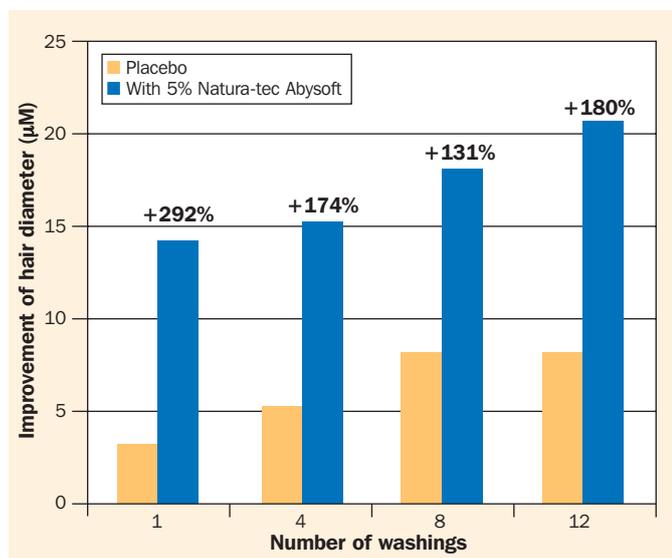


Figure 4: Filming properties. Natura-tec Abysoft in formulation has an immediate effect on the increase of hair volume by forming a film.

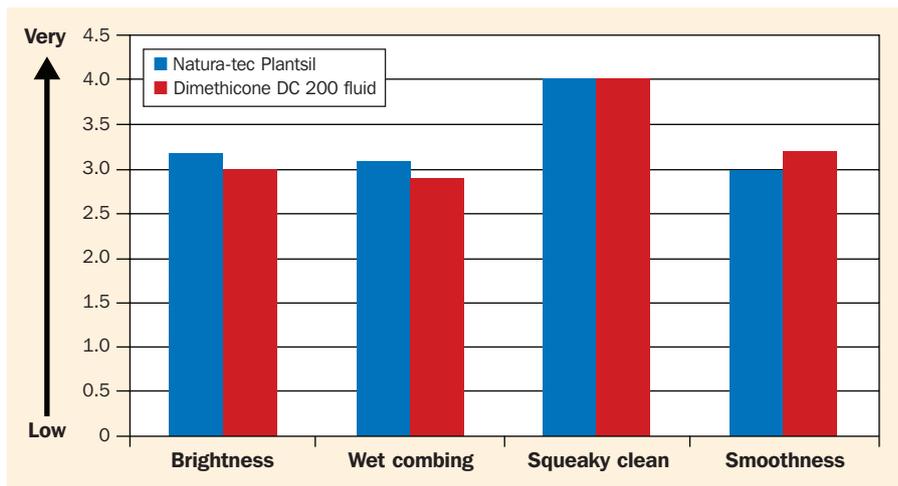


Figure 2: Performance comparison Natura-tec Plantsil vs. dimethicone at 1% in a base shampoo.

protective film which retains the vital balance of water maintaining the substrate in optimal conditions. It also shows self-emulsification and co-emulsifying properties. By creating this delicate natural film it imparts maximum comfort and suppleness to the skin and a velvety feel to hair. Thanks to its excellent moisturising performance it increases the hydration rate over 60% after 5 days and helps restore the substrate's ideal healthy condition.

It has also the ability to enhance colour pigment dispersion improving substantivity and intensity providing a longer lasting effect.

Specific studies on hair application demonstrate that Natura-tec Abysoft improves hair elasticity, increases hair brightness, and shows a significant conditioning behaviour with an immediate effect on the increase of hair volume (Figs. 3-5). It can also be used as a replenishing agent with a perceivable and beneficial sensorial performance.

Conclusion

Extensive laboratory evaluation has shown the above materials to be highly effective as natural based replacements for silicone in conditioning and hair care applications. These innovative ingredients allow cosmetic formulators to develop finished products based on vegetable derived ingredients which conform to modern trends without compromising important parameters such as efficacy and sensorial performance which have great impact on consumer perception. Consequently hair care products today can be both green and efficient, satisfying all the criteria which are considered of major importance by informed, motivated and environmentally-savvy consumers which place emphasis on issues such as renewability, sustainability and eco-friendliness while still looking for quality, performance and cost-effectiveness in the personal care products they purchase.

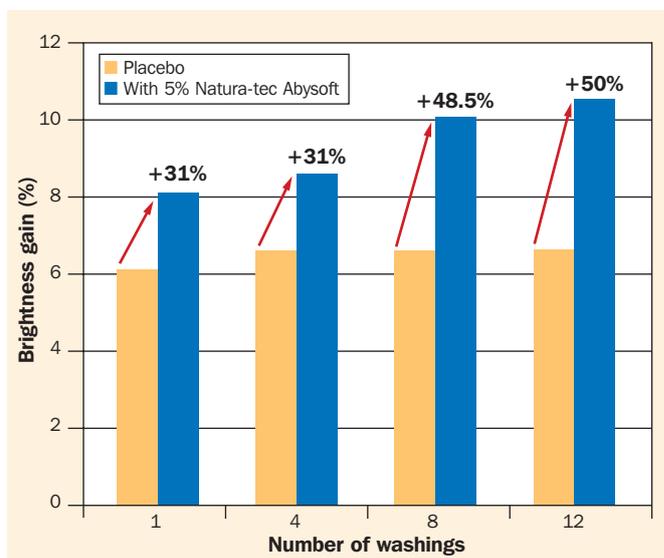


Figure 5: Effect on hair brightness. After 12 washings/treatments increases the hair brightness by +50%. Natura-tec Abysoft in formulation provides an immediate and long lasting effect on hair brightness.

Texture and functionality of natural emulsifiers

Emulsion formulations are a fundamental product type which can be adapted to numerous cosmetic applications, from skin care to makeup, hair care and personal washing. Although cosmetic technology has progressed significantly since the early days of the basic cream or pomade produced in ancient Roman times, modern market and formulating trends are driving the industry towards solutions and ideas which rely on extracting, purifying and utilising the benefits of natural ingredients rather than modifying their structure or characteristics substantially via chemical synthesis. This 'back to nature' or 'back to the future' approach to personal care manufacture and development is driven by strong consumer demand for products that are safe, environmentally friendly and are able to provide the advantages of natural ingredients. All this needs to be achieved without compromising the performance that consumers have become accustomed to and, possibly, delivering added benefits. Within this scenario, among the various ingredient categories, emulsifiers represent a particular challenge. They are essential to formulations in order to guarantee stability, generate an effective system and support the sensorial profile of the finished product.

Natural multifunctionality

In order to satisfy the demands mentioned above, the focus at Natura-tec has been on the development of materials which can both simplify and enhance the formulating experience. This allows cosmetic chemists to make exciting choices which are motivated by the many possibilities offered by the use of premium natural ingredients rather than dictated by technological constraints and limited options. Thanks to the numerous benefits of various components of vegetable origin, natural ingredients can show truly multifunctional performance in formulation, enhancing finished product efficacy and improving perception by the consumer. This is particularly true for emulsion systems. By careful selection of the emulsifier an optimum balance



can be found between stability, viscosity, sensorial profile and efficacy depending on the specific finished product brief.

Natural and innovative

Within this context, Natura-tec has developed three main types of emulsifier which, depending on individual behaviour, are capable of covering a wide range of viscosities for the manufacture of a diverse selection of finished personal care products. Each product is capable of producing different and desirable sensorial profiles, appearance and application characteristics combined with added benefits in terms of enhanced formulation performance.

Two-in-one

Ecomuls 2 In 1 is 100% from vegetable origin, GMO and PEG free, based on a unique association of natural glycerides

Figure 1: Three emulsion preparations.

		1281K	1281C	1281L
		Smooth and bright cream Viscosity (20 °C) 670000 mPa·s (LV4, 6 rpm)	Smooth and bright cream Viscosity (20 °C) 30000 mPa·s (LV3, 2 rpm)	Smooth and bright milk Viscosity (20 °C) 3300 mPa·s (LV2, 5 rpm)
				
Phase	Ingredients	%	%	%
A	Water	72.60	73.35	73.20
	MgSO ₄ , 7 H ₂ O	0.80		
B	Dehydroxanthan Gum		0.05	0.20
	Natura-tec Plantsil	5.00	5.00	5.00
	Natura-tec Babassu Oil-Refined	5.00	5.00	5.00
	Natura-tec Ultrafeel MCT	3.00	3.00	3.00
	Natura-tec White Beeswax	3.00	3.00	3.00
	Natura-tec Liquid Shea	5.00	5.00	5.00
	Natura-tec Ecomuls 2 in 1	5.00		
	Natura-tec Crystal Cream		5.00	
	Natura-tec Emulative W			5.00
C	Geogard ECT (Preservative)	0.60	0.60	0.60

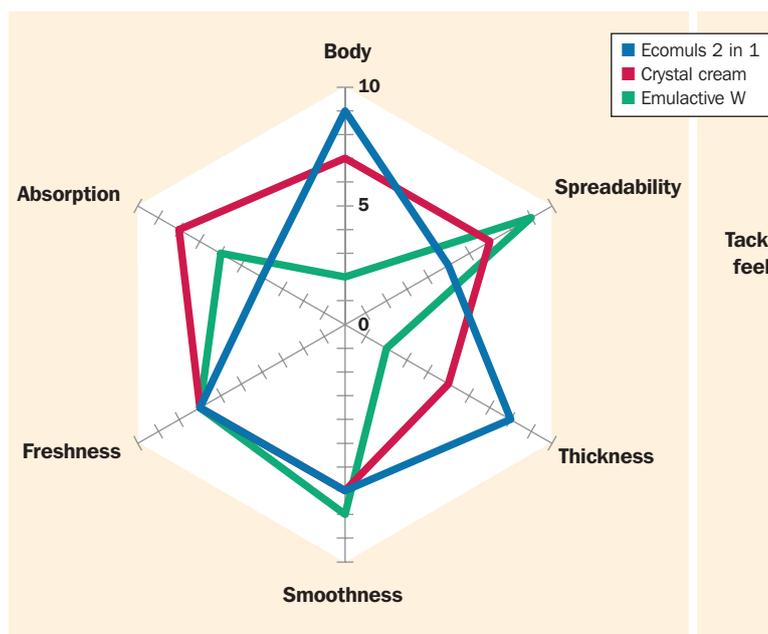


Figure 2: Sensorial profile at application.

and olive unsaponifiables. These active ingredients give the material a high emulsifying effect and an exceptional moisturising capacity.

Particularly eco-friendly, this non-ionic emulsifier can form stable W/O emulsions by cold or hot process even at low concentration, without co-emulsifier and thickening agent. With a single application, it offers an immediate, noticeable and a long lasting moisturising effect even after 8 hours from application.

Liquid crystal generation

Crystal Cream is a skin-friendly and effective O/W emulsifier based on sucrose esters and olive unsaponifiables. It is capable of generating liquid crystal structures in emulsions. Liquid crystals result from the organisation of molecules in a 3D network. This system increases stability of the emulsion by reducing the coalescence of oil droplets. In addition, the similarities with the *stratum corneum* structure create greater affinity with the skin allowing better transfer of actives and significant moisture retention capabilities.

Wheat protein source

Emulactive W is an anionic/non-ionic natural and mild O/W emulsifier based on wheat protein derivatives. Its structure shows excellent compatibility with the skin conferring to natural formulations a light touch with a velvety after feel. It forms lamellar liquid crystal systems that help the delivery of active substances into the skin. It generates light textures that help strengthen the skin barrier and prevent trans-epidermal water loss, leaving the skin fresh, smooth and moisturised.

A natural comparison

Three emulsions were prepared in order to evaluate and compare characteristics in relation to the emulsifying system used; the formulations are shown in Figure 1. Each one of the formulas used a different Natura-tec emulsifier and all three emulsifiers were added at 5%, with the only other difference between systems being the type and dosage of stabiliser or rheology modifier which needs to be specific to the emulsifier and emulsion type. Consequently relative viscosities were tested and sensorial profiles were assessed and compared. The results showed that these three natural emulsifiers can produce emulsions with particular viscosity range and texture suited to specific applications.

Formula 1281K with Ecomuls 2 in 1 resulted in a smooth and bright cream with good body with a rich, non-greasy and luxurious feel and ideally suited for emollient protective emulsions, anti-ageing creams, baby products and natural sunscreen formulations thanks to its W/O structure.

Formula 1281C was prepared with Crystal Cream and produced a smooth, bright and velvety cream with a soft touch making it ideal for natural moisturising emulsions, nourishing liquid crystal O/W systems, ethnic products, men's care products and young skin where sebum control is an important factor.

Formula 1281L was manufactured with the use of Emulactive W producing a light, smooth and bright milk with a fresh touch perfectly adapted to the development of natural skin repair systems, body and natural spray products, active delivery lotions and vegetable-based fluid emulsions.

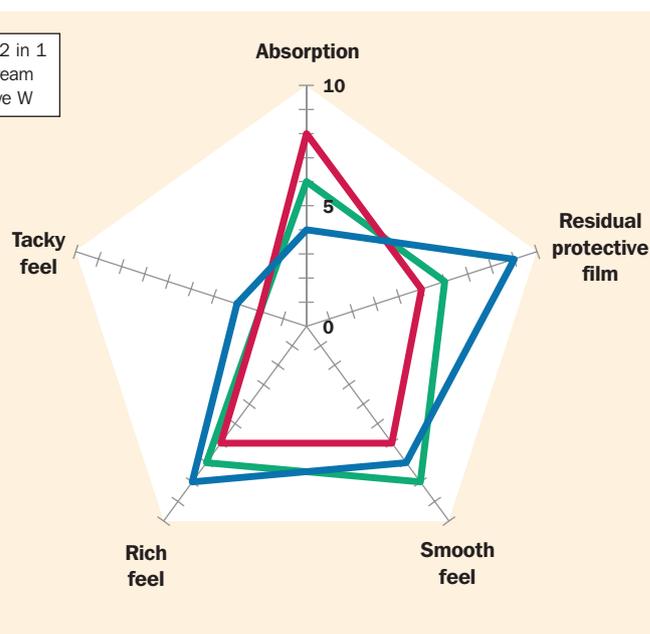


Figure 3: Sensorial profile after application.

A comparison of sensorial profiles was undertaken for all products at application and after application of the emulsions on the forearm of a panel of volunteers. The results are shown in Figures 2 and 3.

At application the three natural emulsifiers can be differentiated mainly by the significant body characteristics shown by Ecomuls 2 in 1, the high absorption of Crystal Cream and the very good spreadability of Emulactive W.

After application sensorial profiles show much greater similarities among all products resulting in desirable sensations of comfortable protection, softness and smoothness without greasy residue, combined with rapid absorption characteristics.

Conclusion

All three natural emulsifiers offered by Natura-tec produce mild, safe, stable and bright white emulsions. Thanks to this selection of innovative materials an interesting and complete choice of viscosities is available, from 3,000 to 670,000 mPa·s, suitable for the manufacture of a wide range of finished cosmetic products. These three different emulsifiers show different behaviour from each other on application but all produce a unique and pleasant after feel which enhances the sensorial experience. Thanks to their advanced concept and their natural origin they are also capable of satisfying the trends of modern and future markets as well as the demands of today's and tomorrow's discerning consumers. Formulations 1-3 show three formulation examples based on these innovative natural emulsifiers.

Formulations based on natural emulsifiers.

1: Regenerating Night Cream.			2: Anti-ageing Daily Cream.			3: Moisturising Body Lotion.		
Phase	Ingredients	%	Phase	Ingredients	%	Phase	Ingredients	%
A	Aqua (Water)	65.4	A	Aqua (Water)	64.25	A	Aqua (Water)	Up to 100.0
	Glycerin	2.0		Glycerin	3.00		Glycerin	3.0
	Sodium Benzoate	0,4		Microcrystalline Cellulose (and) Cellulose Gum	1.50		Xanthan Gum	0.2
	MgSO ₄ , 7 H ₂ O	0.8		Xanthan Gum	0.30	B	Natura-tec Emulactive W	5.0
B	Natura-tec Ecomuls 2 in 1	3.5	Sodium Hyaluronate	0.05	Natura-tec Sunflower Oil - Refined		4.0	
	Natura-tec Macadamia Oil - Refined	4.0	Sodium Benzoate	0.50	Natura-tec Plantsil	2.0		
	Natura-tec Babassu Oil - Refined	3.0	B	Natura-tec Crystal Cream	6.00	Natura-tec Ultrafeel MCT	8.0	
	Natura-tec White Beeswax	2.0		Natura-tec Plantsil	9.00	C	Natura-tec Rice Milk	2.0
	Natura-tec Ultrafeel MCT	10.0	Natura-tec Macadamia Oil - Refined	4.00	Perfume (Fragrance)		0.2	
	Natura-tec Plantsil	5.0	Natura-tec Babassu Oil - Refined	2.00	Tocopherol	0.2		
C	Natura-tec Aminosens Oat	1.0	Natura-tec Ultrafeel AB	3.00	Preservative	as needed		
	Natura-tec Rice Starch	2.0	Ethylhexyl Methoxycinnamate	2.50				
	Perfume (Fragrance)	0.2	Butyl Methoxydibenzoylmethane	1.00				
	Tocopherol	0.3	C	Natura-tec Rice Starch	2.00			
	Benzyl Alcohol	0.4		Perfume (Fragrance)	0.20			
			Tocopherol	0.20				
			Benzyl Alcohol	0.40				
			D	Citric Acid (50%)	0.10			



Art of Nature

Natural ingredients are beautiful

NATURAL EMULSIFIERS

Natura-Tec Crystal Cream - "Soft and light sensation"
Skin-friendly O/W emulsifier forming smooth liquid crystals

Natura-Tec Emulactive W - "Lamellar structure for active delivery"
Gentle O/W emulsifier with velvety feel based on vegetable protein

Natura-Tec Ecomuls 2 in 1 - "Cold process multifunctional emulsifier"
Mild W/O emulsifier offering superior moisturizing performance

...transform your ideas into reality and let nature be your art

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