
Floraesters®
K-20W Jojoba
A New Jojoba Derivative
SPC
SOAP, PERFUMERY & COSMETICS

A new jojoba derivative has been developed [INCI name: Hydrolyzed jojoba esters (and) water; tradename: Floraesters K-20W Jojoba] which demonstrates significant skin substantivity, substantivity which is high even after rinsing in water.

In development, one method used to quantify the product's substantivity was to compare skin hydration using a Nova Dermal Phase Meter (DPM) 9003 instrument. Measurements were taken after application of 'with' and 'without' formulas. Various formulas were selected to show the ability of K-20W to improve skin hydration (ie retain moisture). The Nova DPM 9003 instrument is designed to non-invasively measure biophysical characteristics of the skin using an *in-vivo* impedance measurement.

This new surfactant acts as a quat booster and fragrance fixative, enhances skin hydration and is soluble in alcohol

Built to last

A new jojoba derivative has been found to have impressive substantivity properties in a wide range of formulation types, as Melanie Cummings explains

The electrical quantity (impedance) is the tendency of something to resist the flow of an alternating current. Conductance is the inverse of impedance, ie the tendency of something to pass electrical current. Impedance and conductance are referred to as complex quantities because they take two numbers to describe. There are two common ways of specifying a complex quantity:

- Amplitude and phase
- Real part and imaginary part

These two ways of talking about a complex quantity are not independent. One can be derived from the other. Sometimes it is more useful to talk about amplitude and phase, and at other times the real and imaginary parts make more sense for the researcher. In skin, the amplitude (amount of response) seems to go up with frequency, while the phase (amount of lag) generally seems to go down. The opposite occurs with conductance.

Real and imaginary impedance are not just different data, but a different way of showing a complex quantity. The real part is the part that is synchronised with the stimulus while the imaginary part is the part that is out of synchronisation. In the case of impedance, the real part is called resistance, and the imaginary part is called reactance. There are two kinds of reactance, depending on the algebraic sign of the imaginary part. These are capacitance and inductance. Skin seems to exhibit capacitive reactance for the most part.

When using the Nova DPM 9003 instrument, the researcher will observe a read-out on the LCD when they place the sensor probe on the skin to take a reading. The instrument will typically reflect a reading between 90-999 DPM units. Mindful of the complex quantity of impedance as described previously, the DPM unit used is that which is a relative value or reading.

Table 1 - Astringent formulations

Phase	Tradename	Supplier	Formula 1	Formula 2
A	Ethanol SD 40		33.00	33.00
	Floraesters K-20W Jojoba	Floratech	5.00	0
	Deionised water		57.32	62.32
	Glycerin USP 96%	Dow	4.00	4.00
B	Camphor gum 123340-1195	Belmay	0.60	0.60
	Tea tree oil	Fanning	0.05	0.05
	0.1% Blue 1 solution*	Warner Jenkinson	0.03	0.03
			100.00	100.00

Table 2 - Lotion formulations

Phase	Tradename	Supplier	Formula 1	Formula 2
A	Pristerene 4911	Uniqema	2.50	2.50
	Lanette 16	Cognis	1.80	1.80
	Amphisol	Givaudan	2.50	2.50
	Parsol MCX	Roche	7.00	7.00
	Silicone fluid SF-1202	GE Silicones	5.00	5.00
B	Floraesters K-20W Jojoba	Floratech	10.00	0
	Deionized water		qs	qs
	Glycerin USP 96%	Dow	4.00	4.00
	Preservative		qs	qs
	Keltrol CG BT	CP Kelco	0.25	0.25
			100.00	100.00

Hydro-alcoholic systems

The purpose of this test was to determine whether the incorporation of K-20W into a facial astringent enhanced skin hydration qualities of the astringent when compared to the unadulterated version. The formulas identified in Table 1 were made to provide 'with K-20W' and 'without K-20W' versions. A panel of participants using both astringent versions compared the effects on skin hydration over time using a Nova DPM 9003 instrument.

Table 1 identifies the formulations used for this test. The test versions were made by incorporating 5% K-20W into Formula 1, replacing 5% of the water. Formula 2 was prepared as a 'without' using 5% more water.

Baseline Nova DPM 9003 instrument readings of both inside forearm areas (in triplicate) were obtained prior to application of the astringent. These results were averaged and referred to as the bare skin reading. Astringent was applied to designated areas in a 2" diameter circle. Subsequent readings of the test areas and baseline areas were obtained after application throughout the day. Average Nova DPM 9003 instrument readings are reported.

The results depicted in Figure 1 show a significant increase in Nova DPM 9003 instrument readings with the astringent containing K-20W. This experiment shows that the astringent without K-20W has little, if any, beneficial effect on skin hydration. K-20W gives a traditionally drying product the ability to increase skin hydration while not creating a greasy skin feel after facial cleansing.

Lotion formulations

The purpose of this test was to determine whether the incorporation of K-20W into a lotion enhanced skin hydration qualities of the lotion when compared to the version without K-20W. A panel of participants tested both lotion versions to compare the effects on skin hydration over time using a Nova DPM 9003.

Table 2 identifies the formulations used. The test versions were made by incorporating 10% K-20W into Formula 1, replacing 5% diisostearyl trimethylolpropane siloxy silicate and 5% water. Formula 2 was prepared as a 'without' version which incorporated the 5% diisostearyl trimethylolpropane siloxy silicate and the 5% extra water.

Baseline Nova DPM 9003 readings of both inside forearm areas were obtained in triplicate prior to application of lotion, averaged and referred to as the bare skin reading. Lotion was applied to designated areas in a 2" diameter circle. Subsequent readings of the test areas and baseline areas were obtained after application throughout the day. Average Nova DPM 9003 readings are reported.

Results in Figure 2 show a significant increase in Nova DPM 9003 readings in the lotion containing K-20W. Its inclusion in a lotion formula will improve skin hydration. This experiment shows that lotion without K-20W does increase skin hydration, but the formula enhanced with K-20W increases skin hydration even more. K-20W enhances the lotion's ability to increase skin hydration without creating a greasy skin feel.

Figure 1 - DPM 9003 results for astringent formulas

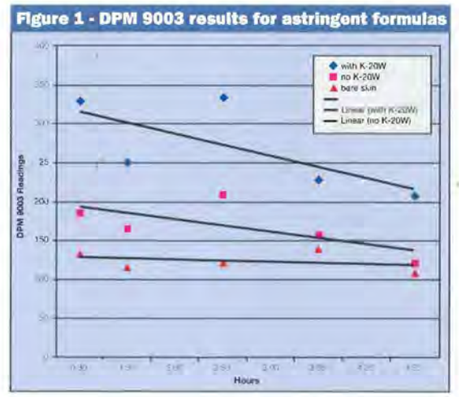

Figure 2 - DPM 9003 results for lotion formulas

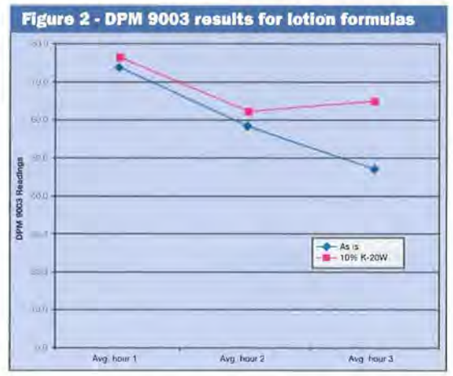

Table 3 - Make-up formulas

Phase	Tradename	Supplier	Formula 1 'as is'	Formula 2 w/ K-20W
A	Deionised water		54.15	34.15
	Floraesters K-20W Jojoba	Floratech	0	25.00
	CMC	Aqualon	0.30	0.30
	Veegum	Vanderbilt	0.80	0.80
	Propylene glycol	Dow	10.00	10.00
B	Topnote 200	Luzenac	3.00	3.00
	Kowet	Warner-Jenkinson	11.00	11.00
	Pur Oxy Red B.C. 34-3080	BF Goodrich	0.20	0.20
	Pur Oxy Yellow B.C. 34-3170	BF Goodrich	1.14	1.14
	Pur Oxy Red B.C. 34-3551	BF Goodrich	0.24	0.24
	Pur Oxy Black B.C. 34-3068	BF Goodrich	0.24	0.24
C	Standapol SH-135	Cognis	0.13	0.13
D	Floraesters IPJ	Floratech	11.00	6.00
	Vitamin E Acetate CG	Roche	0.20	0.20
	Lanette 16	Cognis	0.50	0.50
	Pristerene 4911	Uniqema Americas	2.40	2.40
	Lexemul 561	Inolex	0.60	0.60
	SF 96-200 Silicone Fluid	GE Silicones	0.20	0.20
	SF 1202 Silicone Fluid	GE Silicones	3.00	3.00
E	Preservative		0.50	0.50
	Triethanolamine 99% (to pH 7.4 0.1)	Dow	0.40	0.40
			100.00	100.00

Make-up formulations

The purpose of this test was to determine whether the incorporation of K-20W into a make-up formula would have an effect on skin hydration over time.

Table 3 identifies the two make-up formulas prepared for this experiment, one containing 25% K-20W and the other identical in every way except that the K-20W was omitted and replaced with 5% Floraesters IPJ and 20% water.

Baseline readings for each participant were determined. These results were averaged for each person and used in subsequent calculations to determine the percent difference from baseline. Make-up was applied to outer forearms. Nova DPM 9003 instrument readings of each area where make-up was applied were obtained after four and seven hours.

Figure 3 shows the Nova DPM 9003 results. Four hours after application, average readings showed an improvement in skin hydration of approximately 5% over baseline on the arms with the make-up contain-

ing K-20W. A reduction in skin hydration of approximately 4% was observed on the arms with the make-up not containing K-20W. The delta percent difference between the 'with' and 'without' was approximately 9%.

Seven hours after application, average readings showed a reduction in skin hydration of approximately 4% below baseline on the arms with the make-up containing K-20W. A reduction in skin hydration of approximately 6% was observed on the arms with the make-up not containing K-20W. The delta percent difference between the 'with' and 'without' was approximately 2%.

The incorporation of K-20W into this make-up formulation improved skin hydration compared to baseline and to the formula not containing K-20W after the four hour reading. The incorporation of K-20W into this make-up formulation continued to improve skin hydration compared to the formula without after the seven hour reading, but not compared to baseline.

Modified rubine dye

Rubine was used as a stain for detecting cationic surfactants and polymers on keratin substrates. Direct Red 80 (also known as Sirius Red F 38A) was found to be an acceptable substitute for rubine dye. This modified rubine dye test was conducted to determine whether K-20W improved the ability of quaternium compounds to permit deposition of cationic surfactant or polymer onto keratin. Various quaternium compounds were tested alone and with the addition of K-20W.

Six types of quaternium materials, identified in Table 4, were tested. A 1" square of wool was immersed in a 1% quaternium solution for two minutes. Another square was treated similarly with a solution of the same quaternium solution with the addition of 5% K-20W. The treated swatches were washed five times with 10ml of water each time. The washed swatches were immersed in a Direct Red 80 solution made by dissolving 3.4 millimoles of dye in a litre of water containing 1.25ml glacial acetic acid per litre of water, then diluting the dye solution five to one with water. After a one minute treatment, the swatches were washed five times with 10ml of water each time and patted dry. Swatch intensity was made by visual observation.

Dye uptake was improved in quaternium products with higher numbers. In the two quaternium products with a low number, there was either no change in dye uptake or the dye uptake was reduced. More work is needed in this area to determine when improvement can be expected.

Fragrance fixative

In order to demonstrate the fragrance fixative properties of K-20W, a method was used to ascertain the product's ability to effectively sustain and protract the release of fragrance.

A formulation containing limonene was used to measure the release of limonene over time. The longer limonene can be detected in the formulation, the better the formulation is at sustaining and protracting the release of fragrance. Table 5 identifies the specific formulation used. The fragrance fixative method involves preparing a cosmetic formula with and without the test material. Both formulas contain limonene as the test fragrance. Open vials containing each of the formulas are placed in a heated oven. At set intervals, a vial from each formula is removed from the oven, a measured level of ethyl alcohol is added and the solution is tested by gas chromatography for the presence of limonene. The test is terminated when limonene can no longer be detected. If the test material exceeds the positive control, it is considered to have fragrance fixative properties.

The results of this test, illustrated in Figure 4, show that K-20W perform better as a fragrance fixative than the positive control.

This new jojoba derivative shows impressive substantivity. Properties include occlusivity resulting in increased skin hydration without a greasy feel, something that was observed in every type of formula in which it was tested. It also functions as a fragrance fixative and improves the ability of quaternium compounds to permit deposition of cationic surfactants and polymers on keratin substrates. Cosmetic formulators should find this new ingredient adds functional value to formulas in which substantivity is desired.

Figure 3 - DPM 9003 results for make-up formulas

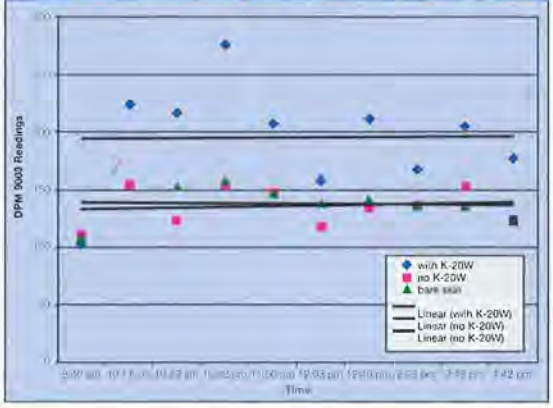

Figure 4 - Hours four to eight of fragrance fixative test

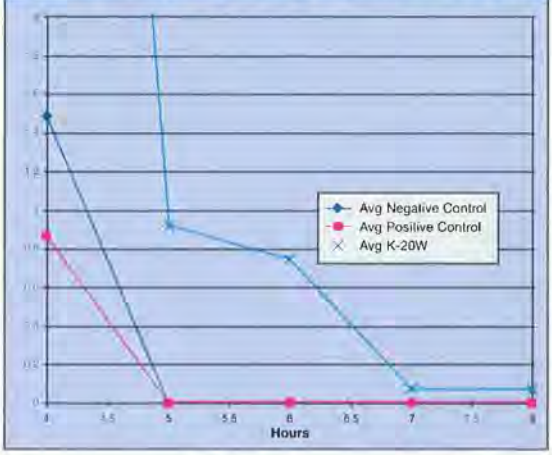

Table 4 - Quaternium materials tested

INCI name	Tradename	Results with K-20W
Polyquaternium-7	Merquat 550	Equal swatch staining
Polyquaternium-7	Mackernium 007S	Decreased swatch staining
Polyquaternium-47	Merquat 2001N	Increased swatch staining
Quaternium-79	Mackpro HHK	Increased swatch staining
Quaternium-80	Abil Quat 3474	Increased swatch staining
Quaternium-80	Abil Quat 3272	Increased swatch staining

Table 5 - Formulations in fragrance fixative test % by weight

	Negative control	Positive control	Floraesters K-20W
Floraesters K-20W Jojoba	0	0	5.00
Dermacryl(r)-79	0	1.00	0
Triethanolamine	0	0.36	0.36
Anhydrous Ethanol	93.00	91.64	91.64
Deionized Water	5.00	5.00	1.00
Limonene	2.00	2.00	2.00
	100.00	100.00	100.00

Note: 5% K-20W is used instead of 1% because K-20W is 80% water. The water in the formula was reduced accordingly

Author
Melanie Cummings
Floratech, US
Tel: +1 480 545 7000
Fax: +1 480 892 7000

Research conducted by M. Cummings, R. Kleiman, R. Koritala, P. Cappillino, J. Hill and J. Meyer of Floratech and J. Reinhardt of Reinhardt Consultants.