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**Advantages of jojoba esters in nonwovens**

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# Advantages of jojoba esters in nonwovens

Jojoba (*Simmondsia chinensis*) is a perennial shrub most commonly found in Arizona, California, and Northwestern Mexico.<sup>2</sup> Jojoba seed oil, the oil produced by this plant, is a wax ester that has been used in the past as a folk remedy for renal colic, sunburn, chaffed skin, hair loss, headache, wounds, sore throats, psoriasis, and acne (e.g., sulfurised jojoba).<sup>3,4</sup> The ester is composed of long-chain linear fatty alcohols, 20 to 24 carbons in length and long-chain linear fatty acids, 18 to 22 carbons in length. Nearly all of the acid and alcohol moieties are  $\omega$ -9 mono-unsaturated.<sup>5</sup> Hydrolysis of this wax ester produces a very unique ingredient that can be used in various commercial cosmetic and personal care formulations such as creams, body washes, hand sanitisers, and multiple nonwoven wipe applications.

## Nonwoven wipes: a growing market

Nonwoven wipe applications span numerous categories, from industrial and household surface cleaning purposes to personal care and cosmetic applications. The nonwoven wipe market has grown exponentially in both sales and number of product launches.<sup>6</sup> In North America, the nonwoven wipe market surpassed the \$4 billion (USD) mark in 2010 compared to \$1.6 billion (USD) in 2000. Although the consumer segment (versus the industrial segment) is dominated by household wipe applications (45%), personal care wipe applications have grown from 8% to 26% between 1995 and 2010.<sup>7</sup>

Similar trends are seen throughout the world. In China, the nonwoven wipe market increased 130% from \$68.4 million (USD) in 2003 to \$157.8 million USD in 2008, and is expected to reach \$230.2 million (USD) by 2013. Personal care nonwoven wipes

## ABSTRACT

Small, vehicle controlled, clinical studies were carried out to explore the benefits associated with incorporating Floraesters K-100 Jojoba [INCI: Hydrolyzed Jojoba Esters (and) Jojoba Esters (and) Water (aqua)] and Floraesters K-20W Jojoba [INCI: Hydrolyzed Jojoba Esters (and) Water (aqua)] into various nonwoven wipe solutions. These solutions included hydro-alcoholic systems, non-alcohol based antimicrobial systems, and baby wipe systems. Incorporation of Floraesters K-100 Jojoba and Floraesters K-20W Jojoba resulted in increased skin hydration, increased consumer

preference, and anti-irritation properties which include decreased erythema and increased skin barrier function (as compared to the known anti-irritant bisabolol<sup>1</sup>). These studies demonstrate how Floraesters K-100 Jojoba and Floraesters K-20W Jojoba provided added functionality to multiple categories of nonwoven products. Therefore they may also impart functionality to other types of nonwovens, including: face treatments, skin whitening, and eye-area patch masks, as well as hand and foot moisturisers, exfoliating wipes, and treatment masks.

are expected to continue to hold a 99% share of the nonwoven wipe market.<sup>8</sup> In Europe, the United Kingdom has the largest nonwoven wipe market and is expected to grow from \$760 million (USD) in 2010 to \$892 million (USD) in 2014, although this market is and is expected to be dominated by baby wipes.<sup>9</sup>

These numbers show an obvious need for increased functionality within

personal care nonwoven wipes. Manufacturers have already started to look for technologies that can enhance the effects for consumers of finished nonwoven wipe applications. Hydrolysed jojoba esters offer a unique way to meet and exceed these consumer desires.

## Skin hydration

Small amounts of Floraesters K-20W Jojoba (now referred to as 'the first jojoba ester') and Floraesters K-100 Jojoba (now referred to as 'the second jojoba ester'), along with glycerin, were incorporated into hydro-alcoholic and non-alcohol based antibacterial nonwoven wipe systems. Skin hydration measurements were taken over time using a Corneometer CM 825 (Courage+Khazaka, Cologne, Germany) in double-blind, randomised, vehicle controlled, clinical studies under controlled environmental conditions.

After one nonwoven wipe application to the lower legs of subjects with dry skin, the hydro-alcoholic nonwoven wipe system containing 1% glycerin plus 1% the first jojoba ester or



*Simmondsia chinensis.*

0.2% the second jojoba ester produced statistically significant increases ( $p < 0.05$ ) in skin hydration over the vehicle nonwoven wipe containing 1% glycerin (Fig. 1).

Using the same study design, the non-alcohol based antibacterial nonwoven wipe system containing 1% glycerin plus 0.5% the first jojoba ester or 0.1% the second jojoba ester produced statistically significant increases ( $p < 0.001$ ) in skin hydration over the vehicle plus 1% glycerin at all time points after one application. The wipes with 1% glycerin plus 0.5% the first jojoba ester or 0.1% the second jojoba ester also performed statistically significantly better ( $p < 0.05$ ) than currently marketed wipe products: Fresh Scent Wet Ones Antibacterial Hand and Face Wipes Pocket Size Singles (Platex Products Inc., Dover, DE), Germ-X Antibacterial Soft Wipes Singles (Vi-Jon Laboratories, St. Louis, MO)], and Mart Equate Antibacterial Wipes (Rockline Industries, Sheboygan, WI) (Fig. 2).

**Anti-irritation: skin barrier function and erythema**

Nonwoven baby wipe formulations with 0.2% the second jojoba ester, 1% the first jojoba ester, or 0.5% bisabolol (a known cosmetic anti-irritant<sup>1</sup>) were evaluated for skin barrier function and erythema reduction potential following skin barrier insult as a result of dry shaving. The Tewameter TM 300 (Courage+Khazaka, Cologne, Germany) was used to measure transepidermal water loss and the Mexameter MX 800 (Courage+Khazaka, Cologne, Germany) was used to measure erythema, in a double-blind, randomised, clinical study under controlled environmental conditions.

Measurements were taken pre-dry shaving and post-dry shaving on forearm skin of healthy subjects. After dry shaving, one application of each nonwoven baby wipe was then performed, and TEWL and erythema measurements were repeated four and twenty-four hours after application. An additional application of the nonwoven wipe was performed following the four hour measurement. Per cent barrier recovery [Per cent Barrier Recovery = (TEWL Post-Shave – TEWL at time X) / (TEWL Post-Shave – TEWL at Baseline) x 100] relative to baseline and change in erythema from baseline were then determined.

The addition of 0.2% the second jojoba ester or 1% the first jojoba ester produced statistically significant ( $p < 0.05$ ) better per cent barrier recovery than the vehicle. The nonwoven baby wipe containing 1% the first jojoba ester also produced

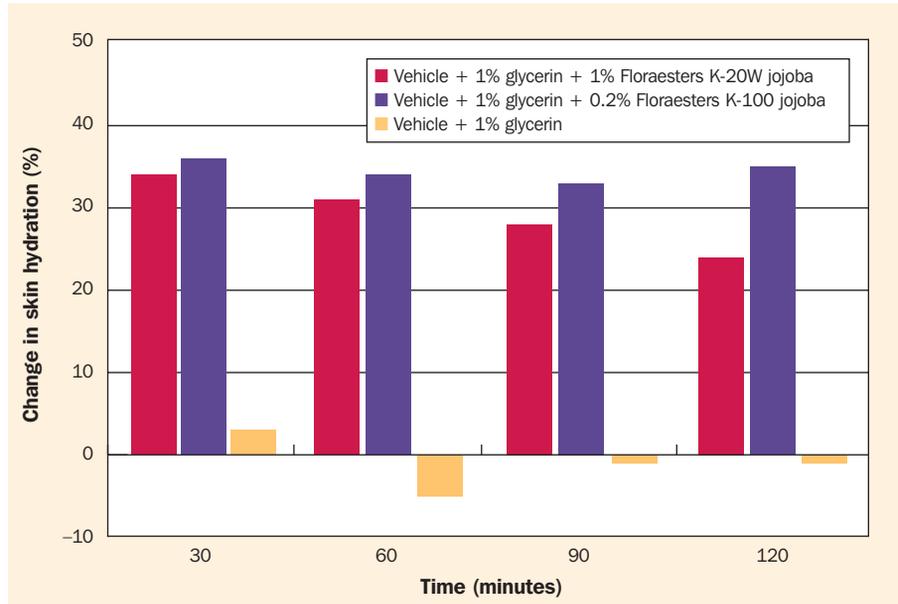


Figure 1: Average per cent change in skin hydration from baseline.

statistically significant ( $p < 0.05$ ) better per cent barrier recovery than 0.5% bisabolol (Fig. 3).

Nonwoven wipes containing 0.2% the second jojoba ester, 1% the first jojoba ester, or 0.5% bisabolol all produced statistically significant ( $p < 0.05$ ) decreases in erythema compared to the vehicle (Fig. 4). [Change in Mexameter Value = Mexameter Value at time X – Mexameter Value at Baseline].

**Consumer preference**

A double-blind, randomised consumer study using 31 females was conducted which compared two non-alcohol based antibacterial nonwoven wipes with or without 0.5% the first jojoba ester. The consumers were asked to compare

the two wipes with regard to such attributes as skin smoothness/softness and skin moistness, as well as dry-down, residue, tackiness, clean-feel, and after-feel. In every case, consumers preferred the nonwoven wipe that contained 0.5% the first jojoba ester. Overall, the wipe containing 0.5% the first jojoba ester was preferred 80% of the time (Fig. 5). An 80% market share preference is especially compelling for makers of face, eye, hand, and foot nonwoven masks that remain on the skin for 15 to 30 minutes per treatment.

**Conclusion**

Nonwoven wipes are a continuously growing industry. The first jojoba ester and the second jojoba ester are botanically-

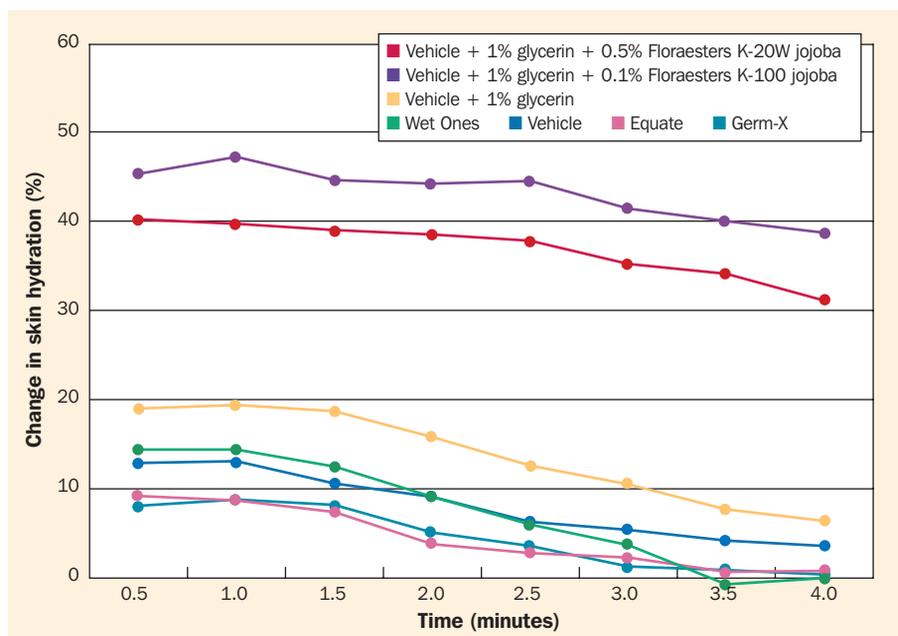


Figure 2: Average per cent change in skin hydration from baseline.

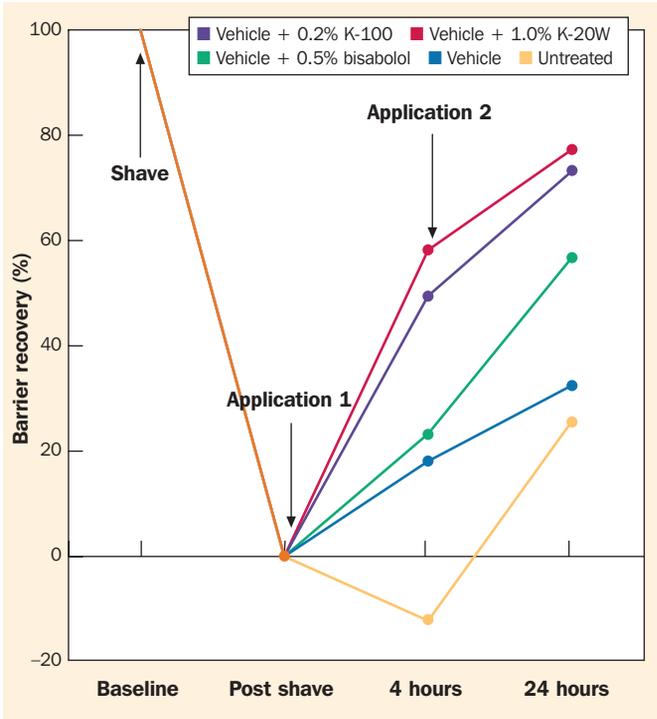


Figure 3: Average per cent barrier recovery (TEWL).

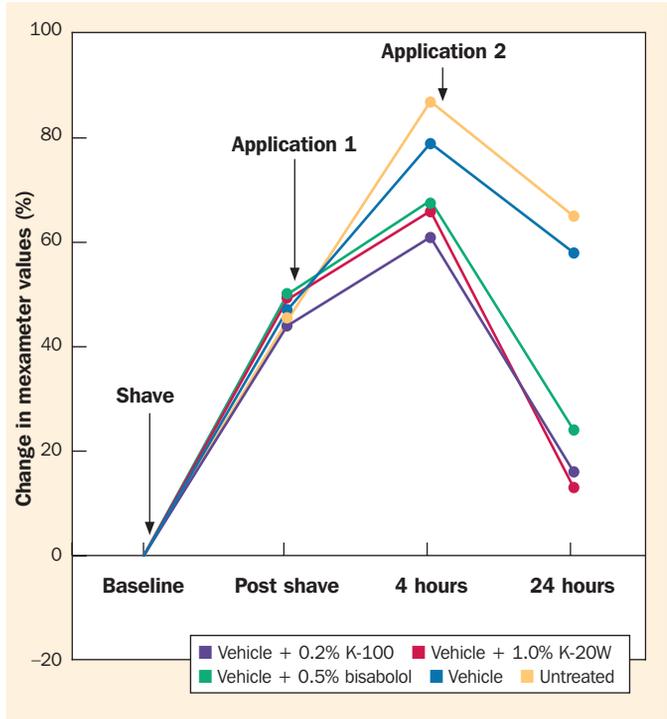


Figure 4: Average change in erythema (mexameter).

derived ingredients that can offer enhanced functionality within various nonwoven wipe systems. Clinical studies of nonwoven wipes with the addition of small amounts of these hydrolysed jojoba esters show:

- Increased skin hydration (when used in conjunction with glycerin).
- Increased skin barrier recovery.

- Reduced erythema.
- Enhanced consumer perception.

Floraesters K-20W Jojoba and Floraesters K-100 Jojoba are highly efficient, globally accepted ingredients which elicit significant positive consumer preference when incorporated into nonwoven personal care products.



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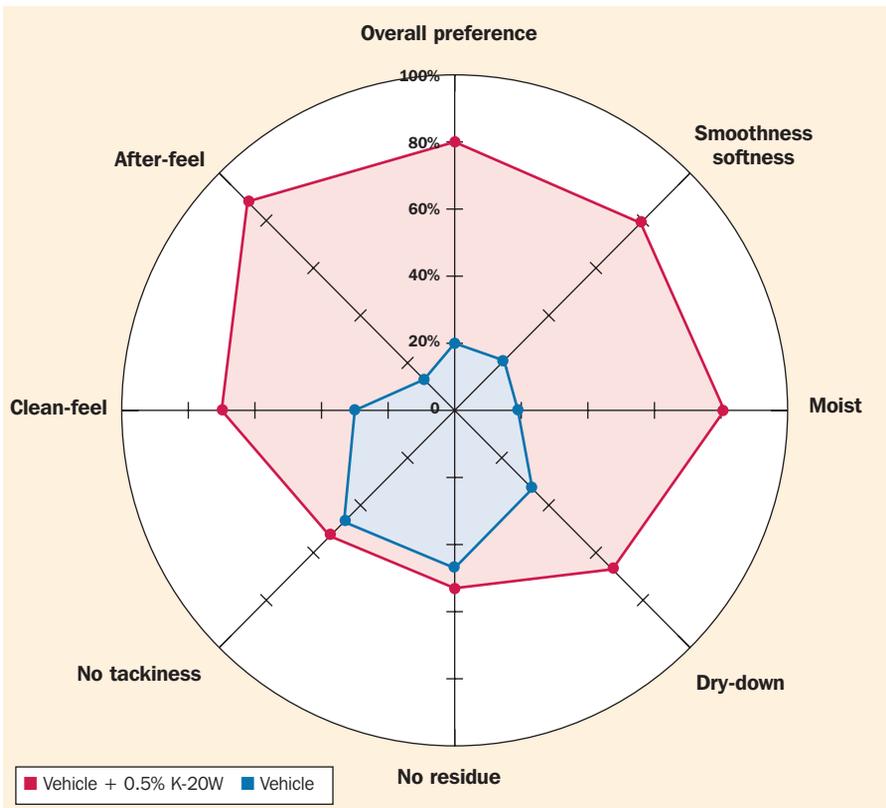


Figure 5: Per cent consumer preference.