



Formulator Report:

Improved Hair Dye Efficacy with Floraesters K-20W[®] Jojoba



Floraesters[®] K-20W Jojoba increases permanent and semi-permanent hair dye deposition and retention.

Floraesters K-20W Jojoba [INCI: Hydrolyzed Jojoba Esters (and) Water (Aqua)] is a multifunctional ingredient that has been tested and utilized in a variety of cosmetic and personal care formulations such as creams/lotions, hand sanitizers, nonwoven wipes, sunscreens, sunless tanners, shampoos/conditioners, toners/astringents, face washes, primers, hair dyes, and oil-free formulations. Its film-forming properties make it ideal for rinse-off products, products that require water resistance, and products that require an extended period of residence time on the skin (*i.e.* long wear).

The substantivity of Floraesters K-20W Jojoba makes it well-suited to entrap molecules on the hair or at the skin surface. For example, in combination with glycerin, Floraesters K-20W Jojoba enhances skin moisturization.¹ Additionally, Floraesters K-20W Jojoba increases sunscreen active retention on the skin after water immersion,² and fragrances remain on the skin longer in the presence of Floraesters K-20W Jojoba.³ Clinical studies have also shown that Floraesters K-20W Jojoba is effective at reducing irritation-associated erythema, as well as improving skin barrier function and restoration;⁴ and *ex vivo* studies have shown that Floraesters K-20W Jojoba remains on hair after rinsing, and provides long lasting conditioning and protection benefits.⁵

The botanically-derived Floraesters K-20W Jojoba is COSMOS/Ecocert certified, sustainable, and EU and China REACH compliant.

Study Facts⁵:

Floraesters K-20W Jojoba in a permanent hair dye:

- **Reduced hair dyeing time** by almost **50%** compared to the vehicle hair dye (**Figure 1**)
- Resulted in **10% less hair dye color loss** than the vehicle hair dye (**Figure 2**)

Floraesters K-20W Jojoba in a semi permanent hair dye:

- Resulted in up to **21% greater hair dye color intensity** than the vehicle hair dye (**Figures 3 and 4**)
- Resulted in up to **58% less hair dye color loss** than the vehicle hair dye (**Figures 3 and 5**)
- **Significantly improved consumer perception** of gray coverage and richness of hair dye color (**Figure 6**)

Formulation Benefits:

- Emolliency remains after rinse-off
- Substantivity
- Allows for oil-free claims
- Readily biodegradable
- Water resistant
- Soluble in most alcohols and glycols
- Botanically-derived

1. See Claim Sheets 09-013, 09-014, 10-017, 10-024, and 13-052 for more information.
2. See Claim Sheet 10-018 for more information.
3. M. Cummings. Built to last. Soap, Perfumery & Cosmetics. November 2001.
4. See Claim Sheets 11-035 and 11-036 for more information.
5. Final Reports available upon request. Figures can be found on the next two pages of this document.

Figures⁶:

Permanent Hair Dye: Increased Deposition and Enhanced Color Retention

Figure 1: Wool swatches dyed with the permanent hair dye containing **2% Floraesters K-20W Jojoba** achieved the **same color intensity with just over 10 minutes** of residence time as the vehicle hair dye with 20 minutes of residence time ($p < 0.05$). (See Claim Sheet 16-080.)

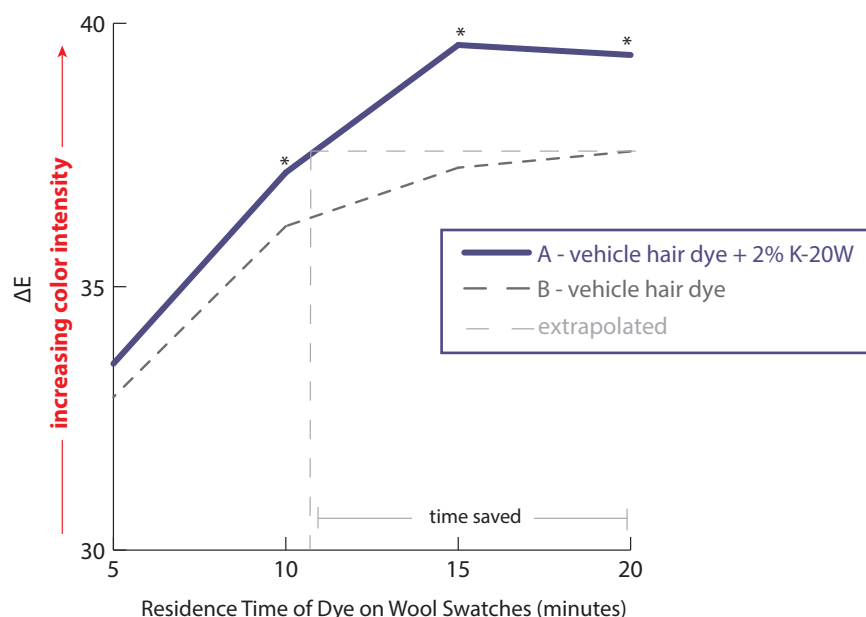
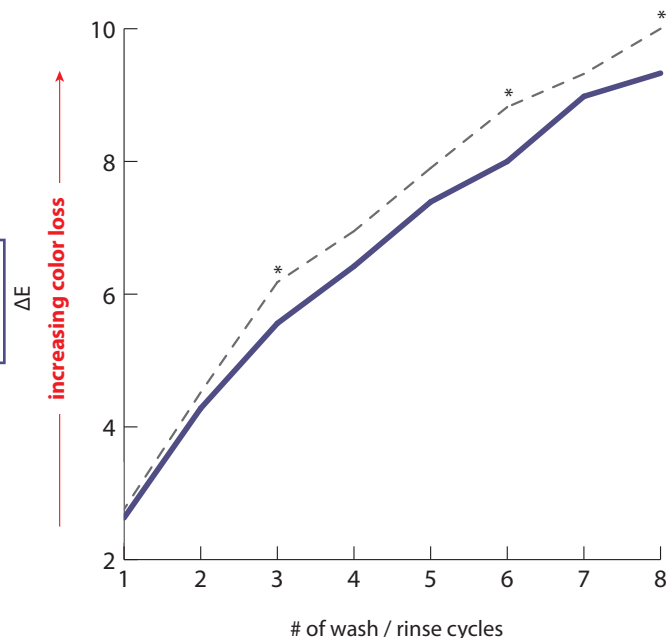


Figure 2: Wool swatches dyed with the permanent hair dye containing **2% Floraesters K-20W Jojoba** retained **more color** (i.e. slower rate of color loss) when compared to the vehicle hair dye ($p < 0.05$). (See Claim Sheet 16-081.)



Study Design: Brown permanent hair dyes with and without 2% Floraesters K-20W Jojoba were applied to wool swatches, and change in color (ΔE) from pre-dye was measured after 5, 10, 15, and 20 minutes of residence time. Additionally, change in color (ΔE) from post-dye was measured after each wash / rinse cycle for a total of 8 cycles.

Semi-Permanent Hair Dye: Increased Deposition and Enhanced Color Retention⁷

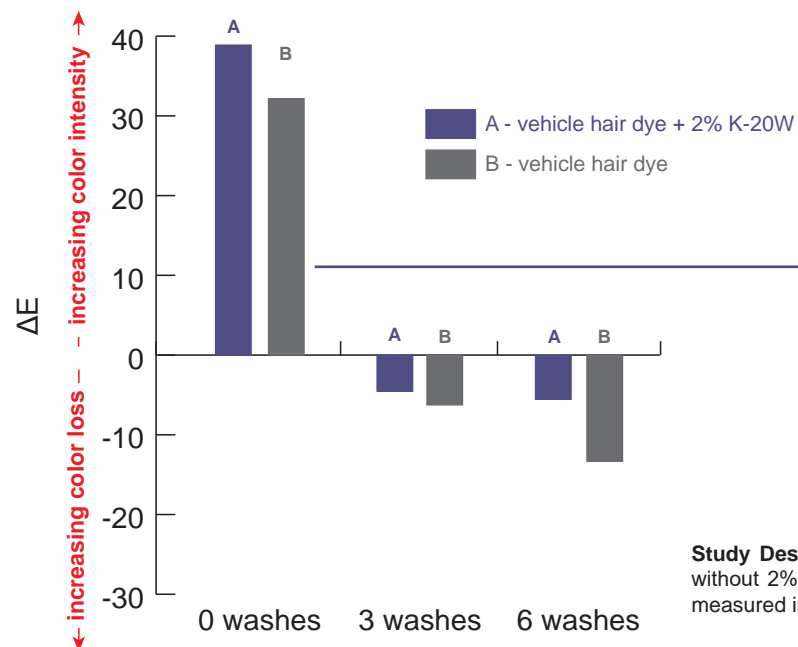


Figure 3: Hair tresses dyed with the semi-permanent hair dye containing **2% Floraesters K-20W Jojoba** achieved **21% greater color intensity** in 20 minutes ($p < 0.05$), and subsequently resulted in up to **58% less color loss** after 6 wash cycles ($p < 0.01$). (See Claim Sheet 16-088.)



Study Design: Hair tresses were dyed with orange semi-permanent hair dyes with and without 2% Floraesters K-20W Jojoba. The change in color (ΔE) of the hair tresses was measured immediately after dyeing (0 washes), and again after 3 and 6 wash cycles.

6. All studies were blinded, vehicle-controlled, and randomized (when applicable).

7. Naturally curly, dark brown hair tresses were double-bleached and cleansed with a 10% sodium lauryl sulfate solution prior to use in the study.

Semi-Permanent Hair Dye: Increased Deposition⁷

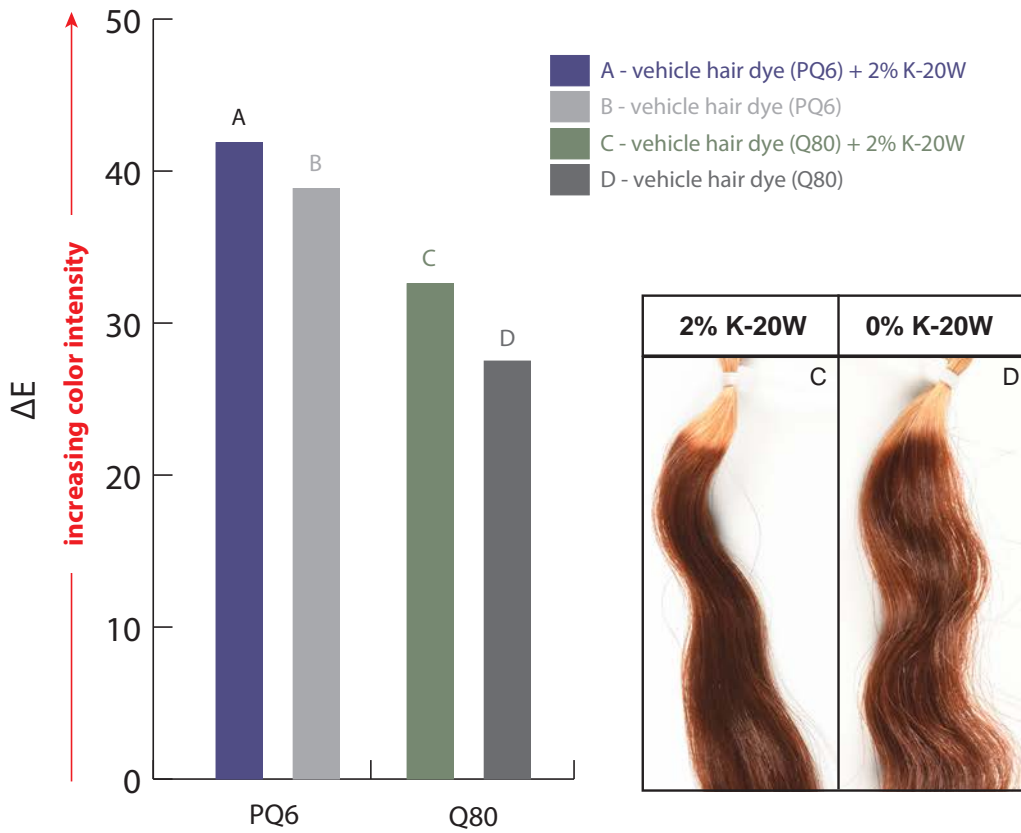
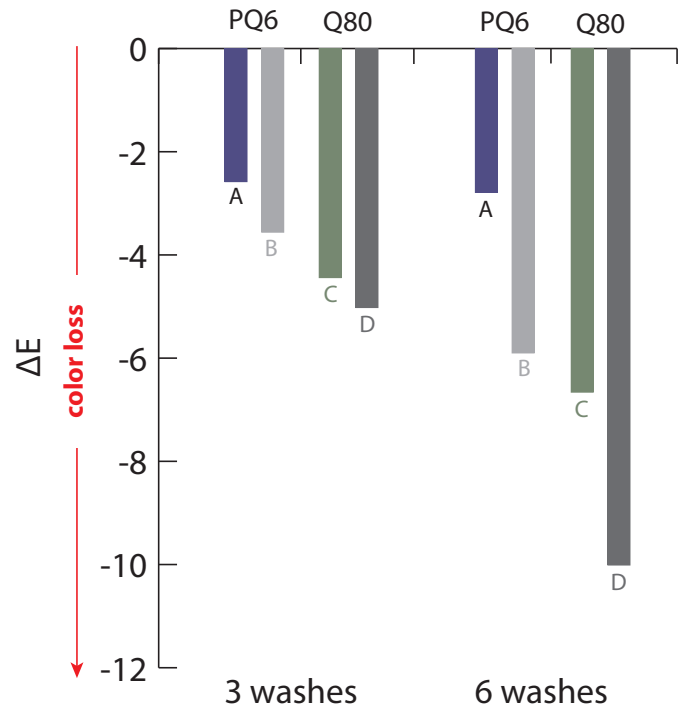


Figure 4: Hair tresses dyed with semi-permanent hair dye containing **2% Floraesters K-20W Jojoba** achieved up to **19% greater color intensity** in 20 minutes ($p < 0.05$). (See Claim Sheet 17-105.)

Study Design: Hair tresses were dyed with brown semi-permanent hair dyes with and without 2% Floraesters K-20W Jojoba. The change in color (ΔE) of the hair tresses was measured immediately after dyeing. (PQ6 = polyquaternium-6; Q80 = quaternium-80)

Semi-Permanent Hair Dye: Enhanced Color Retention⁷

Figure 5: Hair tresses dyed with semi-permanent hair dye containing **2% Floraesters K-20W Jojoba** resulted in up to **53% less color loss** after 6 wash cycles ($p < 0.05$). (See Claim Sheet 17-106.)



Study Design: Hair tresses were dyed with brown semi-permanent hair dyes with and without 2% Floraesters K-20W Jojoba. The change in color (ΔE) of the hair tresses was measured immediately after dyeing, and again after 3 and 6 wash cycles.

■ A - vehicle hair dye (PQ6) + 2% K-20W
■ B - vehicle hair dye (PQ6)
■ C - vehicle hair dye (Q80) + 2% K-20W
■ D - vehicle hair dye (Q80)

Semi-Permanent Hair Dye: Increased Consumer Preference⁸

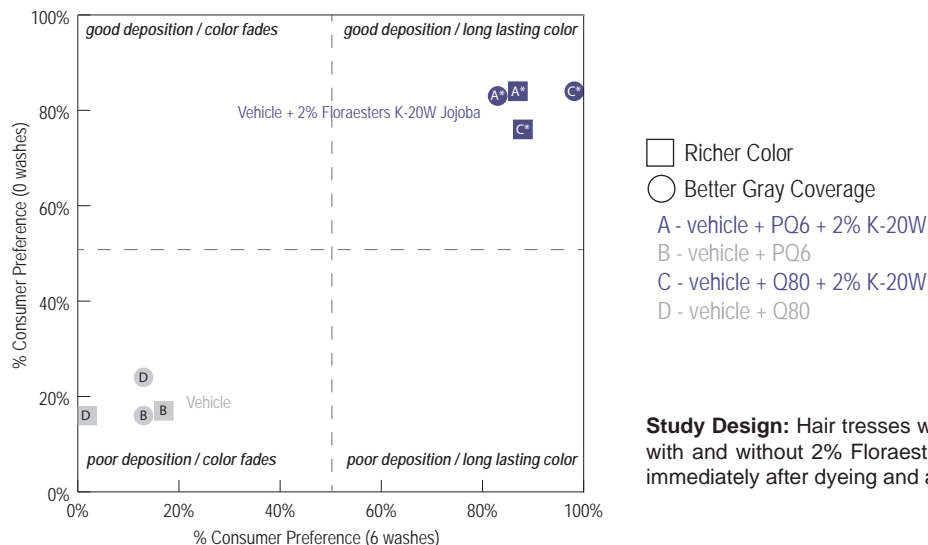


Figure 6: Both initially and after 6 washes, 76% of consumers⁹ preferred the hair dye with 2% Floraesters K-20W Jojoba for **gray coverage** and **richness of color** compared to the hair dye without. Statistical (*) significance between test articles was apparent where indicated ($p < 0.05$). (See Claim Sheet 17-107.)

Study Design: Hair tresses with 50% gray were dyed with brown semi-permanent hair dyes with and without 2% Floraesters K-20W Jojoba. Female consumers evaluated hair tresses immediately after dyeing and after 6 wash cycles.

Formula: Whisk Away Grays Semi-Permanent Hair Dye¹⁰

This semi-permanent hair dye with Floraesters K-20W Jojoba increases color uptake (*i.e.* deposition) and provides more even coverage, leaving hair color looking rich and radiant. Studies have also shown that Floraesters K-20W Jojoba provides longer lasting hair color (less color loss due to washing), decreasing the need for frequent hair dyeing.

Phase	Trade/Common Name	INCI Name	Manufacturer	% wt./wt.
A	Oxowax	Cetyl Alcohol (and) Oleyl Alcohol (and) Cetearyl Alcohol (and) Stearic Acid	Sensient Cosmetic Technologies	15.00
	Genapol® LA 070 S	Laureth-7	Clariant Corporation	10.00
	Ritacet 20	Ceteareth-20	Rita Corporation	4.00
	Hicall K-230	Mineral Oil	Kaneda Co, Ltd.	2.00
B	Lanette® E	Sodium Cetearyl Sulfate	BASF Corporation	1.00
	Deionized Water	Water	----	q.s.
C	Vibracolor® Moonlight Blue	Basic Blue 124	BASF Corporation	0.05
	Vibracolor Ruby Red	Basic Red 51	BASF Corporation	0.03
	Vibracolor Citrus Yellow	Basic Yellow 87	BASF Corporation	0.18
	Vibracolor Flame Orange	Basic Orange 31	BASF Corporation	0.25
	Deionized Water	Water	----	q.s.
D	Floraesters K-20W Jojoba	Hydrolyzed Jojoba Esters (and) Water (Aqua)	Florotech	2.00
	Propylene Glycol USP/EP	Propylene Glycol	Ashland, Inc.	2.00
E	Merquat® 100 Polymer ¹¹	Polyquaternium-6	The Lubrizol Corporation	4.00
	Citric Acid, USP (30% Solution)	Citric Acid (and) Water	Archer Daniels Midland Company	q.s.
Total				100.00

Procedure:

- Mix the ingredients of Phase A at 70-80°C with moderate propeller agitation.
- In a separate vessel, combine the ingredients of Phase B at 70-80°C with moderate propeller agitation.
- Once Phase B is uniform, add Phase B to Phase A.
- Switch Phase AB to homomixing.
- In separate vessel, combine the dyes with the deionized water of Phase C. Mix until the dyes dissolve.
- Add Phase C to Phase AB while maintaining a temperature of 70-80°C. Continue homomixing until uniform. Switch to moderate propeller agitation and cool to 55-60°C.
- In separate vessel, combine Floraesters K-20W Jojoba with Propylene Glycol USP/EP of Phase D. Mix until Floraesters K-20W Jojoba is well dispersed.
- Add Phase D to Phase ABC with moderate propeller agitation.
- Cool mixture to 40-50°C. Add the Merquat 100 Polymer with moderate propeller agitation.
- Once mixture has cooled to 30-40°C, adjust pH to 4.0-4.5 with the Citric Acid, USP (30% Solution) of Phase E.

Formula Properties:

Property	Result
pH	4.0 - 4.5
Viscosity	153K - 320K

Ingredient Information
24/7 Online

iLabel®
www.florotech.com/info



Floraesters K-20W Jojoba

- Naturally curly, 50% dark brown / 50% gray hair tresses were cleansed with a 10% sodium lauryl sulfate solution prior to use in the study.
- The preference data does not include subjects that indicated no preference.
- INCI/Trade names must be verified with each manufacturer.
- Alternatively Abil® Quat 3272 [INCI: Quaternium-80] supplied by Evonik Industries may be used instead.