

Recovered olive oil

PRODUCT SHEET | Virgin olive oil recovered from olive pomace

Olive oil production leaves a valuable fraction of oil within the olive pomace. CircO olive oil is being developed to recover this resource and give it a new purpose as an olive-derived cosmetic ingredient.

A new purpose for the oil that remains

Our starting material is olive pomace, the pulp, skin and stone fragments remaining after olive oil production. The proposed ingredient recovers the oil retained within this material and connects olive processing with cosmetic formulation development.

Ingredient overview

Parameter	Proposed product description
Source	Oil recovered from olive pomace
Botanical origin	<i>Olea europaea</i> L.
Ingredient type	Plant-derived cosmetic oil for formulation evaluation
Geographical origin	Iberian Peninsula
Physical form	Liquid oil
Phenolic composition	~200 mg/kg of secoiridoids derivatives measured by LC-MS/MS (hydroxytyrosol, tyrosol, oleacein, oleocanthal, oleuropein and ligstroside aglycones)
Recovery process	Mechanical means
INCI designation	Virgin vegetable oil

Designed for the cosmetic oil phase

Proposed applications include face creams, body lotions, body and massage oils, balms, cleansing oils, hair oils, conditioning formulations and soaps. Suitability, sensory performance and the recommended use level will be established in the intended formulation.

Traceable circular sourcing

Batch documentation should connect the source material to the recovery process and supplied ingredient, supporting a traceable circular sourcing story.

Explore a formulation partnership

Contact the CircO team to discuss ingredient specifications, sample evaluation and co-development opportunities.

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IOC virgin olive oil quality criteria

COI/T.15/NC No. 3/Rev. 22 | June 2026

Reference limits for the category virgin olive oil, not extra virgin. These are benchmarks, not measured CircO results or a declaration of category compliance. Process eligibility and full analytical conformity must be established separately for oil recovered from pomace.

Analytical profile and batch quality

Parameter	IOC virgin olive oil reference
Free acidity as oleic acid	≤2.0 g/100 g
Peroxide value	≤20.0 meq active oxygen/kg
K270 / K268	≤0.25; cyclohexane / iso-octane respectively
ΔK	≤0.01
K232	≤2.60; optional commercial criterion under IOC section 4.4
Moisture and volatile matter	≤0.2% m/m
Insoluble impurities in light petroleum	≤0.10% m/m
Iron	≤3.0 mg/kg
Copper	≤0.1 mg/kg
Median of sensory defects	0.0 < Md < 3.5, as printed in Rev. 22 section 4.1
Median of fruitiness	Mf >0.0
Fatty acid ethyl esters	No virgin-category limit; ≤35 mg/kg applies to extra virgin only
Polyphenols / phenolic compounds	Report mg/kg; no category minimum or maximum. IOC Doc. 29/Rev.2: identify Method 1 or Method 2 and reporting basis
Food additives	None permitted

Polyphenol reporting

Method 1 reports biophenols as mg/kg expressed as tyrosol. Method 2 uses SPE-HPLC-DAD and reports individual and total phenolic compounds in mg or mmol/kg. These outputs must not be treated as interchangeable. Any CircO minimum will be a separate product specification supported by batch data.

Additional quality controls

Heavy metals and pesticide residues: comply with the applicable Codex limits referenced in IOC section 6. The IOC does not provide a universal “<LOQ” limit. Hygiene follows the Codex framework referenced in section 7; no fixed aerobic, yeast or mould counts are specified in this trade standard.

Oxidative stability, tocopherols, squalene, shelf life and residual-solvent screening remain product-specific controls. This standard gives no virgin-category numeric limits for these parameters. Colour is not assigned a virgin-category limit in the quality table.

Fatty acid identity criteria

IOC purity criteria | Virgin olive oil reference

Fatty acid composition is expressed as % m/m of fatty acid methyl esters, determined by gas chromatography. These ranges assess identity and purity; they are not a typical composition of CircO.

Fatty acid	Reference range or limit
Myristic C14:0	<0.03%
Palmitic C16:0	7.00–20.00%
Palmitoleic C16:1	0.30–3.50%
Heptadecanoic C17:0	<0.40%
Heptadecenoic C17:1	<0.60%
Stearic C18:0	0.50–5.00%
Oleic C18:1	55.00–85.00%
Linoleic C18:2	2.50–21.00%
Linolenic C18:3	≤1.00%; conditional exception below
Arachidic C20:0	<0.60%
Gadoleic C20:1	<0.50%
Behenic C22:0	<0.20%
Lignoceric C24:0	<0.20%
Trans C18:1	<0.05%
Trans C18:2 + trans C18:3	<0.05%

Conditional linolenic acid exception

For edible virgin olive oil with linolenic acid >1.00% and ≤1.40%, authenticity may be accepted when apparent beta-sitosterol/campesterol ≥24 and all other purity criteria comply. Apply the full IOC footnote, not the raised value in isolation.

Methods and sampling

Use the latest IOC referee methods. Relevant references include Doc. 33 for fatty acid methyl esters, Doc. 34 for free acidity, Doc. 35 / Doc. 38 for peroxide value, Doc. 19 for UV absorbance and Doc. 15 for sensory assessment. Sampling and sample preparation follow ISO 5555 and ISO 661 respectively.

Sterols and other purity criteria

IOC virgin olive oil reference | Conditional rules apply

Parameter	Reference limit
Cholesterol	≤0.5% of total sterols
Brassicasterol	≤0.1% of total sterols
Campesterol	≤4.0% of total sterols; exception A
Stigmasterol	<campesterol in edible oils
Delta-7-stigmastenol	≤0.5% of total sterols; exception B
Apparent beta-sitosterol	≥93.0% of total sterols
Total sterols	≥1,000 mg/kg
Erythrodiol + uvaol	≤4.5% of total sterols
Waxes C42 + C44 + C46	≤150 mg/kg
Absolute ΔECN42	≤0.20%
Stigmastadienes	≤0.05 mg/kg
2-glyceryl monopalmitate	<0.9% if C16:0 <14.00%; <1.0% if C16:0 >14.00%
Unsaponifiable matter	≤15 g/kg

Conditional authenticity rules

A. Campesterol >4.0% and ≤4.5%: permitted if stigmasterol ≤1.4%, delta-7-stigmastenol ≤0.3% and all other parameters comply.

B. Delta-7-stigmastenol >0.5% and ≤0.8%: permitted for virgin olive oil if apparent beta-sitosterol/campesterol ≥28, absolute ΔECN42 ≤0.10% and all other parameters comply.

Apparent beta-sitosterol is the sum defined in IOC section 3.3.1: beta-sitosterol, delta-5-avenasterol, delta-5,23-stigmastadienol, clerosterol, sitostanol and delta-5,24-stigmastadienol. The 800 mg/kg sterol exception in Rev. 22 is restricted to specified single-varietal extra virgin oils and is not applied here.

Rev. 22 prints strict inequalities for the sensory defect threshold and the two palmitic-acid branches. Boundary values Md =3.5 and C16:0 =14.00% require confirmation against the applicable classification method and jurisdiction; no boundary rule has been inferred here.

Vegetable oils in cosmetic formulation

Composition and differentiation | Literature context

Vegetable oils differ in lipid structure, minor constituents and formulation behaviour. The comparison below describes reference oil types, not equivalent performance or a ranking. Composition varies with cultivar, extraction, refining and storage.

Comparison with common botanical oils

Oil	Distinguishing composition	Implication for CircO
Olive	Oleic-rich triacylglycerols; phenolics and squalene can occur in unrefined grades [A, B]	Combine a quantified phenolic profile with documented olive pomace recovery
Sunflower	Linoleic-rich conventional grades; distinct high-oleic grades [C]	Oleic acid is not unique to olive oil; compare the actual sunflower grade
Grape seed	Linoleic-rich triacylglycerols; seed-based by-product sourcing [C]	Circular sourcing can also apply to competitors; specify the olive-derived phenolic fraction
Coconut	More saturated, lauric-rich profile [C]	Different lipid chemistry; phenolic content alone does not establish skin superiority
Argan	Oleic and linoleic acids; tocopherols, sterols and squalene [B, D]	An antioxidant-containing competitor; evaluate matched grades rather than assume absence of bioactive compounds
Joboba	Long-chain liquid wax esters rather than mainly triacylglycerols [E]	Structurally different comparator; select by intended texture and formulation role

A direct compositional comparison in the literature

Khallouki et al. (2003) analysed argan oils alongside an extra virgin olive oil and sunflower oil. The following are sample-specific results from that study, not universal values or CircO specifications. [B]

Analyte	Olive sample	Argan samples	Sunflower sample
Total phenolics	793 mg/kg	<5 mg/kg	Not stated in abstract
Squalene	4,990 mg/kg	3,130 ±40 mg/kg	60 mg/kg

Squalene values were converted from mg/100 g to mg/kg. The phenolic comparison supports investigating differentiation from some argan grades, not a claim that all olive oils exceed all cosmetic oils. Squalene and squalane are distinct ingredients.

CircO positioning

Proposed commercial wording: “An upcycled olive-derived oil containing naturally occurring phenolic compounds, recovered from olive pomace for cosmetic formulation development.”

The product fact supplied is the presence of phenolics. Their identities, concentrations, batch consistency and activity in the finished formula must establish the strength of the bioactive positioning.

Bioactive potential of olive phenolic compounds

Experimental evidence and formulation validation

What the experimental literature supports

Antioxidant potential. Hydroxytyrosyl oleate was identified in olive oil and olive-processing by-products. In cultured human keratinocytes, the isolated compound reduced ROS and malondialdehyde. This supports screening olive lipophenols; it does not establish that CircO contains this marker or reproduces the cellular effect. [F]

Inflammatory signalling. Hydroxytyrosol and hydroxytyrosyl acetate attenuated inflammation-related responses in primary human keratinocytes through interference with the NF- κ B pathway. These are mechanistic results for isolated compounds, not clinical results for the recovered oil. [G]

Formulated ingredients. A 2021 study evaluated creams containing extracts of olive-processing by-products, including antioxidant performance and skin compatibility. It supports testing a formulated ingredient rather than transferring extract results directly to a whole oil. [H]

Where differentiation needs evidence

Oil-phase performance: compare oxidation in the supplied oil and a reference emulsion with and without CircO. **Skin-related potential:** establish tolerance and relevant cellular or skin-model endpoints at realistic use levels. These are separate functions; a radical-scavenging assay alone proves neither skin efficacy nor preservation.

Report total phenolics and identified markers in mg/kg of the supplied oil, distinguishing free compounds from derivatives. Document moisture and phase composition, storage retention and batch variability. At oil fraction f in a formula, the nominal phenolic concentration is $f \times$ the oil concentration on the same mass basis; retention and delivery require measurement.

A relevant limit to the skin story

In two forearm-controlled studies involving 19 adults, repeated topical olive oil application reduced stratum corneum integrity and caused mild erythema, while sunflower oil preserved integrity. This concerns the tested oils and application conditions; it is not a test of CircO. It rules out assuming universal barrier benefit from olive origin or high oleic content. [I]

References

- [A] IOC. COI/T.15/NC No. 3/Rev.22 (2026), purity criteria.
- [B] Khallouki et al. (2003). Comparative oil composition. doi:10.1097/00008469-200302000-00011
- [C] FAO/Codex. Named Vegetable Oils CXS 210-1999, fatty acid identity profiles. Historical FAO text: www.fao.org/4/Y2774E/y2774e04.htm; used for qualitative composition only.
- [D] Fatty Acid Composition of Cosmetic Argan Oil: Provenience and Authenticity Criteria (2020). doi:10.3390/molecules25184080
- [E] Miwa (1971). Jojoba wax ester composition. doi:10.1007/BF02638458
- [F] Hydroxytyrosyl Oleate (2019). Antioxidant and skin-related cellular studies. doi:10.3390/antiox8070233
- [G] Aparicio-Soto et al. (2019). Olive phenols in human keratinocytes. doi:10.1002/mnfr.201900019
- [H] Investigations of Olive Oil Industry By-Products Extracts with Potential Skin Benefits in Topical Formulations (2021). PubMed PMID:33808196
- [I] Danby et al. (2013). Olive and sunflower oil and adult skin barrier. doi:10.1111/j.1525-1470.2012.01865.x