



United States  
Department of  
Agriculture

Agricultural  
Marketing  
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Fruit and  
Vegetable  
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Processed  
Products  
Branch

# **United States Standards for Grades of Olive Oil and Olive-Pomace Oil**

**Effective  
October 24, 2010**

This is the second issue of the United States Standards for Grades of Olive Oil published in the **FEDERAL REGISTER** on April 28, 2010 to become effective October 24, 2010. This issue supersedes the first issue, which has been in effect since March 22, 1948.

Voluntary U.S. grade standards are issued under the authority of the Agricultural Marketing Act of 1946, which provides for the development of official U.S. grades to designate different levels of quality. These grade standards are available for use by producers, suppliers, buyers, and consumers. As in the case of other standards for grades of processed fruits and vegetables, these standards are designed to facilitate orderly marketing by providing a convenient basis for buying and selling, for establishing quality control programs, and for determining loan values.

The standards also serve as a basis for the inspection and grading of commodities by the Federal inspection service, the only activity authorized to approve the designation of U.S. grades as referenced in the standards, as provided under the Agricultural Marketing Act of 1946. This service, available as on-line (in-plant) or lot inspection and grading of all processed fruit and vegetable products, is offered to interested parties, upon application, on a fee-for-service basis. The verification of some specific recommendations, requirements, or tolerances contained in the standards can be accomplished only by the use of on-line inspection procedures. In all instances, a grade can be assigned based on final product factors or characteristics.

In addition to the U.S. grade standards, grading manuals or instructions for inspection of several processed fruits and vegetables are available upon request for a nominal fee. These manuals or instructions contain detailed interpretations of the grade standards and provide step-by-step procedures for grading the product.

Grade standards are issued by the Department after careful consideration of all data and views submitted, and the Department welcomes suggestions which might aid in improving the standards in future revisions. Comments may be submitted to, and copies of standards and grading manuals may be obtained from:

Chief, Processed Products Branch  
Fruit and Vegetable Programs, AMS  
U.S. Department of Agriculture  
STOP 0247, Rm. 0709, So. Bldg.  
1400 Independence Ave., SW  
Washington, D.C. 20250-0247

UNITED STATES STANDARDS FOR GRADES OF  
OLIVE OIL AND OLIVE-POMACE OIL

Section	Page No.
§52.1531	Product description. .... 2
§52.1532	Types of olive oil ..... 2
§52.1533	Types of olive-pomace oil. .... 3
§52.1534	Grades of olive oil. .... 3
§52.1535	Grades of olive-pomace oil. .... 4
§52.1536	Recommended sample unit size. .... 5
§52.1537	Recommended fill of container..... 5
§52.1538	Definition of terms. .... 5
§52.1539	Ascertaining the grade. .... 9
§52.1540	Methods of Analysis. .... 14
§52.1541	Ascertaining the grade of a lot ..... 16
§52.1542	Score Sheet ..... 19

Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended (7 U.S.C. 1622, 1624).

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Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

**§52.1531 Product description.**

- (a) **Olive oil** is the oil obtained solely from the fruit of the olive tree (*Olea europaea* L.), to the exclusion of oils obtained using solvents or re-esterification processes and of any mixture with oils of other kinds and shall meet the minimum requirements of Table I, found in **§52.1539** of these grade standards.
- (b) **Virgin olive oils** are the oils obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions, including thermal conditions, that do not lead to alterations in the oil, and which have not undergone any treatment other than washing, decantation, centrifugation, and filtration and shall meet the minimum requirements of Table I, found in **§52.1539** of these grade standards. No additives of any kind are permitted.
- (c) **Olive-pomace oil** is the oil obtained by treating olive pomace (the product remaining after the mechanical extraction of olive oil) with solvents or other physical treatments, to the exclusion of oils obtained by synthetic processes and mixture with oils of other kinds and shall meet the minimum requirements of Table I, found in **§52.1539** of these grade standards. Alpha-tocopherol is permitted to restore natural tocopherol lost in the refining process for refined olive pomace and olive-pomace oil. Maximum level: 200 mg/kg of total alpha-tocopherol is permitted in the final product.

**§52.1532 Types of olive oil.**

- (a) **Virgin olive oils**
  - (1) **Virgin olive oils fit for consumption without further processing include:**
    - i. **Extra virgin olive oil**
    - ii. **Virgin olive oil.**
  - (2) **Virgin olive oil not fit for consumption without further processing designated lampante virgin olive oil.**
- (b) **Olive oil**
- (c) **Refined olive oil**

**§52.1533 Types of olive-pomace oil**

- (a) Olive-pomace oil**
- (b) Refined olive-pomace oil**
- (c) Crude olive-pomace oil**

**§52.1534 Grades of olive oil**

**Olive oils** are graded based on the minimum criteria outlined in Table I, as appropriate. The hierarchy for grades of virgin olive oil is extra-virgin olive oil, virgin olive oil, and virgin olive oil not fit for human consumption (lampante virgin olive oil). Lampante virgin olive oil is the lowest level of quality among the virgin olive oils and must be refined before consumption. Olive oil and refined olive oil fall below the virgin olive oil category in terms of hierarchy.

- (a) “U.S. Extra Virgin Olive Oil”** is virgin olive oil which has excellent flavor and odor (median of defects equal to zero and median of fruitiness greater than zero) and a free fatty acid content, expressed as oleic acid, of not more than 0.8 grams per 100 grams, and meets the additional requirements as outlined in §52.1539, as appropriate.
- (b) “U.S. Virgin Olive Oil”** is virgin olive oil which has reasonably good flavor and odor (median of defects between zero and 2.5 and median of fruitiness greater than zero) and a free fatty acid content, expressed as oleic acid, of not more than 2.0 grams per 100 grams, and meets the additional requirements as outlined in §52.1539 as appropriate. Olive oil that falls into this classification shall not be graded above “U.S. Virgin Olive Oil” (this is a limiting rule).
- (c) “U.S. Virgin Olive Oil Not Fit For Human Consumption Without Further Processing”** sometimes designated as **“U.S. Lampante Virgin Olive Oil,”** is virgin olive oil which has poor flavor and odor (median of defects between 2.5 and 6.0 or when the median of defects is less than or equal to 2.5 and the median of fruit is zero), a free fatty acid content, expressed as oleic acid, of more than 2.0 grams per 100 grams, and meets the additional requirements as outlined §52.1539 as appropriate. Olive oil that falls into this classification shall not be graded above "U.S. Virgin Olive Oil Not Fit for Human Consumption Without Further Processing" (this is a limiting rule). It is intended for refining or for purposes other than food use.

- (d) **“U.S. Olive Oil”** is the oil consisting of a blend of refined olive oil and virgin olive oils fit for consumption **without further processing**. It has a free fatty acid content, expressed as oleic acid, of not more than 1.0 gram per 100 grams, has acceptable odor and flavor characteristic of “virgin olive oil,” and meets the additional requirements as outlined in §52.1539 as appropriate. Olive oil that falls into this classification shall not be graded above “U.S. Olive Oil” (this is a limiting rule). The maximum level permitted of total alpha-tocopherol in the final product is 200 mg/kg.
- (e) **“U.S. Refined Olive Oil”** is the olive oil obtained from virgin olive oils by refining methods that do not lead to alterations in the initial glyceridic structure (basic glycerin-fatty acid structure). It has a free fatty acid content, expressed as oleic acid, of not more than 0.3 grams per 100 grams, is flavorless and odorless and meets the additional requirements as outlined in §52.1539 as appropriate. Olive oil that falls into this classification shall not be graded above “U.S. Refined Olive Oil” (this is a limiting rule). The addition of alpha-tocopherol is permitted to restore natural tocopherol lost in the refining process. The maximum level is 200 mg/kg of total alpha-tocopherol in the final product.

**§52.1535 Grades of olive-pomace oil.**

**Olive-pomace Oils** are graded based on the minimum criteria outlined in Table I, as appropriate. The hierarchy for grades from highest to lowest is olive-pomace oil, refined olive-pomace oil, and crude olive-pomace oil. Crude olive-pomace oil is the lowest level of quality among the olive-pomace oils and must be refined before consumption. **Olive-pomace oils shall not be labeled as “olive oil.”**

- (a) **“U.S. Olive-pomace Oil”** is the oil comprising a blend of refined olive-pomace oil and virgin olive oils fit for consumption without further processing. It has a free fatty acid content, expressed as oleic acid, of not more than 1.0 gram per 100 grams, acceptable flavor and odor slightly characteristic of olive oil, and meets the additional requirements as outlined in §52.1539, as appropriate. Olive pomace oil that falls into this classification shall not be graded above “U.S. Olive-pomace Oil” (this is a limiting rule).
- (b) **“U.S. Refined Olive-pomace Oil”** is the oil obtained from crude olive-pomace oil by refining methods that do not lead to alterations in the initial glyceridic structure. It has a free fatty acid content, expressed as oleic acid, of not more than 0.3 grams per 100 grams, acceptable flavor and odor, and meets the additional requirements as outlined in §52.1539, as appropriate. Olive-pomace oil that falls

into this classification shall not be graded above “U.S. Refined Olive-pomace Oil” (this is a limiting rule).

- (c) **“U.S. Crude Olive-pomace Oil”** is olive-pomace oil that meets the requirements as outlined in §52.1539, as appropriate. Olive oil that falls into this classification shall not be graded above “U.S. Crude Olive-pomace Oil” (this is a limiting rule). It is intended for refining for use for human consumption or for purposes other than food use.

**§52.1536 Recommended sample unit size**

- (a) The sample unit size shall be 500 ml per sample.
- (b) Oil should be kept in original unopened containers, when possible.

**§52.1537 Recommended fill of container.**

The recommended fill of container is not incorporated in the grades of the finished product since fill of container, as such, is not a factor of quality for the purposes of these grades. It is recommended that each container be filled as full as practicable without impairment of quality.

**§52.1538 Definition of Terms.**

- (a) **Absorbency in Ultraviolet (UV).** Spectrophotometric test which examines the olive oil and measures the absorption under ultraviolet light. These absorptions are expressed as K (extinction coefficient) for the specified wavelength. The two wave length regions are examined, 232 nanometers (nm) to calculate K<sub>232</sub> and 270 nm to calculate K<sub>270</sub> and 264-274 nm to calculate delta K ( $\Delta K$ ). This test provides information on the quality of the oil, state of preservation, and changes brought about through processing.
- (b) **Color.** A subjective visual rating to assure that the oil does not have unusual color uncharacteristic of the product.
- (c) **Desmethylsterol Composition.** A test used to indicate the origin and purity of the oil.
- (d) **ECN 42 Content.** The maximum difference between the actual Equivalent Carbon Number 42 (ECN 42) triacylglycerol content of the oil molecules determined by High Performance Liquid Chromatography (HPLC) and the theoretical amount of ECN 42 triacylglycerol using the fatty acid composition. It is used to for the detection of seed oils and verifies authenticity and origin of oils.
- (e) **Erythrodiol and Uvaol.** Two triterpenic alcohol components found in olive oil and olive-pomace oil. The levels present differentiate

oils that were pressed from oils that were produced by solvent extraction.

- (f) **Fatty Acid Composition.** Fatty acids are the molecular components of fats and oils. Basic percentages of fatty acid types are documented for each oil within a certain range. This determination distinguishes between seed oils and olive oil.
- (g) **Flavor and Odor.** Refers to the typical flavor and odor of olive oil or olive-pomace oil produced from olives and the degree of positive attributes such as, but not limited to olive, apple, green, sweet, grass, nutty, tomato and some negative attributes, such as, but not limited to musty, fusty, winey-vinegary, muddy-sediment, and rancid. The organoleptic characteristics are based on a continuous scale by a panel of tasters for virgin olive oil exclusively (See Table I).
  - (1) **Excellent flavor.** Refers to extra virgin olive oil produced from olives, with no defective flavor and having positive flavor attributes, such as, but not limited to olive, apple, green, sweet, grass, nutty, tomato and no negative flavor attributes.
  - (2) **Good flavor.** Refers to virgin olive oil produced from olives, some or no positive flavor attributes and some barely perceptible negative flavor attributes.
  - (3) **Acceptable flavor.** Characterizes olive oil or olive-pomace oil having little or no flavor.
  - (4) **Poor flavor.** Olive oil or olive-pomace oil that is off flavor or does not meet the minimum requirement for acceptable flavor.
- (h) **Free Fatty Acid Content.** The percent by weight expressed in grams per 100 grams, as oleic acid. The free fatty acid is a measure of the quality of the oil, and reflects the care taken in producing the oil and quality of the in-going fruit.
- (i) **Glyceridic Structure.** The molecular structure of fats and oils in the form of various esters corresponding to the reaction of glycerol with fatty acids. The fatty acid groups can replace one, two, or all three of the hydroxyl groups of the glycerol, resulting in mono-, di-, and triglycerides, respectively. Vegetable and animal fats and oils consist of triglycerides.
- (j) **Linolenic Acid** is a fatty acid component found in olive oil. Its level is used to establish the purity of the olive oil. The fatty acid profile of olive oil and olive-pomace oil is well documented except



that linolenic acid limits vary by up to 1.5 percent according to where the oil is grown and harvested.

- (k) **Median of Defects ( $M_d$ ).** A calculation of the median score from a panel of tasters or an equivalent scoring method that characterizes the negative flavor and odor attributes of virgin olive oil, such as, but not limited to musty, fusty, winey-vinegary, muddy-sediment, and rancid.
  - (1) **Fusty.** A flavor defect attributable to poor storage conditions of the olives, usually promoting the bacterial growth of the *Clostridium* and *Pseudomonas* genera.
  - (2) **Muddy-sediment.** A flavor defect caused by storage of olives in contact with the sediment for long periods giving the oil a putrid flavor and odor.
  - (3) **Musty.** A flavor defect occurring when low temperatures and high humidity promote mold growth, mainly of the *Aspergillus* and *Penicillium* genera. The resulting oil has a mushroom-like odor.
  - (4) **Rancid.** A flavor defect caused by the oxidation of the oil and subsequent formation of aldehydes during the production process giving the oil a varnish, paint, or seed-like flavor and odor.
  - (5) **Winey-vinegary.** A flavor defect caused by the storage condition of the olives that causes aerobic fermentation by the growth of yeasts that produce ethanol, acetic acid, and ethyl acetate.
- (l) **Median of Fruity ( $M_f$ ).** A calculation of the median score from a panel of tasters or an equivalent scoring method that characterizes virgin olive oil produced from olives, such as, but not limited to olive, apple, green, sweet, grass, nutty, tomato.
- (m) **Organoleptic.** Organoleptic analysis consists of an evaluation based on visual, flavor and odor characteristics.
- (n) **Peroxide Value.** A measure of the oxidation of olive oil expressed as milliequivalents of active oxygen per kilogram of oil.
- (o) **2-Glycerol Monopalmitate Content Determination.** This test is used to determine if the oil has been re-esterified by synthetic means or by addition of animal fat.
- (p) **Stigmastadiene.** A steroid hydrocarbon found at low levels in virgin olive oil and crude olive-pomace oil. Analysis of its

content is used for the detection of refined oils (olive oil, olive-pomace oil, and some seed oils) in virgin olive oil.

- (q) **Sterol Analysis.** Used to detect the presence of seed oil. Sterols are one of many minor constituents of oils that are characteristic indicators of impurity of the olive oil.
- (r) **Trans Fatty Acid.** When oil is partially hydrogenated or refined, *trans* fatty acids form in which hydrogen atoms arrange on opposite sides of the double bond. Olive oil in its natural state does not consist of *trans* fatty acids. This test is used to determine if any processing has taken place such as, deodorization or de-coloring.
- (s) **Triglyceride.** A component of oil formed by an ester of three fatty acids and glycerol, oleic acid being chief among them.
- (t) **Wax Content.** A determination used to identify the presence of pomace oil or seed oil. Wax content is higher in pomace oil because wax is found in the skin of the olive fruit.

**§52.1539 Ascertaining the grade.**

The U.S. grades of olive oil or olive-pomace oil must meet the following minimum requirements, of the respective grades listed in Table I, as appropriate.

**TABLE I**

Quality Criteria	US Extra Virgin Olive Oil	US Virgin Olive Oil	Lampante Virgin Olive Oil <sup>1/</sup>	US Refined Olive Oil	US Olive Oil	US Olive-pomace Oil	US Refined Olive-pomace Oil	US Crude Olive-pomace Oil
(a) Organoleptic Characteristics								
- Odor And Flavor	Excellent	Good	Poor	Acceptable	Good	Good	Acceptable	N/A
- Odor And Flavor (On A Continuous Scale):								
• Median Of Defect ( $M_d$ )	$M_d = 0$	$0 < M_d \leq 2.5$	$M_d > 2.5$ <sup>2/</sup>	N/A	N/A	N/A	N/A	N/A
• Median Of The Fruity ( $M_f$ )	$M_f > 0$	$M_f > 0$	N/A	N/A	N/A	N/A	N/A	N/A
• Color	Yellow To Green	Yellow To Green	Yellow To Green	Light Yellow	Light Yellow To Green	Light Yellow To Green	Light Yellow To Brownish Yellow	Dark Green, Brown, Or Black
(b) Free Fatty Acid Content, % m/m Expressed As Oleic Acid	$\leq 0.8$	$\leq 2.0$	$> 2.0$	$\leq 0.3$	$\leq 1.0$	$\leq 1.0$	$\leq 0.3$	No limit
(c) Peroxide Value, In Milleq. Peroxide Oxygen Per kg/oil	$\leq 20$	$\leq 20$	No Limit	$\leq 5$	$\leq 15$	$\leq 15$	$\leq 5$	No limit

1/ The criteria in (a), (b), and (c) is not required to be concurrent; one is sufficient (for lampante oil only).

2/ Or when the median of the defect attribute is less than or equal to 2.5 and the median of the fruity attribute is equal to 0.

**TABLE I continued**

	US Extra Virgin Olive Oil	US Virgin Olive Oil	Lampante Virgin Olive Oil	US Refined Olive Oil	US Olive Oil	US Olive-pomace Oil	US Refined Olive-pomace Oil	US Crude Olive-pomace Oil
<b>Quality Criteria</b>								
(d) Absorbency In Ultraviolet (UV) (K1% 1cm)								
- 270 nm	≤ 0.22	≤ 0.25	N/A	≤ 1.10	≤ 0.90	≤ 1.70	≤ 2.00	N/A
- Δ K	≤ 0.01	≤ 0.01	N/A	≤ 0.16	≤ 0.15	≤ 0.18	≤ 0.20	N/A
- 232 nm	≤ 2.50 <sup>6/</sup>	≤ 2.60 <sup>6/</sup>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Purity Criteria</b>								
(e) Fatty Acid Composition As Determined By Gas Chromatography (% m/m Methyl Esters)	-Arachidic Acid (C20:0) ≤ 0.6 -Behenic Acid (C22:0) ≤ 0.2 <sup>3/</sup> -Gadoleic Acid (Eicosenoic) (C20:1) ≤ 0.4 -Heptadecanoic Acid (C17:0) ≤ 0.3 -Heptadecenoic Acid(C17:1) ≤ 0.3 -Lignoceric Acid (C24:0) ≤ 0.2 -Linoleic Acid (C18:2) 3.5 – 21.0					-Linolenic Acid (C18:3) ≤ 1.5 <sup>4/</sup> -Myristic Acid (C14:0) ≤ 0.05 -Oleic Acid (C18:1) 55.0 – 83.0 -Palmitoleic Acid (C16:1) 0.3 – 3.5 -Palmitic Acid (C16:0) 7.5 – 20.0 -Stearic Acid (C18:0) 0.5 – 5.0		
(f) Trans Fatty Acid (T) Content (%) C18:1T <sup>5/</sup>	≤ 0.05	≤ 0.05	≤ 0.10	≤ 0.20	≤ 0.20	≤ 0.40	≤ 0.40	≤ 0.20
(g) Trans Fatty Acid Content (%) C18:2T+C18:3T	≤ 0.05	≤ 0.05	≤ 0.10	≤ 0.30	≤ 0.30	≤ 0.35	≤ 0.35	≤ 0.10

<sup>3/</sup> Limit raised to ≤ 0.3 for olive-pomace oils.

<sup>4/</sup> Linolenic acid values between 1.0 and 1.5 percent would be subject to further testing listed in Table II.

<sup>5/</sup> Fatty acid with 18 Carbon atoms (C) and one *trans* isomer (T)

<sup>6/</sup> Commercial partners in the country of retail sale may require compliance.

**TABLE I continued.**

Purity Criteria	US Extra Virgin Olive Oil	US Virgin Olive Oil	Lampante Virgin Olive Oil	US Refined Olive Oil	US Olive Oil	US Olive-pomace Oil	US Refined Olive-pomace Oil	US Crude Olive-pomace Oil
(h) Desmethylsterol Composition (% Total Sterol)								
(i) Total Sterol Content (mg/kg)	≥1000	≥1000	≥1000	≥1000	≥1000	≥1600	≥1800	≥2500

<sup>7/</sup> Limit raised to  $\leq 0.2$  for olive-pomace oils.

<sup>8/</sup> Campesterol values between 4.0 and 4.5 would be subject to further testing listed in Table II.

**TABLE II. Confirmatory tests for products with linolenic acid values between 1.0 and 1.5 percent, and/or campesterol values between 4.0 and 4.5 percent.**

Purity Criteria	US Extra Virgin Olive Oil	US Virgin Olive Oil	Lampante Virgin Olive Oil	US Refined Olive Oil	US Olive Oil	US Olive-pomace Oil	US Refined Olive-pomace Oil	US Crude Olive-pomace Oil
(j) Maximum Difference Between Actual And Theoretical ECN 42 Triacylglycerol Content	≤0.2]	≤0.2]	≤0.3]	≤0.3]	≤0.3]	≤0.5]	≤0.5]	≤0.6]
(k) Stigmastadiene Content (mg/kg)	≤0.15	≤0.15	≤0.50	≤50	≤50	≤120	≤120	≤0.50
(l) Erythrodiol and uvaol content (% total sterols)	≤4.5	≤4.5	≤4.5 <sup>9/</sup>	≤4.5	≤4.5	>4.5	>4.5	>4.5 <sup>10/</sup>
(m) Wax content C40+C42+C44+C46 (mg/kg)	≤250	≤250	≤300 <sup>9/</sup>	≤350	≤350	>350	>350	>350 <sup>10/</sup>
(n) Content of 2-glyceryl monopalmitate (2P) C16:0 ≤ 14%  C16:0 > 14%	2P≤ 0.9%  2P≤ 1.0%	2P≤ 0.9%  2P≤ 1.0%	2P≤ 0.9%  2P≤ 1.1%	N/A	N/A	≤1.2%	≤1.4%	≤1.4%

<sup>9/</sup> When the oil has a wax content between 300mg/kg and 350 mg/kg it is considered lampante virgin olive oil if the total aliphatic alcohol content is less than or equal to 350 mg/kg or the erythrodiol + uvaol content is less than or equal to 3.5 percent.

<sup>10/</sup> When the oil has a wax content between 300 mg/kg and 350 mg/kg it is considered crude olive-pomace oil if the total aliphatic alcohol content is less than or greater than 350 mg/kg or the erythrodiol +uvaol content is less than or greater than 3.5 percent.

**TABLE III. Optional requirements.**

Quality Criteria	US Extra Virgin Olive Oil	US Virgin Olive Oil	Lampante Virgin Olive Oil	US Refined Olive Oil	US Olive Oil	US Olive-pomace Oil	US Refined Olive-pomace Oil	US Crude Olive-pomace Oil
(o) Moisture and volatile matter (% m/m)	≤ 0.2	≤ 0.2	N/A	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1	≤ 1.5
(p) Insoluble impurities in light petroleum (% m/m)	≤ 0.1	≤ 0.1	N/A	≤ 0.05	≤ 0.05	≤ 0.05	≤ 0.05	N/A
(q) Flash point	N/A	N/A	N/A	N/A	N/A	N/A	N/A	≥ 120°C
(r) Trace metals (mg/kg) Iron copper	≤ 3.0 ≤ 0.1	≤ 3.0 ≤ 0.1	≤ 3.0 ≤ 0.1	≤ 3.0 ≤ 0.1	≤ 3.0 ≤ 0.1	≤ 3.0 ≤ 0.1	≤ 3.0 ≤ 0.1	N/A
(s) Unsaponifiable matter (g/kg)	≤15	≤15	≤15	≤15	≤15	≤30	≤30	≤30
(t) Aspect At 20°C (68°F) After 24 Hours	N/A	N/A	N/A	Limpid	Limpid	Limpid	Limpid	N/A
(u) Halogenated Solvents	Maximum content of each halogenated solvent 0.1 mg/kg Maximum content of all halogenated solvents 0.2 mg/kg							
(v) Heavy Metals Lead (Pb) Arsenic (As)	Maximum permissible content is 0.1 mg/kg							
(w) Pesticide Residues	The products covered by this standard shall comply with the maximum residue limits established by the U. S. Environmental Protection Agency.							

**§52.1540 Methods of Analysis**

**The following methods shall be used as references in determining the characteristics for olive oil or olive-pomace oil. Alternative methods may be used, provided they give equivalent results.**

**(a) Sampling**

Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products (7 CFR 52.1 through 52.83).

**(b) Preparation of the test sample**

According to International Standards Organization (ISO) 661, "Animal and vegetable fats and oils – Preparation of the test sample".

**(c) Determination of the fatty acid composition**

According to International Olive Council (COI) COI/T.20/Doc. No. 24; ISO 5508, "Analysis by gas chromatography of methyl esters of fatty acids"; or American Oil Chemists Society (AOCS) Ch 2-91. "Preparation of methyl esters", AOCS Ce-66, ISO 5509, or IOC/T.20/24-2001.

**(d) Determination of the trans fatty acid content**

According to COI/T.20/Doc. No. 17; ISO 15304; or AOCS Ce 1f-96.

**(e) Determination of the sterol composition and total sterol content**

According to According to COI/T.20/Doc. No. 10, "Determination of the composition and content of sterols by capillary-column gas chromatography"; ISO 12228 or AOCS Ch 6-91.

**(e) Determination of the content of erythrodiol + uvaol**

According to IUPAC no. 2.431, "Determination of the erythrodiol content".



- (f)** Determination of the wax content  
According to COI/T.20/Doc. No. 18/Rev.2, "Determination of wax content by capillary-column gas chromatography" or AOCS Ch 8-02.
- (g)** Determination of the difference between the actual and theoretical ECN 42 triacylglycerol content. According to COI/T.20/Doc. No. 23, "Determination of the difference between actual and theoretical content of triacylglycerol with ECN 42" or AOCS 5b-89.
- (h)** Determination of the stigmastadiene content  
According to COI/T.20/Doc. No. 11, "Determination of stigmastadienes in vegetable oils", or COI/T.20/Doc. No. 16, "Determination of sterenes in refined vegetable oils"; ISO 15788-1; or AOCS Cd 26-96.
- (i)** Determination of the fatty acids in the 2-glyceryl monopalmitate  
According to COI/T.20/Doc. No. 23, "Determination of percentage of 2-glyceryl monopalmitate".
- (j)** Determination of the unsaponifiable matter  
According to ISO 3596, "Determination of the unsaponifiable matter method using diethyl ether extraction"; AOCS Ca 6b-53; or ISO 18609. The results should be expressed in grams of unsaponifiable matter per kilogram/oil.
- (k)** Determination of the organoleptic characteristics  
According to COI/T.20/Doc. No. 15, "Organoleptic assessment of virgin olive oil".
- (l)** Determination of the free fatty acidity content  
According to ISO 660, "Determination of acid value and acidity", or AOCS Cd3d-63.
- (m)** Determination of the peroxide value  
According to ISO 3960, "Determination of the peroxide value," or AOCS Cd8b-90.

- (n) Determination of the absorbency in ultraviolet. According to COI/T.20/Doc. No. 19, "Spectrophotometric investigation in ultraviolet"; ISO 3656; or AOCS Ch 5-91.
- (o) Determination of the moisture and volatile matter  
According to ISO 662, "Determination of moisture and volatile matter"
- (p) Determination of the insoluble impurities in light petroleum  
According to ISO 663, "Determination of the insoluble impurities".
- (q) Determination of the flash point  
According to the Federation of Oils, Seeds and Fats Associations (FOSFA) International method.
- (r) Determination of the trace metals  
According to ISO 8294, "Determination of copper, iron and nickel by direct graphite furnace atomic absorption spectrometry".
- (s) Determination of the alpha-tocopherol  
According to ISO 9936, "Determination of tocopherols and tocotrienols contents – Method using high-performance liquid chromatography".
- (t) Detection of traces of halogenated solvents  
According to COI/T.20/Doc. no. 8, "Determination to tetrachlorethylene in olive oils by gas-liquid chromatography".
- (u) Determination of traces of heavy metals.  
Determination of lead: according to ISO 12193, AOCS Ca 18c-91 or AOAC 994.02.  
Determination of arsenic: according to AOAC 952.13, AOAC 942.17, or AOAC 985.16.

**§52.1541 Ascertaining the grade of a lot.**

The grade of a lot of olive oil or olive-pomace oil covered by these standards is determined by the procedures set forth in the **Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products** (7 CFR 52.1 through 52.83). Provided that:

- (a) Such sample complies with the applicable standards of quality promulgated under the Federal Food, Drug, and Cosmetic Act;
- (b) Such sample complies with the product description;
- (c) Such samples meet the indicated grade with respect to quality factors not rated by scorepoints; and
  - 1. None of the samples falls more than one grade below the indicated grade because of any quality factor to which a limiting rule applies; and
  - 2. The number of deviants does not exceed the applicable acceptance number indicated in the sampling plans (“deviants” means sample units that fall into the next grade below the indicated grade).
- (d) Required analysis on each lot shall include but is not limited to the following:
  - 1. Determination of the organoleptic characteristics;
  - 2. Determination of free fatty acid content (as oleic acid);
  - 3. Determination of peroxide value;
  - 4. Determination of absorbency in ultraviolet;
  - 5. Determination of the fatty acid composition;
  - 6. Trans fatty acid;
  - 7. Desmethylsterol composition (% Total Sterol); and
  - 8. Total sterol content
- (e) Any additional analysis outlined in Table II or Table III found in §52.1539 of this subpart will be performed at the request of the applicant or when indicated by test results.
- (f) **Lot inspection.** A lot of olive oil or olive-pomace oil is considered as meeting the requirements for the intended grade:
  - 1. The requirements of §52.1539 specified in Table I are met;
  - 2. If applicable, the additional requirements of §52.1539 specified in Table II are met;
  - 3. If the criteria for the individual analyses are not exceeded for the applicable grade designation; and

4. If any of the provisions contained in the above subparagraphs are not met, then the grade is determined by considering such provisions in connection with succeeding lower grades until the grade of the lot, if assignable, is established.
- (g) **Single sample unit.** Each unofficial sample unit submitted for quality evaluation will be treated individually and is considered as meeting the requirements of the intended grade:
1. The requirements of §52.1539 specified in Table I are met.
  2. If applicable, the additional requirements of §52.1539 specified in Table II.
  3. If the criteria for the individual analyses are not exceeded for the applicable grade designation.
- (h) **In-plant.** See Lot Inspection except that the quality criteria in §52.1539 Table I may be the sole basis for the grade, if appropriate.

**§52.1542 Score sheet for olive oil and olive-pomace oil.**

The following score sheet may be used to summarize the factors determining the various grades:

Size and kind of container ..... Container code or markings ..... Label..... Net contents (liquid measure)..... Free acidity (as oleic) ..... Organoleptic Characteristics..... -Median of Defects..... -Median of Fruity..... Flavor and Odor.....(Excellent, Good, Acceptable, Poor) Color.....(Normal, Off) Peroxide value ..... Absorbency in UV ..... 270 nm ..... 232 nm ..... ΔK ..... Fatty acid composition..... (Meets) (Fails) Trans fatty acid content..... Desmethylsterol composition .....(Meets) (Fails) Total sterol content ..... Stigmastadiene content..... Difference between actual and theoretical ECN 42 triacylglycerol content ..... Erythrodiol and uvaol content..... Wax content ..... 2-glyceryl monopalmitate content ..... Alpha tocopherol content..... Other analyses .....
<b>U.S. Grade</b>
“U.S. Extra Virgin Olive Oil” “U.S. Virgin Olive Oil” <u>1/</u> “U.S. Lampante Olive Oil” <u>1/</u> “U.S. Olive Oil” <u>1/</u> “U.S. Refined Olive Oil” <u>1/</u> “U.S. Olive-pomace Oil” <u>1/</u> “U.S. Refined Olive-pomace Oil” <u>1/</u> “U.S. Crude Olive-pomace Oil” <u>1/</u>
<b><u>1/</u> Indicates limiting rule</b>