2024 Olive Oil Testing Study Report

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2024 OLIVE OIL TESTING STUDY REPORT

This report, submitted to the North America Olive Oil Association (NAOOA), summarizes results from tests carried out on olive oil samples collected for the 2024 NAOOA olive oil testing study. All and any data generated for purposes of this and any future reports and analysis are the ownership of NAOOA.

Findings and Conclusions

Study Highlights

- Data from laboratory analysis of purity parameters of 190 products that were a representative sample of the top 15 proprietary retail olive oil brands accounting for 85% of market share as well as 37 private label brands collected from US and Canadian retail shelves indicated no evidence of adulteration, and thus did not support media reports expressing concern about widespread adulteration prompted by diminished supplies from two prior historically poor harvests.
- Data from laboratory analysis of an additional 26 samples of brands in the bottom 15% market share indicated two products that appear to be adulterated, one labeled extra virgin olive oil (EVOO) and one labeled olive oil (OO), each having relatively small market share (0.15% and 0.36%, respectively).
- Data indicated that the challenging harvest conditions may have negatively impacted grade quality. However, given study limitations, it was not possible to rule out that there may be other factors at play.
- Analysis of health-quality relevant parameters from a subset of the samples measured against government-authorized health claim indicators for polyphenols[1] and monounsaturated fatty acids demonstrated that notwithstanding any adverse impact from the challenging climate conditions (or possible implication of other adverse factors), the average value of established parameters tested indicate that the olive oils tested generally retained healthful properties.

[1] The commonly used term “polyphenols” is used herein to describe the micronutrient compounds more accurately described as phenolic compounds or biophenols.

Note: It is important to recognize that, while the sample of oils tested in this study was drawn using methodologically sound practices to be representative of all oils in US/Canada market, there are inherent limitations on the extrapolation of its findings to the total pool of oils in this market. Thus, given that it would be impossible to test every single oil in this market, conclusions drawn should be in the context of and in acknowledgement of the representativeness of this sample of oils.

I. Study Design.

This report summarizes the results of analyses conducted on behalf of the North American Olive Oil Association (NAOOA) on a total of 216 olive oil samples collected at retail outlets in the United States during the period of September through December 2024, including both proprietary "name" brands and private label "store" brands.[2]

The study was initiated by the NAOOA for two primary reasons, as described in its press release on December 11, 2024. First, following two prior years of drought and high temperatures in many olive-growing regions, concern was expressed in the media that higher prices could lead to an increased risk of adulteration. The primary objective of the testing study therefore was to determine whether there was indeed an elevated risk of olive oil fraud in the U.S. market.

Second, challenging harvest conditions can also negatively impact quality. For this reason, the NAOOA also sought to determine the extent to which the quality of olive oils sold in the U.S. market may have been impacted by the drought and high temperatures.

[2] As part of the testing program, the NAOOA also had 37 samples collected and analyzed from "cash-and-carry" wholesaler outlets primarily servicing the foodservice industry (excluding club stores like Costco, BJ's and Sam's Club). Upon review of the data, it became apparent that a disproportionate number of the samples had been collected from a single wholesaler and therefore did not provide an adequate basis for assessing quality and purity in that channel of trade. The NAOOA has been provided with the test results from the testing of those samples for further consideration.

A. Sampling Methodology

In keeping with best practices for a study of this sort, the sampling protocol designed by this report's author required that sample selection and collection, blinding (decanting into lab glass and assigning a numeric code) and laboratory analysis be executed by independent third parties. In addition, test result data were to be kept anonymous except in cases that adulteration was suspected and confirmed by legal review.

The protocol for sampling the retail products was also designed to be reasonably representative of the market. The 179 proprietary brand samples and 37 private label brand samples were divided between extra virgin (EVOO) and refined olive oil (OO) at a ratio of 75%/25% for proprietary brands and 65%/35% for private label brands, which are consistent with the ratios in current syndicated sales data.[3] Similarly, samples were collected across defined sales geographic regions proportionate to market share from the same syndicated data source.[4] See Table 1.

For the proprietary brands, we took a representative sample of the brands comprising the top 85% of retail market share, comprising the 15 top-selling brands: approximately 85% of the samples of the EVOO and OO categories among this group of brands were randomly sampled in proportion to their market share. The proprietary brands with market share between 0.15% and 1%, comprising approximately 15% of the samples, were also randomly selected, but due to the relatively small number of samples, the selection was random and not based on actual market shares of the selected brands. Among the private label brands, the samples were randomly chosen among the highest selling retailers in each geographic region. The characteristics of the retail samples collected are detailed in Table 2.

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[3] All market share data used for this study was from A.C. Nielsen for the 52-week period ending 8/23/2023, collected from a sample of 67,000+ A.C. Nielsen-cooperating stores across the grocery, mass merchant, club, drug, dollar, and military channels in the United States (i.e., Total US xAOC).

[4] According to the data, the estimated olive oil market share of retail private label sales (versus proprietary brands) is close to 40% for EVOO and OO. However, since it is estimated the private label share is represented by fewer than 10 supplier entities, to avoid oversampling from this group, the decision was made to limit sampling from this sector to 10-20% of total retail samples collected.

B. Testing and Analysis.

All retail samples were analyzed to determine the extent to which they met applicable chemical and sensory quality standards established by the International Olive Council (IOC), using labs and sensory panels recognized by the IOC.

The study followed a testing protocol for physico-chemical analyses based on the one established by the IOC for use in its program for the monitoring of quality and authenticity on foreign markets, of which the NAOOA is a member. This protocol includes two separate batteries of tests. (A copy of the IOC protocol for testing extra virgin olive oil and refined olive oils products is attached as Exhibit A.) For this study, however, the NAOOA made modifications to the IOC testing protocols with respect to EVOO samples:

- In the first battery, NAOOA specified that EVOO samples be analyzed by a single taste panel and included an analysis of two quality parameters that are not currently part of the IOC standard, namely, 1,2 diacylglycerols (DAGs) (%) and pyropheophytin (PPP) (%).[5]
- In the second battery, NAOOA requested the addition of polyphenol content analysis; polyphenols are listed as quality parameters without limits in the IOC standard, but such analysis is not included in the IOC quality monitoring testing protocol.

The modified IOC protocol used by the testing laboratory in the study is attached as Appendix B. The lab that tested the samples was instructed that any sample that had a questionable result in the first battery using the modified IOC testing protocol and standard would be submitted for testing under the second battery.

[5] Both DAGs and PPP are included in the proposed Standard of Identity for Olive Oils and Olive-Pomace Oils pending before the U.S. Food and Drug Administration (FDA) of which NAOOA is a petitioner.

1. Purity Testing Results

For purposes of this study, the term "purity" refers to whether the product is adulterated, i.e., mixed with extraneous oils which could include seed or nut oils; in the case of extra virgin olive oil, refined olive oil is considered an extraneous oil.

The study results show that two (less than 1%) of the 216 samples of EVOO and OO purchased at retail and tested against the purity standards set by the IOC failed such tests indicating adulteration: one among the EVOO samples (n=158 samples) and one among the OO samples (n= 58 samples). As discussed further below, both products were proprietary brands (as opposed to private label) with market shares below 0.36%. Results of purity standards testing did not indicate adulteration among the 37 private label samples tested. See Table 3.

The findings of this study are consistent with past shelf studies of olive oil purity conducted in the U.S. A study by scientists from the Food and Drug Administration (FDA), whose peer-reviewed research was published in 2015 in the *Journal of American Oil Chemists' Society*, tested 88 extra virgin olive oil samples off the shelves of Washington, D.C.-area retail outlets and found no confirmed adulteration in any of the samples tested.[6] The FDA researchers concluded that the occurrence rate of adulteration for the market samples they analyzed was "low," i.e., at <5%.

The findings are also consistent with two reports published by the University of California at Davis Olive Center, which analyzed a total of 186 samples of extra virgin olive oil purchased in California markets over a two year period and found no evidence of adulteration.[7]

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[6] Similar to the results for one refined olive oil product sampled as part of this study as will be discussed below, three of the samples in the FDA study showed anomalies in purity parameters that are known to be exceeded in genuine oils grown in certain climates or regions. The researchers, however, pointed to one of the samples as "the most likely candidate for potential adulteration with commodity oil because this sample failed on multiple parameters of purity."

[7] Although frequently mischaracterized as having found widespread adulteration, the UC Davis reports found issues with quality but found no adulteration. See, Frankel, E.N., Mailer, R.J, Shoemaker, C.F., Wang, S.C., & Flynn, J.D. (2010), Tests Indicate that Imported "Extra Virgin" Oil Often Fails International and USDA

a.) Retail extra virgin olive oils

According to the lab results, among the 158 EVOOs sampled at retail, one product was found to be adulterated. See Table 3A.

Sample ID 272 failed five purity parameters: brassicasterol, campesterol, betasitostenal, delta-7 Stigmastenol and stigmastadienes. It was collected among the proprietary brands with a relatively small market share (i.e., those between 0.15% and 1%), and the market share for this brand was 0.15%.

Additional purchase data indicate that the price paid for this product was $0.30/oz, which is the lowest price of any retail product (EVOO or OO, proprietary brand or private label) sampled in this study. The range of retail prices paid for the EVOO samples for this study was between $0.30/oz and $2.08/oz, and the average EVOO price was $0.61/oz.

Sample 272 had a best-before date of 12/2026.

b.) Retail refined olive oils

Among the 58 OOs sampled at retail, one product was found to be adulterated.[8] See Table 3B.

Sample ID 276 failed two purity parameters: erythrodiol plus uvaol, and waxes. It was collected among proprietary brands with market shares (i.e., those between 0.15% and 1%), and the market share for this brand was 0.36%.

Additional purchase data indicate that the price paid for the product was $0.50/oz. The range of retail prices paid for the OO samples for this study was between $0.30/oz and $0.83/oz. and the average price was $0.51/oz.

Sample 276 had a best-before date of 11/30/2025.

Standards; and Frankel, E.N., Mailer, R.J, Shoemaker, C.F., Guinard, J.-X.; Flynn, J.D., Sturzenbeger, N.D. (2011), Evaluation of Extra-Virgin Olive Oil Sold in California.

[8] One additional OO product (Sample ID 250) failed the IOC limit for delta-7 stigmastenol content that can exceed applicable limits in genuine oils from certain climates and regions including nontraditional growing areas. The IOC provides a decision tree to address this, and in this case, the sample passed the decision tree: app. β-sitosterol/campesterol≥28, ΔECN42≤ $\left|0.15\right|$

2. Quality Testing Results.

For purposes of this study, the use of the term "quality" is distinct from the purity parameters. While the latter term is concerned with whether the oil appears adulterated with extraneous oils, "quality" concerns whether the product in question meets expected standards. "Grade quality" assessments include whether a product labeled as EVOO meets the physico-chemical and sensory criteria established by the IOC standard for the specified grade.

In addition, however, because health is a primary reason why many consumers purchase and consume olive oils, the quality analysis in this study included an assessment of the extent to which a subset of samples labeled as EVOO or OO met thresholds for authorized health claims established by the U.S. Food and Drug Administration and/or the European Food Safety Agency (EFSA) for monounsaturated fat and polyphenol content as a "health quality" assessment.

a.) Grade Quality

Data from the study revealed issues with the grade quality. This could be related to the challenging harvest conditions but given study limitations, it is not possible to rule out that any questionable results were caused at least partly by other factors—including both causes before the oil was placed on the shelf and those occurring after the oil was purchased for sampling.

First, unlike purity parameters, exposure to ambient conditions (i.e., heat, light and oxygen) can negatively impact quality, and the study could not control for such factors after purchase and during handling and shipping, nor for the potential exposure to oxygen after the bottles were opened and decanted for blinding purposes.[9]

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[9] The IOC guide on the handling of samples provides:

> *Samples must be properly stored before being sent to laboratories for analysis. They must be kept under the appropriate light, temperature and contamination conditions so that they do not deteriorate. These conditions should be traceable at all times and agreed upon beforehand with the*

Similarly, the age of an oil negatively impacts grade quality characteristics. As a natural product, an olive oil's technical grade quality parameters decline over time. The IOC recommends that companies indicate the shelf life of an olive oil as no more than 24 months from bottling; typically, manufacturers use 18 to 24 months. Due to complications in the sampling, shipping and testing, much more time passed than had been anticipated between purchase and testing which could also have negatively impacted the grade quality.[10]

Third, sensory characteristics (i.e., the absence of flavor defects and the presence of fruitiness attributes) are among the qualities of EVOO that are affected by time and exposure to ambient conditions. Because the study sought to gather information about whether the quality of the oil being sold in the market might have suffered due to the challenging harvests—and not for enforcement purposes—the protocol specified that only a single panel test would assess each EVOO labeled sample. According to the IOC's universally accepted methodology for sensory assessment, negative assessments are not valid until an opportunity is provided for reassessments by different test panels, therefore the results of a single panel are not conclusive.[11]

> *operators involved. Storage conditions and their traceability should be included in the final documentation of the verification process. Any other conditions and deadlines required by the standards at this stage of the process should also be recorded.*

The IOC guide also recommends that the samples should be kept under the conditions defined by an additional IOC guidance document that recommends including "thermal probes inside the secondary packaging to verify the temperature range of the oils during the transportation."

[10] The EVOO samples purchased for the study had an average remaining shelf life of 15.26 months when they were purchased. After purchasing, they were packed and shipped to Chicago from locations around the country, where they were kept and aggregated for shipment to a lab services company in Spain. Although the sampling plan called for sending a single shipment, delays in the collection of samples made that impractical, so two shipments were sent to the lab services company. Unfortunately, the delays in shipping meant that the samples arrived at the lab services company in Spain over the Christmas and New Year's holiday period, which also delayed the work in preparing blinded samples and shipping them out to the labs and panels. As a result of all these delays, from the time the oils were purchased at retail to the date of their last test, an average of 4.3 months passed, which was 28% of the average remaining shelf life of the oils. See Table 2.

[11] In recognition that human sensory assessments are inherently subjective, the IOC's scientific method for organoleptic assessment of virgin oils requires that analysis be conducted by a panel with at least 8 expert

For the foregoing reasons, it is not possible to assess from the generated data the extent to which drought or high temperatures during the prior two harvests may have negatively impacted quality. Nor is it possible to establish that the failure of a product to meet an IOC EVOO quality parameter at the time of testing means that the oil would have also failed said parameter at the time of purchase, given the potential negative impact of time or exposure to ambient conditions during handling prior to testing.

To avoid potential for mischaracterization and misinterpretation of the study's grade quality results, a table with grade data for the EVOOs tested was not included in this report ; such data is being provided to the NAOOA under separate cover for further evaluation and analysis, as deemed appropriate. This data includes findings, for instance, that eight (5%)[12] of the EVOO labeled samples tested failed to conform to more than one IOC physico-chemical parameter (provided at least one was not within the margin of error , as determined by the laboratory during their standard testing processes, for the parameter assessed; see Appendix C), and another 10 samples (6%) failed one physico-chemical parameter and had a median sensory defect at a level for which there should be a high degree of accuracy (i.e., >3.5 on a scale of 1-10).

b.) Health Quality.

Potential health benefits are a primary driver of olive oil consumption. Therefore, the study assessed two key health quality attributes—the content of both monounsaturated fatty acids ("MUFA") and polyphenols—against

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tasters, led by a qualified leader trained in the scientific method. In fact, while it is generally accepted that consumers cannot perceive and identify taste defects at or below the 2.5 level of defect quantification, the IOC standard allows a defect level in the class of virgin oils for which there may be a perceptible defect to 3.5 to allow for uncertainty. The IOC method further clearly provides that a deviation found by a single panel is not conclusive: "Should the panel not confirm the declared category as regards the organoleptic characteristics, the interested party may request the national authorities or their representatives to have carried out without any delay two independent counter-assessments by two other panels recognised by the IOC or approved by the competent authorities at national level. The characteristics concerned shall be deemed consistent with the characteristics declared if both counter- assessments confirm the declared category."

[12] Of the 158 EVOO samples collected from retail, physico-quality data on four of them was not provided due to lab error.

levels required by governmental authorized health claims for each nutrient.[13] See Table 4.

As discussed below, the findings revealed on average the oils in the subset qualified for qualified health claims issued by both the U.S. Food and Drug Administration ("FDA") and the European Food Safety Authority ("EFSA").

i. MUFA content.

In 2004, the FDA established a qualified health claim for MUFA content in olive oils for the reference amount of 2 tablespoons:

> Limited and not conclusive scientific evidence suggests that eating about 2 tablespoons (23 grams) of olive oil daily may reduce the risk of coronary heart disease due to the monounsaturated fat in olive oil. To achieve this possible benefit, olive oil is to replace a similar amount of saturated fat and not increase the total number of calories you eat in a day. One serving of this product contains [x] grams of olive oil."[14]

FDA concluded that the qualified health claim could be made on olive oils containing at least 17.5 g of MUFA content in two tablespoons.

Study findings: the average MUFA content per two tablespoons of the tested oils was 18.7 grams,[15] exceeding the threshold for the FDA qualified health claim for MUFA content.[16]

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[13] Due to budgetary constraints, the study assessed health quality only on a subset of EVOO labeled samples. Because MUFA (i.e., oleic acid) was in the second battery of the testing protocol, polyphenol assessment was also added to that battery. It is worth noting, however, that polyphenol content is a quality criterion that can also be impacted by age and ambient conditions during storage and handling after production. Since the oils tested in the second battery included those that exhibited questionable grade quality characteristics in the first battery, it is possible that the polyphenol content may have also been negatively impacted by the same conditions that resulted in those questionable grade quality findings.

[14] Monounsaturated Fatty Acids from Olive Oil and Coronary Heart Disease

[15] According to the study's results, the average MUFA content measured by oleic acid content in the subset was 68.6%, which converts to 18.7 g in the referenced two tablespoon amount (i.e., 13.6 grams of fat x .686 x 2).

[16] 13.5% of the oils tested fell below the health claim threshold with the lowest having 52.9 % oleic acid content. That an oil did not have sufficient MUFA content to quality for the health claim does not, however, mean that it is unhealthy.

ii. Polyphenol content.

The FDA does not have a qualified health claim for polyphenols. However, EFSA authorizes a qualified health claim for the protection against oxidation of blood lipids for olive oils that contain 5 mg of polyphenols in 20 grams, which converts to a concentration of 250 mg/Kg.

Study findings: the average polyphenol content in the tested oils using the IOC official method was 273.6 mg/Kg which exceeds the threshold for the EFSA qualified health claim for polyphenol content.[17]

Note: The 18 samples referenced above that had failed more than one IOC parameter were in the subset of oils that were tested for health properties. All 18 exceeded the polyphenol health claim threshold (250mg/Kg), averaging 283 mg/Kg, and had, on average 67.9% MUFA content that also exceeds the monounsaturated health claim MUFA percentage.

[17] The laboratory used the IOC method for assessing total polyphenol content. Were FDA to adopt the rationale behind the EFSA claim but use the same reference amount used by FDA for the MUFA health claim (i.e., 2 tablespoons instead of 20 grams), the concentration of polyphenols required by EFSA in 20 g. would convert to 184 mg/Kg (with one tablespoon of olive oil being the equivalent of 13.6 grams). Indeed, only 6% of the oils tested fell below 184 mg/Kg, with the lowest having 156 mg/Kg.

SUMMARY AND CONCLUSION

The NAOOA study was undertaken to assess whether the higher prices resulting from two successive poor (in quantity or yield) olive harvests, primarily due to high heat and drought, (a) increased the risk of olive oil adulteration, a speculation being reported in the media, and/or (b) impacted the quality of the oil being sold from those harvests.

Based on this study's results purity parameter data in two, (one EVOO and one OO) of the 216 (less than 1%) total retail oil samples tested, including both proprietary name brands and private label retail store brands indicated adulteration. Accordingly, the study results do not support reports that appeared in the media suggesting that higher olive oil prices would lead to widespread adulteration.

Both oils with purity parameter data indicating adulteration:

- were proprietary brands (not private labels store brands);
- had market shares of 0.15% for the EVOO and 0.36% for the OO; and
- were sold at prices which for the EVOO labeled product was more than 50% below the average price of all EVOO purchased for the study, and for the OO labeled product, was just below the average price of all OO samples.

The level of adulteration found by analyzing oil samples in this NAOOA study is consistent with other off-the-shelf U.S. studies over the past 15 years, i.e., the study by the FDA (2015) and reports issued by the UC Davis Olive Center (2010-11).

As to the second inquiry, i.e., whether the drought and high temperatures over the past two harvests negatively impacted grade quality, it is not possible to reach a conclusion because the study did not control for the time that it took for some steps of the process, nor was there information on the ambient conditions to which the samples may have been exposed between purchase and testing, which was exacerbated by unanticipated delays.

The subset of samples tested for health quality, however, demonstrated that despite the presence of conditions or circumstances that may have impacted the grade quality, the average monounsaturated and polyphenol content exceeded the requisite thresholds for making the qualified health claims established by FDA for MUFA content and EFSA for polyphenol content.

The full set of quality data tables are being provided to the NAOOA for further analysis of the quality assessments. Data in these tables cover parameters such as best-before dates, packaging type, country of origin, shelf location, temperature at the shelf, etc., to assess how the industry could consider measures to better control any factors affecting grade quality results.

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TABLE 1. TESTING PROGRAM OVERVIEW

Brackets	No. of Samples
Bracket 1 Proprietary Retail Brands 1A: name brand, mkt sh. =>1.0% 1B: name brand, mkt sh. btw 0.15% & 1.0% Total:	179 total (EVOO and OO) EVOO 112, OO 41 EVOO 21, OO 5 EVOO 133, OO 46
Bracket 2: private label retail brands	37 total (EVOO and OO) EVOO 25, OO 12
Brackets 1 and 2 (i.e., total retail samples)	EVOO 158, OO 58 TOTAL: 216

TABLE 2. Retail Olive Oil Sample Characteristics

A. Overall Description of EVOO and OO Samples (N=216)

Characteristics	Total (n,%)
Bracket 1A: name brand, mkt sh. =>1.0% 1B: name brand, mkt sh. btw 0.15% & 1.0% 2 : private label	 153 (70.83) 26 (12.04) 37 (17.13)
Container Type Tin Glass Plastic Bag Other	 9 (4.17) 61 (28.24) 146 (67.59) 0 (0.00) 0 (0.00)
Oil Grade on Purchased Bottle Extra Virgin Olive Oil (EVOO) Olive Oil (OO) Olive-Pomace Oil (OPO)	 158 (73.15) 58 (26.85) 0 (0.00)
Price per ounce (in US dollars) *(range, mean)*	Min = 0.30 Max = 2.08 Range = 1.78 Mean = 0.58
Region Sample Purchased South (SA, EW/S) Northeast (NE/MA and Pointe-Claire) West (P/M and Vancouver) Midwest (EW/N and Toronto)	 69 (31.94) 51 (24.07) 53 (24.54) 42 (19.44)
Time left on Best By Date (BBD-Date Purchased) *(range and mean number of days/weeks/months)*	Days: Max = 1043.00 Min = 82.00 Range = 961.00 Mean = 483.94 Weeks: Max = 149.00

	Min = 11.71 Range = 137.28 Mean = 69.13 Months: Max = 34.26 Min = 2.69 Range = 31.57 Mean = 15.90
Time between purchase and last test date *(range, mean)*	Days: Max = 176.00 Min = 63.00 Range = 113.00 Mean = 122.99 Weeks: Max = 25.14 Min = 9.00 Range = 16.14 Mean = 17.57 Months: Max = 5.78 Min = 2.07 Range = 3.71 Mean = 4.04

B. Overall Description of EVOO Samples (N=158)

Characteristics	Total (%)
Bracket	
1A: name brand, mkt sh. =>1.0%	70.89
1B: name brand, mkt sh. btw 0.15% & 1.0%	13.29
2 : private label	15.82
Container Type	
Tin	2.53
Glass	15.82
Plastic	63.29
Bag	0
Other	0

Price per ounce (in US dollars) *(range, mean)*	Max = 2.08 Min= 0.30 Range = 1.78 Mean = 0.61
Region Sample Purchased South (SA, EW/S) Northeast (NE/MA and Pointe-Claire) West (P/M and Vancouver) Midwest (EW/N and Toronto)	 31.01 22.15 24.68 22.15
Time left on Best By Date (BBD-Date Purchased) *(range and mean number of days/weeks/months)*	Days: Max = 1043.00 Min = 113.00 Range = 930.00 Mean = 464.37 Weeks: Max = 149.00 Min = 16.14 Range = 132.86 Mean = 66.34 Months: Max = 34.26 Min = 3.71 Range = 30.55 Mean = 15.26
Time between purchase and last test date *(range, mean)*	Days: Max = 176.00 Min = 63.00 Range = 113.00 Mean = 130.59 Weeks: Max = 25.14 Min = 9.00 Range = 16.14 Mean = 18.66 Months:

	Max = 5.78 Min = 2.07 Range = 3.71 Mean = 4.29

C. Overall Description of OO Samples (N=58)

Characteristics	Total (%)
Group 1A: name brand, mkt sh. =>1.0% 1B: name brand, mkt sh. btw 0.15% & 1.0% 2: private label	 70.89 8.62 20.69
Container Type Tin Glass Plastic Bag Other	 8.62 12.07 79.31 0 0
Price per ounce (in US dollars) *(range and mean)*	Max = 0.83 Min= 0.30 Range = 0.53 Mean = 0.51
Region Sample Purchased South (SA, EW/S) Northeast (NE/MA and Pointe-Claire) West (P/M and Vancouver) Midwest (EW/N and Toronto)	 34.48 29.31 24.14 12.07
Time left on Best By Date (BBD-Date Purchased) *(range and mean number of days/weeks/months)*	Days: Max = 957.00 Min = 82.00 Range = 875.00 Mean = 536.59 Weeks: Max = 136.71 Min = 11.71 Range = 125.00

	Mean = 76.66 Months: Max = 31.44 Min = 2.69 Range = 28.75 Mean = 17.63
Time between purchase and last test date *(range, mean)*	Days: Max = 154.00 Min = 65.00 Range = 89.00 Mean = 102.53 Weeks: Max = 22.00 Min = 9.29 Range = 12.71 Mean = 14.65 Months: Max = 5.06 Min = 2.14 Range = 2.92 Mean = 3.37

TABLE 3: PURITY TESTING RESULTS

A. EVOO Purity Result

Parameter Tested	Total (%)
Cholesterol *(range, mean, std)*	0.25, 0.08 ± 0.03 Max = 0.30, Min = 0.05
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Brassicasterol *(range, mean, std)*	8.75, 0.11 ± 0.70 Max = 8.80, Min =0.05
Within IOC Standard (%)	99.37
Outside IOC Standard (%)	0.63
Campesterol *(range, mean, std)*	29.60, 3.60 ± 2.32 Max = 32.50, Min = 2.90
Within IOC Standard (%)	99.37
Outside IOC Standard (%)	0.63
Stigmasterol *(range, mean, std)*	0.60, 0.69 ± 0.12 Max = 1.00, Min = 0.40
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Beta Sitosterol *(range, mean, std)*	38.20, 94.49 ± 2.99 Max = 95.50, Min = 57.30
Within IOC Standard (%)	99.37
Outside IOC Standard (%)	0.63
Delta 7 Sigmastenol *(range, mean, std)*	0.30, 0.31 ± 0.07 Max = 0.50, Min = 0.20
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Total Sterols *(range, mean, std)*	4171.00, 1715.85 ± 384.39 Max = 5228.00, Min = 1057.00
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00

Erythrodiol + Uvaol *(range, mean, std)*	3.90, 2.44 ± 0.47 Max = 4.10, Min = 0.20
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Stigmata 3,5-diene *(range, mean, std)*	4.99, 3.98 ± 2.01 Max = 5.00, Min = 0.01
Within IOC Standard (%)	99.37
Outside IOC Standard (%)	0.63
Myristic Acid *(range, mean, std)*	0.01, 0.01 ± 0.00 Max = 0.02, Min = 0.01
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0 0.00
Palmitic Acid *(range, mean, std)*	6.96, 14.15 ± 1.53 Max = 17.68, Min = 10.72
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Palmitoleic Acid *(range, mean, std)*	1.70, 1.53 ± 0.37 Max = 2.46, Min = 0.76
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Margaric Acid *(range, mean, std)*	0.11, 0.08 ± 0.03 Max = 0.15, Min = 0.04
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Margaroleic Acid *(range, mean, std)*	0.19, 0.14 ± 0.04 Max = 0.25, Min = 0.06
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Estearic Acid *(range, mean, std)*	1.87, 2.75 ± 0.35 Max = 3.76, Min = 1.89
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Oleic Acid (*range, mean, std)*	20.71, 68.55 ± 4.03 Max = 78.72, Min = 58.01

Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Linoleic Acid *(range, mean, std)*	13.30, 11.15 ± 2.48 Max = 17.65, Min = 4.35
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Arachnic Acid *(range, mean, std)*	0.23, 0.44 ± 0.03 Max = 0.59, Min = 0.36
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Linolenic Acid *(range, mean, std)*	0.37, 0.74 ± 0.05 Max = 0.94, Min = 0.57
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Gadoleic Acid *(range, mean, std)*	0.15, 0.25 ± 0.03 Max = 0.34, Min = 0.19
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Behenic Acid *(range, mean, std)*	0.06, 0.12 ± 0.01 Max = 0.15, Min = 0.09
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Lignoceric Acid *(range, mean, std)*	0.05, 0.06 ± 0.01 Max = 0.09, Min = 0.04
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Trans Oleic Isomers *(range, mean, std)*	0.01, 0.02 ± 0.02 Max = 0.02, Min = 0.01
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Trans Linoleic and Linolenic Isomers *(range, mean, std)*	0.03, 0.03 ± 0.01 Max = 0.04, Min = 0.01
Within IOC Standard (%)	100.00

Outside IOC Standard (%)	0.00
ECN42 (HPLC) and ECN42 *(range, mean, std)*	0.19, 0.06 ± 0.05 Max = 0.19, Min = 0.00
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Waxes C42+C44+C46 *(range, mean, std)*	105.00, 70.83 ± 20.62 Max = 140.00, Min = 35.00
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00

B. OO Purity Results

Parameter Tested	Total (%)
Cholesterol *(range, mean, std)*	0.35, 0.11 ± 0.06 Max = 0.40, Min = 0.05
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Brassicasterol *(range, mean, std)*	0.05, 0.05 ± 0.01 Max = 0.10, Min =0.05
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Campesterol *(range, mean, std)*	1.10, 3.32 ± 0.24 Max = 3.80, Min = 2.70
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Stigmasterol *(range, mean, std)*	1.50, 1.28 ± 0.33 Max = 2.10, Min = 0.60
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Beta Sitosterol *(range, mean, std)*	2.10, 94.21 ± 0.42 Max = 95.50, Min = 93.40
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Delta 7 Sigmastenol *(range, mean, std)*	0.40, 0.42 ± 0.06 Max = 0.70, Min = 0.30

Within IOC Standard (%) Outside IOC Standard (%)	98.28 1.72
Total Sterols *(range, mean, std)*	2984.00, 1661.14 ± 409.06 Max = 4241.00, Min = 1257.00
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Erythrodiol + Uvaol *(range, mean, std)*	19.80, 3.90 ± 2.44 Max = 21.80, Min = 2.00
Within IOC Standard (%) Outside IOC Standard (%)	98.28 1.72
Myristic Acid *(range, mean, std)*	0.00, 0.02 ± 0.00 Max = 0.02, Min = 0.01
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Palmitic Acid *(range, mean, std)*	1.36, 12.78 ± 0.96 Max = 13.46, Min = 12.10
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Palmitoleic Acid *(range, mean, std)*	0.15, 0.98 ± 0.11 Max = 1.05, Min = 0.90
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Margaric Acid *(range, mean, std)*	0.04, 0.12 ± 0.03 Max = 0.14, Min = 0.10
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Margaroleic Acid *(range, mean, std)*	0.04, 0.17 ± 0.03 Max = 0.19, Min = 0.15
Within IOC Standard (%) Outside IOC Standard (%)	100.00 0.00
Estearic Acid *(range, mean, std)*	0.62, 3.10 ± 0.44 Max = 3.41, Min = 2.79
Within IOC Standard (%)	100.00

Outside IOC Standard (%)	0.00
Oleic Acid (*range, mean, std)*	0.23, 69.99 ± 0.16 Max = 70.10, Min = 69.87
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Linoleic Acid *(range, mean, std)*	1.57, 11.13 ± 1.11 Max = 11.91, Min = 10.34
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Arachnic Acid *(range, mean, std)*	0.04, 0.51 ± 0.03 Max = 0.53, Min = 0.49
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Linolenic Acid *(range, mean, std)*	0.08, 0.69 ± 0.06 Max = 0.73, Min = 0.65
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Gadoleic Acid *(range, mean, std)*	0.02, 0.29 ± 0.01 Max = 0.30, Min = 0.28
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Behenic Acid *(range, mean, std)*	0.05, 0.16 ± 0.04 Max = 0.18, Min = 0.13
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Lignoceric Acid *(range, mean, std)*	0.01, 0.09 ± 0.01 Max = 0.09, Min = 0.08
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Trans Oleic Isomers *(range, mean, std)*	0.13, 0.11 ± 0.09 Max = 0.17, Min = 0.04
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00

Trans Linoleic and Linolenic Isomers *(range, mean, std)*	0.02, 0.12 ± 0.01 Max = 0.13, Min = 0.11
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
ECN42 (HPLC) and ECN42 *(range, mean, std)*	0.22, 0.18 ± 0.16 Max = 0.29, Min = 0.07
Within IOC Standard (%)	100.00
Outside IOC Standard (%)	0.00
Waxes C40+C42+C44+C46) *(range, mean, std)*	3676.00, 2146.00 ± 2599.32 Max = 3984.00, Min = 308.00
Within IOC Standard (%)	50.00
Outside IOC Standard (%)	50.00

TABLE 4: EVOO Health Quality

Laboratory Measured Parameters

Parameter Tested	Total
Total Polyphenols (Biophenols), mg/Kg *(range, mean, std)*	284.00, 273.56 ± 54.64 Max = 440.00, Min = 156.00
Oleic Acid, % (*range, mean, std)*	20.71, 68.55 ± 4.03 Max = 78.72, Min = 58.01

APPENDIX A

TESTING OF OLIVE OILS AND OLIVE-POMACE OILS

ANALYTICAL RESULTS SHEET

Sample code:

Grade: **EXTRA VIRGIN OLIVE OIL**

Name of laboratory:

Analysis supervisor:

Date:

Stigmastadienes content (ppm)

Sterol and triterpenic alcohol composition:

- individual sterols (%):
  - cholesterol
  - brassicasterol
  - 24-methylene-cholesterol
  - campesterol
  - campestanol
  - stigmasterol
  - delta-7-campesterol
  - delta-5-23-stigmastadienol
  - clerosterol
  - beta-sitosterol (true)
  - sitostanol
  - delta-5-avenasterol
  - delta-5-24 stigmastadienol
  - delta-7-stigmastenol
  - delta-7-avenasterol
  - apparent beta-sitosterol

- total sterols (mg/kg)

- erythrodiol+uvaol(% of total sterols)

Code:

When there is any doubt or a value is outside the limit for the content of at least one of the preceding analytical parameters, the additional analyses specified have to be carried out:

Fatty acid composition (on capillary column) (%):
- C14:0 myristic acid
- C16:0 palmitic acid
- C16:1 palmitoleic acid
- C17:0 heptadecanoic acid
- C17:1 heptadecenoic acid
- C18:0 stearic acid
- C18:1 oleic acid
- C18:2 linoleic acid
- C18:3 linolenic acid
- C20:0 arachidic acid
- C20:1 gadoleic acid
- C22:0 behenic acid
- C22:1 erucic acid
- C24:0 lignoceric acid
- C18:1 trans (%)
- C18:2 trans + C18:3 trans (%)

ECN 42 triglyceride content:
- real content (%):
  - LLL
  - OLLn
  - PLLn
  - total
- theoretical content
- difference between real and theoretical content

Wax content (mg/kg) :
C40 + C42 + C44 + C46

Free acidity

Peroxide value

Absorbency in ultra-violet
$(K^{1\%}_{1cm})$
- 270 nm (cyclohexane) / 268 nm (iso-octane)
- Δ K
- 232 nm*

Fatty acid ethyl esters (FAEEs)

ASSESSMENT OF OIL CONSISTENCY WITH ITS GRADE:

- oil consistent with grade:
- oil inconsistent with grade reasons and % of other oils:

Sample code:

Grade: **OLIVE OIL**

Wax content (mg/kg):
C40 + C42 + C44 + C46

Sterol composition:
- individual sterols (%):
    - cholesterol
    - brassicasterol
    - 24-methylene-cholesterol
    - campesterol
    - campestanol
    - stigmasterol
    - delta-7-campesterol
    - delta-5-23-stigmastadienol
    - clerosterol
    - beta-sitosterol (true)
    - sitostanol
    - delta-5-avenasterol
    - delta-5-24 stigmastadienol
    - delta-7-stigmastenol
    - delta-7-avenasterol
    - apparent beta-sitosterol

- total sterols (mg/kg)

- erythrodiol + uvaol (%)

Fatty acid composition (on capillary column) (%):
- C14:0 myristic acid
- C16:0 palmitic acid
- C16:1 palmitoleic acid
- C17:0 heptadecanoic acid
- C17:1 heptadecenoic acid
- C18:0 stearic acid
- C18:1 oleic acid
- C18:2 linoleic acid
- C18:3 linolenic acid
- C20:0 arachidic acid
- C20:1 gadoleic acid
- C22:0 behenic acid
- C22:1 erucic acid
- C24:0 lignoceric acid

- C18:1 trans (%)
- C18:2 trans + C18:3 trans (%)

ECN 42 triglyceride content:
real content (%):
LLL
OLLn
PLLn
total
theoretical content
difference between real and theoretical content

When there is any doubt or a value is outside the limit for the content of at least one of the preceding analytical parameters, the additional analyses specified have to be carried out:

Stigmastadienes ppm

ASSESSMENT OF OIL CONSISTENCY WITH ITS GRADE:

- oil consistent with grade:

- oil inconsistent with grade: reasons and % of other oils:

Sample code:

Grade: **OLIVE-POMACE OIL**

Name of laboratory:

Analysis supervisor:

Date:

Sterol composition (%)
- individual sterols (%):
    - cholesterol
    - brassicasterol
    - 24-metylen-cholesterol
    - campesterol
    - campestanol
    - stigmasterol
    - delta-7-campesterol
    - delta-5,23-stigmastadienol
    - clerosterol
    - beta-sitosterol (true)
    - sitostanol
    - delta-5-avenasterol
    - delta-5,24-stigmastadienol
    - delta-7-stigmastenol
    - delta-7-avenasterol
    - apparent beta-sitosterol

- total sterols (mg/kg)

Fatty acid composition (on capillary column) (%):

- C14:0 myristic acid
- C16:0 palmitic acid
- C16:1 palmitoleic acid
- C17:0 heptadecanoic acid
- C17:1 heptadecenoic acid
- C18:0 stearic acid
- C18:1 oleic acid
- C18:2 linoleic acid
- C18:3 linolenic acid
- C20:0 arachidic acid

C20:1 gadoleic acid
C22:0 behenic acid
C22:1 erucic acid
C24:0 lignoceric acid

C18:1 trans (%)
C18:2 trans + C18:3 trans (%)

ECN 42 triglyceride content:
real content (%):
LLL

OLLn
PLLn
total
theoretical content
difference between real and theoretical content

When there is any doubt or a value is outside the limit for the content of at least one of the preceding analytical parameters, the additional analyses specified have to be carried out:

Stigmastadienes ppm

ASSESSMENT OF OIL CONSISTENCY WITH GRADE:

- oil consistent with grade:

- oil inconsistent with grade: reasons and % of other oils:

Appendix B

International Olive Council Testing Protocol (Modified) Used for the NAOOA Study

Parameter		EVOO	OO	OPO
BATTERY 1: The below have been tested in ALL specimens				
COLEST	**Cholesterol** (Colesterol)	<=0.5	<=0.5	<=0.5
BRASI	**Brassicasterol** (Brasicasterol)	<=0.1	<=0.1	<=0.2
24MET	**24-Methylenecholesterol** (24-Metilencolesterol	n/a	n/a	n/a
CAMPE	**Campesterol** (Campesterol)	<=4.0	<=4.0	<=4.0
CAMPS	**Campestanol** (Campestanol)	n/a	n/a	n/a
ESTIG	**Stigmasterol** (Estigmasterol)	<Campesterol	<Campesterol	<Campesterol
DELA7	**Delta 7-Campesterol** (Delta7-Campesterol)	n/a	n/a	n/a
BETA	**Beta-sitosterol** (Beta-sitosterol (aparente))	>=93.0	>=93.0	>=93.0
DELTA7	**Delta 7 Sigmastenol** (Delta-7-Estigmastenol)	<=0.5	<=0.5	<=0.5
DELTA7A	**Delta 7-Avenasterol** (Delta-7-Avenasterol)	n/a	n/a	n/a
ESTOT	**Total Sterols** (Esteroles Totales)	>=1,000	>=1,000	>=1,600
EU	**Erythrodiol+Uvaol** (Eritrodiol+Uvaol)	<=4.5	<=4.5	> 4.5
STIG	**Stigmata 3,5-diene** (Estigmasta-3,5-dieno)	<=0.05	n/a	n/a
DAG	**1,2 Diacylglycerol** (1,2-Diacilglicerol)	n/a	n/a	n/a
PIROFEOFITINAS	**Pyropheophytin** (PPP) (Pirofeofitina A)	n/a	n/a	n/a
BATTERY 2: The below parameters where only tested in samples undergoing a REPEAT test				
ACDZ	**Free Fatty Acids (Acidity)** (Acidez)	<=0.80	<=1.00	<=1.00
IP	**Peroxide Index** (Indice de peroxidos)	<=20.00	<=20.00	<=15.00
K270	**K270** (K270)	<=0.22	<=1.15	<=1.70
K232	**K232** (K232)	<=2.50	n/a	n/a
DELTAK	**Delta-K** (Delta-k)	<=0.01	<=0.15	<=0.18
AGMIR-C14:0	**Myristic Acid** (Ac. Mirístico)	<=0.03	<=0.03	<=0.03
AGPAL-C16:0	**Palmitic Acid** (Ac. Palmítico)	7.00-20.00	7.00-20.00	7.00-20.00
AGPAL2-C16:1	**Palmitoleic Acid** (Ac. Palmitoleico)	0.30-3.50	0.30-3.50	0.30-3.50
AGMAR-C17:0	**Margaric Acid** (Ac. Margárico)	<=0.40	<=0.40	<=0.40
AGMAR2-C17:1	**Margaroleic Acid** (Ac. Margaroleico)	<=0.60	<=0.60	<=0.60
AGEST-C18:0	**Stearic Acid** (Ac. Esteárico)	0.50-5.00	0.50-5.00	0.50-5.00
AGOLEI-C18:1	**Oleic Acid** (Ac. Oleico)	55.00-85.00	55.00-85.00	55.00-85.00
AGLINO-C18:2	**Linoleic Acid** (Ac. Linoleico)	2.50-21.00	2.50-21.00	2.50-21.00
AGARA-C20:0	**Arachnic Acid** (Ac. Aráquico)	<=0.60	<=0.60	<=0.60
AGLIN2-C18:3	**Linoleic Acid** (Ac. Linolénico)	<=1.00	<=1.00	<=1.00
AGGAD-C20:1	**Gadoleic Acid** (Ac. Gadoleico)	<=0.50	<=0.50	<=0.50
AGBE-C22:0	**Behenic Acid** (Ac. Behénico)	<=0.20	<=0.20	<=0.30
AGLIGN-C24:0	**Lignoceric Acid** (Ac. Lignocérico)	<=0.20	<=0.20	<=0.20
TRANSOL	**Trans Oleic Isomers** (Isomeros Trans Oleicos)	<=0.05	<=0.20	<=0.40

TRANSLINS	**Trans Linoleic acid and Linoleic Isomers** (Isómeros Trans Linoleicos y Linolénicos)	<=0.05	<=0.30	<=0.35
LLL	**LLL** (LLL)	n/a	n/a	n/a
OLLn	**OLLn** (OLLn)	n/a	n/a	n/a
PLLn	**PLLn** (PLLn)	n/a	n/a	n/a
TOTAL REAL	**Real Content** (Real Content)	n/a	n/a	n/a
TEORICO	**Theoretical Content** (Theoretical Content)			
ECN42 Diferencia:	**ECN42 (HPLC) and ECN42** (ECN42 (HPLC) y ECN42 (teórico)	<=|0.20|	<=|0.30|	<=|0.50|
CERAS42-46	**Waxes** C42+C44+C46 (Ceras (C42+C44+C46))	<=150.00	n/a	n/a
FAEEs	**Ethyl Esters** (Ésteres Etílicos)	<=35.00	n/a	n/a
BIOFEN HPLC	**Total Polyphenols (Biophenols)** (Biofenoles totales)	n/a	n/a	n/a
CERAS40-46	**Waxes** C40+C42+C44+C46) Ceras (C40+C42+C44+C46)	n/a	<=350.00	>350.00

**Spanish variable names in brackets*

Appendix C

Laboratory-Provided Uncertainty Margins for Error

PARAMETRO	UNIDADES	RANGO	INCERTIDUMBRE U (%)
ÍNDICE DE PERÓXIDOS	mEq O2/Kg	10,0-20,0	16
K232	-	1,50-2,60	4,3
K270	-	0,10-0,30	11
	-	0,30-0,65	2,9
	-	0,65-1,40	2,9
		1,40-2,00	5,0
DELTAK	-	0,00-0,04	35
		0,04-0,12	35
	-	0,12-0,20	10
CERAS	mg/Kg	91-180	15
	mg/Kg	181-400	17
ESTIGMASTADIENOS	mg/Kg	0,02-0-50	25
	mg/Kg	0,51-4,0	27
COLESTEROL	%	0,1-0,30	62
	%	0,31-2,0	26
	%	2,1-4,0	10
	%	0,02-0,2	50
BRASICASTEROL	%	>0,2	26
24-METILENCOLESTEROL	%	0,05-0,4	23
CAMPESTEROL	%	2,0-15,0	4
CAMPESTANOL	%	0,04-0,2	51
ESTIGMASTEROL	%	1,0-10,0	4
DELTA-7-CAMPESTEROL	%	0,03-2,6	62
BETA-SITOSTEROL APARENTE	%	80,0-95,0	0,6
BETA-SITOSTEROL	%	50,0-90,0	1,2
DELTA-5-AVENASTEROL	%	3,6-8,6	8
DELTA-7-ESTIGMASTENOL		0,2-1,8	26
	%	1,9-20,0	10
DELTA-7-AVENASTEROL	%	0,1-9,0	36
ESTEROLES TOTALES	mg/Kg	900-3800	8
ERITRODIOL	mg/Kg	20-600	10,9
ERITRODIOL+UVAOL	%	2,0-16,5	6,5
Á.LÁURICO	%	0,01-0,15	23
Á.MIRÍSTICO	%	0,01-0,90	23
Á.PALMITICO	%	4,00-45,00	2
Á.PALMITOLEICO	%	0,10-0,30	13
	%	0,40-1,50	5
Á.MARGARICO	%	0,03-0,20	15
Á.MARGAROLEICO	%	0,02-0,25	12
Á.ESTEARICO	%	1,80-5,00	4
Á.OLEICO	%	25,00-83,00	1
Á.LINOLEICO	%	4,00-19,99	2
	%	20,00-63,00	1
Á.LINOLÉNICO	%	0,10-10,00	8
Á.ARAQUÍDICO	%	0,25-0,60	6
Á.GADOLEICO	%	0,12-1,50	13
Á.BEHÉNICO	%	0,07-1,00	10

Á.ERÚCICO	%	0,01-0,25	16
Á.LIGNOCÉRICO	%	0,05-0,25	20
ISOMEROS TRANSOLEICOS	%	0,01-0,25	26
ISOMEROS TRANSLINOLÉICOS+TRANSLINOLÉNICOS	%	0,01-0,60	35
DIFERENCIA ECN42 Real-Teórico	%	0,00-0,70	33
ÉSTERES ETÍLICOS	mg/Kg mg/Kg mg/Kg	4-29 30-100 101-400	26 14 10