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Standard Practice for Bulk Sampling, Handling, and Preparing Edible Vegetable Oils for Sensory Evaluation¹

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1. Scope

1.1 This practice covers the recommended procedures for bulk sampling, handling, and preparing edible vegetable oil (liquid at room temperature) prior to sensory evaluation.

1.2 This practice is consistent with the background information presented in ASTM STP 433;433, ASTM STP 434;434, and ASTM STP 758;758. These should be consulted for supplemental guidance.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Publications:*²

ASTM STP 433 Basic Principles of Sensory Evaluation

ASTM STP 434 Manual on Sensory Testing Methods

ASTM STP 758 Guidelines for the Selection and Training of Sensory Panel Members

2.2 *AOCS Standard:*³

Method C1-47 Sampling

3. Summary of Practice

3.1 This practice consists of the following basic steps: removing oil from bulk source, transporting and starting oil prior to evaluation, preparing oils for evaluation, presenting samples to panel, and cleaning glassware.

4. Significance and Use

4.1 This practice is designed for use by the oil processor or research laboratory for evaluation by a trained sensory panel, or for use by quality control (QC) and quality assurance (QA) personnel for sampling from a tank truck, car, or any other bulk transportation container, or by both.

4.2 The consistent use of this practice will provide representative samples for all sensory, chemical and physical analyses and will protect the oil from oxidation.

4.3 The objective of this practice is to ensure that the sample is representative of the sample source from the time of sampling until the time of evaluation and to protect oil quality during that time.

4.4 This practice addresses neither evaluation and scaling techniques, nor the sampling, handling, and preparing of solid fats.

¹ This practice is under the jurisdiction of ASTM Committee E-48E18 on Sensory Evaluation of Materials and Products, and is the direct responsibility of Subcommittee E18.06 on Food, Beverage, and Tobacco Evaluation.

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² Basic Principles of Sensory Evaluation, ASTM STP 433, ASTM, 1968.

² Available from ASTM International Headquarters, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.

³ Manual on Sensory Testing Methods, ASTM STP 434, ASTM, 1968.

³ Available from American Oil Chemists' Society, P.O. Box 3989, Champaign, IL 61826.

5. Apparatus

- 5.1 *Liquid Zone Sampler*,³ or core sampler, or trier.^{4,5}
- 5.2 *Wide-Mouth Jars*, made of polyethylene terephthalate, 0.5 to 1.0 L.
- 5.3 *Amber Glass Bottles*, 250 mL to 1 L, with narrow-mouth tops that will withstand freezer temperatures.
- 5.4 *Plastic Caps with Liners*, or tape (PTFE pipe thread tape), to cover top of bottle opening before capping with new non-metallic screw type caps. Tape should be 2.5 cm in width or wider to completely cover bottle openings.
- 5.5 *Glass Funnels*.
- 5.6 *Glove Box* with inert gas nitrogen atmosphere, including an oxygen scavenging device.
- 5.7 *Glass Vial*, 50 mL. Use amber glass for flavor evaluation and clear glass for visual examination of oil.
- 5.8 *Standard Disposable Glass Pipets*, 10 mL, one per each sample.
- 5.9 *Circulating Waterbath*, with automatic timer, thermostat and rack.
- 5.10 *Waterbath Thermometer*, with range from 20 to 100°C in 1°C divisions, calibrated for 76 mm immersion, 305 mm long.

6. Precautions

- 6.1 Oil submitted for chemical and physical testing and for sensory evaluation should be from the same bulk sampling. Tank trucks, cars, or any other bulk transportation containers may be filled with as many as seven layers and each level of oil may be slightly different in quality. Oil samples should be handled in the same manner and time frame to ensure high data correlation.
- 6.2 Do not expose oil to any environmental condition (for example, light, heat, oxygen, moisture) or any equipment (metals) that will cause oxidation of the oil and alter sensory characteristics of the oil.
- 6.3 Use only new, clean, dry, and odor-free polyethylene terephthalate wide-mouth jars to collect oil samples; dispose of jars rather than cleaning them.
- 6.4 Flush bottles with nitrogen in a glove box prior to filling the bottle.
- 6.5 Obtain a representative oil sample for all evaluations (sensory, chemical, instrumental); unblended multiple samples may produce different results.
- 6.6 Do not allow glass containers in processing or production areas where oil sampling is done. Use new plastic containers such as polyethylene terephthalate bottles for initial sampling. Flush empty bottle with nitrogen as described in 6.4.
- 6.7 Transfer oil from plastic bottle to recommended glass bottles within one hour of collection and flush headspace with nitrogen to minimize potential transfer of odors or flavors from the plastic container to the oil (conduct procedure in glove box under nitrogen atmosphere).
- 6.8 Use PFTE-lined caps or PFTE tape under caps to protect oil from off-odors or flavors imparted from metallic or unlined plastic caps.
- 6.9 Store oil in amber glass bottles to protect the oil from light oxidation.
- 6.10 Choose size of storage bottle based on purpose of evaluation, amount of oil required for each testing session or for number of panelists, and amount of oil needed for instrumental or chemical tests. For example, a 1 L sample of oil that requires evaluation quarterly should be stored in four 250-mL bottles.
- 6.11 Discard any unused oil.

7. Procedures for Handling Samples Obtained from Bulk Storage

- 7.1 Refer to the AOCS Official Method C1-47 on oil sampling for specifications for detailed information on equipment and procedures.
- 7.2 Flush bottle with nitrogen and fill bottle with oil, allowing a small amount of headspace. Flush headspace with nitrogen to remove oxygen, and cap bottle (conduct procedure in glove box under nitrogen atmosphere).
- 7.3 *Headspace Considerations:*
 - 7.3.1 Keep an inert gas such as nitrogen in contact with the oil at all times to avoid exposure of the oil to oxygen.
 - 7.3.2 Leave 0.5 to 1 cm of headspace between the oil and the cap liner.
 - 7.3.3 Fill headspace with inert gas (nitrogen) to remove all oxygen which deteriorates the oil. Flush only the headspace with nitrogen since bubbling nitrogen through oil for short periods of time has little benefit.
 - 7.3.4 Analyze headspace for oxygen to ensure that bottles are being flushed correctly as follows: (1) Flush headspace of bottle with nitrogen, seal with silicon rubber septum in screw type cap, (2) withdraw a gas sample with a syringe through the septum, and (3) inject sample into gas chromatograph with thermal-conductivity detector using a two column system. Column conditions are: ethylvinyl benzene-divinylbenzene polymer 80 to 100 mesh (3 ft by 1/8 in.) and molecular sieve 5A 80 to 100 mesh (9 ft by 1/16 in.) with 25°C oven temperature and 20 mL/min helium flow rate.⁶

³ Guidelines for the Selection and Training of Sensory Panel Members, ASTM STP 758, ASTM.

⁴ Available from Zone Devices, Inc., San Rafael, CA.

⁵ Available from American Oil Chemists' Society, P.O. Box 3989, Champaign, IL 61826.

⁶ Available from Refinery Supply Co., Tulsa, OK.

⁷ Available from Zone Devices, Inc., San Rafael, CA.