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Official methods and recommended practices of the aocs pdf

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The AOCS's Official Methods and Recommended Practices, 7th edition, was released in March 2017, introducing five new analytical methods to the existing 450. These new methods include three Official Methods, one Recommended Practice, and one Standard Procedure. The additions address critical analytical needs for the fats and oils community. In 2016, significant events like Brexit, Trump's election, and corporate mergers occurred alongside AOCS approving five new methods. Although seemingly less impactful globally, these new AOCS methods fill essential gaps in edible oil and oilseed analysis. Since the 1920s, AOCS has validated analytical methods for fats, oils, lipids, and related products. To become official, proposed methods follow a well-established process. Proposers submit their ideas, which are then presented at an AOCS Annual Meeting or Industry Showcase. The audience provides feedback, and the proposal is reviewed by an expert panel or subcommittee. If deemed sufficient, a collaborative study ensues, involving at least eight laboratories from various countries to validate the method. Samples are prepared and delivered to participating labs, with results analyzed statistically. #### In the field of analytical testing, two key concepts come into play: repeatability and reproducibility. Repeatability refers to a lab's ability to produce consistent results within a short period of time. On the other hand, reproducibility measures how well multiple labs can reproduce the same results when performing the same method. According to Cantrill, repeatability is important for evaluating a lab's internal performance, while reproducibility assesses how well a method performs across different labs. The relative standard deviation (RSD) is used to express the standard deviation as a percentage of the mean value. For repeatability and reproducibility, the desired RSD is typically 1-2%, but this can increase significantly when working near the limit of detection. The data and statistical analysis are then reviewed by the Uniform Methods Committee, which may reject or approve the method based on its performance. Once a method is approved, it is given an official name according to AOCS conventions and included in their list of Official Methods and Recommended Practices. There are three types of AOCS methods: Official Methods, Recommended Practices, and Standard Procedures. The naming convention for AOCS methods involves using capital letters that refer to the specific section of the Official Methods book where the method can be found. Designates a group of related methodologies within a section, such as "Ab" methods that analyze peanuts as vegetable oil source materials. The first number refers to the method's position within its group, like Ab 1, Ab 2, and so on. The second number indicates the year the method was initially published. For instance, Ac 6-16 was released in 2016, while Aa 1-38 debuted in 1938. To access the Official Methods and Recommended Practices of the AOCS, 7th Edition, or purchase individual methods, visit the Methods section on the AOCS website (. Official Method Ac 6-16 is titled "Extraction and indirect enzyme-linked-lectin-assay (ELLA) analysis of soybean agglutinin in soybean grain". Soybean agglutinin (SBA), a carbohydrate-binding protein or lectin, decreases the growth rate of animals consuming raw soybean seeds. It's considered an anti-nutrient and is measured in all soybean biotech products as part of their safety assessment for regulatory approvals, says Elisa Leyva-Guerrero, a plant biochemist at Monsanto. Heat from cooking or processing destroys most SBA in raw soybeans. Since the 1950s, scientists have quantified SBA using hemagglutination techniques that require rabbit red blood cells. However, this method is costly, time-consuming, and has arbitrary units. The new method Ac 6-16 uses an enzyme-linked lectin assay (ELLA) to quantify SBA. The technique is similar to the well-known ELISA but uses carbohydrates to capture and detect SBA rather than antibodies. Specifically, N-acetylgalactosamine (GalNAc) is linked to polyacrylamide (PAA) to immobilize the carbohydrate within microtiter plate wells. Soybean extract binds to the immobilized GalNAc-PAA-Biotin, forming a "sandwich". To detect the immobilized GalNAc-PAA-Biotin and associated SBA, researchers add neutravidin-HRP. Upon addition of TMB, a chromogenic substrate for HRP, a yellow pigment is produced that absorbs light at 450 nm. The microtiter plate can then be read to measure absorbance at 450 nm and calculate the mg of SBA per g of soybean tissue by comparing it to a standard curve. With a 2-hour incubation procedure, ELLA exhibits sensitivity in the µg/mL range. The new method provides a linear response to purified SBA over a range of one order of magnitude. Another advantage is that all required reagents, including GalNAc-PAA and GalNAc-PAA-Biotin, are commercially available. Leyva-Guerrero et al. used the validated ELLA method to quantify SBA in nine commercial soybean varieties introduced between 1972 and 2008. The study revealed that the concentration of SBA ranged from 2.03 to 2.92 mg/g and varied with soybean genotype and environment. The ELLA method can measure SBA with increased accuracy, non-arbitrary units (mg lectin/g seed), and decreased cost and time in comparison to the hemagglutination method. Official Method Ac 6-16 was developed and validated with the support of the Analytical Excellence through Industry Collaboration (AEIC) Composition Working Group. Official Method Cd 30-15: Analysis of 2- and 3-MCPD fatty acid esters and glycidyl esters in oil-based emulsions Monochloropropane-1,2-diol (MCPD) esters and glycidyl esters are process contaminants formed during the high-temperature deodorization step of edible oil refining. These contaminants have been linked to cancer, infertility, and other health problems in animal studies. Official Method Cd 30-15 joins three other AOCS Official Methods for the simultaneous analysis of 2- and 3-MCPD esters and glycidyl esters. The method involves an extraction procedure for isolating 2- and 3-MCPD and glycidyl esters from oil-based emulsions, followed by analysis using one of the previously published methods. cleavage of esters from 2- and 3-MCPD and measurement of the free MCPD using gas chromatography/mass spectrometry (GC/MS). Two methods involve converting glycidyl esters to 3-monobromopropanediol (3-MBPD) prior to GC/MS analysis, while a third method converts 2- and 3-MCPD and glycidyl esters directly to 3-MCPD. The extraction procedure shows good recovery of 2- and 3-MCPD and glycidyl esters with high sensitivity and satisfactory repeatability and reproducibility. Phytosterols, cholesterol-like molecules in plants, have been shown to reduce serum total and low-density lipoprotein (LDL) cholesterol levels. They are added to many foods and dietary supplements, such as margarines, salad dressings, snack bars, and supplements. The US Food and Drug Administration (FDA) allows health claims on the relationship between phytosterols and a reduced risk of coronary heart disease, provided that products contain specified amounts of five major phytosterols. Official Method Ce 12-16 arose from a collaboration between Cargill and the FDA, aiming to test whether foods and supplements contain the correct amounts of sterols and stanols as claimed on the label. This method can determine total free sterols/stanols and total steryl/stanol esters, as well as quantify each of the five major phytosterols. Ce 12-16 provides three protocols for extracting phytosterols from different matrices, derivatizing them to trimethylsilyl (TMS) ethers for GC separation and detection. A method has been developed to analyze the total phytosterol content in various food products, including spreads, beverages, baked goods, and dietary chews. The method utilizes eicoprostanol as an internal standard and allows researchers to accurately determine the phytosterol content in these products. The study found that 25 analyzed samples had a total phytosterol content ranging from 0.2 to 55.2 g/100 g, which is between 83% and 137% of the amounts declared on labels. The limit of detection (LOD) for an individual phytosterol was 0.3 mg/100 g, while the limit of quantitation (LOQ) was 1 mg/100 g. A Recommended Practice has been established to determine the fatty acid profiles in cottonseed and cottonseed oil using gas chromatography. This practice combines the analysis of nutritional fatty acids and cyclopropenoid fatty acids into a single procedure, which is more efficient than performing two separate analyses. The study found that the LOQ for various nutritional and cyclopropenoid fatty acids ranged from 0.001 to 0.012 mg/mL. The method has been successfully applied to analyze the fatty acid profiles in cottonseed and cottonseed oil. A Standard Procedure has also been established to determine the oxidation stability of foods, oils, and fats using the Oxitest Oxidation Test Reactor. This procedure assesses the shelf life of these products by measuring lipid oxidation. Lipid oxidation testing in whole food samples has traditionally required fat extraction before analysis. However, the Oxitest instrument allows for simultaneous analysis of multiple samples without prior extraction. This simplified and rapid method measures oxygen uptake and induction periods to determine a sample's resistance to oxidation. The instrument can analyze various food types with at least 2-4% fat content, including meats, oils, mayonnaise, and baked goods. Researchers used the Oxitest method to examine the oxidative stability of extra virgin olive oils from two Italian regions. They found a strong correlation between polyphenol content and oxidation resistance, as measured by induction period. The study also showed no direct link between geographical origin and oxidation resistance. The global fats and oils industry has long relied on the analytical integrity of the Official Methods and Recommended Practices of the AOCS. The 5th edition maintains this tradition, featuring over 400 critical analytical methods for processing, trading, utilizing, and evaluating fats, oils, and lipid products. Each method is self-contained and can be used without cross-referencing other methods, with clear definitions, scope, apparatus, reagents, procedures, calculations, and notes to guide the technician. The Official Methods and Recommended Practices contain methodology required for proficiency testing in the Laboratory Proficiency Program, as well as AOCS laboratory certification. The publication covers major subjects such as vegetable oil source material, oilseed by-products, commercial fats and oils, soap and synthetic detergents, glycerin, sulfonated and sulfated oils, soapstocks, specifications for reagents and solvents, and method development procedures.