Comparative Analysis of Cooking Oils Using a Solid Core HPLC Column

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Key Words

Accucore, Core Enhanced Technology, HPLC, lipids, charged aerosol detector, C30, cooking oil

Abstract

The use of Thermo Scientific™ Accucore™ C30 columns for the characterization of different cooking oils is demonstrated. The C30 phase offers greater selectivity and resolution of minor components when compared to the C18 phase.

Introduction

Accucore HPLC columns use Core Enhanced Technology™ to facilitate fast and highly efficienct separations. The 2.6 µm diameter particles are not totally porous, but instead have a solid core and a porous outer layer. The optimized phase bonding creates a series of high coverage, robust phases. The tightly controlled 2.6 µm diameter of Accucore particles results in performance typically seen with sub-2 µm materials but at much lower backpressures.

The Accucore C30 HPLC column offers high shape selectivity for hydrophobic, long chain, structurally related isomers, for example carotenoids and steroids. It is also an excellent alternative to normal-phase columns for lipid analysis. The optimized bonding density of the long alkyl chains facilitated by a wider pore diameter particle results in a phase that is stable even in highly aqueous mobile phases.

Cooking oils derive from many sources, each with a characteristic profile of triglycerides. The major components are frequently similar, so it is important to resolve even the minor constituents. The C30 phase excels at distinguishing among subtly different large hydrophobic molecules.

Experimental Details

Consumables	Part Number
Oil samples were obtained from local food vendors.	
Acetonitrile, Fisher Scientific™	A/0626/17
Isopropanol, Fisher Scientific	A461
Ammonium acetate, Sigma-Aldrich®	431311
Acetic acid, Fisher Scientific	A507

Sample Handling | Part Number

Thermo Scientific Premium 8 mm Standard Opening Screw Thread Vial Convenience Kit, 2 mL Clear Vial with Patch, Black Polypropylene Closure with Red PTFE/White Silicone Septa	60180-600

Sample Preparation

Working standards of vegetable oils were prepared to 1 and 10 mg/mL in isopropanol.

Separation Conditions

Instrumentation:	Thermo Scientific Dionex™ UltiMate™ 3000 RS system consisting of LPG-3600-RS dual-ternary pump, WPS-3000 RS thermostatted split-loop autosampler, and TCC-3000 RS column thermostat, with an aerosol detector.	
Column 1:	Accucore C30 2.6 µm, 100 mm x 3 mm	27826-103030
Column 2:	Accucore C18 2.6 µm, 100 mm x 3 mm	17126-103030
Column 3:	Accucore C30 2.6 µm, 100 mm x 4.6 mm	27826-104630
Mobile Phases:	A: Acetonitrile	
	B: Isopropanol	
	C: 7.7 g/L ammonium acetate + 2.0 g/L acetic acid, pH 5.2	
Isocratic:	25% A, 70% B, 5% C	
Column temperature:	30 °C	
Flow rate:	1.25 mL/min (4.6 mm bore) or 0.50 mL/min (3 mm bore)	
Injection details:	5 µL x 1 mg/mL (4.6 mm bore) or 1 µL x 10 mg/mL (3 mm bore)	
Injection wash solvent:	Acetonitrile	
Backpressure:	338 Bar	

Results

The results presented in Figure 1 for four different cooking oils (1 mg/mL) analyzed on an Accucore C30 (100 x 4.6 mm) HPLC column clearly show differences that can be used to characterize the individual oils.
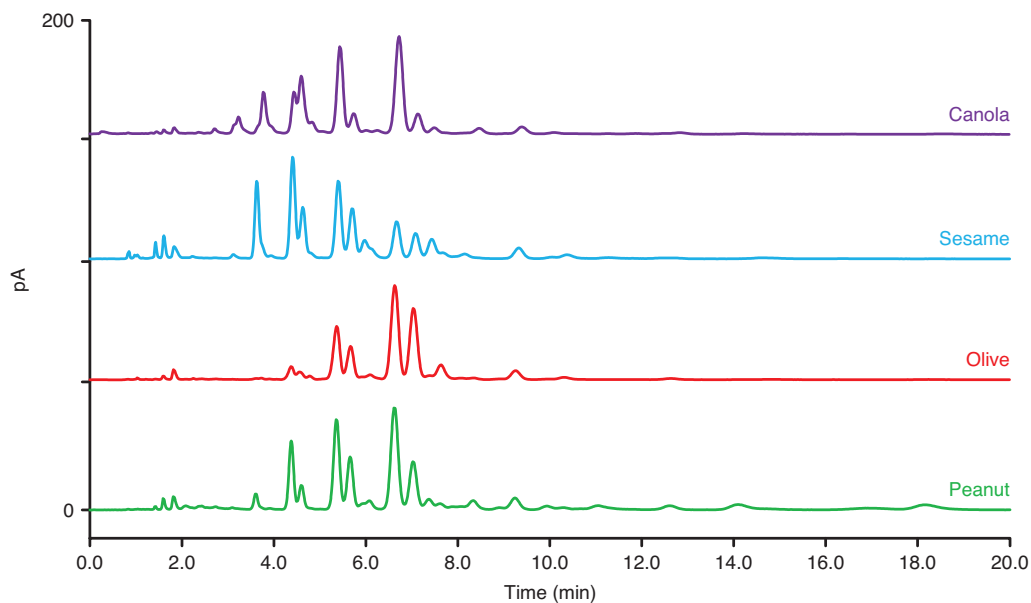

Figure 1: Comparison chromatograms showing the differences in constituents amongst four types of cooking oil using an Accucore C30 HPLC column and aerosol detection

A sample of peanut oil (10 mg/mL) was analyzed on an Accucore C30 and an Accucore C18 HPLC column (100 x 3 mm) using aerosol detection at a flow rate of 0.5 mL/min. Figure 2 shows the extra detail that was obtained from the increased selectivity of the C30 phase.
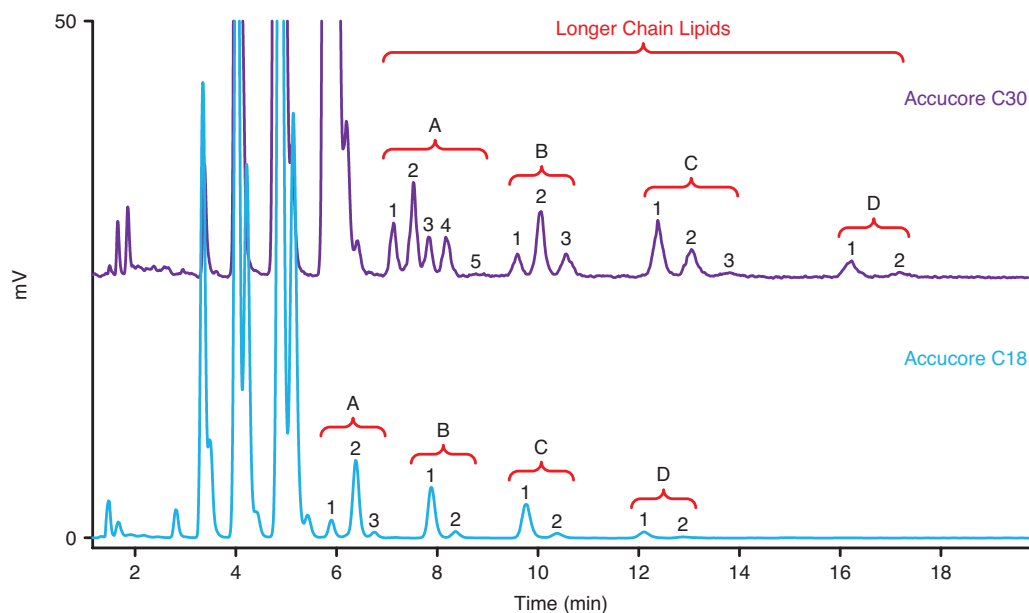

Figure 2: Comparison chromatograms showing the differences in selectivity achieved using an Accucore C30 HPLC column compared to an Accucore C18 HPLC column for the analysis of peanut oil

Conclusion

The Accucore C30 phase provides additional selectivity for molecules containing alkyl chains greater than eighteen carbon chain length. This enhanced separation allows for more extensive characterization of lipids used in food manufacturing and other similar long chain molecules.

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