

ALCOHOL PROFILING & ETHANOL BREAKDOWN PRODUCTS

Alcohol Profiling

Alcoholic beverages contain a complex mix of compounds, uniquely characteristic of each beverage, that creates the individual aroma and flavour profile. Many compounds contribute to the aromas and flavours experience of the consumer. Volatile compounds interact with receptors in the nasal passages creating the aroma sensation. Flavour, however, is experienced as a combination of aroma and taste.

Whilst the majority of added compounds add to the desired aroma and flavour aspects of a beverage, trace components can contribute off-flavours and odours. These compounds can be generated a variety of ways - contaminants in raw materials used in the beverage, migration into the beverage from process equipment or packaging materials and degradation of naturally occurring flavour compounds due to oxidation, or exposure to light or heat.

Changes in the relative concentrations these compounds may result in an undesirable change in the flavour of the beverage. Accurately profiling the compounds contributing to flavour and aroma, which can span a wide range of volatility, is therefore essential in ensuring product quality.

The compounds were analysed using an Ellutia 200 Series GC with a EL-FFAP column. To ensure an accurate injection the Ellutia Liquid Sampler was utilised. The Liquid Sampler produces a lower percentage of thermal discrimination between volatile and lesser volatile molecules in the sample injection when compared to the Headspace Autosampler. In this case the EL3100A Automatic Liquid Autosampler - 15 position was employed.

Range Switching

As the ethanol content can be over 40% (v/v) in some beverages, trace compounds would be difficult to analyse simultaneously with this level of ethanol present. However, adding a timed event to switch between ranges during the analysis would facilitate this. Figure 2 and 3, show the same concentration ethanol solution being analysed on various ranges. As seen from figure 2, trace compounds could be 1000 times less concentrated than the ethanol. Therefore, a range switch during the appearance of ethanol would bring the peak within a practical scale to allow for the trace compounds to be analysed in one run, shown in figure 3.

GC Conditions		
Injector Temperature	250°C	
Liner Type	Focus Liner With Wool	
Carrier Gas Type	Hydrogen	
Carrier Gas Control Method	Programmed Pressure	
Splitless Time	0.8 min	
Injection Volume	1.0 µl	
Column Type	EL-FFAP	
Column Length	60 m	
Column Internal Diameter	0.32 mm	
Column Film Thickness	0.50 µm	
Column Temperature Program		Carrier Pressure
Initial Temperature	50°C/2 min Hold Time	5 psi
Temperature Ramp 1	2 °C min ⁻¹	
Column Temperature 1	60°C/0 min Hold Time	6.8 psi
Temperature Ramp 2	2°C min ⁻¹	
Column Temperature 2	90°C/0 min Hold Time	15 psi
Temperature Ramp 3	12°C min ⁻¹	
Column Temperature 3	220°C/1.5 min Hold Time	20 psi
Detector	FID	
Range	Various	

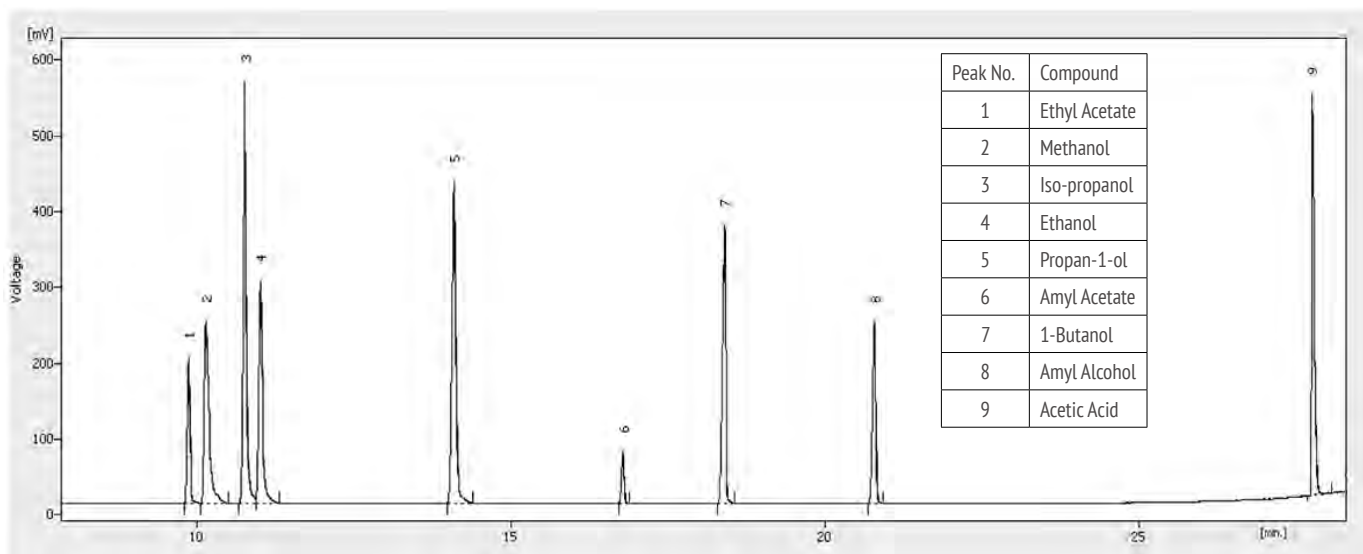


Figure 1. Chromatogram of 9 compounds found in alcoholic beverages

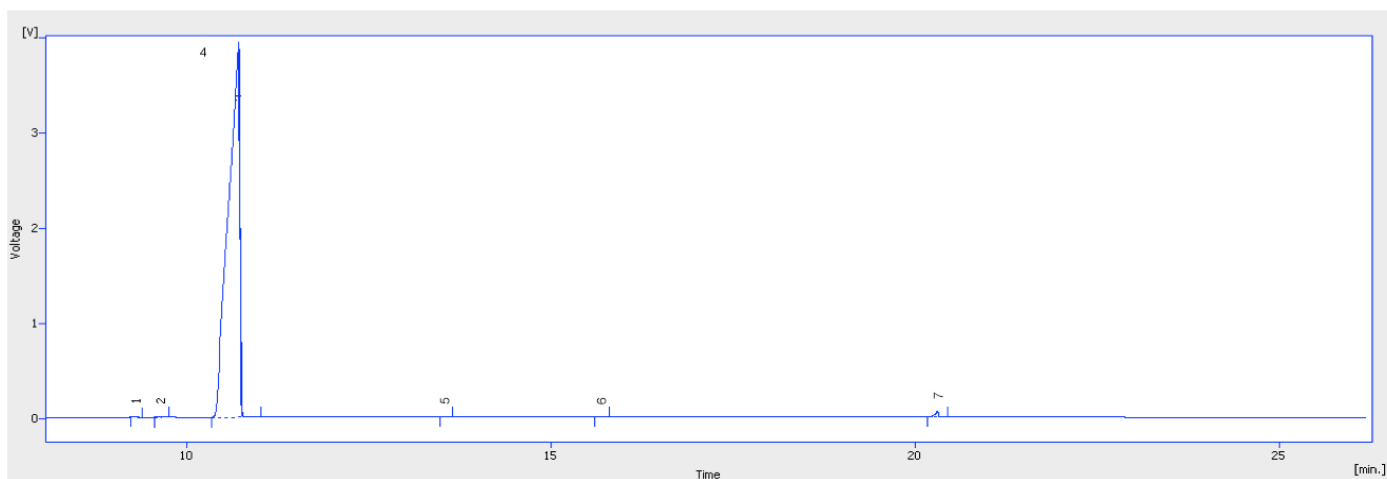


Figure 2. Red wine sample at x10 detector range.

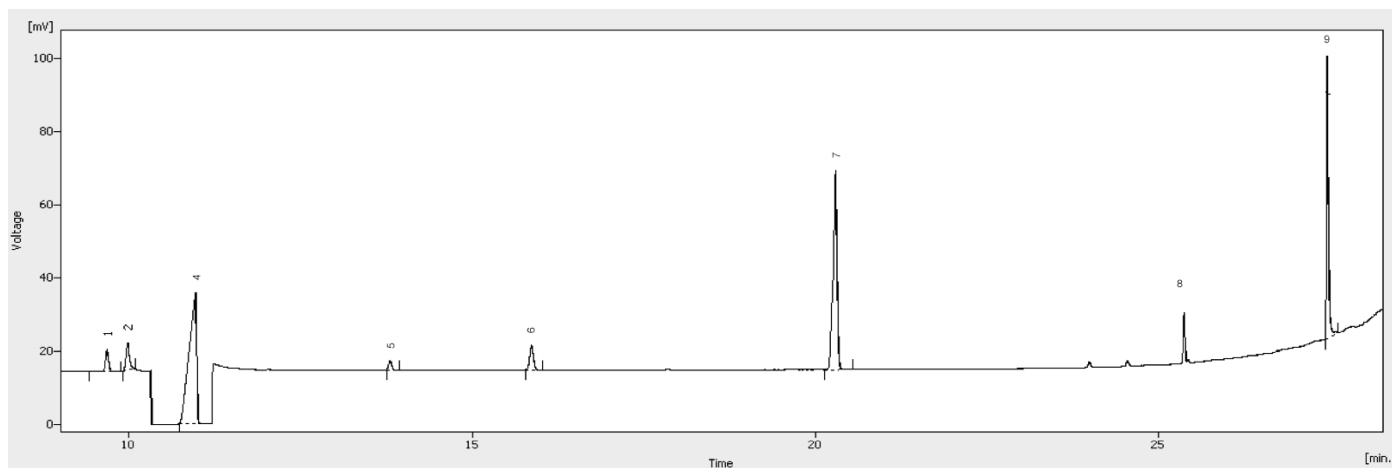


Figure 3. Red wine sample at x10 detector range and range switched to x1000 between 10.3 and 11.2 mins.

Ordering Guide

Ellutia 200 Series Gas Chromatograph, FID	(Part no. 20500130)
EL-1 Capillary Column, 60 m x 0.25 mm x 0.25 µm	(Part no. 51100038)
Ellution Software, Single Instrument	(Part no. 23001001)

Optional:

Ellutia EL3100A Automatic Liquid sampler - 15 position	(Part no. 30500011)
Ellutia EL3000A Automatic Liquid Sampler - 121 position	(Part no. 30500010)
Ellutia EL3200A Automatic Liquid Sampler - 209 position	(Part no. 30500012)
Autosampler Control Software	(Part no. 23001012)



Accessories

2ml Vials	(Part no. 20511101)
2ml Vials screw Caps	(Part no. 20511107)
1µl Liquid Syringe	(Part no. 20511204)
Septa	(Part no. 20512101)