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Laimburg researchers developed a GC-MS method that measures wine and spirits volatiles without extraction

Tests on four wines and one spirit found the simpler workflow worked for measurable compounds but lagged on trace-level analysis

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A study published in Food Analytical Methods reports that researchers at Laimburg have developed and optimized a direct liquid injection gas chromatography-mass spectrometry method to measure selected volatile organic compounds in wine and spirits without a separate extraction step.

The work focused on 10 volatile compounds and compared the direct injection approach with headspace solid-phase microextraction gas chromatography-mass spectrometry, or HS-SPME-GC-MS, a widely used technique for aroma analysis. According to the study, the researchers tested the method on four wines and one spirit and found that the simpler procedure can be used for quantitative analysis of compounds present at measurable levels, while more sensitive methods still have an advantage for substances found only in traces.

Volatile compounds play an important role in how wines and spirits smell and taste. Laboratories often track them to study composition, follow production changes and check product quality. But measuring those compounds can require several sample-preparation steps before an instrument run begins. The new study examined whether direct liquid injection, which introduces the sample more directly into the analytical system, can reduce that preparation burden while still producing reliable numbers for selected compounds.

The paper’s title indicates that the researchers set out both to optimize the direct injection GC-MS method and to compare it with HS-SPME-GC-MS. That comparison matters because HS-SPME-GC-MS is commonly used when analysts need high sensitivity, especially for compounds present in very small amounts. A direct injection method is generally simpler in workflow, but its usefulness depends on whether it can deliver results that are accurate enough for the compounds and concentrations being studied.

Based on the study summary, the answer was mixed but practical. The direct injection method was able to quantify the selected volatile compounds without prior extraction, which simplifies the analytical process. At the same time, the researchers found that it should be seen as complementary to more sensitive techniques rather than as a full replacement. For trace-level compounds, the summary indicates, HS-SPME-GC-MS or

similar approaches still offer better performance.

That distinction is important for the beverage industry. Winery and distillery laboratories do not always need the most sensitive possible method for every test. In routine compositional work or quality control, a method with less sample preparation can be attractive if it is robust and sufficiently accurate for the target compounds. A simpler workflow can reduce handling time, limit opportunities for sample loss or contamination and make it easier to process more samples in a working day. For that reason, the approach described in the paper could offer producers and contract laboratories another option for monitoring volatile profiles in wines and spirits, particularly when the goal is to track known compounds present above trace levels.

The findings also reflect a broader reality in food and beverage testing: different analytical tools are often suited to different jobs. High-sensitivity methods are critical when laboratories are looking for very low concentrations, subtle aroma markers or compounds that may influence sensory quality even at trace amounts. Simpler methods can still be useful when analysts need repeatable quantification of a defined group of compounds and want to keep preparation steps to a minimum. The Laimburg study appears to place direct liquid injection GC-MS in that second category.

Although the source material available from the journal page does not include the full experimental details, the study description suggests the authors carried out method optimization before applying the technique to real samples. In analytical chemistry, that usually involves adjusting instrumental and sample-handling conditions so measurements are stable and reproducible across repeated runs. A comparison against an established method such as HS-SPME-GC-MS is a standard way to test whether a simpler procedure can stand up in routine use.

The study arrives as producers and testing laboratories continue to look for methods that balance speed, cost and analytical performance. Wine and spirits are chemically complex products, and their volatile profiles can be influenced by raw materials, fermentation, aging, storage and packaging. That makes laboratory analysis an important part of both research and production. Even a modest reduction in preparation time can matter when many samples must be checked for consistency or

investigated after a process change.

The paper does not appear, from the available summary, to argue that direct liquid injection should replace more advanced extraction-based approaches across the board. Instead, it points to a narrower and more practical message: for a defined set of compounds and sample types, a less elaborate GC-MS workflow may be good enough to support quantitative analysis. Where trace sensitivity is essential, the more established headspace microextraction route remains the stronger choice.

For beverage producers, that kind of method development can be valuable even when it does not overturn existing practice. Laboratories often need a range of tools rather than a single method for every question. A direct injection procedure that removes an extraction step could become useful for routine checks in wines and distilled products, while specialized high-sensitivity methods remain in place for deeper aroma profiling or trace analysis.