

New rapid test detects quality and authenticity of olive oil

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Testing an olive oil sample at the North Bavarian NMR Centre on the campus of the University of Bayreuth. Credit: ALNuMed GmbH

Extra virgin olive oil is extracted from cold-pressed, high-quality olives and is one of the most popular foods in Europe. However, inferior counterfeits are coming onto the market in increasing number. A research team led by Prof. Dr. Stephan Schwarzsinger at the University of Bayreuth has now developed a highly effective rapid test against this food fraud. Within one hour, the quality and authenticity of olive oils on the market can be clearly determined and counterfeits detected. Information on origin can also be checked for plausibility.

Increasingly, counterfeits of high-quality food are harming both customers and producers. The organizations responsible for the certification of foodstuffs are therefore emphatically calling for tougher legal measures. Until recently, however, comprehensive tests of the quality and authenticity of olive oils could only be carried out using different [test](#) procedures applied one after the other. They were therefore time-consuming and expensive. A new method for a rapid test from Bayreuth now overcomes these obstacles with the help of nuclear magnetic resonance spectroscopy (NMR spectroscopy). Prof. Dr. Stephan Schwarzsinger from the Northern Bavarian NMR Centre at the University of Bayreuth (NBNC) developed the test in cooperation with the University of Athens, the analytical laboratory ALNuMed GmbH, and partners from the [olive oil](#) industry. "Over several years, we collected and systematically analyzed more than 1,000 different samples of extra virgin olive oil. The NMR measurement provided us with an individual profile for each sample that includes all properties relevant to quality and authenticity," says Schwarzsinger, who heads the Working

Group for Quality and Authenticity of Food and Materials at NBNC.

The new rapid test is based on the special ability of NMR spectroscopy to detect ingredients that occur in very different amounts with high resolution and reproducibility. Practically, this means highly concentrated main ingredients, such as the fatty acids in olive oil, but also very low concentrated substances can be detected. These include in particular the polyphenols, which act as antioxidants in the human body and have a positive effect on health. The quick test therefore indicates whether the oil examined is entitled, in principle, to bear a health claim according to the corresponding EU regulation. At the same time as the analysis of ingredients, taste impressions are also tested, which are important for consumer acceptance. In addition, a comparison with existing olive oil profiles can be used to check how credible the declaration of origin of the respective producer or trader is. NMR spectroscopy can be used to check whether the examined olive oil sample comes from Greece, Italy, or Spain, for example.

Counterfeits of the popular extra virgin olive oil have been a problem for many years. "Cheap alternative vegetable oils are dyed green and sold as olive oil, rancid oil is mixed with good oil, or old oils are glossed over with special technologies and come back into circulation as extra virgin olive oil. These frauds damage the good reputation of this high-quality product, and could trigger a downward spiral that ultimately hits olive oil farmers via a drop in prices. And this, in turn, leads to the leaving fallow of large olive groves in the Mediterranean region with corresponding, negative ecological effects," says Schwarzinger.

NMR spectroscopy, because it enables a rapid and simultaneous analysis of many parameters, is the tool of choice for detecting these forms of food fraud. Schwarzinger recently presented the basics of the new olive oil rapid test at BioFach in Nuremberg, the leading trade fair for the food industry. "This year, due to the pandemic, the trade fair was held

online. Nevertheless, our new test option met with broad interest. The olive oil experts were very impressed by how quickly and thoroughly the quality and authenticity of olive oils can be determined. It is already clear that this can significantly improve the transparency of olive oil supply chains and markets. We hope that our development will now be quickly implemented in contracting laboratories and brought to market," says the Bayreuth NMR expert.

In the past, Schwarzingler and his group have made significant contributions to a method, also based on NMR spectroscopy, for checking the quality and authenticity of honey. Meanwhile, the University of Bayreuth is one of the world's leading [research institutions](#) for the [authenticity](#) of honey.

Provided by University of Bayreuth

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