CASE STUDY

Food Quality and Safety

A Better Way to Target Pesticides in Berries

Berries and Pesticides

Just about everyone loves berries. From fresh-picked to frozen, preserves to juices, the global berry industry is literally bursting at the seams. Analysts estimate the global berry business is worth more than $78 billion (USD) a year and – no pun intended – it is growing fast[1].

To meet the global demand for berries, growers rely on dozens of pesticides to protect their crops and increase their production. A recent consumer survey, meanwhile, shows that 85% of us berry eaters are worried about pesticides on and possible in our fruit.

Pesticides and People

"Fetuses, babies, and kids are more vulnerable to the effects of pesticides because their organs and nervous systems are still developing," Philip Landrigan, M.D., director of the Children's Environmental Health Center at the Icahn School of Medicine at Mount Sinai Hospital in New York, told *Consumer Reports* recently. Kids with high levels of a particularly toxic class of pesticides called organophosphates (OPs) have a 50% higher rate of attention deficient disorder and lower IQ scores than kids who tested negative for the toxin[2].

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But it is not only children who need to worry. Average adults have 29 different pesticide residues in their bodies, and some of them are known carcinogens. As for the majority of the hundreds of other pesticides on the market? We just do not know enough about them to determine their long-term impact on human health[3].

Regulating the Berry Business

For those pesticides that we do classify as potentially dangerous, most nations set strict regulations on their use and maximum allowable amounts in foods, usually measured in the parts per million (ppm) and parts per billion (ppb). Diazinon, for example, is one of the aforementioned organophosphates that is used globally to control pests. In the U.S., the FDA allowable limit for diazinon residue on blueberries is .5 ppm. In the EU, that same pesticide is limited to .01 ppm[4].

In order to measure such small amounts of these compounds in berries, producers, as well as federal and state regulators, rely on Liquid Chromatography coupled with tandem Mass Spectrometry (LC-MS/MS) as their method of choice because it is both sensitive and accurate[5].

Improving on a Standard

Scientists at PerkinElmer recently employed a new and unique laminar flow UPLC-ESI-MS/MS triple-quad mass spectrometer to detect and quantify 40 different pesticides in four brands of off-the-shelf nonorganic berries[6].

In order to do so, PerkinElmer researchers first employed the "QuEChERS" (Quick, Easy, Cheap, Effective, Rugged, Safe) system to extract the pesticide residues in the heavily pigmented berry samples. They then used the PerkinElmer Altus® A-30 UPLC® System for chromatographic separation as well as the PerkinElmer QSight™ 220 MS/MS detector with dual ionization source for detection of the various compounds.

"All of the tested pesticides were detected with good signal to noise even at concentrations well below the regulatory limits," Josh Ye, Senior Application Scientist at PerkinElmer, says. The only pesticide detected at a level close to the EU limit in berries was hexyythiazox, but it was still below the .5 ppm[7].

According to PerkinElmer scientists, their UPLC-ESI-MS/MS triple-quad mass spectrometer technique not only detected all of the tested pesticides at levels well below regulatory limits, it also demonstrated some distinct advantages over previous methods.

"First, the dilution of the QuEChERS extract with water makes the sample extract more compatible with typical reversed phase separation, leading to reduced solvent effects," the team concludes. Equally important, "the dilution also helps to reduce any potential matrix effects, leading to more accurate and reproducible results." Finally, Ultra Performance Liquid Chromatography (UPLC) significantly decreases the amount of time and solvent used for the analysis[8].

So what does all that mean for us? How about peace of mind, thanks to the professionals at PerkinElmer, a company dedicated to innovation for a healthier world – one berry at a time.

Reference

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8. Lucie Nováková, Ludmila Matysová, Petr Solich, "Advantages Of Application Of UPLC In Pharmaceutical Analysis," Talanta, Vol.68, Issue 3, 15 January 15, 2006, pp. 908–918.

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