FAST, QUANTITATIVE ANALYSIS OF
1000+ PESTICIDES
Using MRM Mass Spectrometry

SHIMADZU

Excellence in Science

ANALYZE OVER 1000 PESTICIDES WITH MRM MASS SPECTROMETRY

As the global population continues to increase, food security becomes a greater concern. This places significant pressure on agricultural producers to grow food in a faster, safer and more sustainable fashion. Faced with this challenge, many farmers use pesticides to protect crops from environmental pests, such as weeds (herbicides), insects (insecticides) and fungus (fungicides).

These chemical and biological agents improve cultivation, but at a cost. Toxic pesticide residues can remain in the crops even after harvesting is complete. That is why it is critical to test any food products cultivated with pesticides to ensure that they are safe for public consumption.

LIMITING EXPOSURE TO TOXIC PESTICIDES

The hazardous level of a pesticide depends on two factors: the pesticide's toxicity and a person's exposure to that pesticide. Just a single exposure can have acute effects, such as impaired vision and motor skills. Long-term, chronic exposure can lead to more serious illnesses and diseases, including blood and nerve disorders and even cancer. Because of these risks, the Environmental Protection Agency (EPA) sets tolerances, which are the maximum amount of pesticides allowed in or on a food in the United States. In other countries, these tolerances are called maximum residue limits (MRLs). Food products are constantly tested to ensure pesticide levels never exceed these approved limits. The table shows examples of EPA pesticide tolerences in various commodities.

Pesticide	Commodity	Parts per Million
Capatan	Apple	25.0
Capatan	Grain, cereal	0.05
Capatan	Peach	15.0
Dicamba	Barley, grain	6.0
Dicamba	Corn, pop, grain	0.1
Dicamba	Wheat, grain	2.0
Imidacloprid	Banana	0.5
Imidacloprid	Blueberry	3.5
Imidacloprid	Fish	0.05
Azoxystrobin	Asparagus	0.04
Azoxystrobin	Peanut	0.2
Azoxystrobin	Peppermint, tops	30.0
Glyphosate	Beet, sugar, tops	10.0
Glyphosate	Egg	0.05
Glyphosate	Poultry, meat	0.1

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UNPARALLELED RESIDUE ANALYSIS

Pesticide analysis is no easy task. Over 1 billion pounds of pesticides are used in the United States each year, and there are many different types of pesticides to look for. Pesticides are complex substances, with multiple pesticide residues belonging to multiple classes.

Pesticide analysis may require either a liquid chromatograph-mass spectrometer/mass spectrometer (LC-MS/MS) or gas chromatograph-mass spectrometer/mass spectrometer (GC-MS/MS). These instruments are referred to as triple quadrupole mass spectrometers. The type of instrument you use will depend on the characteristics of the pesticide, such as the polarity, volatility, thermal stability and ionization efficiency.

Shimadzu's LCMS-8060 delivers fast quantitative analysis of 646 pesticides
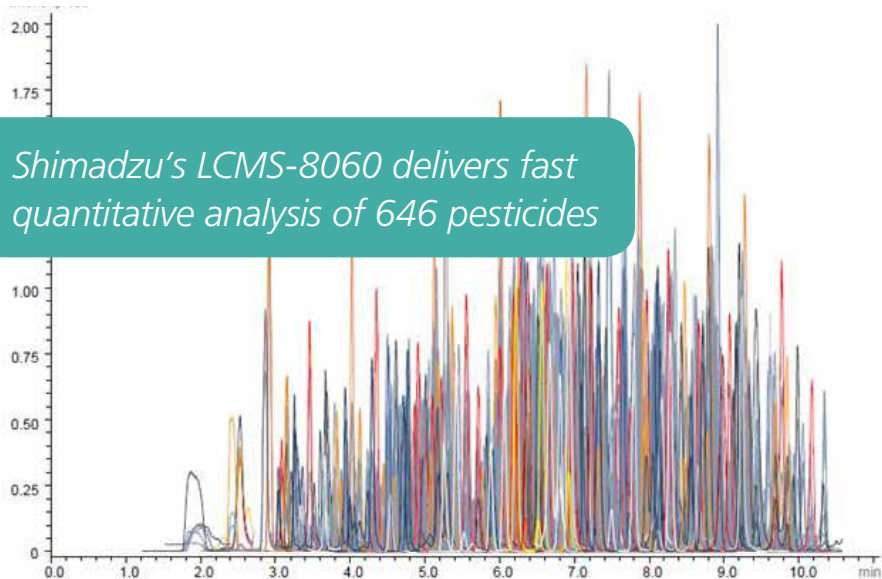
LC-MS/MS technology is used to ensure that agricultural crops are safe to consume and under tolerance levels set by the EPA. For a faster and more comprehensive pesticide analysis, **Shimadzu offers the LCMS-8060 triple quadrupole mass spectrometer.**

This liquid chromatograph mass spectrometer offers unmatched analysis capabilities. Shimadzu's LCMS-8060 delivers fast quantitative analysis of **646 pesticides with 1,929 multiple-reaction monitoring in just 10½ minutes**. Equipped with a state-of-the-art ion guide, an enhanced ion sampling device and high vacuum efficiency, it sets a new standard for sensitivity. Now, this complex and time-consuming process is fast and easy.

LCMS-8060 acquires data at up to 30,000 μ/second with a 0.1 Dalton step size without the loss of mass accuracy. With a rapid polarity switching time of 5 msec, the LCMS-8060 can support an analysis of 612 pesticides in positive ion mode and 34 compounds in negative mode. This instrument also features our LabSolutions Insight data analysis software package that enables faster quantitative analysis and more effective reviewing of multi-analytical panels for pesticide residues in food products. This software features user-defined colored flags, allowing users to highlight outliers and review by exception for easy recognition and fast data review.

Twin Line MS Kit

For complete pesticide residue identification, samples may require an analysis by GC-MS/MS. Shimadzu designed the **GCMS-TQ8050** to meet the need for a highly sensitive instrument that can detect ultra-trace level contaminants. This **triple quadrupole gas chromatograph mass spectrometer** is ideal for identifying residues from less polar pesticides.
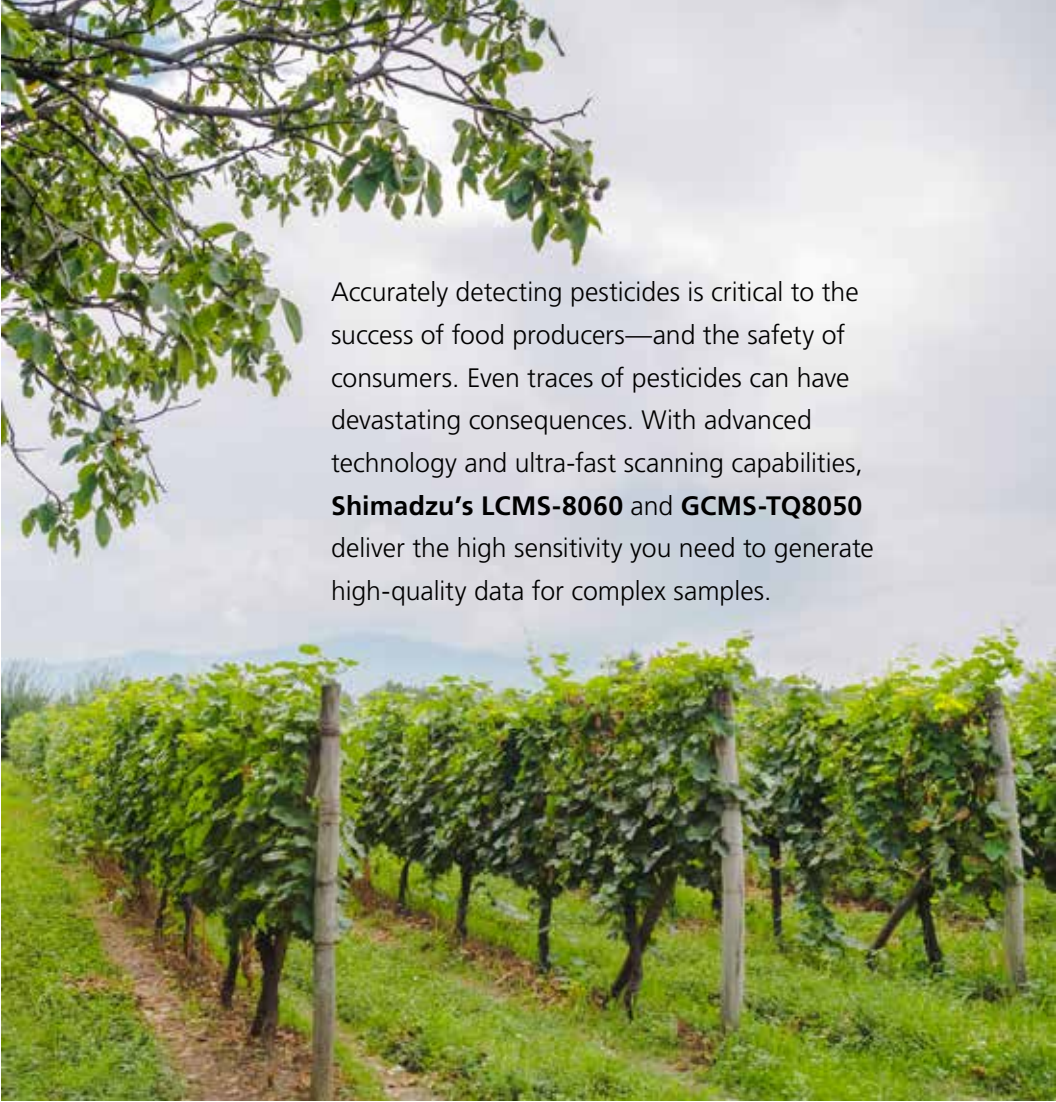
With Shimadzu's GCMS-TQ8050, it is now possible to simultaneously analyze **477 non-polar and low-polar pesticide components** without compromising sensitivity or accuracy. If used in combination with Shimadzu's unique Twin Line MS Kit, this instrument enables the analysis of a high number of pesticides in a single analytical run. The Twin Line MS Kit features two columns of different phases, eliminating the need to swap columns during analysis.

Featuring off-axis ion optics, a long-life detector and a contamination-resistant ion source, the GCMS-TQ8050 enables better performance and less maintenance. It provides high-speed scan and data acquisition, using Advanced Scanning Speed Protocol to achieve speeds up to 20,000 μ/second across all masses. The GCMS-TQ8050 ships with LabSolutions Insight software to improve all residue data review, and Shimadzu also offers an extensive Smart Pesticides Database for GC-MS/MS and a Pesticides MS library with over 500 pesticides.

This Pesticides MS library enables simple method creation and routine library screening of food samples. When the database is combined with our Twin Line MS system, analysis with different columns can be performed smoothly without compromising the MS vacuum.
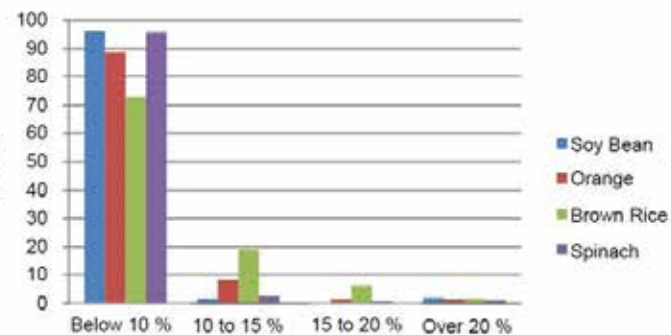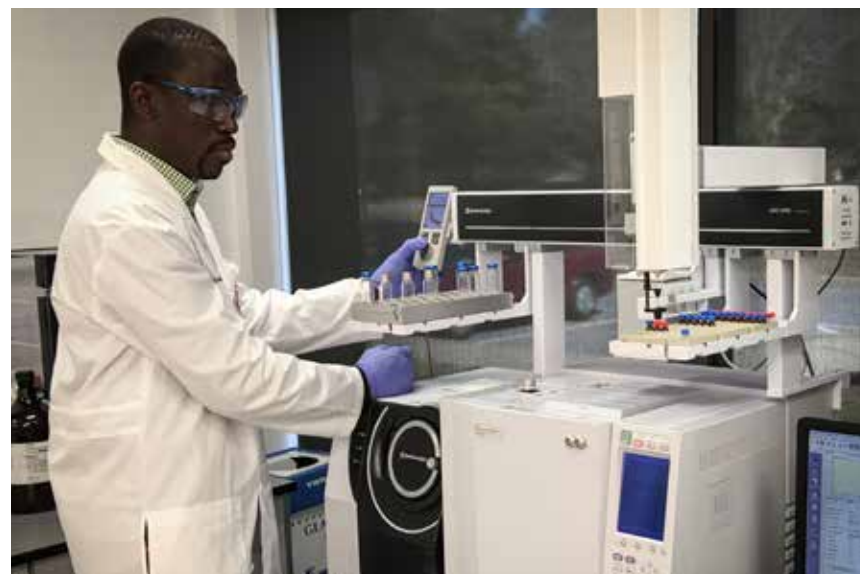
% RSD distribution obtained for each matrix indicates that high analytical precision was achieved when analyzing as many as 477 components simultaneously.