

Shodex HILICpak VT-50 2D: A HILIC + Anion Exchange HPLC Column for Polar Pesticide Analysis including Glyphosate

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Introduction:

There has recently been a peak in research involving herbicides, food additives and GMO related topics. Herbicides are generally referred to as a poison that can kill weeds or specific plants. Over the past century, there has been a steady rise in the use of herbicides in the agricultural sector. The main benefit is that herbicides allow the farmer to select which plants will flourish, what size the produce will reach, as well as other factors. However, not all herbicides have been deemed "safe" or approved for agricultural usage.

Glyphosate is a non-selective herbicide specifically used in agriculture for the control of weeds and shrubs. The most common brand name using glyphosate as an active ingredient is Monsanto's *Roundup*.¹ Glyphosate has also been used on genetically modify produce. Europe has restricted glyphosate as well as some other pesticides due to adverse effects on the soil and surrounding areas. With new restrictions, methods were developed to detect targeted compounds including aminomethylphosphonic acid, chlorate, ethephon, fosetyl aluminum, glufosinate, glyphosate, maleic hydrazide and phosphonic acid.

Companies including Waters² have developed a method for the best way to analyze herbicides in accordance with the Quick Polar Pesticides (QuPPE) extraction method.³ They have selected the Shodex VT-50 2D column to successfully complete this task.

The organophosphate herbicides easily form metal complexes with SUS housing, so PEEK housing has been used for the VT-50 to avoid tailing. The developed method shows a fast and stable analysis of organophosphate herbicides and related compounds without the use of pre-column derivatization, ion-pair reagents, nor gradient elution

Shodex analyzed four variations of herbicides using a Shodex HILICpak VT-50 2D column under LC-MS conditions. The sample contained different active ingredients in common pesticides, providing different functions. This analytical condition can also be used with other detectors including RI, ELSD, and corona CAD.

Experimental Conditions:

The analysis of containing aminomethylphosphonic acid, glufosinate, glyphosate, and 3-methylphosphinopropionic acid was accomplished using the Shodex HILICpak VT-50 2D (2.0 mm ID x 150 mm ID, 5 μ) a HILIC column suitable for LC/ESI-MS. The column temperature was 40 °C and flow rate was 0.3 mL/min. The eluent conditions were H₂O/ 1% HCOOH aq./CH₃CN: 70/20/10. An injection volume of 5 μ L of 1 μ g/mL of each sample was used for the experiment. The HPLC system was coupled with an ESI-MS (SIM) detector.

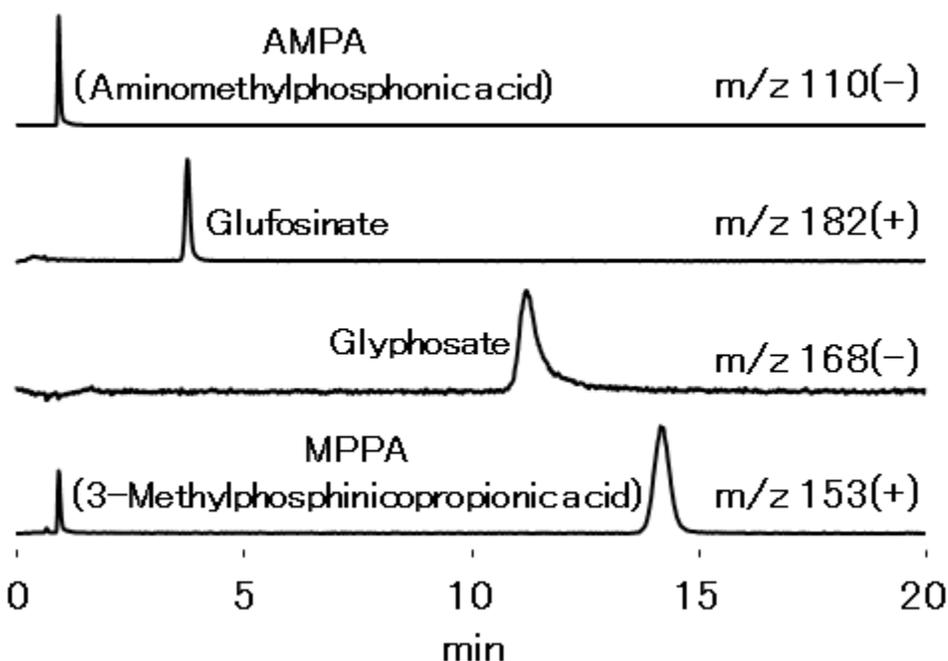
Results:

The aqueous sample containing aminomethylphosphonic acid, glufosinate, glyphosate, and 3-methylphosphinicopropionic acid was analyzed successfully using HILIC and ESI-MS detection with Shodex HILICpak VT-50 2D (Figure 1). Each herbicide or related metabolite prominently detected.

Conclusions:

Shodex HILICpak VT-50 2D, a Hydrophilic Interaction Chromatography (HILIC) column is suitable for the analysis of phosphorous-containing amino acids herbicides including glyphosate, glufosinate and their metabolites using ESI-MS detection. The polymer-based packing material provides excellent chemical stability and minimum deterioration over extended periods of time.

Figure 1. The Analysis of Phosphorylated Saccharides using Shodex VT-50 2D.



References:

1. RoundUp is a registered trademark of Monsanto
2. www.waters.com/posters
3. www.eurl-pesticides.eu/docs/public/tmp/tp_article.asp?CntID=88&LabID=200&Lang=EN

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