

The Analysis of Organic Acids in Foods and Beverages Using Reversed Phase HPLC

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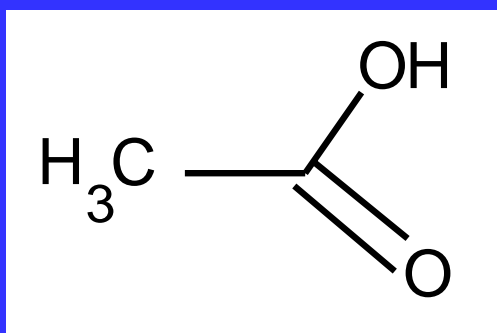


Roles of Organic Acids in Foods & Beverages

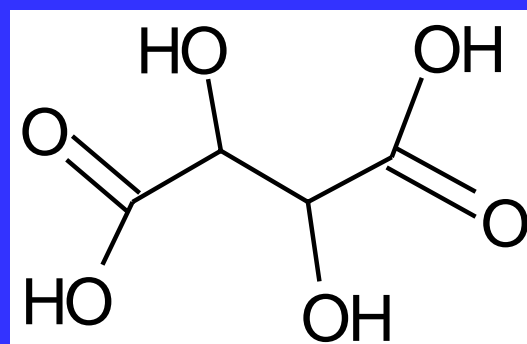
- Flavor Compounds
- Indicators of Product Quality
- Purity Determinations using an Organic Acid Profile
- pH Control in Products
- Antimicrobial Agents

Common Food & Beverage Organic Acids

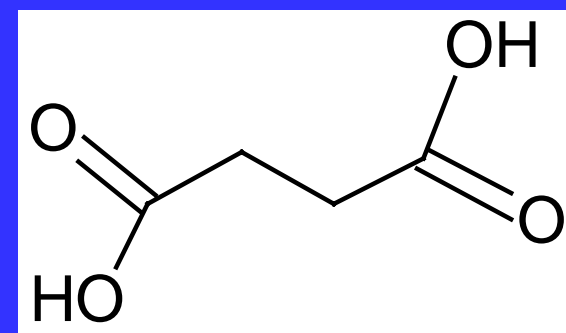
1. Acetic acid



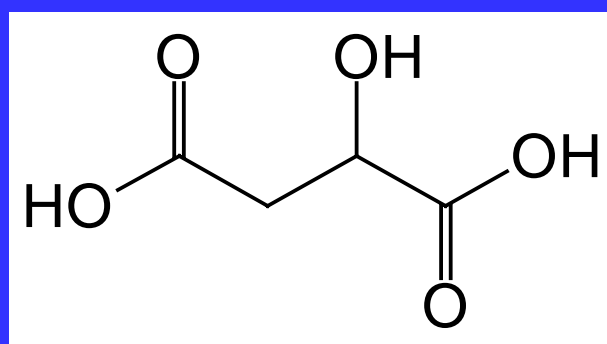
2. Tartaric acid



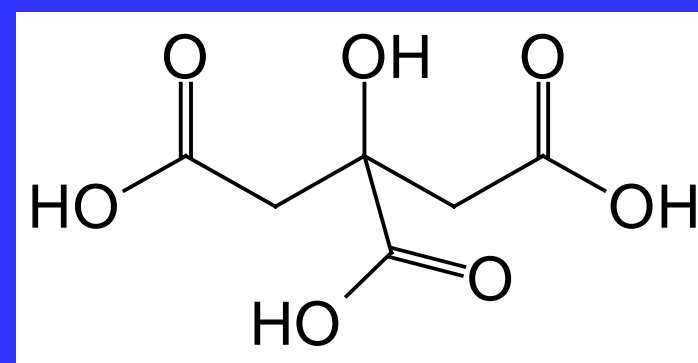
3. Succinic acid



4. Malic acid



5. Citric acid



Challenges in Organic Acid Analysis

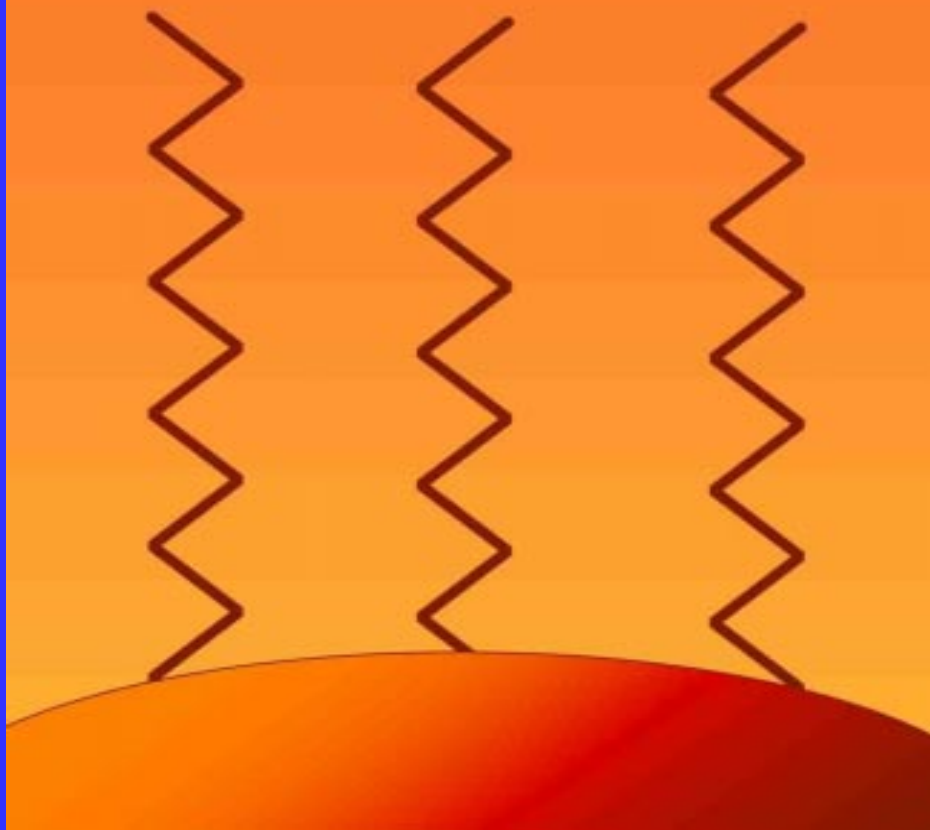
- Specific Assays
- Column Selection
 - Small carboxylic acids can be difficult to retain by reversed phase HPLC
 - Specialty columns for organic acid analysis
- Mobile Phase Selection
 - Reversed phase requires a highly aqueous mobile phase
 - Chain folding can occur with highly aqueous mobile phases and conventional C18 columns
- Reproducibility and Stability
 - The ideal analysis would provide stable and reproducible retention, even with completely aqueous mobile phases

Chain Folding

- Highly aqueous mobile phases can cause chain folding with conventional C18 columns
- Chain folding can result in a total loss of retention
- Exposure to completely aqueous mobile phases at ambient pressure (no flow) accelerates the chain folding process

Chain Folding on a Conventional C18 Column

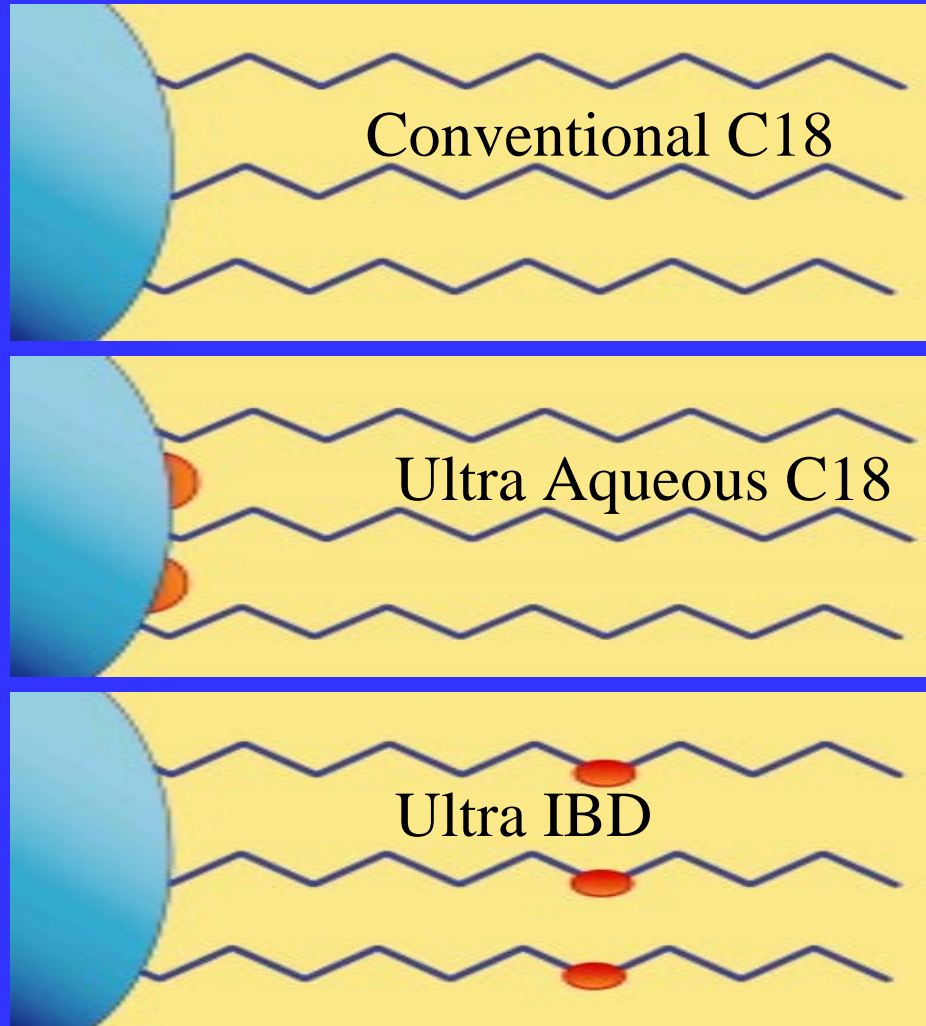
Organic Mobile Phase



Highly Aqueous Mobile Phase



Stationary Phases



Columns with added polar functionalities:

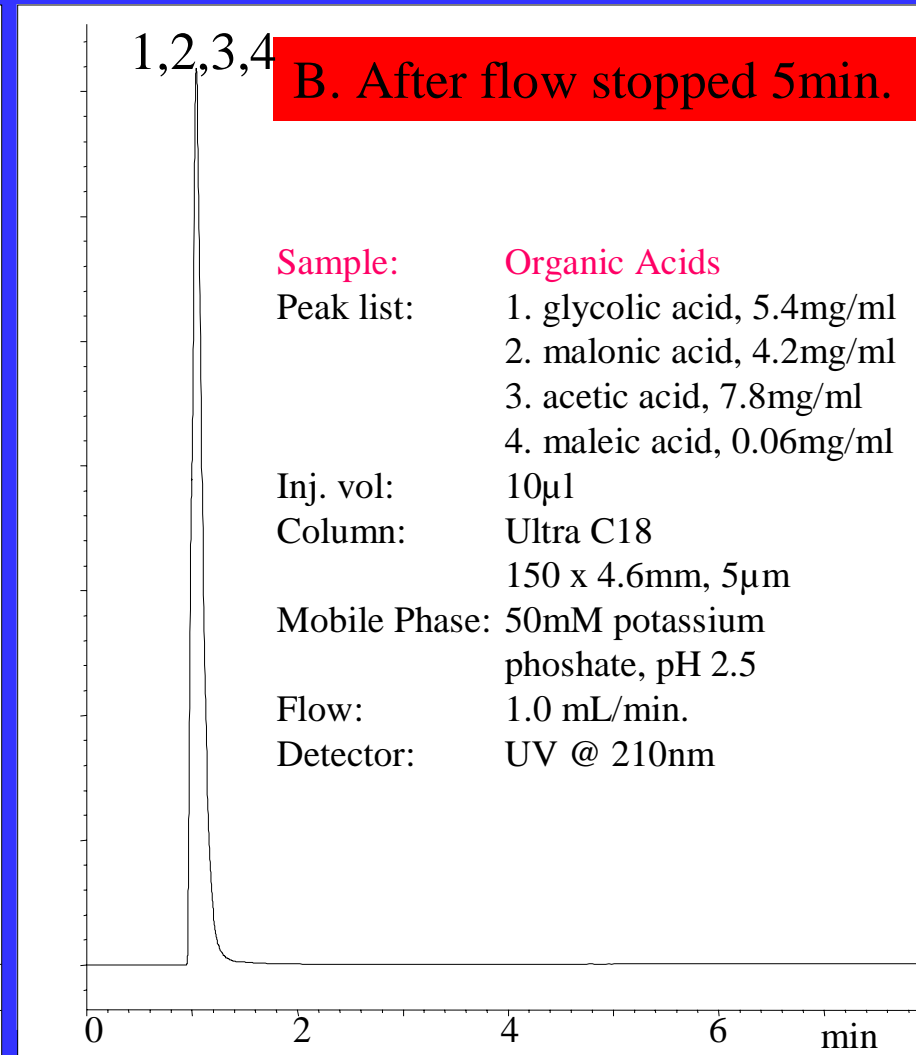
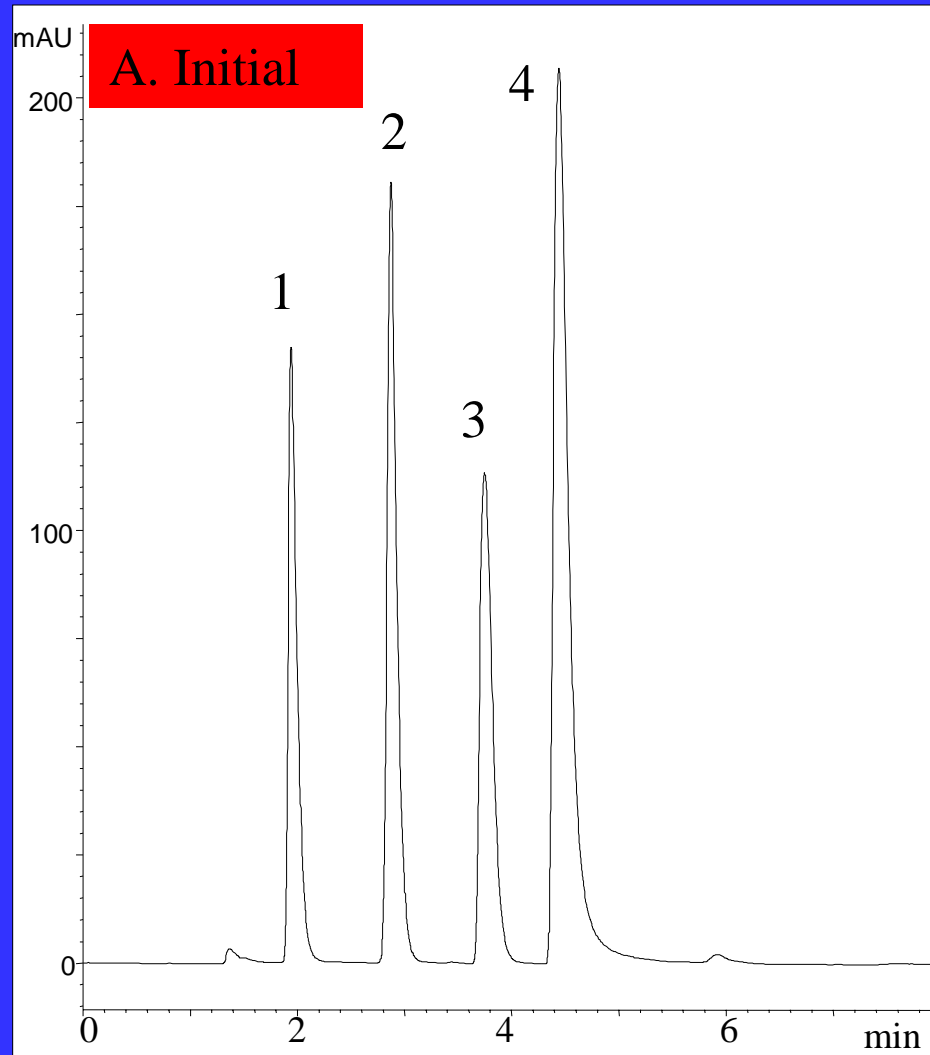
- enhance the retention of polar compounds
- eliminate retention loss caused by chain folding (even in 100% aqueous mobile phase)
- can provide unique selectivity

 = polar functionality

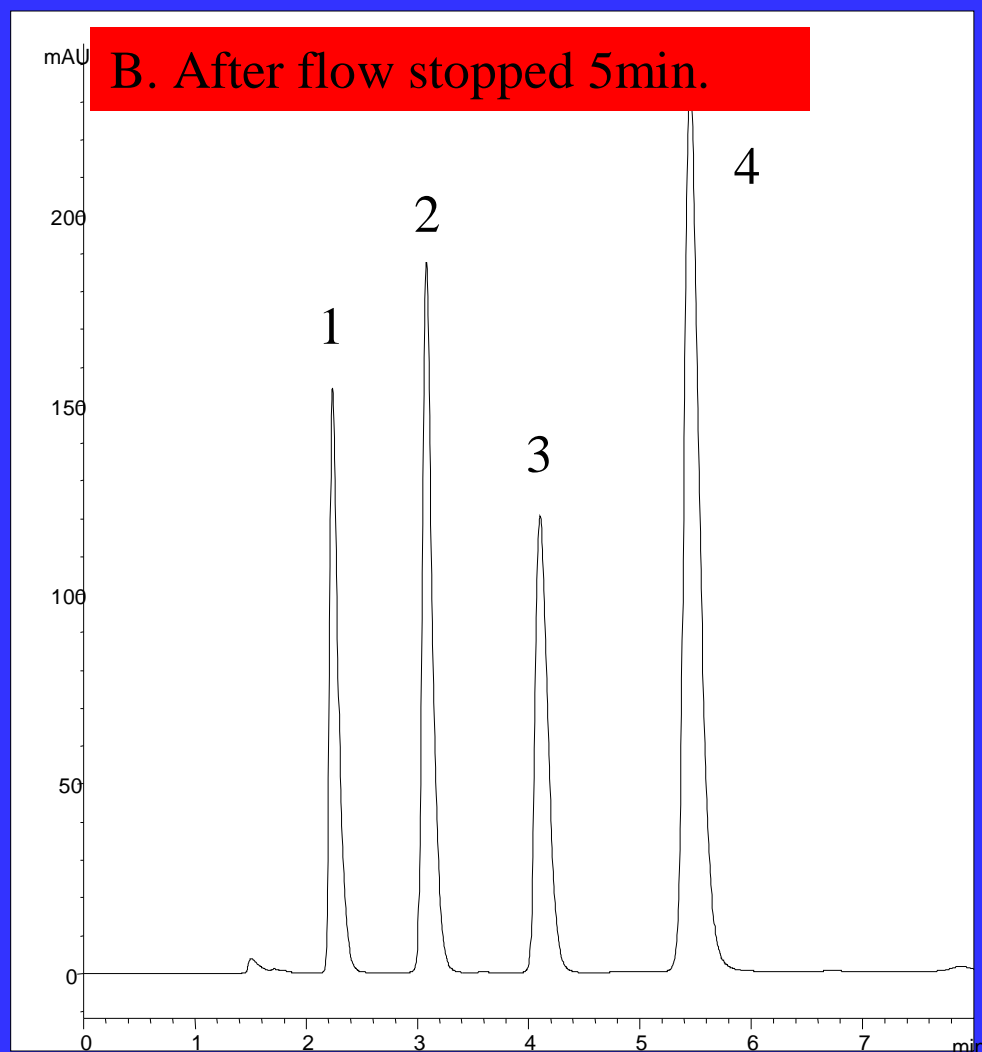
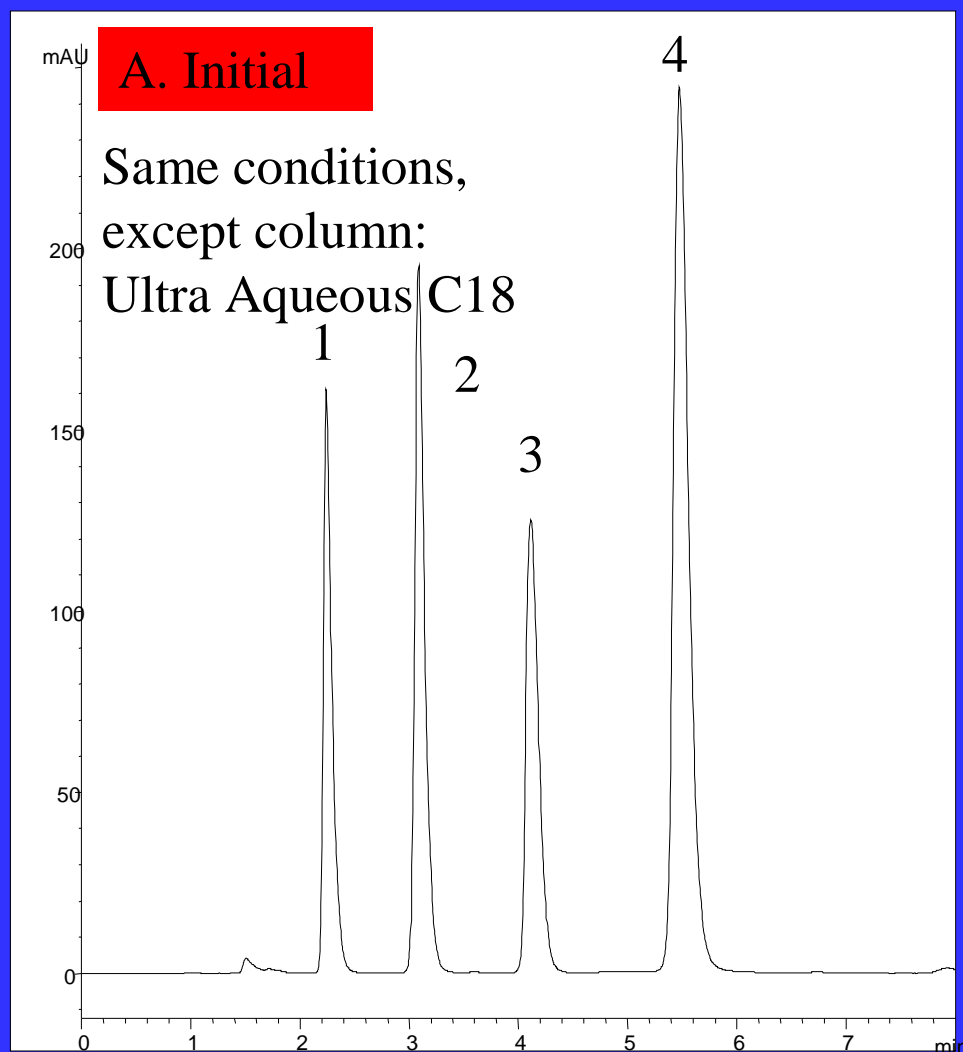
The Ultra Aqueous C18 Column

- Provides reproducible retention
- Provides stability, even when stored in highly aqueous mobile phases
- Prepared using Type B, high purity silica
- True C18 phase (USP L1)

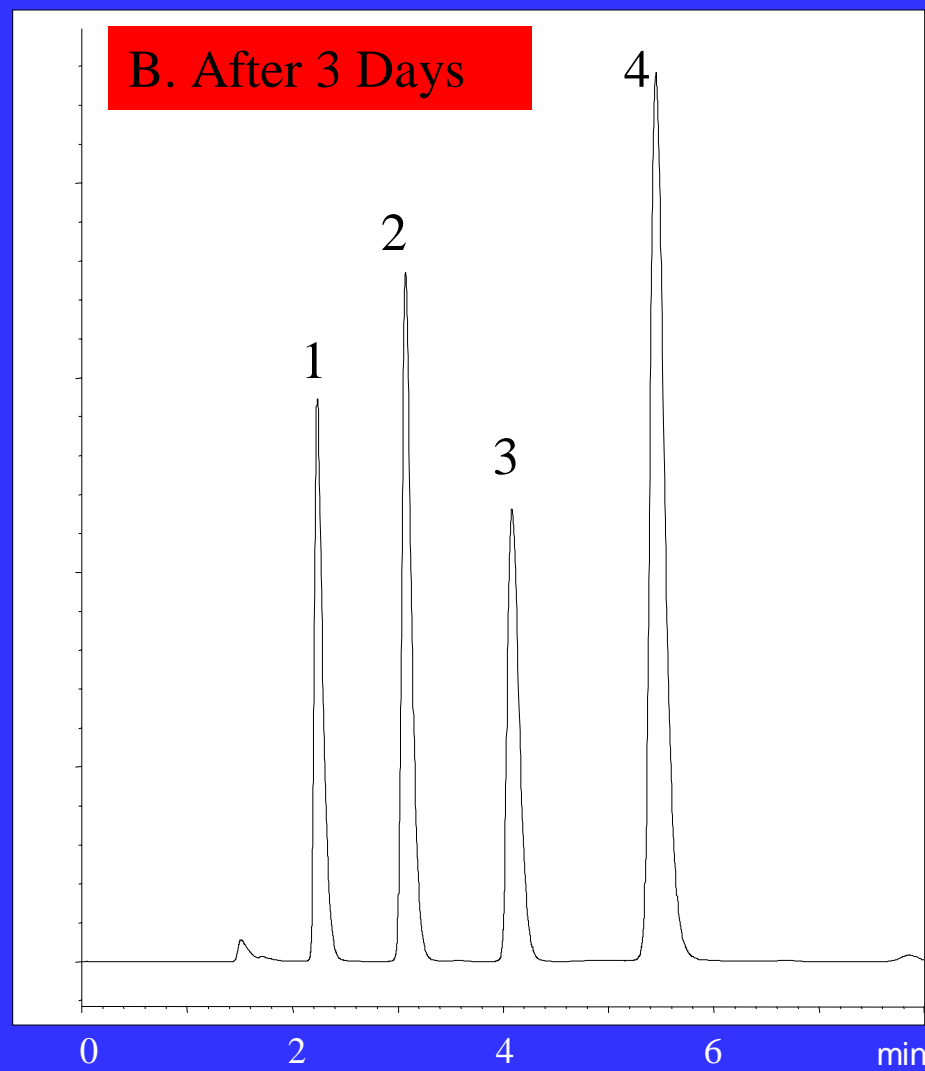
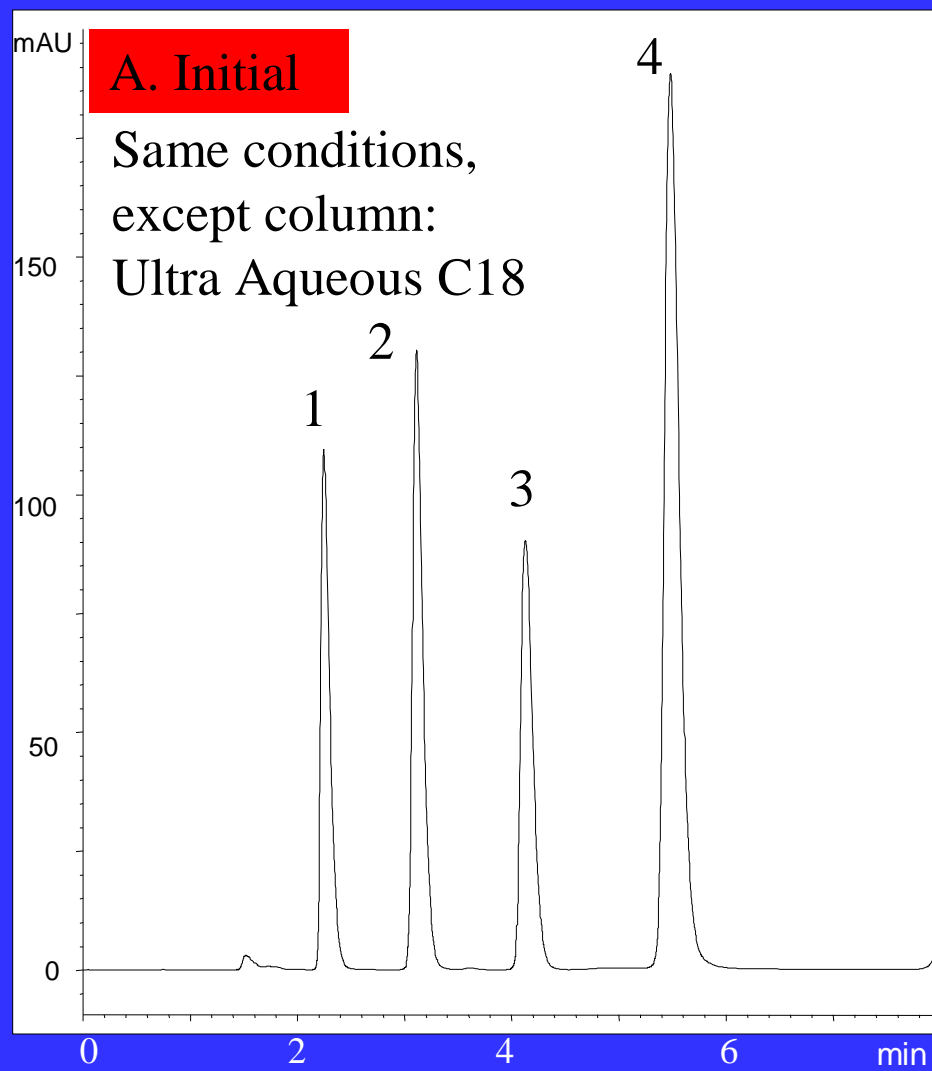
Chain Folding with a Conventional C18 Column



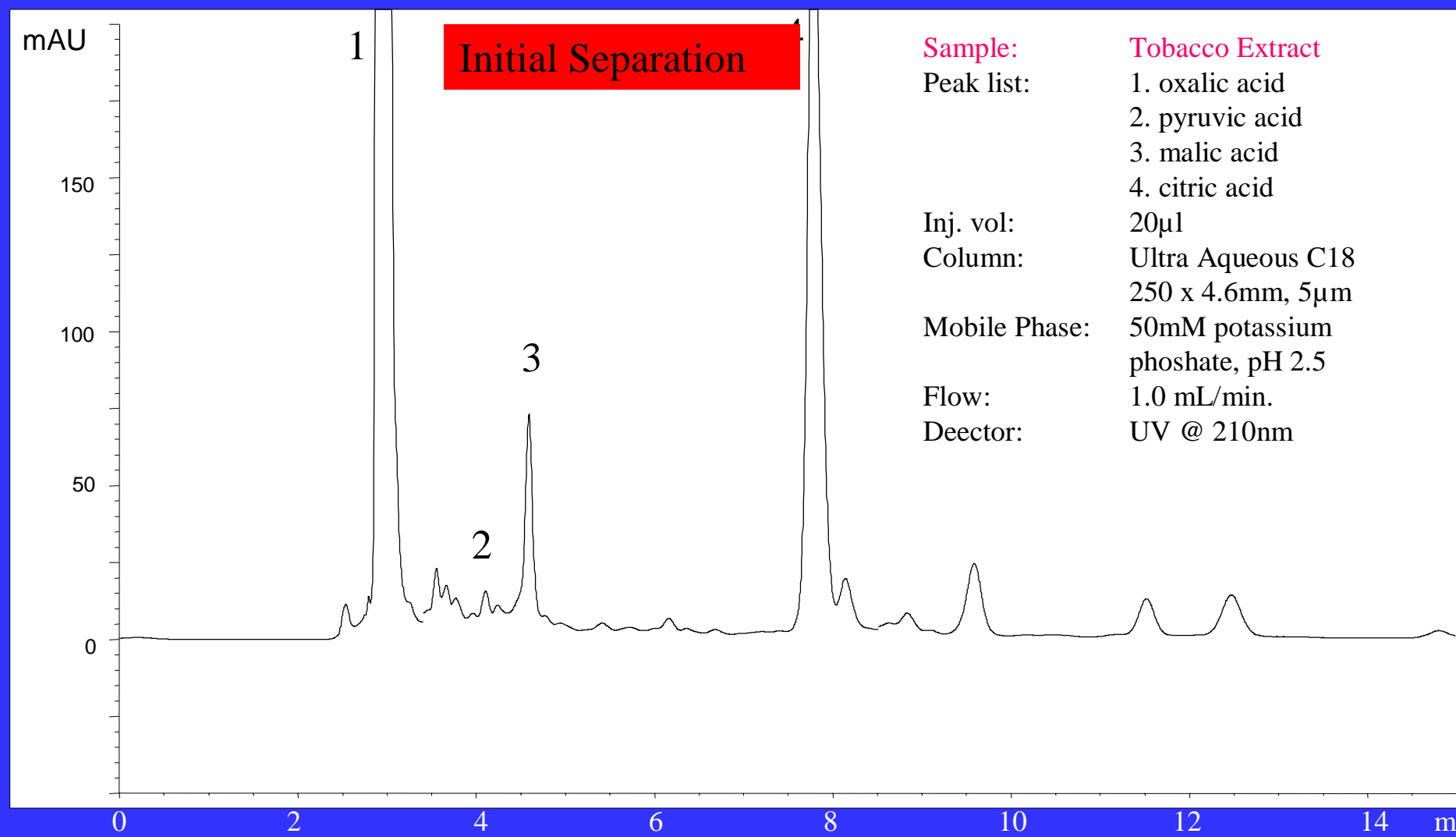
Stability of the Ultra Aqueous C18 Column



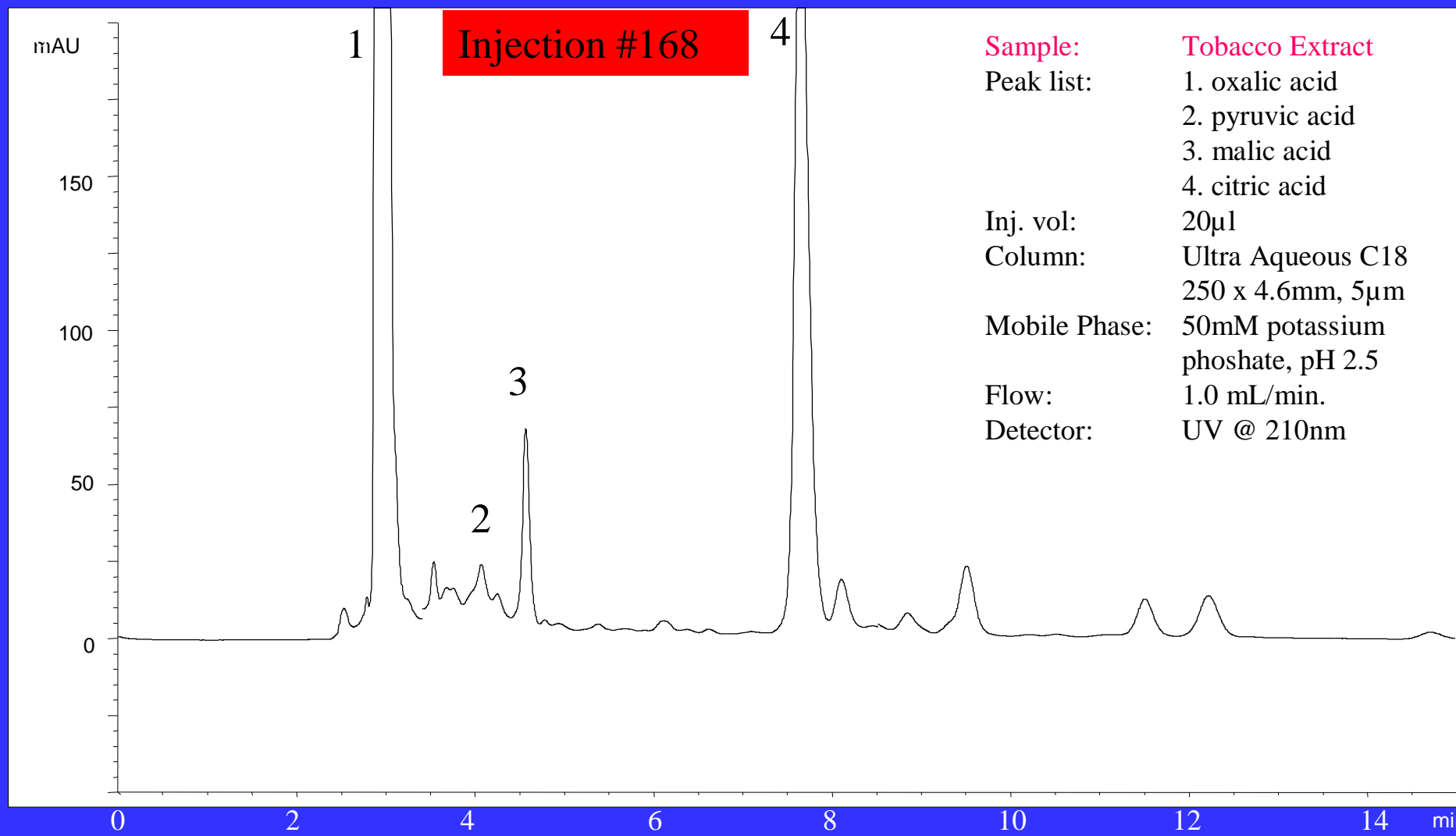
Stability of the Ultra Aqueous C18 Column



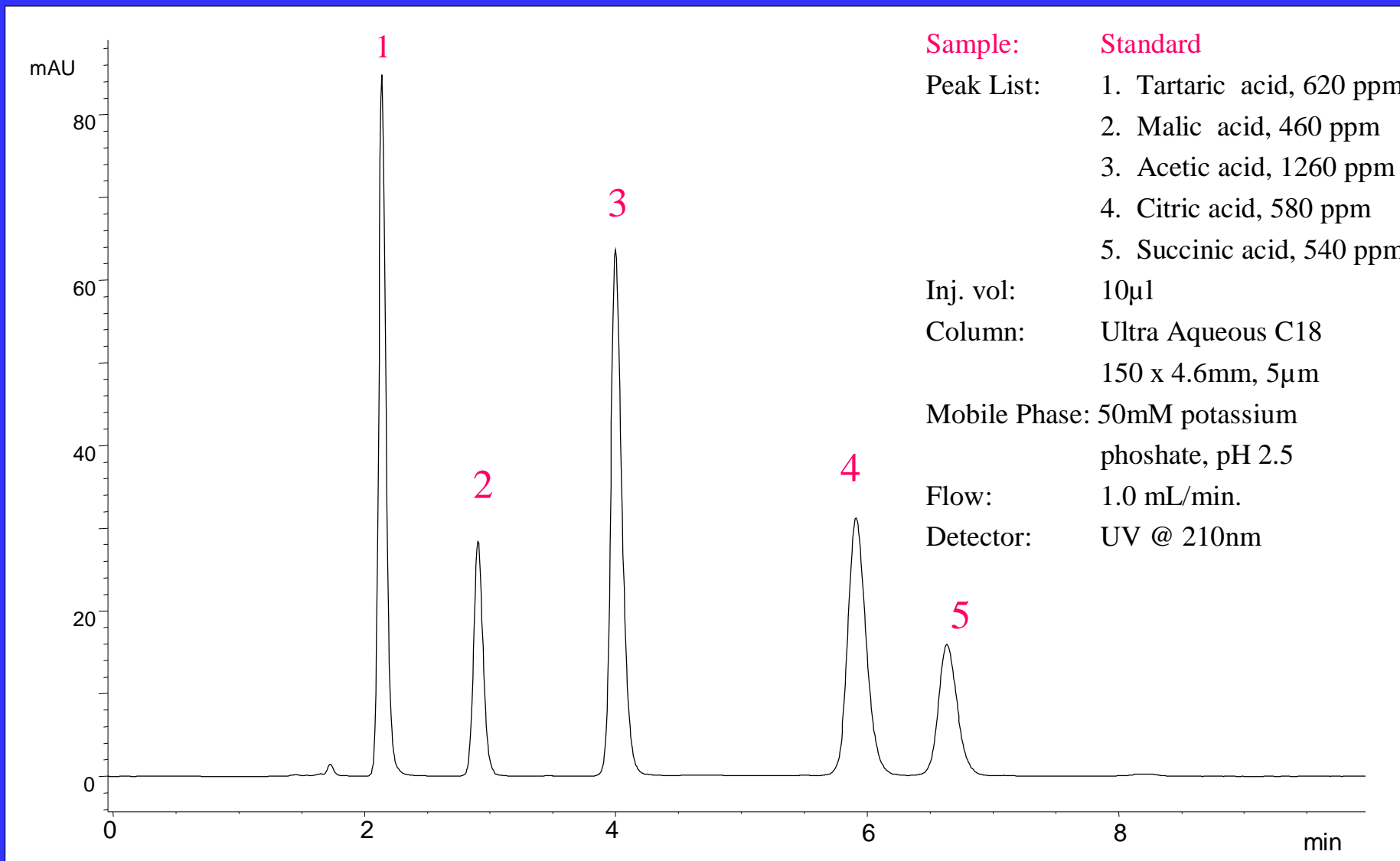
Tobacco Extract: Ultra Aqueous C18 Column



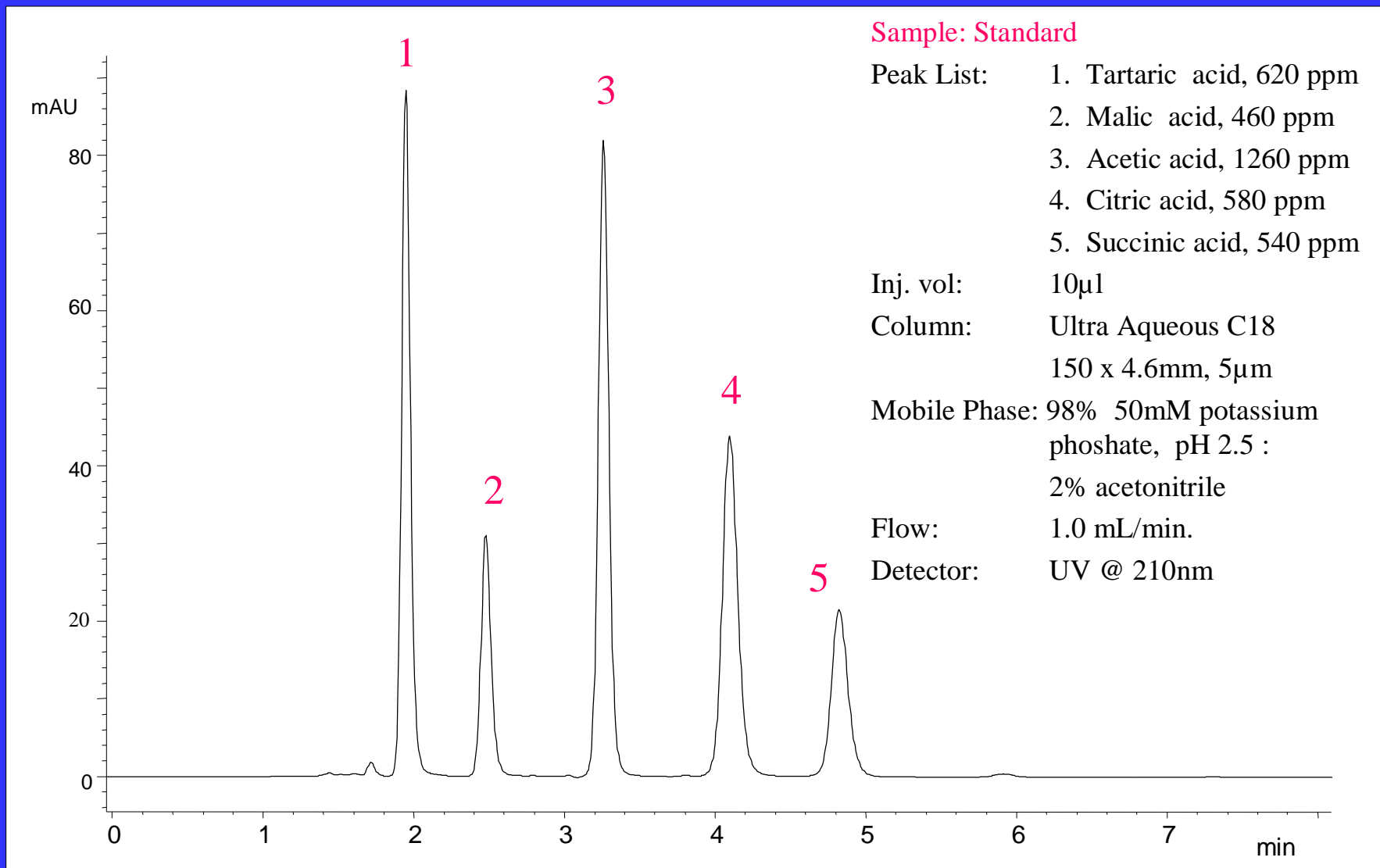
Tobacco Extract: Ultra Aqueous C18 Column



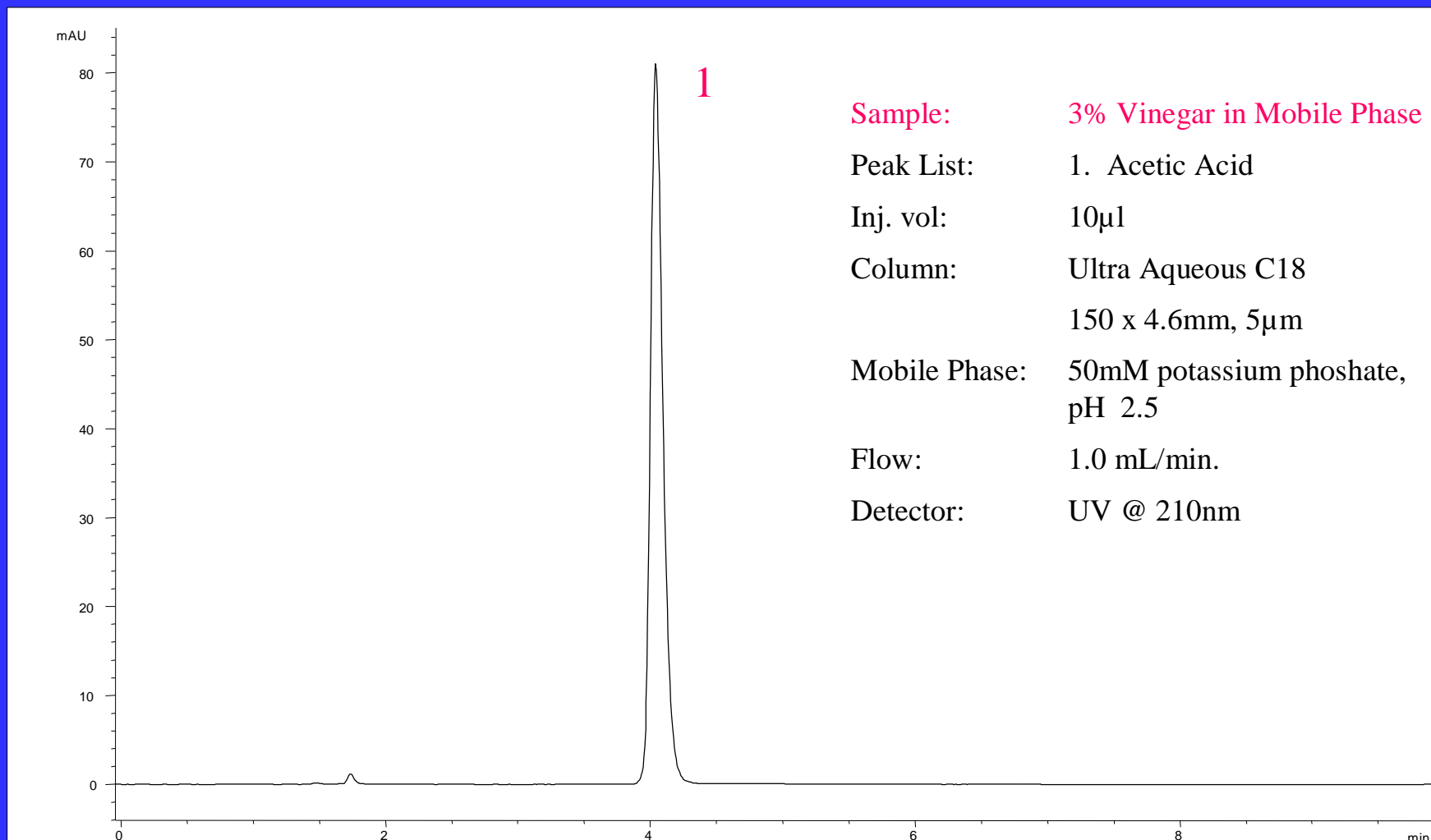
Foods & Beverage Organic Acids Standard



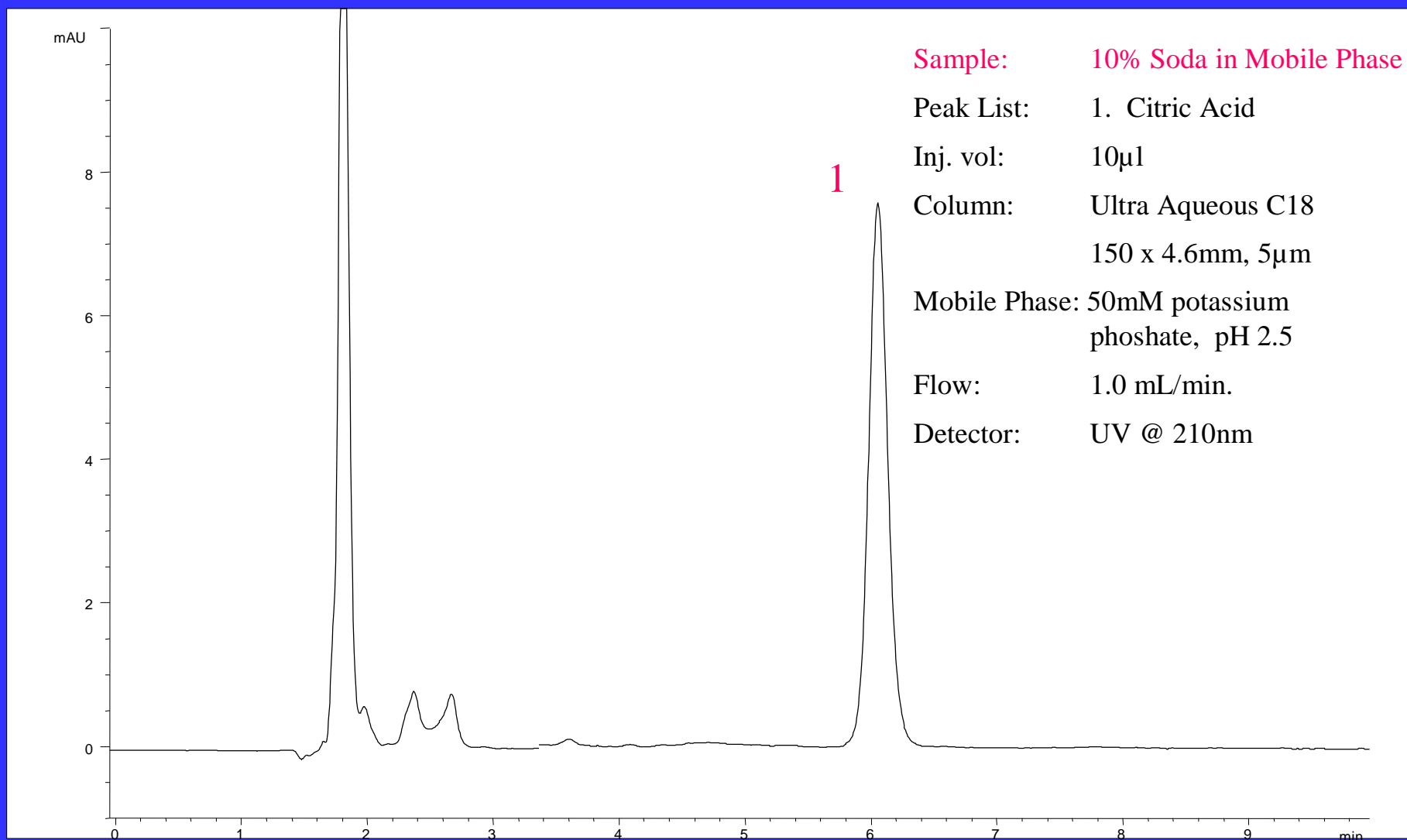
Foods & Beverage Organic Acids Standard



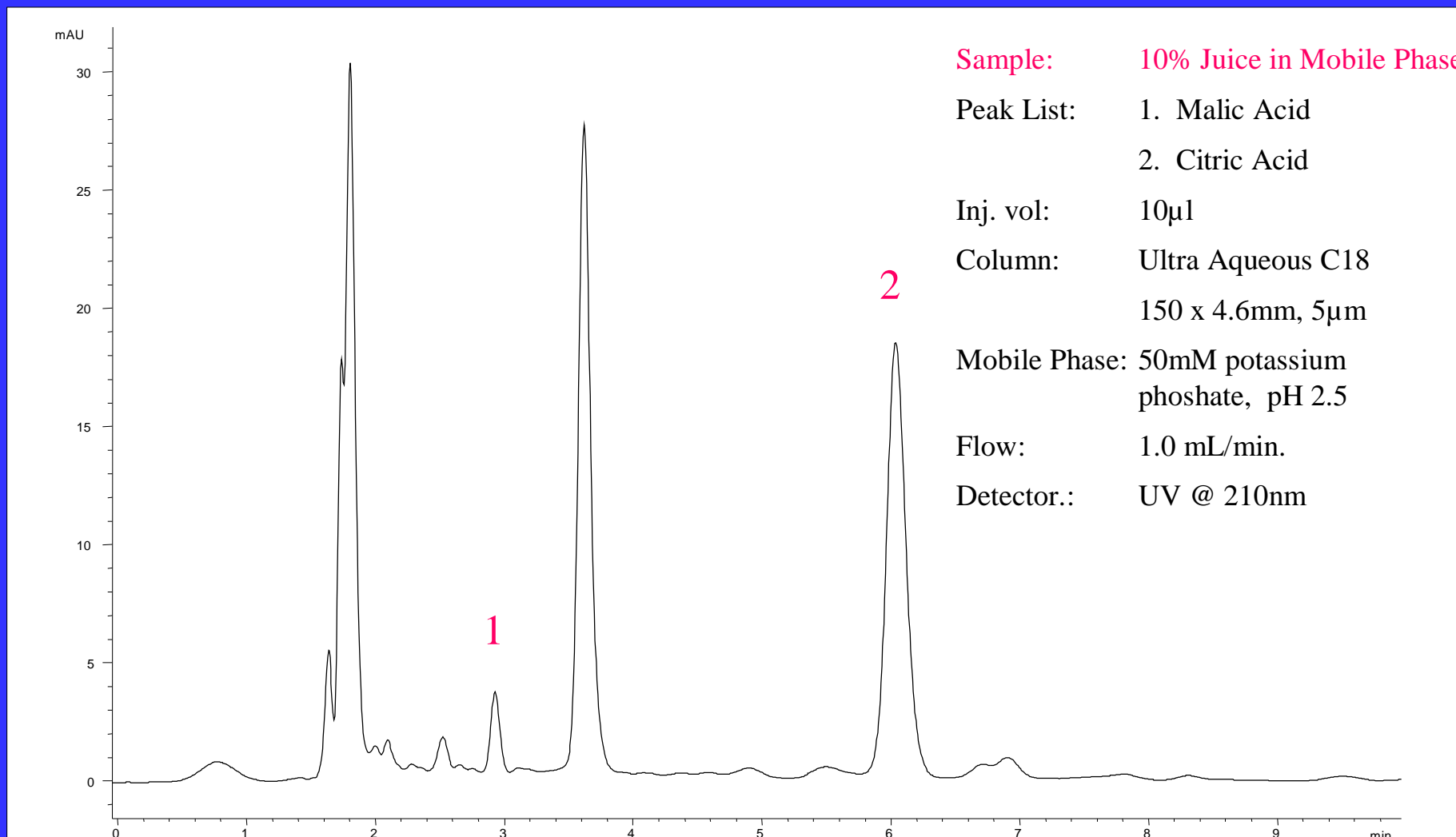
Organic Acids: Vinegar



Organic Acids: Lemon-Lime Soft Drink



Organic Acids: Orange-Mango Juice



Conclusions

- ❑ The Ultra Aqueous C18 column provides enhanced retention of organic acids
- ❑ Stable and reproducible retention is possible, even with highly aqueous mobile phases
- ❑ Columns with added polar functionalities can be advantageous for analyzing a wide range of polar compounds, including:
 - ❑ Carboxylic acids
 - ❑ Vitamins
 - ❑ Nutraceuticals
 - ❑ Pesticides