



Simultaneous Determination of Roxarsone and Nitarosone in Poultry Feed Waters using Liquid Chromatography-Mass Spectrometry



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Objective

- Develop an efficient and sensitive method to simultaneously detect and quantify roxarsone and nitarosone in poultry farm waters using liquid chromatography-mass spectrometry (LC-MS).

Introduction

- Organoarsenicals have been used as feeding additives in poultry operations.

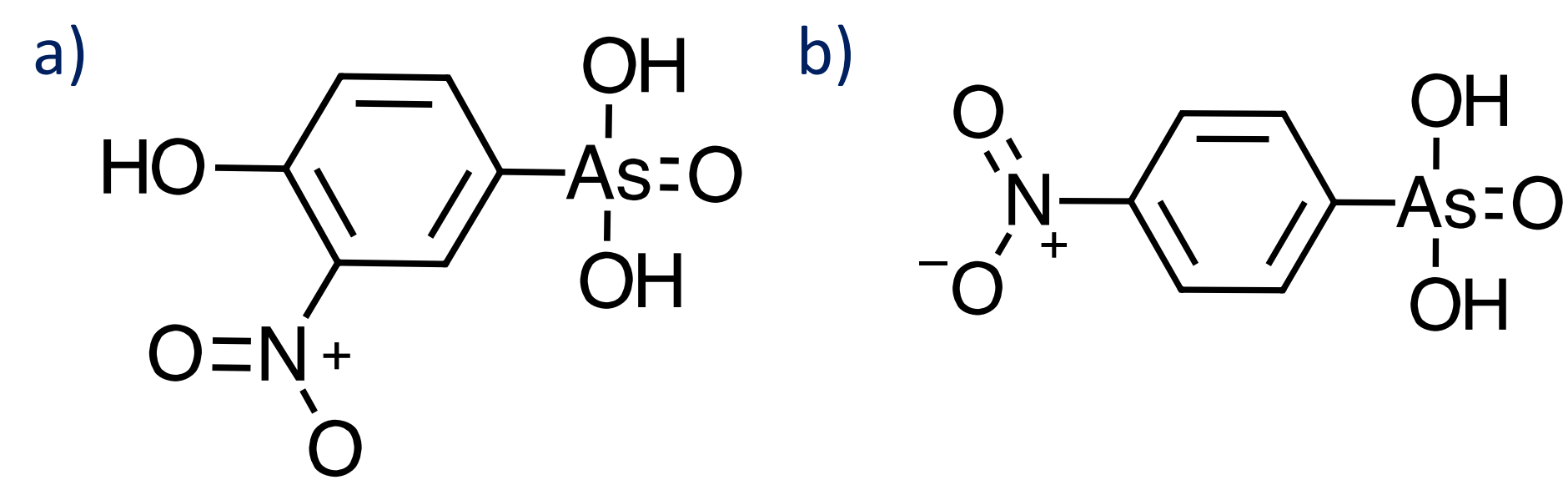


Figure 1. Chemical structure of a) roxarsone and b) nitarosone.

- More than 90% of the dietary organoarsenic additives are excreted unchanged.
- Land application of poultry litter as fertilizer introduces them into the environment.
- The degradation products, arsenic and its derivatives, are more toxic and mobile than the organoarsenicals, therefore pose a treat to soil and ground water quality.

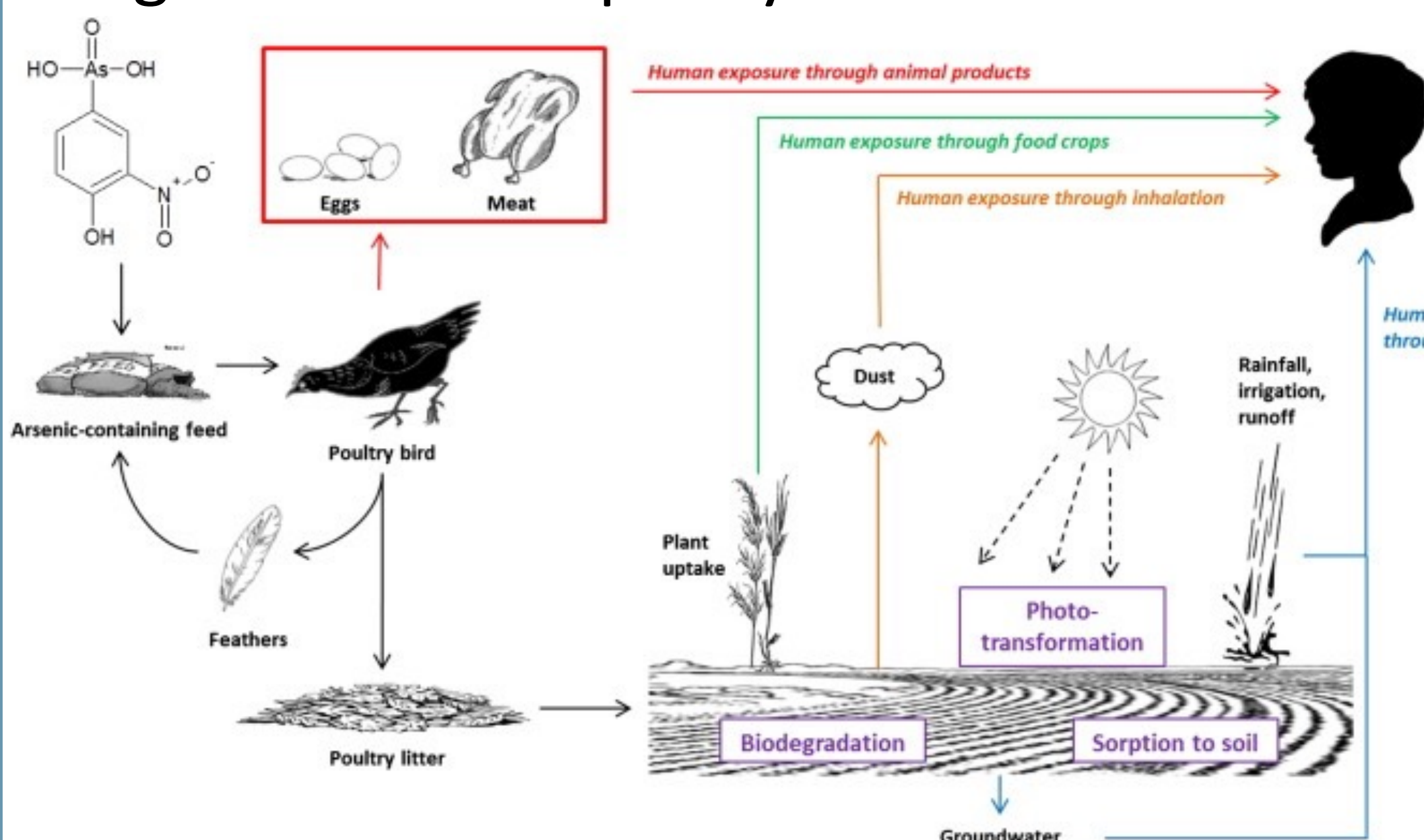


Figure 2. Fate of organoarsenicals used as feeding additives.

Experimental

Instrument:

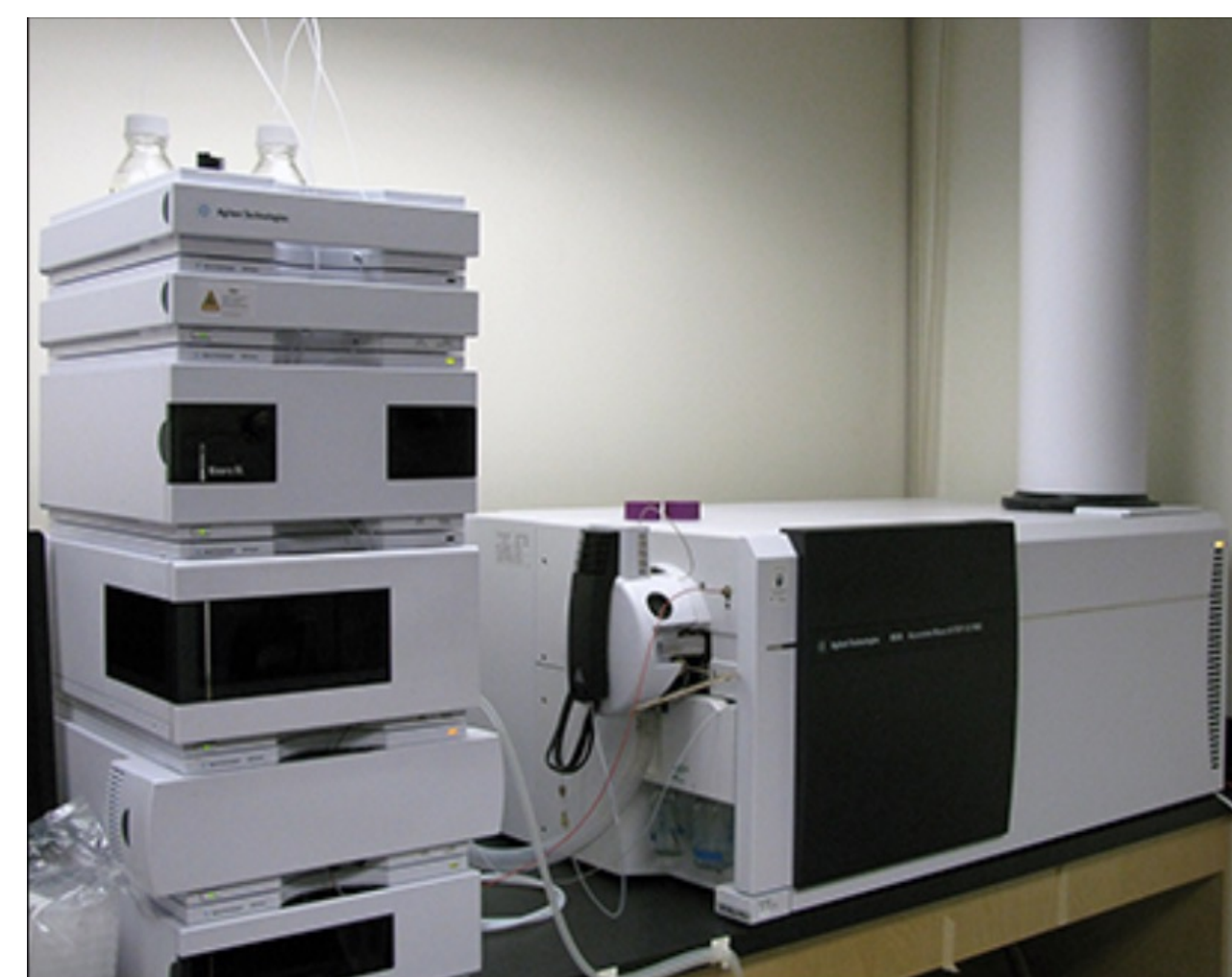


Figure 3. Agilent 1200 LC coupled to Agilent G6530 Q-TOF MS.

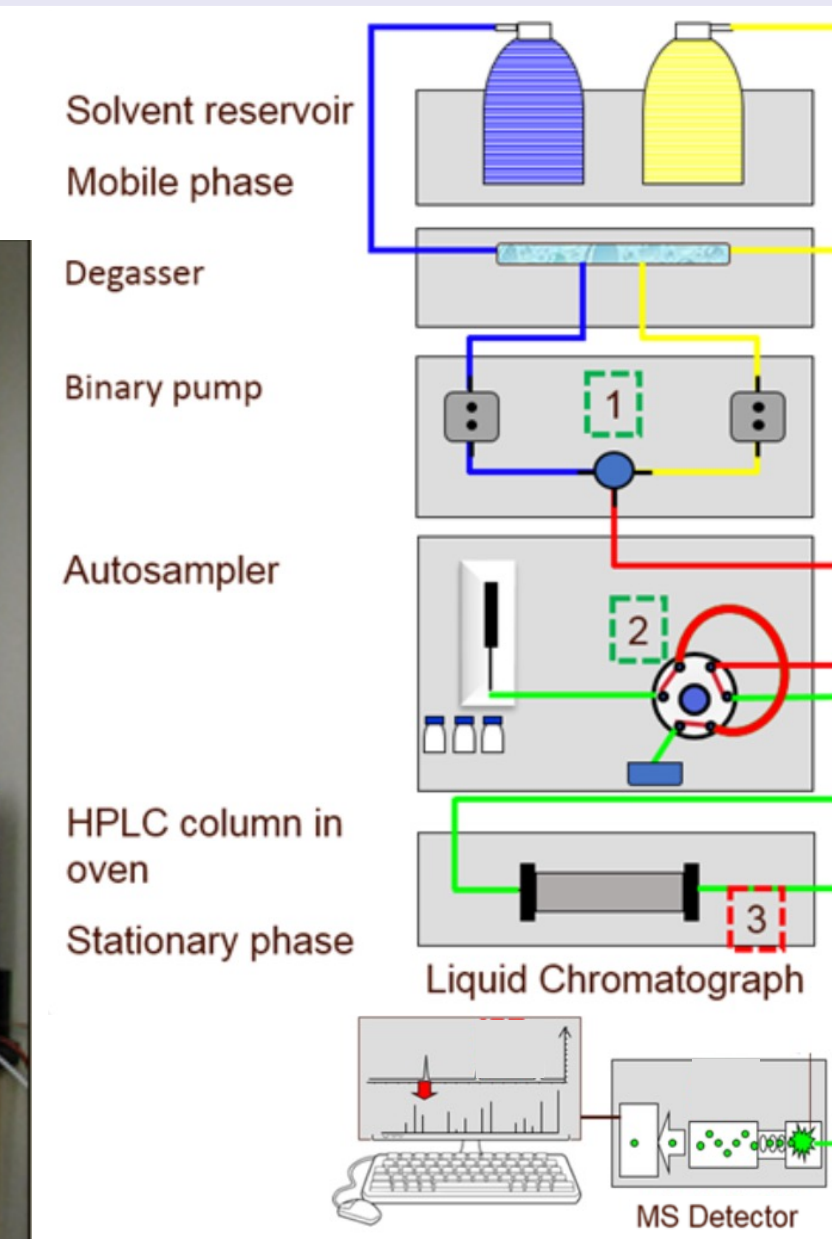


Figure 4. Schematic of LC-MS components.

Method:

- Roxarsone and nitarosone standards were prepared with concentrations ranging from 0.5 ppm to 20 ppm.
- Five farm water samples were collected and filtered with 0.45 μm Nylon[®] syringe filters.
- Samples were labelled R1 (river sullendus), R2 (river), R3 (river), T1 (trough) and TW (trough waste).

Table 1. Instrument parameters for Agilent 1200 LC system and Agilent G6530 Q-TOF MS.	
Injection volume	5 μL
Flow rate	0.4 mL/min
Solvent compositions	A: 0.2% Formic acid in water B: 0.2% Formic acid in ACN
Conditions	Isocratic at 60% A and 40% B
Analysis time	15 minutes
Column	Agilent Eclipse Plus C18 (1.8 μm , 2.1x100mm)
Ion source	ESI
Ion polarity	Positive
Gas temperature	300 $^{\circ}\text{C}$
Drying gas	8 L/min
Nebulizer	35 psig
Sheath gas temperature	350 $^{\circ}\text{C}$
Sheath gas flow	10 L/min
Vcap	3500 V
Fragmental voltage	175 V
Mass range	100-500 m/z

Results

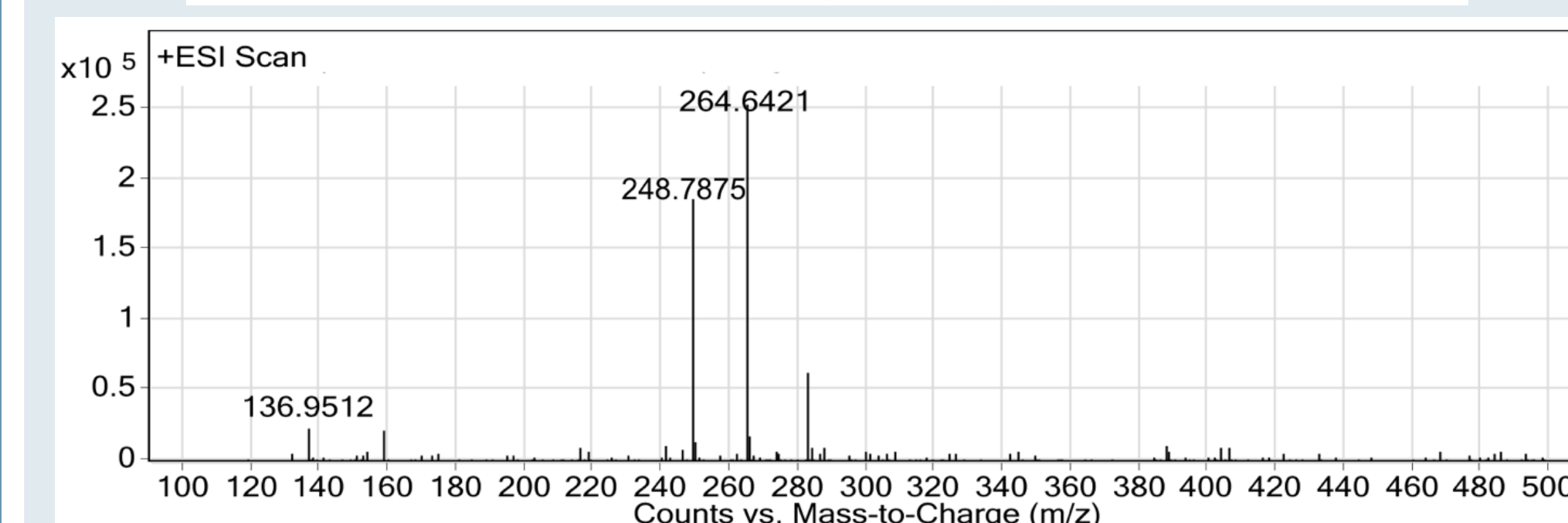
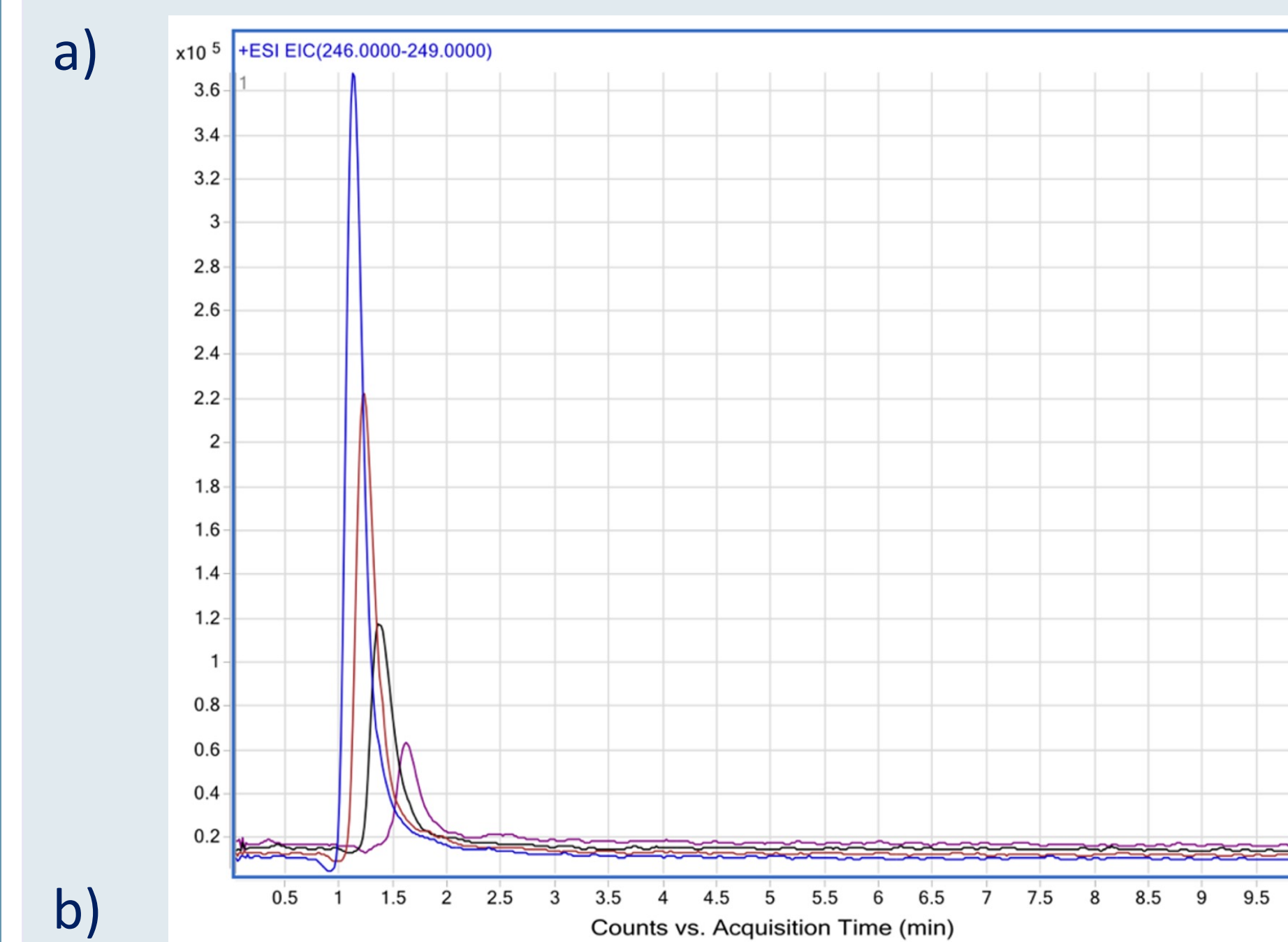


Figure 5. a) Chromatogram of nitarosone standards and b) MS spectra of the 20 ppm standard.

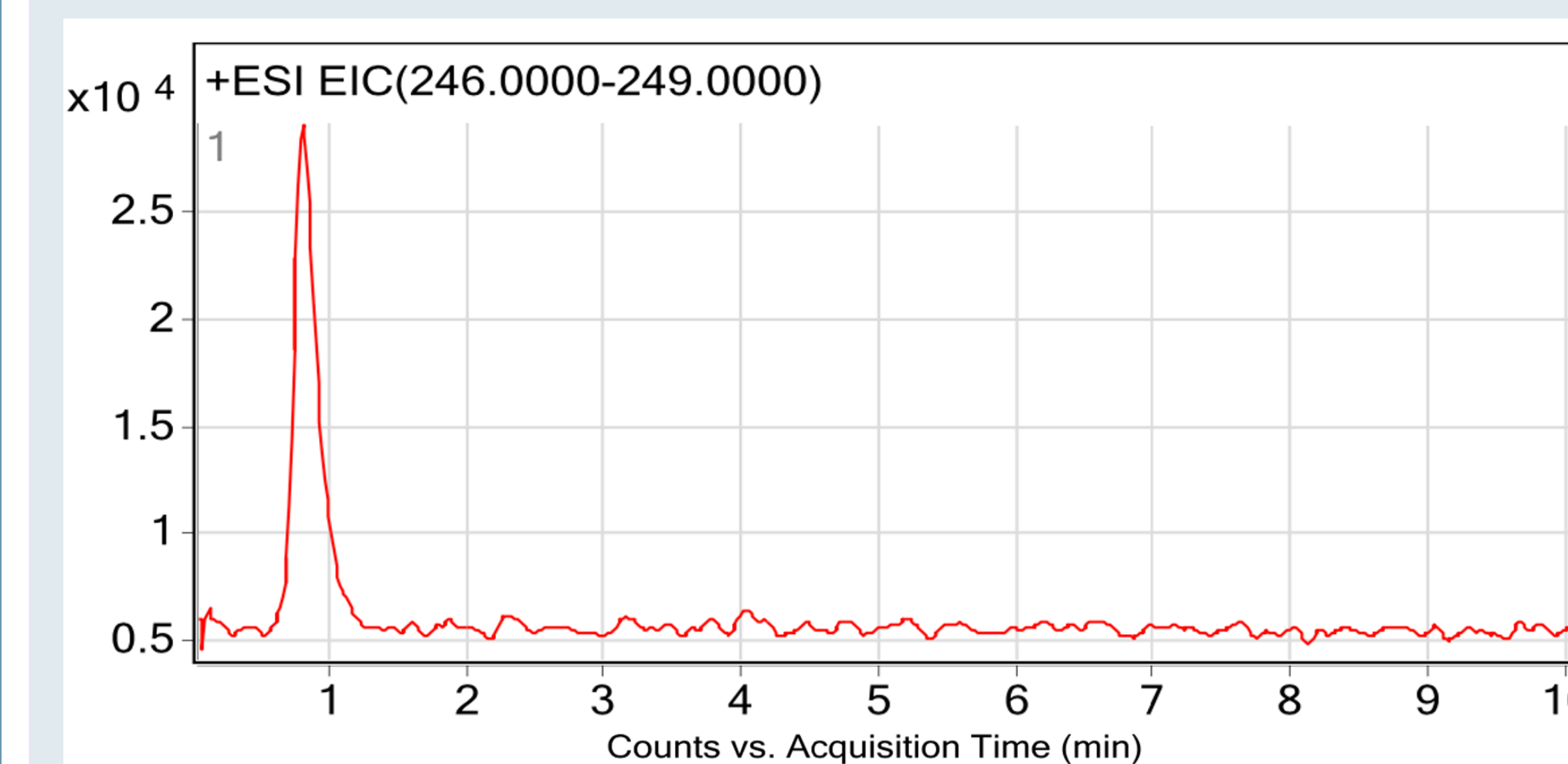


Figure 6. Chromatogram of nitarosone from TW sample.

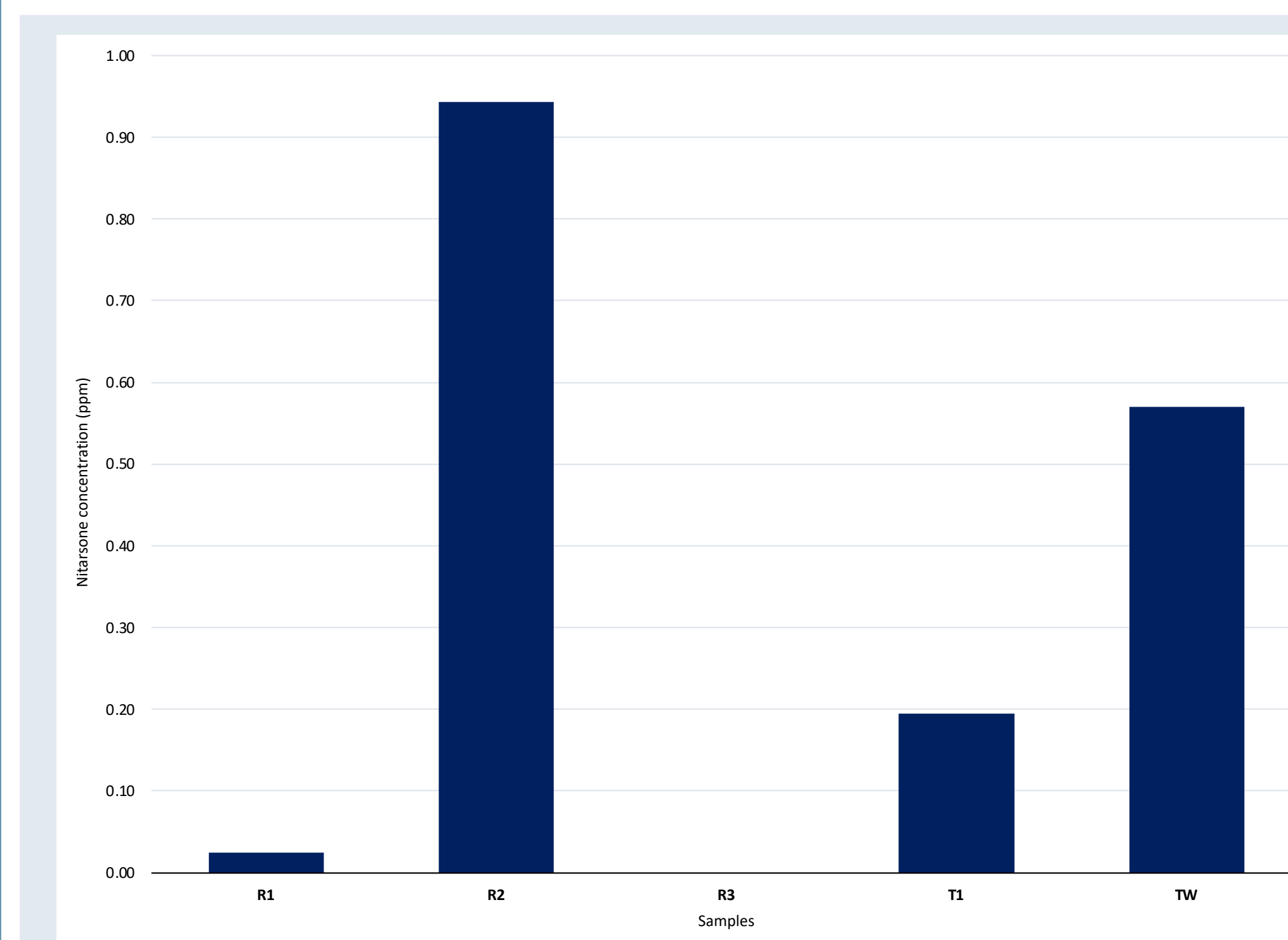


Figure 7. Nitarosone concentrations of farm water samples.

Conclusion

- Chromatograms show an increase in peak area relative to increasing nitarosone concentration.
- Traceable levels of nitarosone were detected in 4 of the 5 water samples.
- Roxarsone was not detected in the samples and the chromatograms of the standard solutions yielded no results.

Future work

- To further improve the method for the detection and quantification of roxarsone.
- Compare concentrations to reported values detected using a capillary electrophoresis method as well as concentrations obtained from an HPLC method.

Acknowledgements

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References

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