

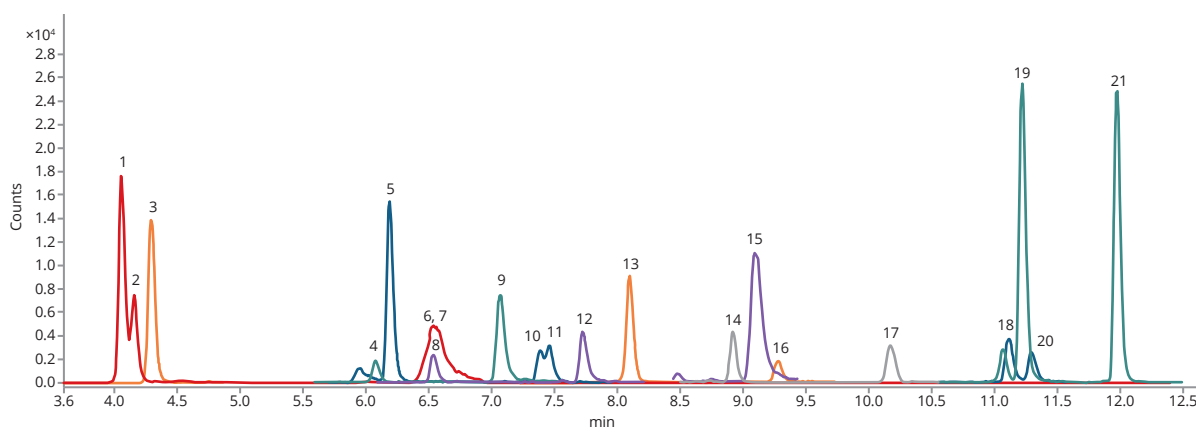
Pyrrolizidine alkaloids in herbal tea

Pyrrolizidine alkaloids belong to a class of plant toxins, which are associated with diseases in human and animal bodies.

Substance

1. Lycopsamine N-oxide, CAS number 95462-15-0
2. Intermedine N-oxide, CAS number 95462-14-9
3. Europine N-oxide, CAS number 65582-53-8
4. Retrorsine N-oxide (Isatidine), CAS number 15503-86-3
5. Heliotrine N-oxide, CAS number 6209-65-0
6. Lycopsamine, CAS number 10285-07-1
7. Intermedine (Indicine), CAS number 10285-06-0
8. Seneciphylline N-oxide, CAS number 38710-26-8
9. Europine, CAS number 570-19-4
10. Senecivernine N-oxide, CAS number 101687-28-9
11. Senecionine N-oxide, CAS number 13268-67-2
12. Senkirkine (Renardine), CAS number 2318-18-5
13. Echimidine N-oxide, CAS number 41093-89-4
14. Lasiocarpine N-oxide, CAS number 127-30-0
15. Heliotrine, CAS number 303-33-3
16. Retrosine, CAS number 480-54-6
17. Seneciphylline, CAS number 480-81-9
18. Senecivernine, CAS number 72755-25-0
19. Echimidine, CAS number 520-68-3
20. Senecionine (Aureine), CAS number 130-01-8
21. Lasiocarpine, CAS number 303-34-4

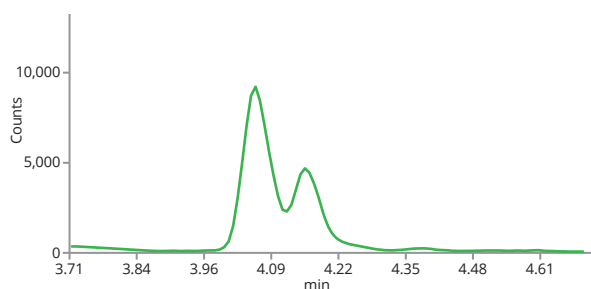
Pyrrolizidine alkaloids in herbal tea



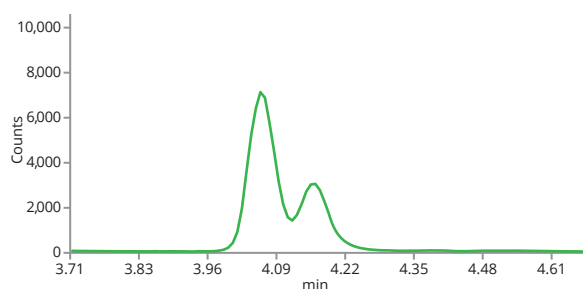
Total chromaogram of sample on ARION® column

Column	ARION® Plus C18, 2.2 µm
Dimensions	100 mm × 2.1 mm
Part number	ARI-5720-EI21
Mobile phase	10 mM ammonium carbonate in water/ACN (LC-MS grade) (v/v) Isocratic
Flow rate	0.4 mL/min
Temperature	40 °C
Detection	LC-MS/MS
Injection volume	5 µL

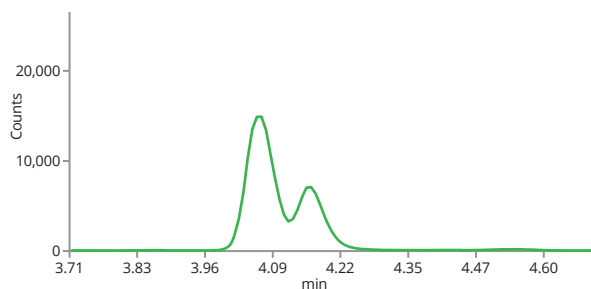
Pyrrolizidine alkaloids in herbal tea



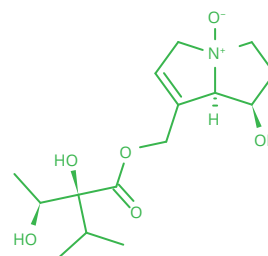
Lycopsamine N-oxide (316.2->94.0)



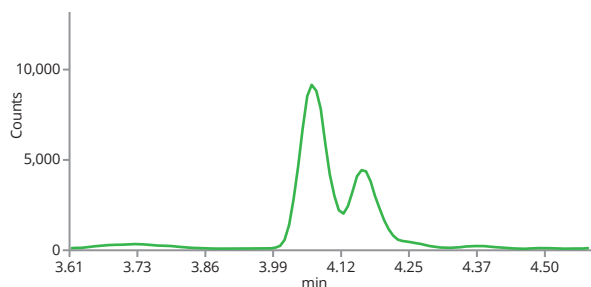
Lycopsamine N-oxide (316.2->111.0)



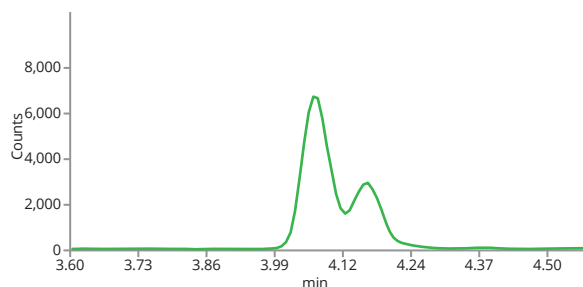
Lycopsamine N-oxide (316.2->172.0)



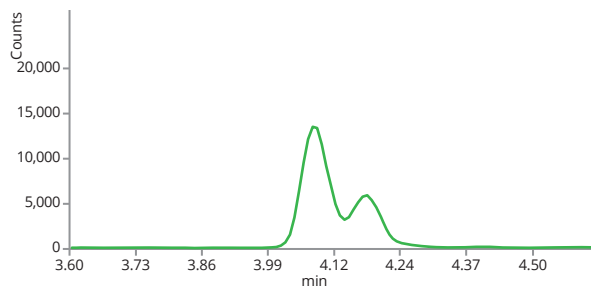
Lycopsamine N-oxide



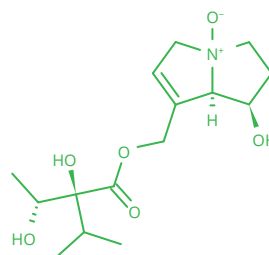
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

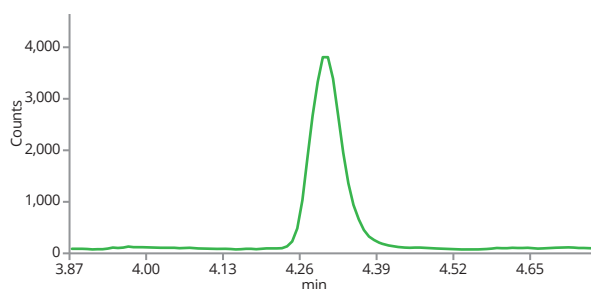


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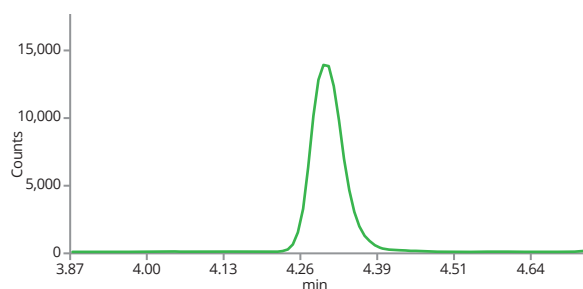


Intermedine N-oxide

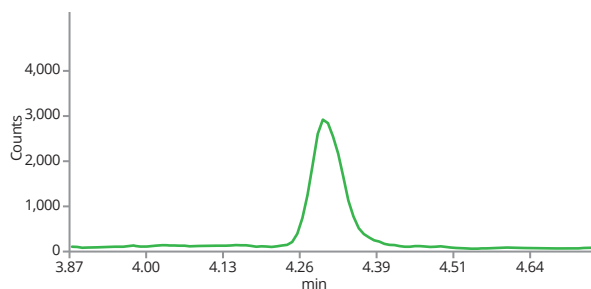
Pyrrolizidine alkaloids in herbal tea



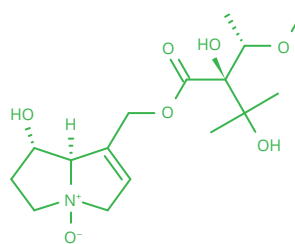
Lycopsamine N-oxide (316.2->94.0)



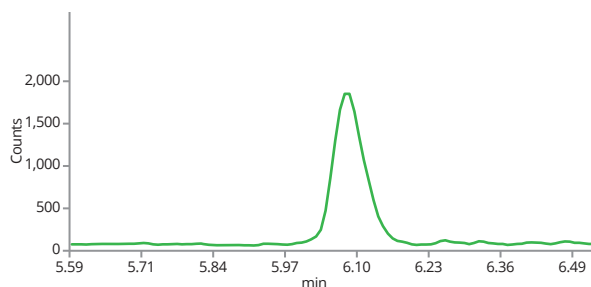
Lycopsamine N-oxide (316.2->111.0)



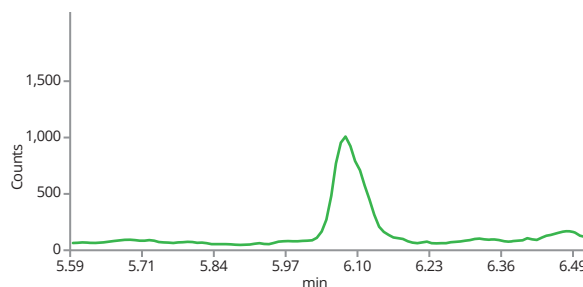
Lycopsamine N-oxide (316.2->172.0)



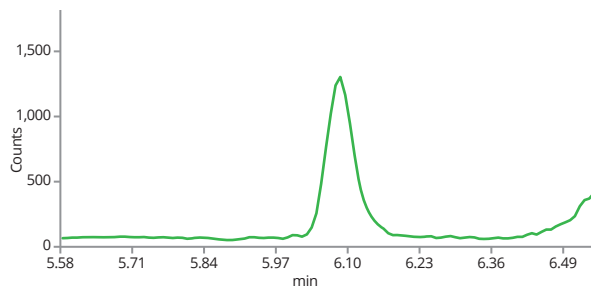
Europine N-oxide



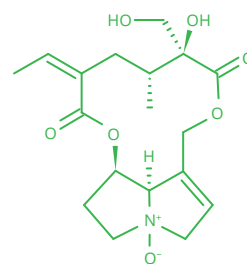
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

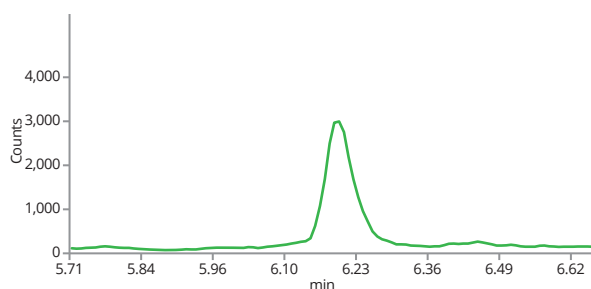


Intermedine N-oxide (316.2->172.0)

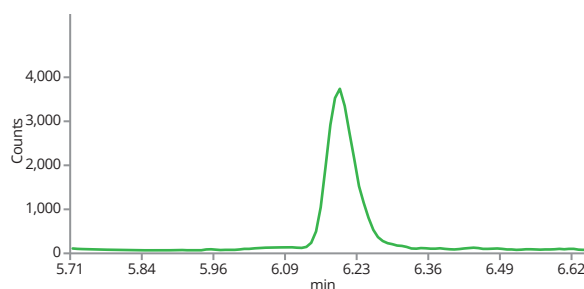


Retrorsine N-oxide

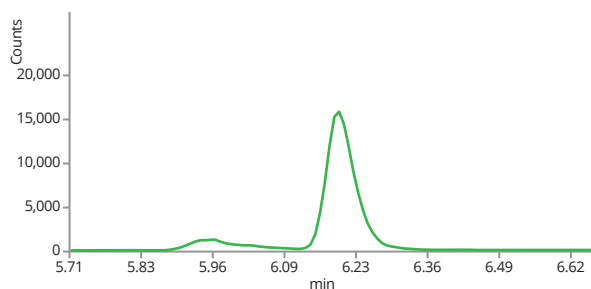
Pyrrolizidine alkaloids in herbal tea



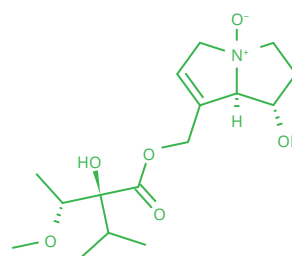
Lycopsamine N-oxide (316.2->94.0)



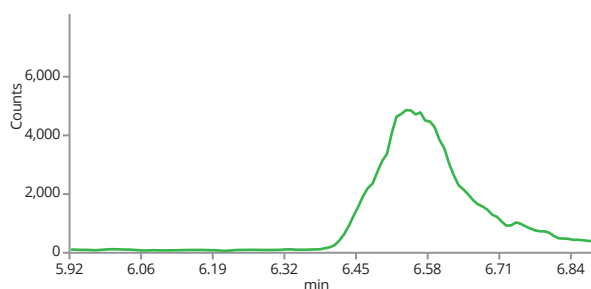
Lycopsamine N-oxide (316.2->111.0)



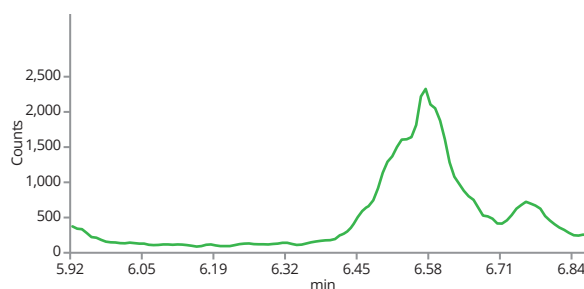
Lycopsamine N-oxide (316.2->172.0)



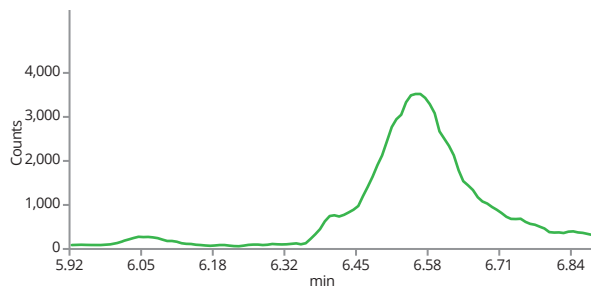
Heliotrine N-oxide



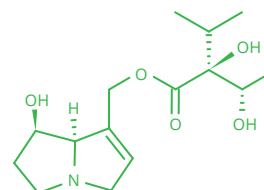
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

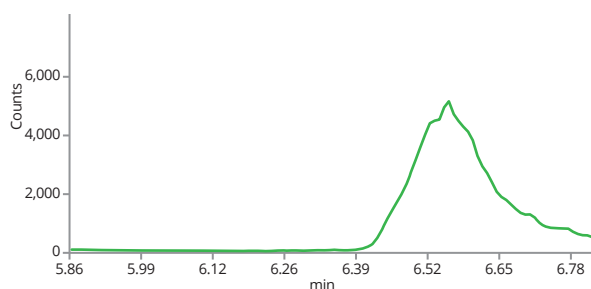


Intermedine N-oxide (316.2->172.0)

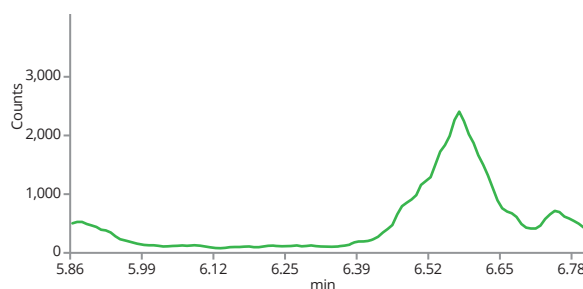


Lycopsamine

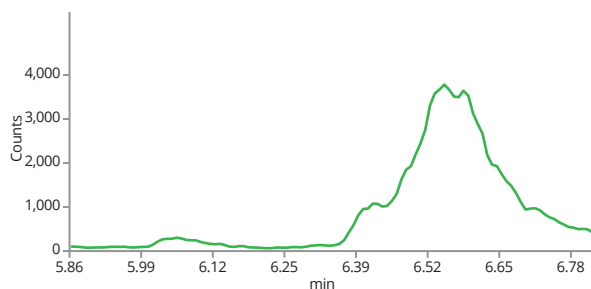
Pyrrolizidine alkaloids in herbal tea



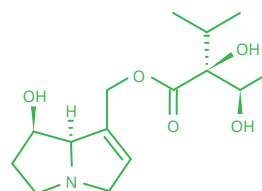
Lycopsamine N-oxide (316.2->94.0)



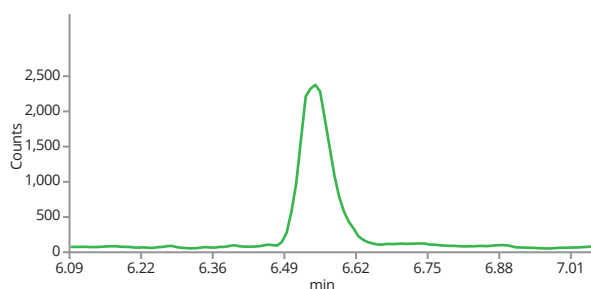
Lycopsamine N-oxide (316.2->111.0)



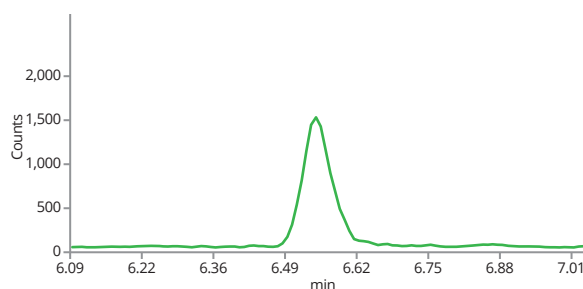
Lycopsamine N-oxide (316.2->172.0)



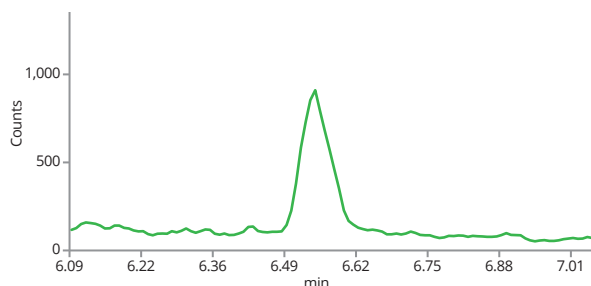
Intermedine



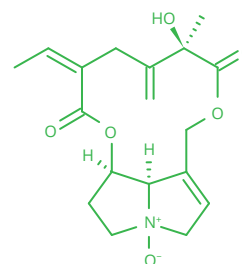
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

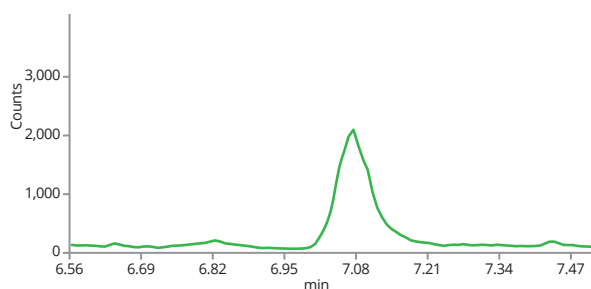


Intermedine N-oxide (316.2->172.0)

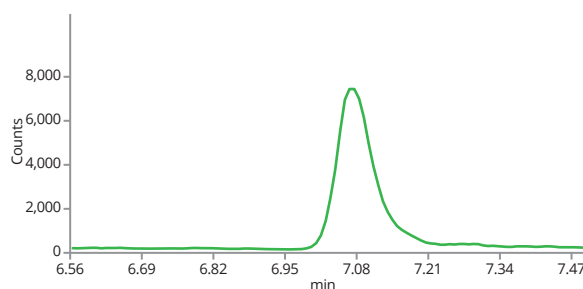


Seneciophylline N-oxide

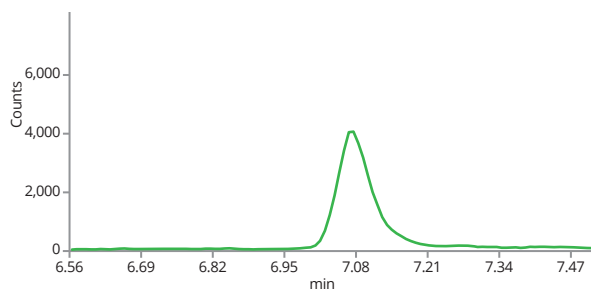
Pyrrolizidine alkaloids in herbal tea



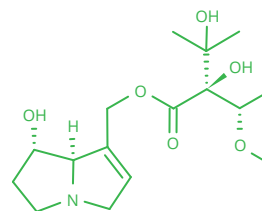
Lycopsamine N-oxide (316.2->94.0)



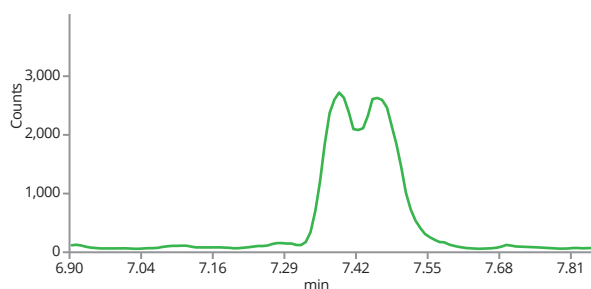
Lycopsamine N-oxide (316.2->111.0)



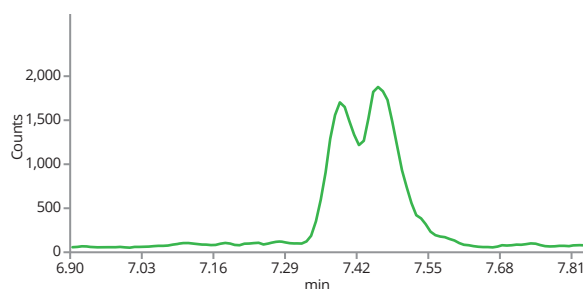
Lycopsamine N-oxide (316.2->172.0)



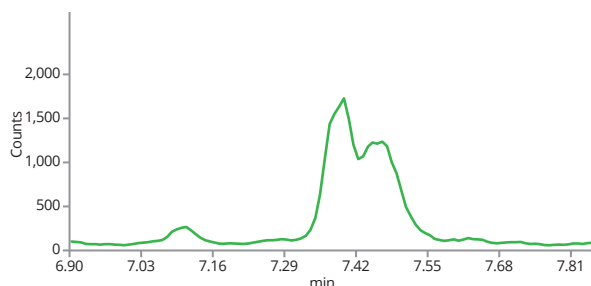
Europine



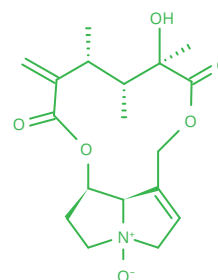
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

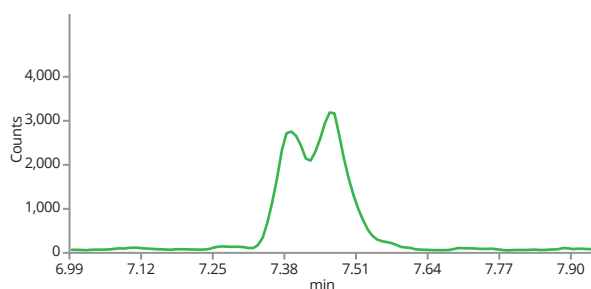


Intermedine N-oxide (316.2->172.0)

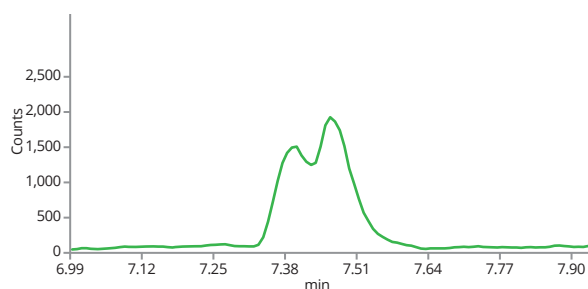


Senecivernine N-oxide

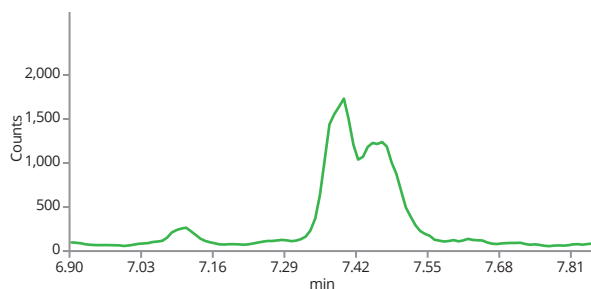
Pyrrolizidine alkaloids in herbal tea



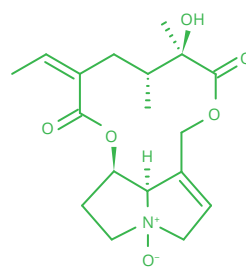
Lycopsamine N-oxide (316.2->94.0)



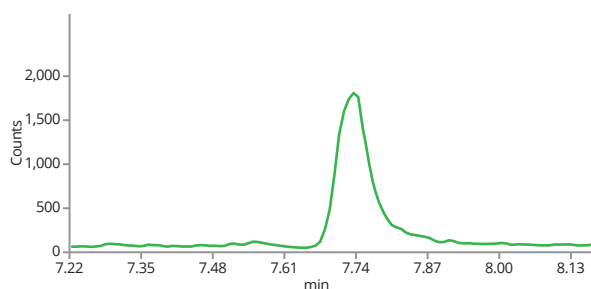
Lycopsamine N-oxide (316.2->111.0)



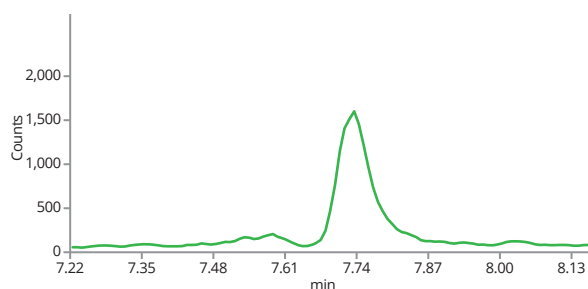
Lycopsamine N-oxide (316.2->172.0)



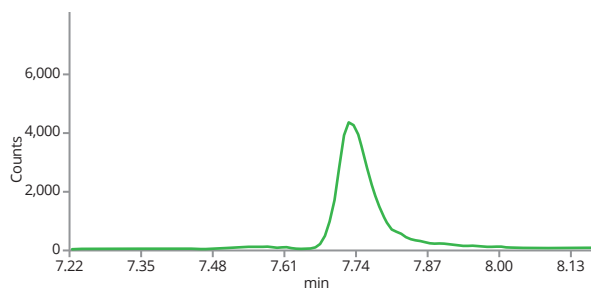
Senecionine N-oxide



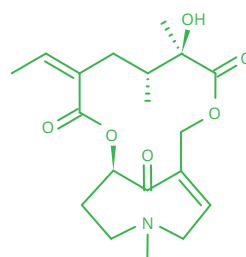
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

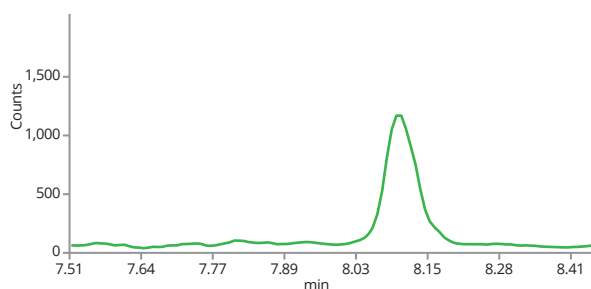


Intermedine N-oxide (316.2->172.0)

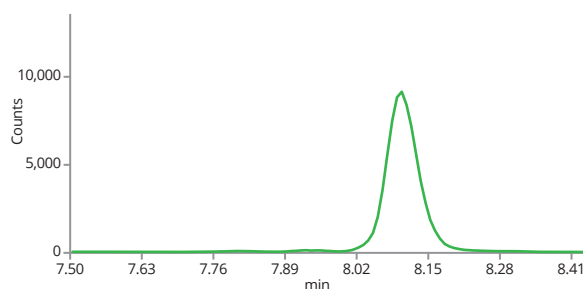


Senkirkine

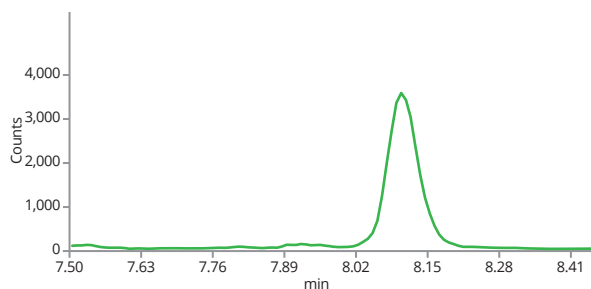
Pyrrolizidine alkaloids in herbal tea



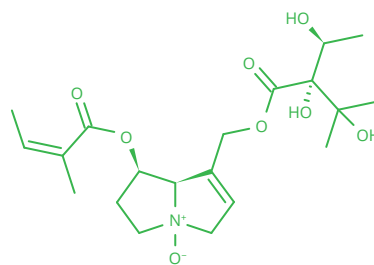
Lycopsamine N-oxide (316.2->94.0)



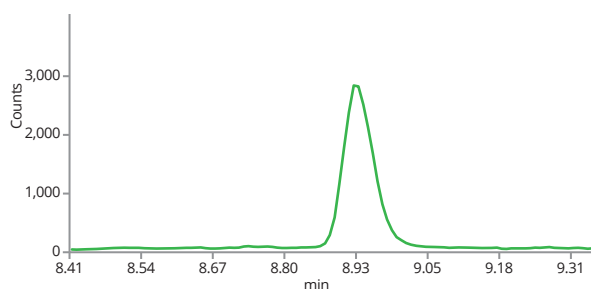
Lycopsamine N-oxide (316.2->111.0)



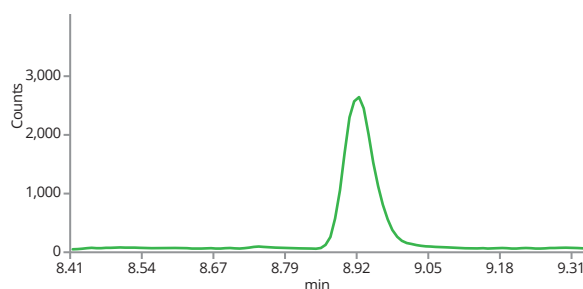
Lycopsamine N-oxide (316.2->172.0)



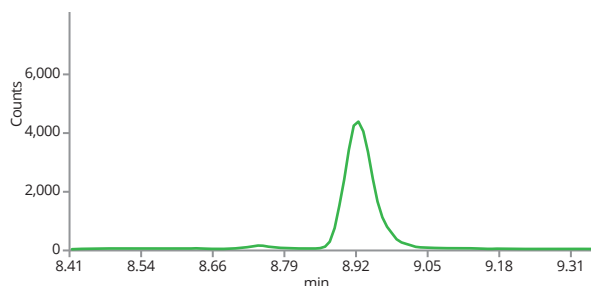
Echimidine N-oxide



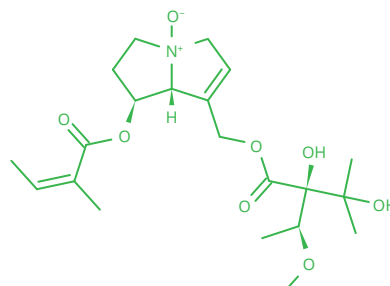
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

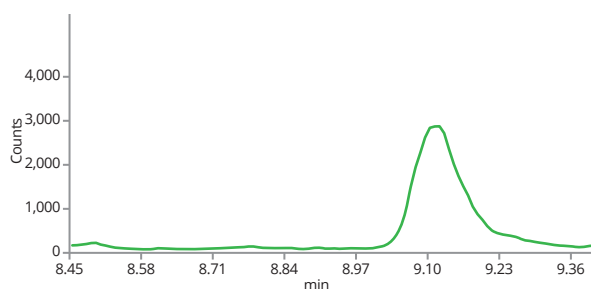


Intermedine N-oxide (316.2->172.0)

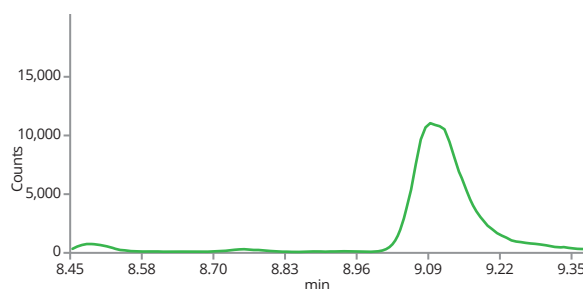


Lasiocarpine N-oxide

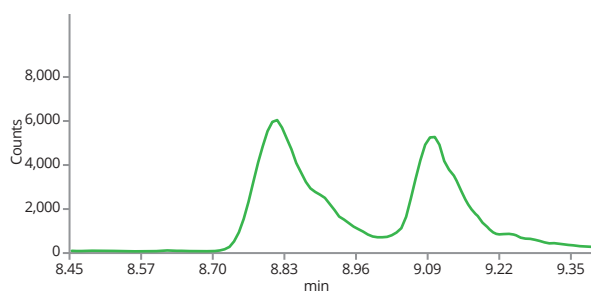
Pyrrolizidine alkaloids in herbal tea



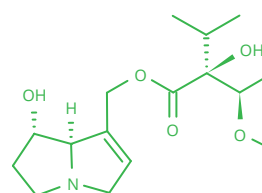
Lycopsamine N-oxide (316.2->94.0)



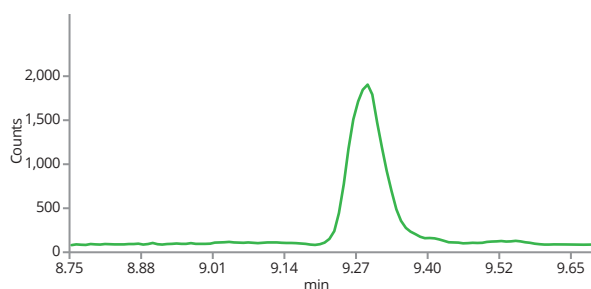
Lycopsamine N-oxide (316.2->111.0)



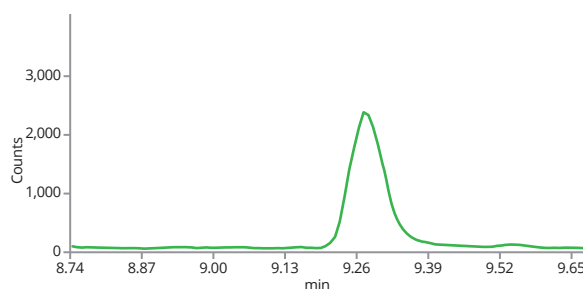
Lycopsamine N-oxide (316.2->172.0)



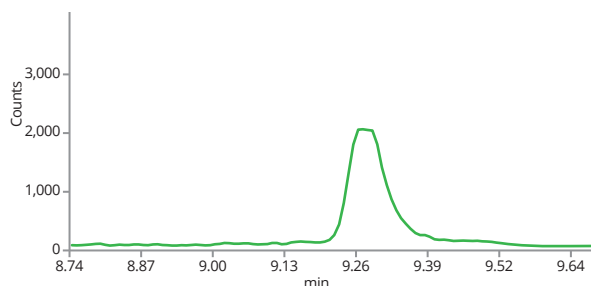
Heliotrine



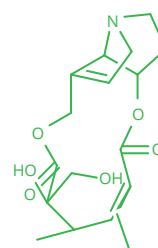
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

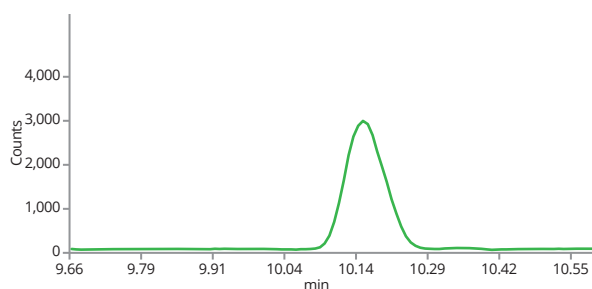


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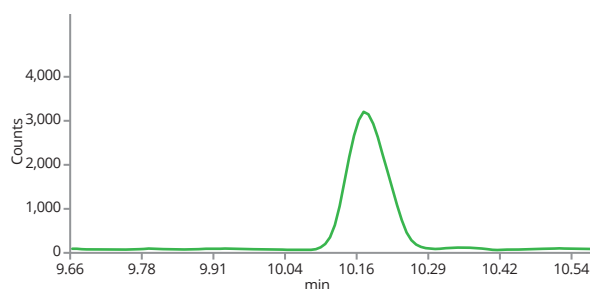


Retrorsine

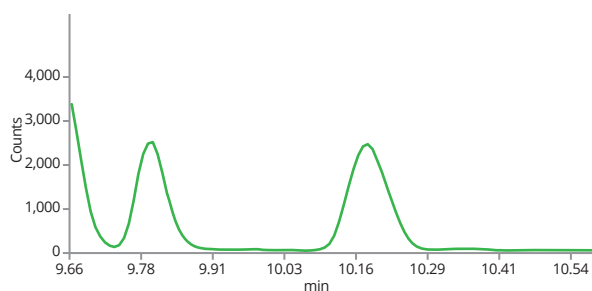
Pyrrolizidine alkaloids in herbal tea



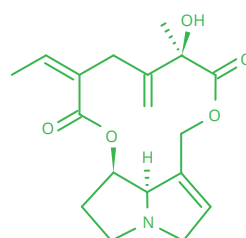
Lycopsamine N-oxide (316.2->94.0)



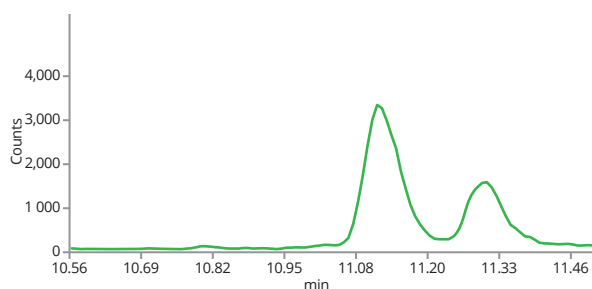
Lycopsamine N-oxide (316.2->111.0)



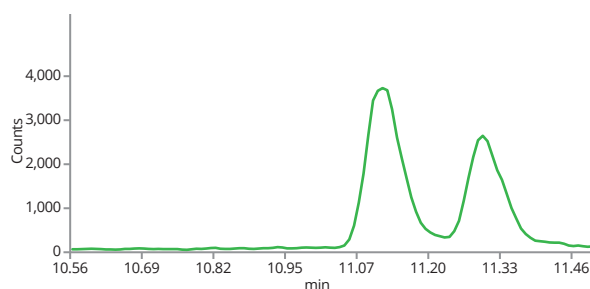
Lycopsamine N-oxide (316.2->172.0)



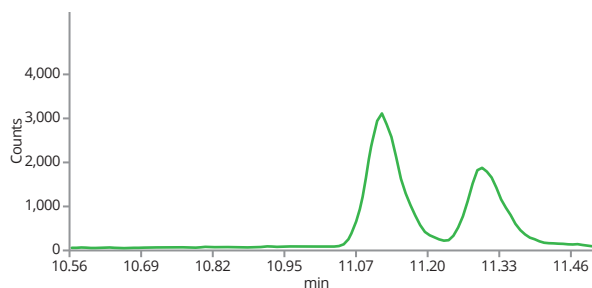
Seneciophylline



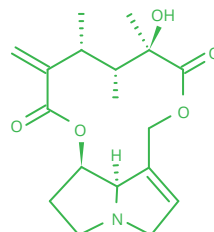
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

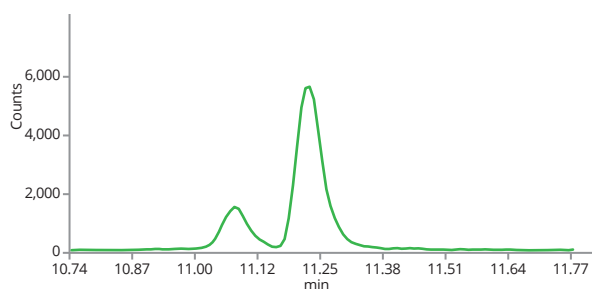


Intermedine N-oxide (316.2->172.0)

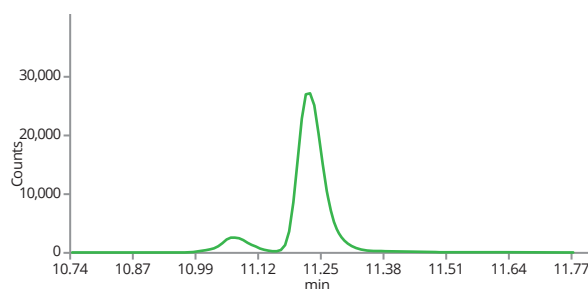


Senecivernine

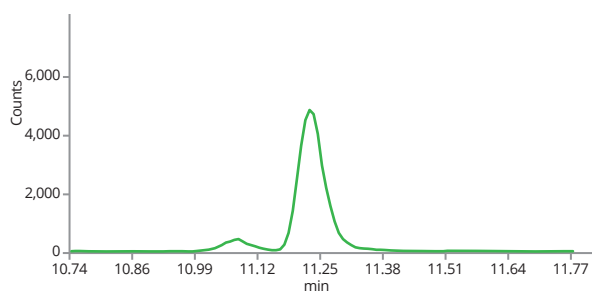
Pyrrolizidine alkaloids in herbal tea



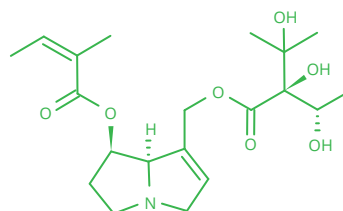
Lycopsamine N-oxide (316.2->94.0)



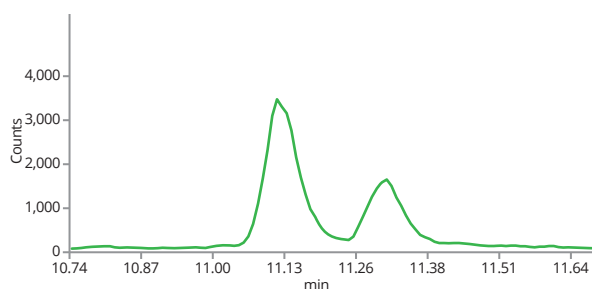
Lycopsamine N-oxide (316.2->111.0)



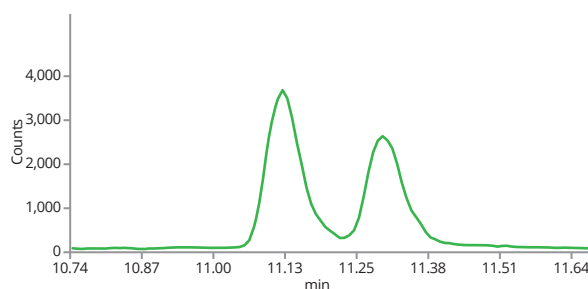
Lycopsamine N-oxide (316.2->172.0)



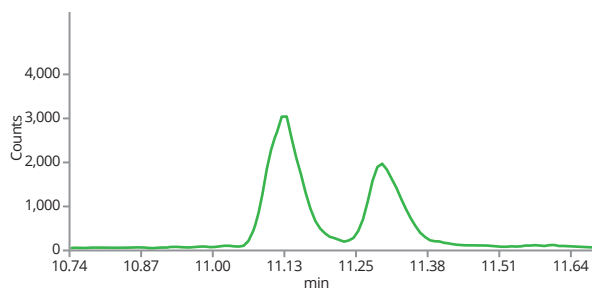
Echimidine



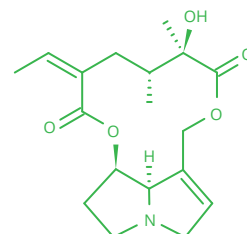
Intermedine N-oxide (316.2->94.0)



Intermedine N-oxide (316.2->111.0)

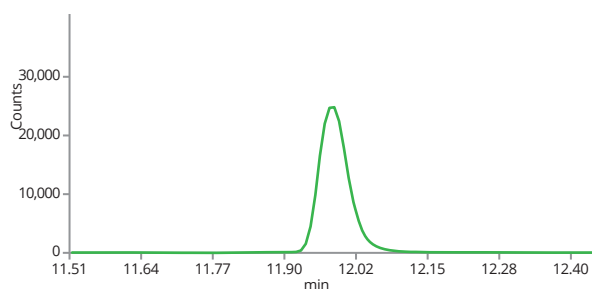


Intermedine N-oxide (316.2->172.0)

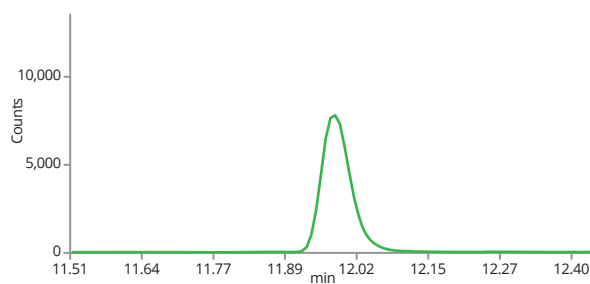


Senecionine

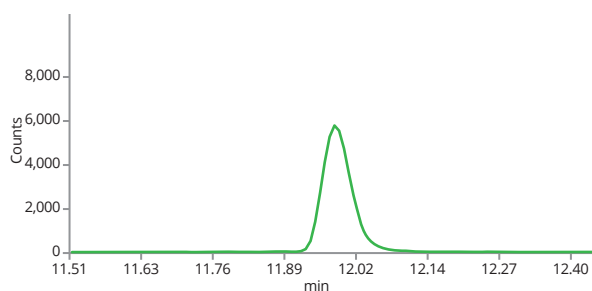
Pyrrolizidine alkaloids in herbal tea



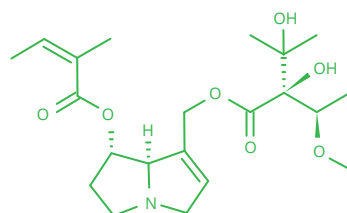
Lycopsamine N-oxide (316.2->94.0)



Lycopsamine N-oxide (316.2->111.0)



Lycopsamine N-oxide (316.2->172.0)



Lasiocarpine

Pyrrolizidine alkaloids in herbal tea

MS/MS method

Analyte	Retention time (min)	Q1 (amu)	Q2 (amu)	Collision energy (V)
Lycopsamine N-oxide	4.122	316.2	94	40
			111	40
			172	30
Intermedine N-oxide	4.225	316.2	94	40
			111	40
			172	30
Europine N-oxide	4.394	346.2	111	40
			172	30
			256	25
Retrorsine N-oxide	6.108	368.2	94	40
			119	30
			120	30
Heliotrine N-oxide	6.225	330.2	94	40
			111	35
			172	25
Lycopsamine	6.420	300.2	94	35
			138	30
			156	30
Intermedine	6.499	300,2	94	35
			138	30
			156	30
Seneciophylline N-oxide	6.608	350.2	94	40
			118	30
			138	30
Europine	7.073	330.2	94	35
			138	30
			156	30
Senecivernine N-oxide	7.412	352.2	94	40
			120	30
			136	30
Senecionine N-oxide	7.498	352.2	94	40
			120	30
			136	30

Pyrrolizidine alkaloids in herbal tea

MS/MS method

Analyte	Retention time (min)	Q1 (amu)	Q2 (amu)	Collision energy (V)
Senkirkine	7.757	366.2	122	30
			168	25
			150	25
Echimidine N-oxide	8.091	414.2	94	40
			254	30
			352	25
Lasiocarpine N-oxide	8.906	428.2	94	40
			138	30
			254	25
Heliotrine	8.972	314.2	94	35
			138	25
			156	25
Retrosine	9.255	352.2	94	40
			120	30
			138	30
Seneciphylline	10.185	334.2	94	40
			120	30
			138	30
Senecivernine	11.091	336.2	94	40
			120	30
			138	30
Echimidine	11.206	398.2	83	25
			120	25
			220	20
Senecionine	11.270	336.2	94	40
			120	30
			138	30
Lasiocarpine	12.008	412.2	120	25
			220	20
			336	20