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Identification of "Kratom" (*Mitragyna speciosa*) Alkaloids in Commercially Available Products



VIRGINIA COMMONWEALTH UNIVERSITY

Office of Research | Undergraduate Research Opportunities Program

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Purpose

The purpose of this study was to identify "Kratom" (*Mitragyna speciosa*) alkaloids in commercially available products by AccuTOF™ Direct Analysis in Real Time Mass Spectrometry (DART-MS) and Gas Chromatography-Mass Spectrometry (GC-MS).

Introduction

Kratom

- Botanical *mitragyna speciosa*
- Tree native to Southeast Asia
- Used as traditional medicine since 19th century



Young *M. speciosa* tree

Leaves

- Contain psychoactive alkaloids
- Can be brewed in teas, chewed, or smoked
- Small doses-stimulant
- Large doses-opioid



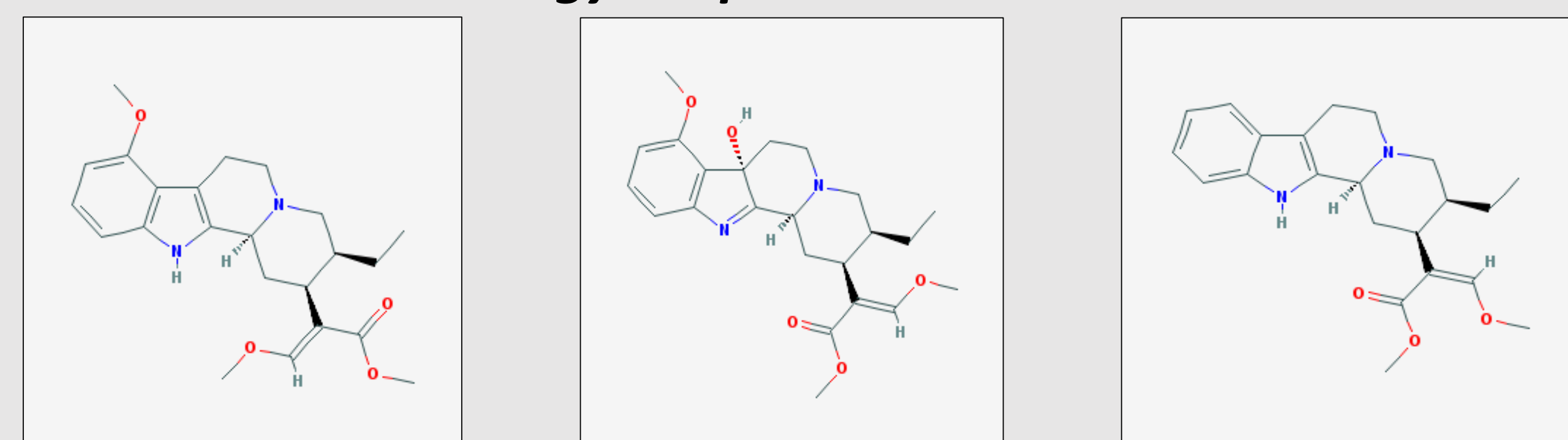
Kratom leaves

Issues

- Overdoses can result in vomiting, seizures, and death
- Drug Enforcement Agency (DEA) placed Kratom on Schedule 1, but it has since been removed
- Prone to abuse
- Yet readily available to public



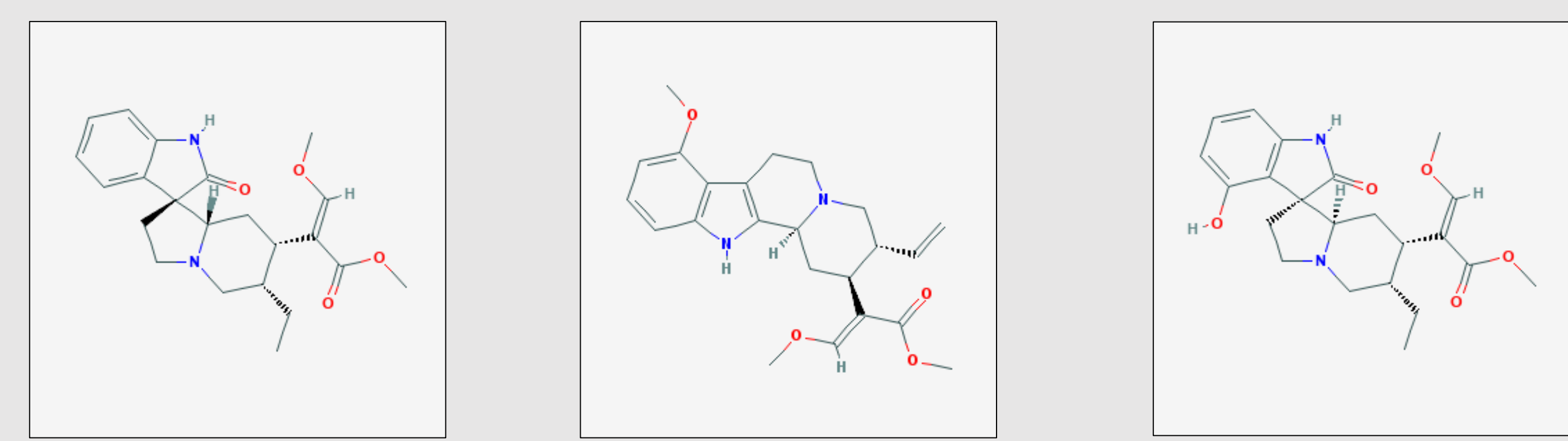
Mitragyna speciosa alkaloids



Mitragynine

7-hydroxymitragynine

Corynantheidine



Corynoxine

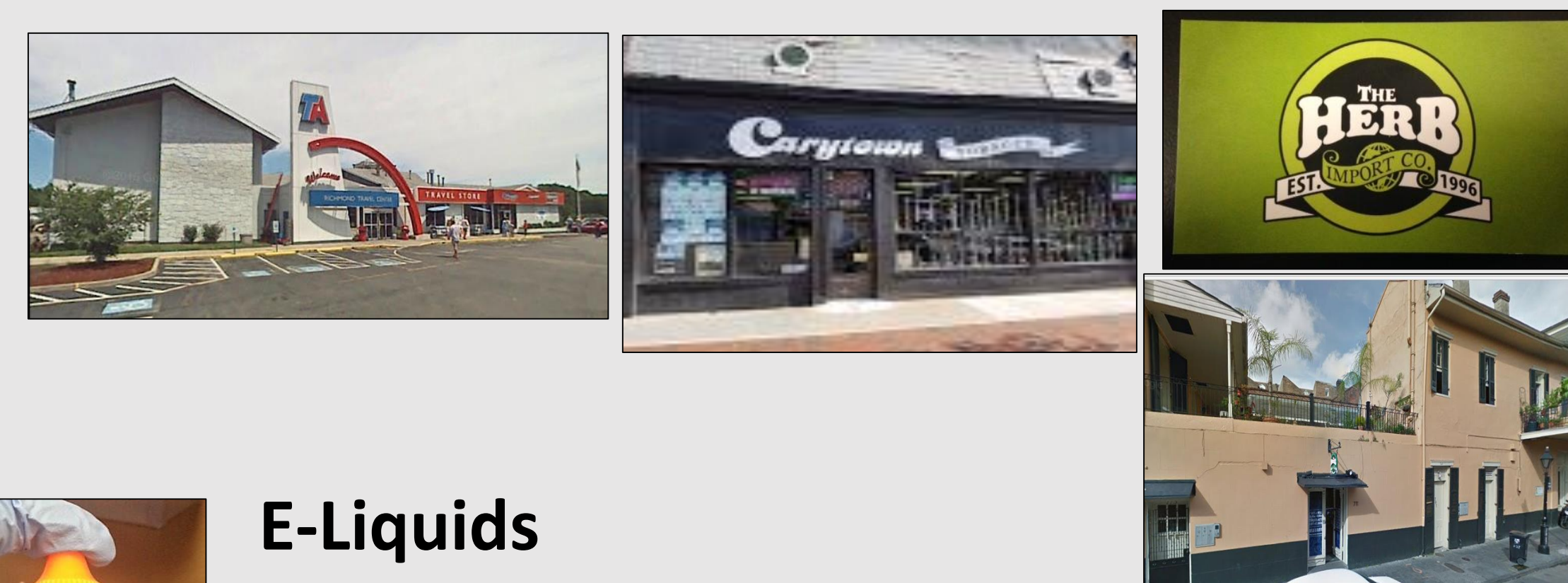
Paynantheine

Speciofoline

Samples

Capsules

- Choice
 - Label: Jumbo Maeng Da Kratom, 2.5 g per serving, serving size 1-3 capsules
- Krave
 - Label: Maeng Da Kratom, 3 g per capsule, serving size 5 capsules
- Mojo
 - Label: Maeng Da Kratom Leaf



E-Liquids

- King Kratom
 - 0 mg and 12 mg nicotine
 - Kratom extract labeled as ingredient
- Purple Haze
 - 0 mg and 12 mg nicotine
 - Kratom extract NOT labeled as ingredient



Other

- O.P.M.S Liquid Kratom Concentrate
 - Label: Organically purified, 8 mL
- K Kratom Chocolate Bar
 - Label: 2 g Red Vein Maeng Da Kratom per serving, serving size 1 bar



Methods

Sample Preparation

- 1:10 dilution of Concentrate: MeOH
- 1:1 dilution of Capsules/Powder/E-Liquids/Chocolate Bar: MeOH

Screening

- JEOL JMS T100LC AccuTOF™ DART-MS
- Parameters:
 - Calibrator: PEG 600
 - Helium: 350 °C
 - Positive ion mode
 - 20 V
- Data processed by T.S.S. Pro 3.0



Confirmation

- Agilent 6890N/5973 GC/MS
 - HP-5MS column
 - 30 m x 0.25mm ID x 0.25µm
 - Front Inlet
 - Mode: Split
 - Initial Temp: 275 °C
 - Pressure: 11.61 psi
 - Split ratio: 20:1
 - Split flow: 19.9 mL/min
 - Total flow: 23.7 mL/min
 - Oven
 - Initial temp: 120 °C
 - Rate: 10.0 °C/min until 300 °C hold for 12 mins
 - Run time: 30.0 min.

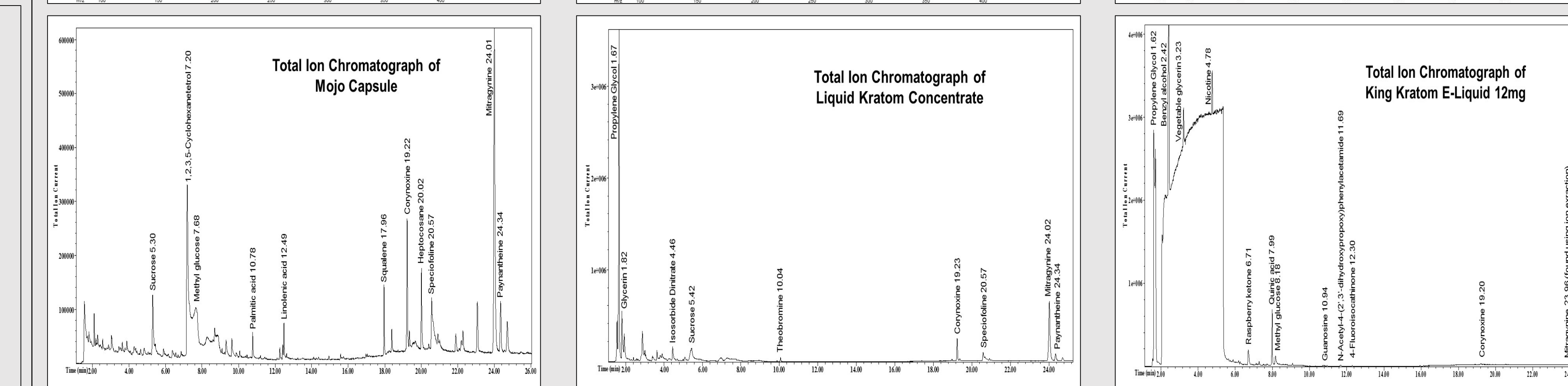
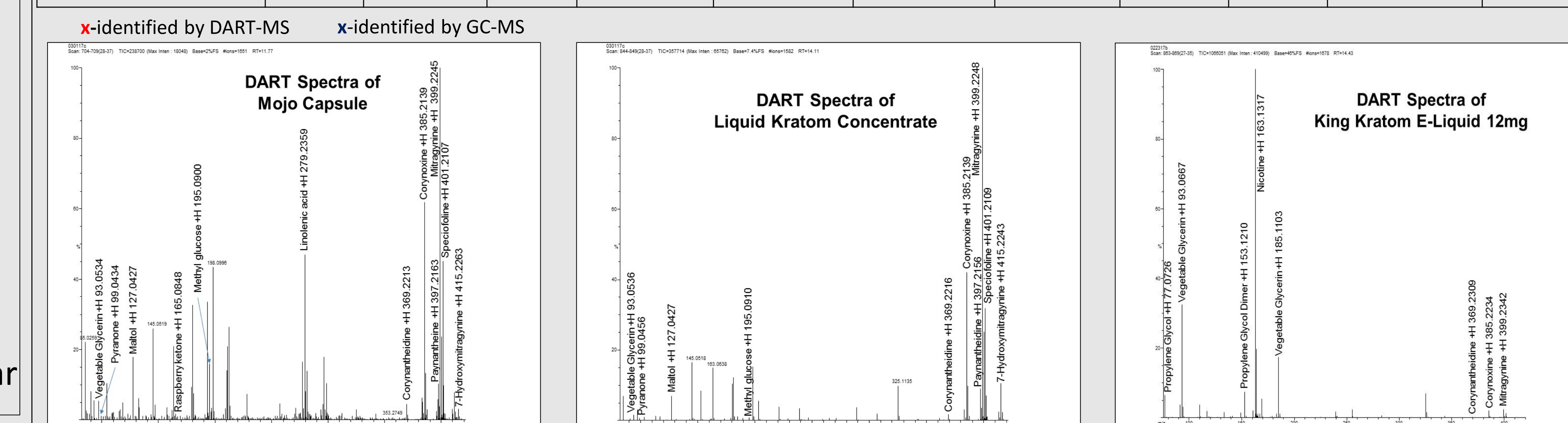
Identification

- Primary reference
 - PubMed-NCBI
- NIST v2 2011



Results

	Choice Capsule	Krave Capsule	Mojo Capsule	King Kratom E-Liquid 0 mg	King Kratom E-Liquid 12 mg	Purple Haze E-Liquid 0 mg	Purple Haze E-Liquid 12 mg	Choice Powder	Lucky Powder	O.P.M.S Liquid Kratom Concentrate	K Kratom Chocolate Bar
Mitragynine	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
7-hydroxymitragynine	x	x	x	x	x	x	x	x	x	x	x
Corynantheidine	x	x	x	x	x	x	x	x	x	x	x
Corynoxine	x x	x x	x x	x x	x x	x	x	x	x	x x	x
Paynantheine	x x	x x	x x	x x		x	x x	x	x x	x x	x
Speciofoline	x x		x x				x			x x	x
d-Allose	x	x						x	x x		
Benzyl Alcohol				x	x						
Caffeine						x x	x				x x
Cholesterol											x
1,2,3,5-Cyclohexanetetrol	x	x	x					x	x		
Glycerin				x x	x x	x x				x x	x
2-Hydroxy-5-methylisophthalaldehyde	x x	x x						x x	x x		
Linolenic acid	x x	x x	x x					x x	x		
d-Mannose	x	x						x	x		
Methyl glucose	x x	x x	x x	x	x	x	x	x x	x x	x	
Nicotine				x	x x	x x	x x				
Palmitic acid	x x	x x	x	x				x x	x x		x
Phytol acetate	x	x						x	x		
Propylene Glycol				x x	x x	x x	x x			x	
Raspberry Ketone				x x	x		x				
Sucrose	x	x	x					x		x	x
Theobromine										x	x x
Vanillin				x			x				



Conclusion

- Formulated a robust method for identification.
- Products were easy to purchase and inexpensive
- The psychoactive alkaloids mitragynine and 7-hydroxymitragynine along with four others, corynantheidine, corynoxine, paynantheine, and speciofoline, were identified in all 11 unregulated commercial products.

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