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High-throughput Screening of Kratom with a DART XZ-Scanner

Introduction

The XZ-Scanner is a module that, when coupled to a DART-MS, allows for up to 96 samples to be analyzed in a rapid fashion. Analysis takes just seconds for each sample. 96 samples can be analyzed in approximately 40 minutes.

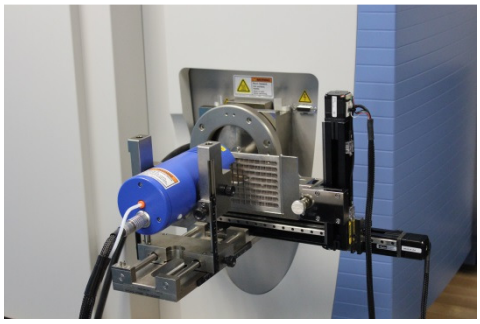


Image 1 – The DART XZ-Scanner coupled to a MS

Kratom usage is gaining popularity due to its availability and uncontrolled legal status in the US. Kratom is a tree native to Southeast Asia and its leaves contain the psychoactive chemical mitragynine. When ingested, the user feels a relaxed sensation, but adverse effects, such as psychosis, have been reported. Its increased usage and popularity has led to increased adulteration worldwide. Kratom is often adulterated with different plant materials to increase the total weight.

This app note will highlight a method developed to screen adulterated kratom samples and determine the percentage of adulteration.

Experiment

Samples were prepared with a simple extraction method. 50 mg of sample was weighed into a vial and 2 mL of 50:50 water:acetonitrile was added. The sample was sonicated and then centrifuged. A 1 mL aliquot of the supernatant was removed and diluted ten-fold. An external standard of deuterated mitragynine was added to the dilution prior to analysis. This solution was spotted onto a sample plate for analysis (Image 2).

A five-point standard curve was developed using kratom adulterated with green tea. Green tea was added in known percentages to kratom and the external standard was added after the extraction.

To develop the standard curve, the ratio of the peak intensities of mitragynine to the deuterated mitragynine was plotted against the percentage of kratom in the sample.

The standard curve was quickly developed using the XZ-Scanner. Five replicates for each point were collected in one run that required approximately 10 minutes.

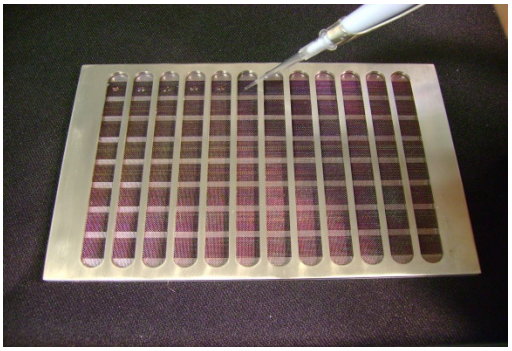


Image 2 – Pipetting onto an X-Z mesh holder

Blind study

A blind study was employed to test the performance of this method in determining kratom adulteration. The blind study consisted of 9 samples of kratom adulterated to percentages unknown to the analyst.

The samples were analyzed in a single run with the XZ-Scanner, requiring only 20 minutes to analyze a total of 45 samples, which included five replicates of each sample. With this method up to 19 different samples could be analyzed in replicates of five, each in approximately 40 minutes.

Results

The standard curve (Image 3) consisted of 5 points, including a 0% kratom blank. The equation of the standard curve was precise with a R^2 value of 0.98.

The peak intensity ratios were determined for each replicate of each unknown in the blind study. The five replicates were then averaged and that value was used to determine the percentage of kratom in each sample by using the standard curve. Image 4 shows a line graph comparing the actual and predicted kratom percentage.

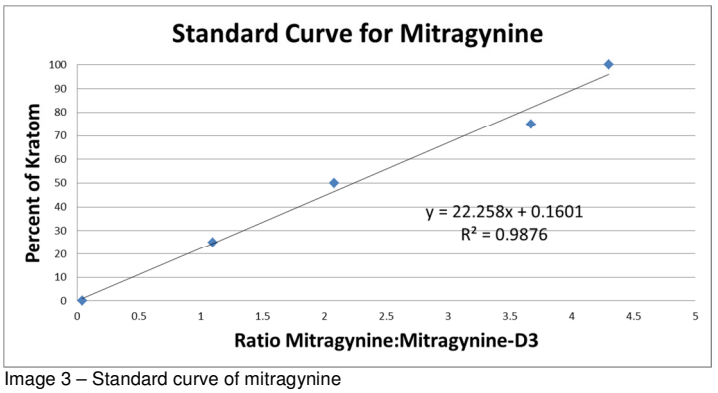
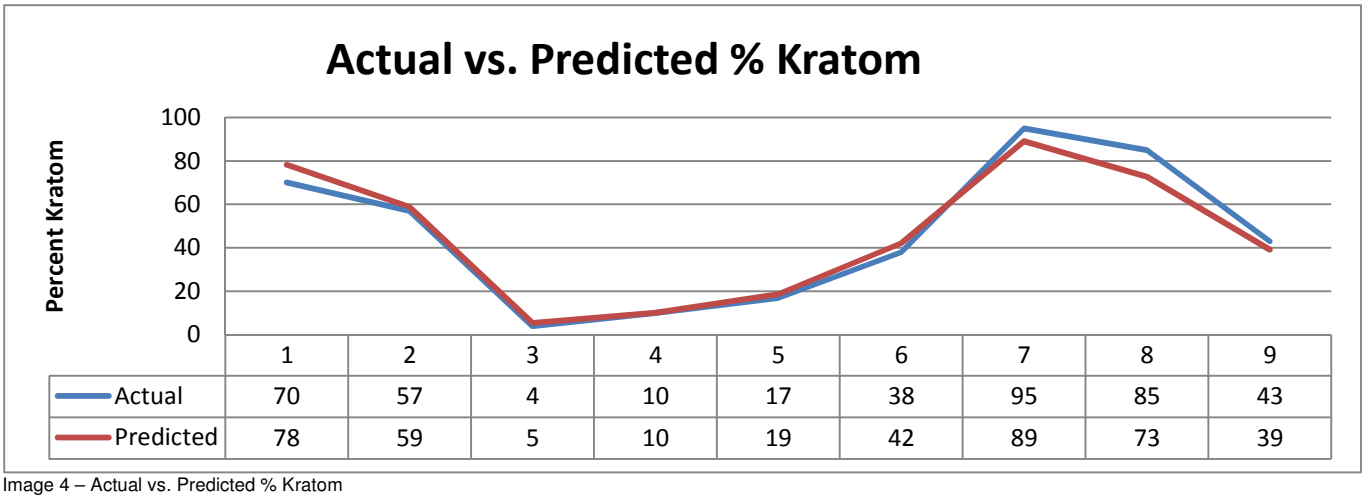


Image 3 – Standard curve of mitragynine

Conclusions and Discussion

Kratom adulteration was successfully quantified using this method. All unknowns were identified to within 10% of their actual percentage with the exception of one sample.

The most important aspect of this experiment was the efficiency at which the XZ-Scanner was able to collect data. A total of 70 samples were analyzed for this experiment and they were collected in approximately 30 minutes whereas it would require hours to analyze the same number of samples with a GC- or LC-based method.



	1	2	3	4	5	6	7	8	9
Actual	70	57	4	10	17	38	95	85	43
Predicted	78	59	5	10	19	42	89	73	39

Image 4 – Actual vs. Predicted % Kratom