



### **B33 The Use of Inductively Coupled Plasma-Mass Spectrometry (ICP/MS) in the Identification of the Elemental Composition of Kratom and the Determination of Geographical Origin**

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**Learning Overview:** After attending this presentation, attendees will understand the principles of Inductively Coupled Plasma-Mass Spectrometry (ICP/MS) and how the elemental composition of kratom can be used in conjunction with Discriminant Function Analysis (DFA) to classify kratom samples by geographical origin.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by introducing a new method to differentiate kratom based on elemental composition with the purpose of increasing the discrimination between visually similar kratom samples and helping with geographical origin attribution.

Kratom (*Mitragyna speciosa*) is a tropical evergreen tree native to Southeast Asia whose leaves are commonly consumed for their analgesic, opiate-like, and stimulant properties. The most common alkaloid that produces these effects is mitragynine, although there are over 40 alkaloids produced by the plant. Kratom is indigenous to Thailand, Indonesia, Malaysia, and Vietnam. When Kratom is consumed in high doses, a depressant effect due to mitragynine is observed and has been found in a number of fatalities in combination with other CNS depressant drugs.

In recent years, kratom's use as a recreational drug has increased worldwide and numerous case studies have documented the various effects on users. Kratom is currently a controlled substance in 16 countries including Malaysia, Myanmar, and Thailand. The United States Drug Enforcement Administration (DEA) currently includes kratom on the list of Drugs and Chemicals of Concern and is considering labeling kratom as a Schedule I substance. The legality of kratom in the United States currently varies by state. In February 2018, the Food and Drug Administration (FDA) stated that there is no evidence that kratom is safe or effective for treating any condition.

Elemental composition determination is beneficial as it can be utilized for geographical origin attribution. The basis of geographical origin determination is that kratom grown in different regions will have variations in trace elements due to soil nutrients and composition, water content, and fertilizer use. This allows for the determination of the geographical origin of unknown kratom samples.

In this study, 33 kratom samples were purchased from 4 reputable internet vendors with a varying number of countries of origin. The countries of origin include Malaysia, Thailand, Borneo, Bali and Vietnam. The samples were digested and then analyzed using ICP-MS to determine the concentration of 21 different elements. Discriminant Function Analysis (DFA) was used to analyze the resulting elemental composition for each kratom sample and identify elements that optimized the multivariate differentiation of each sample group.

#### **Kratom, ICP/MS, Attribution**