



# Ethnopharmacology of Bejuco de Indio (*Gouania lupuloides*), a Caribbean Medicinal Plant Used for Oral Health

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## INTRODUCTION



Throughout the Caribbean, *Gouania lupuloides* (L.) Urb. (Rhamnaceae), is commonly used as a chew stick to clean teeth, remove plaque, and massage gums. Previous research has established that *G. lupuloides* contains antimicrobial compounds that support its traditional use. *Gouania lupuloides* is frequently sold as bejuco de Indio in Spanish language Caribbean herbal markets (botánicas) in New York City (NYC). However, as with other herbs of commerce, there is a possibility that chew sticks sold as bejuco de indio are not actually *G. lupuloides*.

Figure 1. *Gouania lupuloides* (L.) Urb.

The overall aim of this research is to understand the phytochemistry and traditional knowledge of *G. lupuloides* as it is used in NYC, and to authenticate its botanical identity in commerce. We observed morphological differences between *G. lupuloides* type specimens and chew sticks sold as bejuco de Indio that may indicate adulteration. Dammarane saponins, such as gouanoside B, which are distinctive of *G. lupuloides*, have been tentatively identified in type specimens using UPLC-QTOF-MS. Principal component analysis indicates that at least three of the chew stick samples collected as bejuco de Indio are chemically distinct from *G. lupuloides* type specimens. Our phytochemical analysis aims to characterize a chemical fingerprint typical of *G. lupuloides* to aid in the chemotaxonomic identification of unknown chew sticks. Additionally, *G. lupuloides* extracts are being screened against microbes related to its other documented medicinal uses in the Caribbean. An ethnobotanical survey is also being conducted to understand how *G. lupuloides*, and other herbs of commerce, are used in the NYC area for oral health. We aim to understand the plant chemistry and knowledge of *G. lupuloides* and understand the general usage of various medicinal plants for oral health used in New York.

## MATERIALS AND METHODS

**Phytochemistry.** *Gouania lupuloides* samples and unidentified chewsticks sold as 'bejuco de Indio' were collected in botanicas in NYC. Samples were validated by botanists at the New York Botanical Garden. Chewsticks were assessed for morphological differences, ground, and extracted in 80% methanol. Crude extracts were syringe filtered and analyzed by liquid-chromatography mass-spectrometry in negative ionization mode. LC-MS data was imported into Progenesis Q1 and EZInfo to analyze chemical similarities and differences between known and unknown samples.

**Ethnobotany.** A short Microsoft forms questionnaire (15 minutes) including questions on basic demographic information, use of medicinal plants for oral health, and the species used will be administered to at least 100 participants. Data will be collected without identifiers in a Microsoft Excel sheet and will be used for subsequent data analysis.

## RESULTS

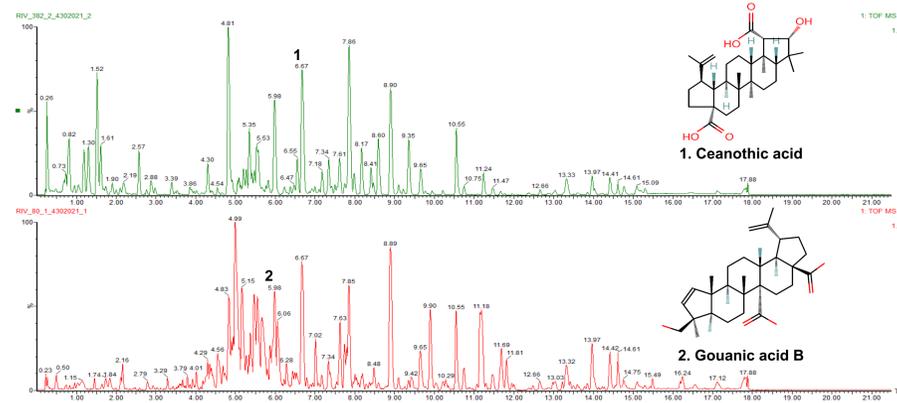


Figure 2. Comparison of chromatograms for unknown sample IV-382-2 (top) and known *G. lupuloides* sample (IV-80-1).

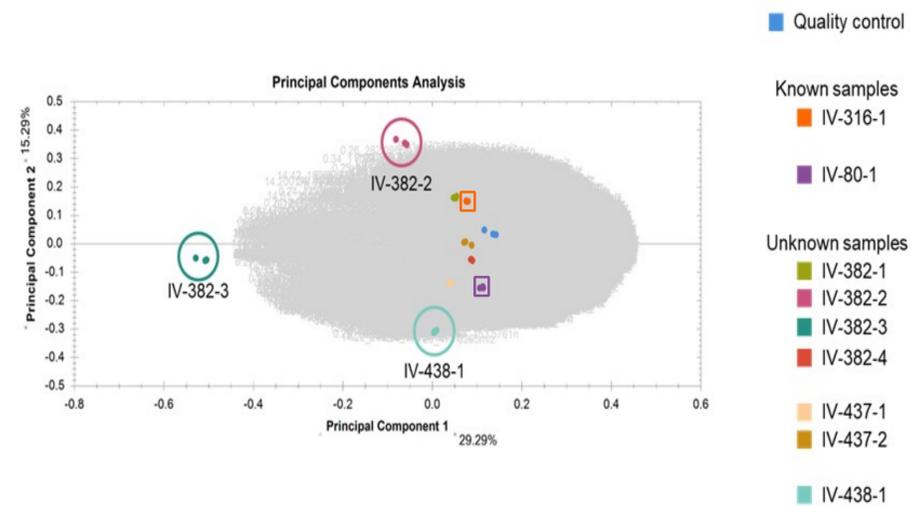


Figure 3. PCA Analysis of known and unknown samples of *Gouania lupuloides*.

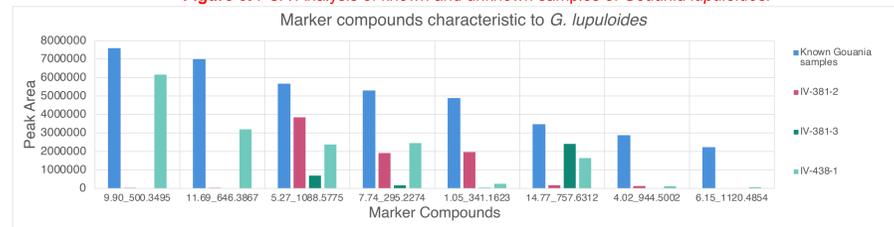


Figure 4. Marker compounds characteristic to *G. lupuloides* compared to outlier samples.

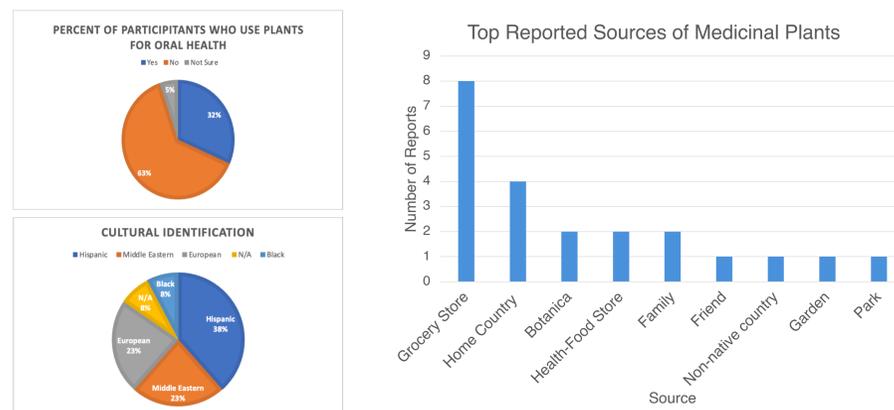


Figure 5. Percent of participants who use plants for oral health and reported cultural-identities of participants with knowledge of medicinal plants (left). Sources of medicinal plants for oral health reported by participants (bottom).

## DISCUSSION

**Phytochemistry.** There were differences in texture, color and morphology in known and unknown chew sticks samples in our preliminary visual observations. These differences were supported by PCA analysis, which identified at three of the chewsticks (two samples from IV-382 and one from IV-438) were chemically distinct from the other chewsticks, including those known to be *G. lupuloides*. This indicated that there may be adulteration or misidentification of chewsticks sold as 'bejuco de Indio' in NYC. Further analysis in EZInfo, identified marker compounds that differed significantly between chemically distinct samples. Further investigation and identification of these compounds is in progress to determine a chemical fingerprint for *G. lupuloides* chewsticks in NYC.

**Ethnobotany.** From the responses collected at point in the survey, most of the participants did not have knowledge of medicinal plants. However, a majority of those who did report having knowledge of medicinal plants identified as Hispanic from countries like the Dominican Republic, Puerto Rico or Bolivia. Most people reported using medicinal plants as a teeth cleaner or oral rinse and purchased these products in grocery stores.

**Future Directions.** We plan to identify marker compounds distinct to *G. lupuloides* in order to determine a characteristic chemical fingerprint for chemotaxonomic identification. We plan to continue the ethnobotanical study to reach our target goal of 100 participants to provide qualitative and quantitative data about the use of dental chew sticks in New York.

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