Evaluating the Medicinal Potential of Cilantro (*Coriandrum sativum*): Relative Quantification of Bioactive Compounds in Leaf vs. Stem

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ABSTRACT

Cilantro (*Coriandrum sativum*) is a widely utilized culinary herb with a rich history of medicinal uses across diverse cultural traditions. This study explores the relationship between the ethnomedicinal uses and phytochemistry of *C. sativum* by conducting an untargeted analysis of bioactive compounds in cilantro leaf and stem tissues using Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS). Relative quantification was performed using apigenin and quercetin as standards. The analysis revealed several bioactive compounds with anti-inflammatory, antimicrobial, an antioxidant properties, demonstrating significant differences in relative abundance between leaf and stem tissues. This phytochemical profiling bridges traditional knowledge and scientific understanding, providing a foundation for future phytotherapy research and promoting cilantro's intentional consumption as a functional food.

OBJECTIVES

Objective 1: Compare and analyze the phytochemical profile of cilantro leaf and stem tissues using LC-MS/MS.

Objective 2: Correlate identified high-confidence annotation compounds with traditional medical uses.

INTRODUCTION

Phytotherapy, the use of plants for medicinal purposes, is a vital aspect of global healthcare, with 80% of the global population relying on it as their primary treatment (Ekor, 2014). *Coriandrum sativum*, commonly known as cilantro has a rich history of culinary and medicinal applications (Abascal et al., 2012). Cilantro contains numerous bioactive compounds that offer health benefits beyond basic nutrition. Despite its extensive use, there remains a need for comprehensive analysis of cilantro's phytochemical profile to understand the distribution and potential health benefits of its bioactive compounds in different plant tissues. This study employs Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) for an untargeted analysis to comprehensively profile beneficial bioactive compounds.

METHODS

Plant Material

- Two varieties of cilantro were sourced from separate commercial grocery stores and combined.
- 3 biological replicates were prepared for leaf and stem analyses.

Extraction

- Cilantro will be freeze-died in preparation for extraction.
- Bioactive compounds will be extracted from 50mg of cilantro tissue using a Precellys homogenizer.

Liquid Chromatography-Mass Spectrometry(LC-MS/MS)

- LC-MS/MS analysis was performed to identify and quantify bioactive compounds in cilantro leaf and stem samples.
- Compound identification was facilitated by mzCloud for accurate characterization of the bioactive compounds.

Figure 1: Bundle of fresh commercial cilantro

Figure 2: Close up of fresh commercial cilantro leaflets

RESULTS

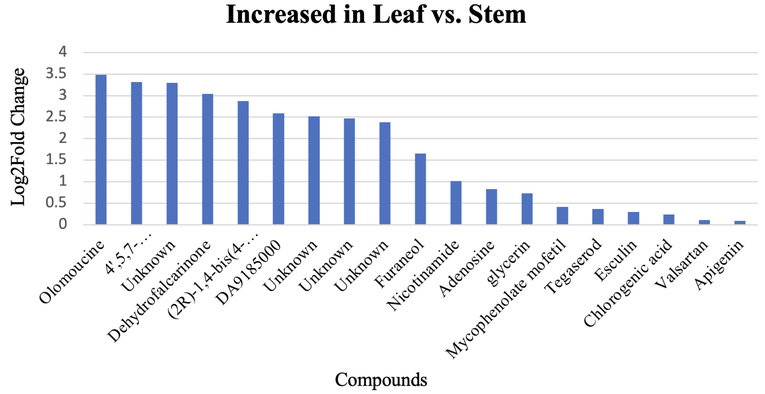

Figure 3: Compounds relatively more abundant in cilantro leaf compared to stem.

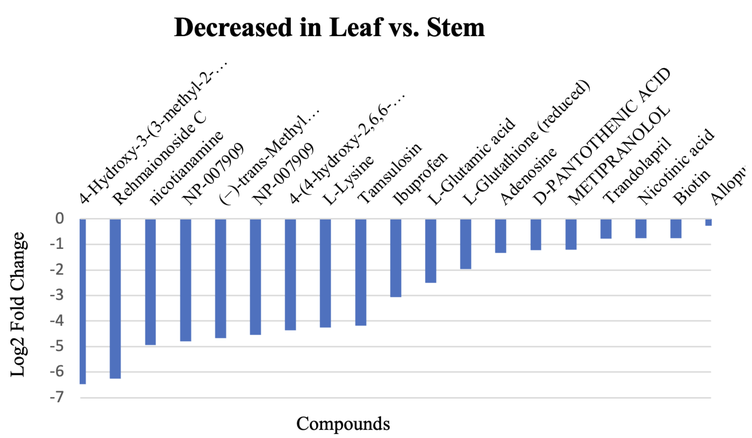

Figure 4: Compounds relatively less abundant in cilantro leaf compared to stem.

DISCUSSION

The untargeted LC-MS/MS analysis of *Coriandrum sativum* (cilantro) reveals significant differences in the phytochemical profiles of leaf and stem tissues, emphasizing their potential medical applications. Leaf tissues exhibit higher levels of bioactive compounds such as olomoucine, a cyclin-dependent kinase inhibitor with anticancer properties (Glab et al.,1994), and 4,5,7-trimethoxyflavone, known for its antioxidant and anti-inflammatory effects (Heo et al., 2001). Beneficial compounds like furaneol, nicotinamide and chlorogenic acid further support traditional uses. In contrast, stem tissues contain compounds such as rehmaionoside C and nicotinamide, which may enhance antioxidant capacity and support iron metabolism (Surjana et al., 2010). While leaves are richer in antioxidants, stems offer essential amino acids and other beneficial phytochemicals. This analysis demonstrates the importance of using both leaf and stem parts of cilantro for maximizing health benefits. However, limitations such as sample diversity, environmental factors, and the need for further validation of unidentified compounds highlight the necessity for additional research to fully explore cilantro's medicinal potential.

CONCLUSION

This phytochemical analysis of *Coriandrum sativum* highlights its potential role in phytotherapy. The identification of diverse bioactive compounds, including antioxidants and anti-inflammatory argents, supports cilantro's traditional medical uses. The varying concentrations of these compounds in leaf and stem tissues demonstrate the importance of utilizing the whole plant for health applications. By bridging traditional knowledge with modern scientific insights, this study empowers consumers to make informed decisions about cilantro's use in treating health conditions. Additionally, it opens avenues for further research into novel therapeutic compounds, reinforcing the value of medicinal plants in contemporary healthcare practices.

FUTURE WORK

Future research on absolute quantification of select bioactive compounds in cilantro to enable precise dosage determination and standardization for therapeutic applications.

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