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Title: Identification of Flavor Active Compounds in Micro- and Macro- Algae *Introduction*

Algae is a nutrient dense and sustainable source of alternative proteins. Algae has a distinctive ocean-like flavor and has the potential to be used in alternative seafood. However, the volatile profiles of different species of algae vary significantly. Comparison of the flavor compounds of different algae species has not been well studied. Our study aimed to identify flavor active compounds in algae samples using both instrumental analysis and human sensory evaluation. *Methods*

Three kelp (*Ascophyllum nodosum*) and three microalgae (*Arthrospira platensis*, *Chlorella vulgaris*, and *Dunaliella salina*) powders were characterized for their flavor profiles using headspace solid-phase microextraction and gas chromatography-olfactometry-mass spectrometry (HS SPME/GC-O-MS). Sample preparation included mixing 1 g of the algae with 10 mL of deionized water until homogeneous, then adding mixture into a sterile vial. The vial was added into a hot water bath over a heated stir plate and kept at 60 °C for 20 minutes. The SPME fiber was inserted through the top of the vial, into the headspace, then continued heating for an additional 35 minutes. The SPME fiber was then removed and inserted into the injector port of the column of the GC-MS.

Results

Over fifty volatiles were detected, including pleasant aroma compounds such as D-limonene (citrus and fresh aroma) and linalool (citrus, floral, sweet), as well as undesirable compounds like (E)-2-octen-1-ol (soap and plastic aroma). Numerous volatiles from seafood were detected in the algae samples. All three kelp samples and *A. platensis* powder contained 1-octen-3-ol, which presents a mushroomy and green aroma and is a key-aroma compound of crab, tuna, and salmon. *A. platensis* and *C. vulgaris* contain the flavor compound tetramethyl pyrazine, which is found in crab and shrimp, and presents a grassy and musty aroma. Initial human sensory testing was also conducted using a group of 7 sensory panelists. Sensory descriptors were obtained using an algae flavor wheel. Panelists described the aroma of the kelp samples as seaweed-, seafood-, ocean-like, and fishy. The *A. platensis* and *C. vulgaris* had descriptors relating to green, green tea, and earthy, while the *Dunaliella salina* lacked many of the similar sensory attributes due to its overwhelming bitter taste.

Conclusion

The knowledge on the flavor profiles of algae ingredients will further the understanding on the flavor compounds formation and removal, as well as providing guidance on developing seafood flavor from algae. This research was presented at the Southern California Institute of Food Technologies (SCIFTS) Research Poster Showcase, 2023 Southern California Conference for Undergraduate Research, and the 2024 SDSU Student Symposium (S3).