

## Key Aroma Compounds as Predictors of Pineapple Sensory Quality

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**Abstract :** Pineapple (*Ananas comosus*), with its unique sweet flavour, is one of the most popular tropical, non-climacteric fruits consumed worldwide. It is also the third most important tropical fruit in world production. In Australia, 99% of the pineapple production is from the Queensland state due to the favourable subtropical climatic conditions. The flavourful fruit is known to contain around 500 volatile organic compounds (VOC) at varying concentrations and greatly contribute to the flavour quality of pineapple fruit by providing distinct aroma sensory properties that are sweet, fruity, tropical, pineapple-like, caramel-like, coconut-like, etc. The aroma of pineapple is one of the important factors attracting consumers and strengthening the marketplace. To better understand the aroma of Australian-grown pineapples, the matrix-matched Gas chromatography-mass spectrometry (GC-MS), Head Space - Solid-phase microextraction (HS-SPME), Stable-isotope dilution analysis (SIDA) method was developed and validated. The developed method represents a significant improvement over current methods with the incorporation of multiple external reference standards, multiple isotopes labeled internal standards, and a matching model system of pineapple fruit matrix. This method was employed to quantify 28 key aroma compounds in more than 200 genetically diverse pineapple varieties from a breeding program. The Australian pineapple cultivars varied in content and composition of free volatile compounds, which were predominantly comprised of esters, followed by terpenes, alcohols, aldehydes, and ketones. Using selected commercial cultivars grown in Australia, and by employing the sensorial analysis, the appearance (colour), aroma (intensity, sweet, vinegar/tang, tropical fruits, floral, coconut, green, metallic, vegetal, fresh, peppery, fermented, eggy/sulphurous) and texture (crunchiness, fibrousness, and juiciness) were obtained. Relationships between sensory descriptors and volatiles were explored by applying multivariate analysis (PCA) to the sensorial and chemical data. The key aroma compounds of pineapple exhibited a positive correlation with corresponding sensory properties. The sensory and volatile data were also used to explore genetic diversity in the breeding population. GWAS was employed to unravel the genetic control of the pineapple volatilome and its interplay with fruit sensory characteristics. This study enhances our understanding of pineapple aroma (flavour) compounds, their biosynthetic pathways and expands breeding option for pineapple cultivars. This research provides foundational knowledge to support breeding programs, post-harvest and target market studies, and efforts to optimise the flavour of commercial pineapple varieties and their parent lines to produce better tasting fruits for consumers.

**Keywords :** *Ananas comosus*, pineapple, flavour, volatile organic compounds, aroma, Gas chromatography-mass spectrometry (GC-MS), Head Space - Solid-phase microextraction (HS-SPME), Stable-isotope dilution analysis (SIDA).

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