

## Abstract

Okinawa is the only prefecture that is located in the subtropical region in Japan, and has various crop and horticultural products that are different from other prefectures. Flavor characteristics and biological functions of food materials from sugary and citrus resources in Okinawa, Japan, i.e. sugarcane (*Saccharum officinarum* L.) and Shiikuwasha (*Citrus depressa* Hayata), were studied, with the intention of fostering the food and nutraceutical applications of these two economical Okinawan crops.

The composition and content differences of sugarcane wax in different sugarcane cultivars, including policosanol (a mixture of bioactive long-chain alcohols) and long-chain aldehyde were investigated. Sugarcane waxes were comprised of 55–60% aldehyde and sterol esters, and 32–40% policosanol. The composition and content of waxy materials may vary depending on sugarcane cultivar, specific part, and degree of maturity.

The potent antioxidant activity of sugarcane molasses fractions against peroxy radicals was evaluated with chemical, cellular, DNA/biomolecular model systems. Ten phenolic constituents were identified in the fractions, such as ferulic acid, schaftoside, *p*-coumaric acid, and *p*-hydroxybenzaldehyde.

Changes in the physicochemical characteristics, aroma compounds, and Maillard reaction products (MRPs) of cane brown sugar were monitored over a 1-year storage period. The cane brown sugar lost its acidic and sulfuric odors; subsequently, the nutty and roasted aroma increased due to the volatile MRPs during storage. The browning rate of stored cane brown sugar was positively associated with the development of MRPs.

Volatile aroma composition and antioxidant activity of unripe Shiikuwasha peel oils of different extraction methods were investigated. The major constituents of the oils were limonene (43–45%) and  $\gamma$ -terpinene (28–29%). The cold-press extraction system may better retain phenolics of the peel and display superior antioxidant capabilities, compared to the steam distillation extraction method.

The composition and content differences of volatile aroma components, flavanones, and polymethoxylated flavones (PMFs) in Shiikuwasha peels of four cultivation lines were evaluated. The peel oils composed mainly of limonene (47–68%) and  $\gamma$ -terpinene (21–31%). Neohesperidin (97%) was the predominant flavanone in 'Izumi kugani' peel, while the other peels had high hesperidin contents (89–99%). Moreover, the PMFs of Shiikuwasha peels were composed of nobiletin and tangeretin.

The effect of cultivation line and peeling on food composition, taste characteristic, aroma profile, and antioxidant activity of peeled flesh and whole fruit juices of Shiikuwasha from four cultivation lines were distinguished. Shiikuwasha juice from these lines had diverse food components. The composition of volatile aroma components was influenced by fruit cultivation line, whereas its content was affected by peeling process. Peeling also caused Shiikuwasha juice to be less astringent and acidic bitter and to lose its antioxidant activity.

Sugarcane and Shiikuwasha that possess distinctive profiles of flavor components and biological functions are highly valuable food crops in Okinawa Prefecture. More food and agricultural chemical characterizations of these sugary and citrus materials revealed should promote their food, biotechnological or nutraceutical commercial uses, and therefore should endorse agribusiness development of the region.