Physico-chemical properties of pectin from jelly fig

ASSIGN BUSTER

Changes in physico-chemical properties of pectin from jelly fig (*Ficus awkeotsang* Makino) seeds during extraction and gelling

- Chii-Ming Jiang ,
- Ying-Jang Lai ,
- Bor-Hon Lee ,
- Wei-Hsien Chang ,
- Ming-Chang Wu ,
- Hung-Min Chang

Abstract

Degree of esterification of pectin from jelly fig (*Ficus awkeotsang* Makino) achene seeds and the pH value decreased rapidly during extraction, while apparent reduction of free calcium content in the pectin extract was observed at the gelling stage. Compared to those of the native pectin, total ester linkages and methyl ester linkages of pectin extract decreased, and the bound calcium content increased during pectin gelling. However, non-methyl ester linkages (the difference between the total ester linkage and the methyl ester linkage) increased by approximately 40% during pectin gelling, revealing esterification reaction between C_6 carboxyl groups and hydroxyl groups in the presence of pectinesterase. Scanning electron microscopy showed that pectin fragments from jelly curds were large with flake-like structure, while those from hot (85°C) ethanol-treated achenes were small and porous.

Keywords

- Pectin;

- Jelly fig (*Ficus awkeotsang* Makino) achenes;
- Jelly curd;
- Scanning electron microscope;
- Ester linkage

Abstract

Volatile essences of Calimyrna, Kadota, and Black Mission and Adriatic figs were prepared by passing large volumes of headspace gas through porous polymer traps at room temperature. The essences were analysed by gas chromatography, utilising wall-coated open-tubular glass capillary columns; structural elucidations were based on gas chromatography-mass spectrometry. Differences between varieties appear to be quantitative rather than qualitative, and are not noticeably greater than differences between samples of the same variety. Compounds identified included acetaldehyde, dimethyl lacetal, methyl acetate, ethyl acetate, ethyl alcohol, ethyl propionate, ethyl iso butyrate, propyl acetate, methyl butyrate, isobutyl acetate, ethyl butyrate, ethyl- *2* -methyl butyrate, *2* -methyl butyl acetate, *2* -ethyl- *1, 2* -dihydrothiophene, ethyl vale rate and *3* -hydroxy- *2* -butanone.

Nutritional Values of 14 Fig Species and Bat Feeding Preferencesin Panama:

Figs are a critical resource for many tropical frugivores, yet they often are referred to as low quality fruits. To determine their nutritive value, both as a group and for individual species, we analysed 14 fig species from Barro Colorader Island (BCI), Panama, for fiber, tannins, lipids, protein, carbohydrates, amino acids, and minerals. Seeds and pulp were analyzed separately. Fig fruit pulp consisted of about one-third digestible components,

mostly carbohydrates with some lipids and proteins. Tannin, lignin, and water-soluble carbohydrates showed considerable variation among species, as did fruit size. Figs contained high amounts of amino acids, such as, lysine, valine, and arginine, and minerals, such as potassium, calcium, magnesium, sodium, and phosphorus. One species, *Ficus insipida,* contained the highest concentrations of almost all amino acids, many minerals, and protein. Small figs had as much nutritional value per gram as large figs. Free-standing figs had higher percentages of protein, complex carbohydrates, and ash than strangler figs, which had higher percentages of water-soluble carbohydrates, tannins, and hemicellulose. The guild of fruit eating bats on BCI included ten common species with diets dominated by figs. Fecal analyses and captures at ripe fig trees showed a consistent pattern of resource partitioning. Small bats preferentially ate small-fruited and strangler figs while large bats consumed mostly large-fruited and free-standing figs. Small bats most often ate *F. bullenei,* which has high levels of lipid and carbohydrates, and *F. yoponensis,* which has high levels of protein. Medium and large bats most often ate *F. insipida,* a nutritionally superior species; their second most eaten species was *F. obtusifolia,* in which the large size may make it efficient to eat. Each bat ate a variety of fig species, supporting the idea that although no single species of fig may be sufficient to sustain frugivores, a mix of fig species can provide a complete set of nutrients.

Natural occurrence of fumonisin B1 in dried figs as an unexpected hazard

Fumonisins produced by several Fusarium species especially by Fusarium verticilloides and Fusarium proliferatum and natural contaminants of corn and corn products all over the world (Jacksonand Jablonski, 2004; Scaff and

Scussel, 2004). Fumonisins have been isolated in 1988 from F. verticilloides (formerly F. moniliforme Sheldon MRC 826) which is isolated from corns consumed in Transkei Region of Southern Africa (Gelderblom et al., 1988). Among the fumonisin derivatives, FB1 is the most common one and constitutes about 70–80% of the total fumonisin content of F. verticilloides cultures and naturally contaminated foods. Fumonisin

B2 accounts for 15–25% of the total fumonisin, while fumonisin B3 accounts for 3–8% (Rheeder et al., 2002). However F. verticilloides and Fumonisins are found in all corn

Production areas, Fusarium spp. are more dominantly found in warm and dry regions. In addition to corn and corn products, Fumonisins have also been found in wheat and barley (Castella et al., 1999), beer (Hlywka and Bullerman, 1999; Torres et al., 2001), rice (SCOOP, 2003), sorghum (Jackson and Jablonski, 2004), asparagus (Logrieco et al., 1998; SCOOP, 2003; Liu et al., 2005), black tea (Martins et al., 2001), medical plants (Omurtag and YazÄ±cÄ±ogË˜lu, 2004) and incaparina (Trucksess et al., 2002). Although its effects on human beings have not been clearly determined, it has been found that there may be a positive correlation between human esophageal cancer rates and occurrence of F. verticilloides and fumonisin in diet in Transkei – Southern Africa and Linksian–China (Castella et al., 1999; EHC, 2000; Scaff and Scussel, 2004). It has also been determined that FB1 has nephrotoxic, hepatotoxic and immunosuppressive effects against various animal species (EHC, 2000). It has been detected that fumonisins cause leukoencephalomalacia in horses, Porcine Pulmonary Edema and liver cancer in rats (Nelson et al., 1992; Castella et al., 1999; Scaff and Scussel, 2004).

Fumonisins have been classified as a possible human carcinogen (Group 2B) by International Agency for Research on Cancer (IARC) according to findings obtained from test animals (IARC, 1993). Furthermore, tolerable daily intake (TDI) for fumonisin B1, B2 and B3 determined by European Commission-Scientific Committee on Food is 2 lg/kg body weight (SCF, 2003). Dried fig, very nutritional and a healthy food, is one of the most widely produced fruits in the world. Dried figs can be consumed directly, or as fig paste in production of different desserts and candies.

Dried figs are the only known fruit that is allowed to fully ripen and semidry on the tree (Desai and Kotecha, 1995; Drusch and Ragab, 2003) Turkey is ranked first in dried fig exporting countries with approximately 52, 600 tons of dried figs in 2005, equivalent to 52% of world’s dried fig exports (FAO, 2007). Dried figs are produced mainly in the Aegean Region in the western part of Turkey.

Dried figs are a high risk commodity among dried fruits. Occurrence of aflatoxins (Iamanaka et al., 2007) and ochratoxin A (KarbancÄ±oglu- Guler and Heperkan, 2008) in dried figs have been previously determined. The temperature in Aegean Region duringthe ripening, harvesting and drying of figs are favourable for mould.