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ORIGINAL ARTICLE

Enhancement of quality attributes of canned pumpkin and pineapple

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Abstract This study was carried out to produce and enhance sensory properties and nutritional value of canned pumpkin and pineapple and the effect after processing and storage on these products. Pumpkin and pineapple cubes were packed with sugar solution (control treatment), diluted orange juice at a ratio 1:1 of water:juice (wt:wt), diluted mango juice at a ratio 3:1 of water:juice (wt:wt), all filling media were raised to 40% by sucrose and then packed at a ratio 2:1 of cubes:solution (wt:wt). The obtained results indicate that the total sugars, ash, total phenols, total carotenoides and ascorbic acid contents of flesh pumpkin and pineapple were (62.16% and 78.49%), (5.69% and 2.21%), (3.74% and 4.28%) on dry weight basis and (0.38% and 0.16%) and (33.81 and 37.79 mg/100 g) on fresh weight basis, respectively. Results indicate that total soluble solids, total sugars, total phenols, total carotenoids and ascorbic acids of canned pumpkin and pineapple were ranged from 17.1% to 19.5%, 89.50% to 97.49%, 0.87% to 1.47%, 0.42% to 1.27% and ascorbic acid 88.19 to 210.53 mg/100 g on dry weight basis. Firmness of canned pumpkin and pineapple showed a sever decrement as a result of canning process and storage. Also, non-enzymatic browning was slightly increased during storage without noticeable effect on products quality. Chemical constituents of canned pumpkin and pineapple were slightly decreased during storage. Statistical analyses for sensory evaluation of canned pumpkin and pineapple with added natural juice especially orange juice (treatments, nos. 2 and 5) recorded a high score of acceptability ever after 6 months of storage at room temperature.

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Introduction

Pumpkins belong to the family of Cucurbitaceae. They are classified to *Cucurbita pepo*, *Cucurbita moschata*, *Cucurbita maxima* and *Cucurbita mixta*, according to the texture and shape of their stems (Rakcejeva et al., 2011). The nutritional value of pumpkin fruits is high but varies from one species or cultivar to another. Thus, in the fresh mass of the fruit, total content of carotenoids, a major contributory factor in the high nutritional value of pumpkins, ranges from 2 to 10 mg/100 g, the content of vitamins C and E accounting for 9–10 mg/100 g and 1.03–1.06 mg/100 g, respectively. Pumpkin fruit is also a valuable source of other vitamins, e.g., B6, K, thiamine,

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and riboflavin, as well as minerals, e.g., potassium, phosphorus, magnesium, iron, and selenium. Pumpkin flesh is a delicious and fully appreciated additive in a diversity of products for children and adults. The major carotenoid in pumpkin (>80%) is β-carotene, with lesser amounts of lutein, lycopene, β-carotene and cis α-carotene (Seo et al., 2005). Pumpkin is poor in taste and carbohydrates but high in vitamins, especially, provitamin A, antioxidants and minerals, and it is mixed with orange or carrot to improve of its nutritional and sensory properties (Abou-Zaid et al., 2012). Pumpkin is a vegetable which is healthy and functional, being rich in phenolic compounds, flavonoids and vitamins, and has a low energy. Fu et al. (2006) showed that a pumpkin-rich diet could reduce blood glucose. Also, Li et al. (2005) showed the active polysaccharides from the pumpkin fruit could obviously increase the levels of serum insulin, reduce the blood glucose levels, improve tolerance of glucose and hence could be developed as new antidiabetic agent. Pumpkin fruits mainly are being processed to obtain juice, pickles and dried products (Nawirska et al., 2009).

Pineapple (*Ananas comosus* L.) belongs to the family Bromeliaceae and is one of the most important commercial fruits of the world (Dhar et al., 2008). The pineapples fruits are normally eaten fresh or as fresh pineapple juice. Pineapple fruits are an excellent source of vitamins and minerals and supply arrays of color, flavor and texture to the pleasure of eating (Othman, 2011). The popularity of the pineapple is due to its sweet sour taste containing 15% sugar, malic and citric fruits acids. It is also high in vitamin C and the essential mineral, manganese (Okonkwo et al., 2012). The pineapple was originally consumed only as a fresh fruit. With the development of the processing industry, the fruit is now prepared and consumed in various forms such as chunks, slices, juices, syrups, jams, crushed pineapple and diced pineapple. Pineapple is the only source of bromelain, a complex proteolytic enzyme used in the pharmaceutical market and as a meat-tenderising agent, also the wastes from processing the fruit are now further processed into a powdered product to be used as a dietary fiber supplement (Pineapple Technical Group, 1999; Ackom and Tano-Debrah, 2012).

This study aimed to evaluate new canned pumpkin and pineapple with orange and mango juice and the effects of this processing on the organoleptic, physical and chemical properties of these products.

Materials and methods

Materials

Egyptian pumpkins (*C. moschata*), pineapples (*A. comosus*), Valencia oranges (*Citrus sinensis*) and mango fruit (*Sukari cultivar*) were purchased in season 2011–2012 from the local supermarket, Giza governorate, Egypt. Sucrose was obtained from Sugar and Integrated Industries Co., Egypt.

Processing methods

Preparation of pumpkin and pineapple cubes

Pumpkins were peeled, seeded and cut into cubes (approximately, 0.5 cm × 0.5 cm × 0.5 cm). Pineapple was removed shells with their eyes and cut into cubes (approximately, 0.5 cm × 0.5 cm × 0.5 cm). The prepared cubes were blanched for 1 min in hot water (90 °C) and then cooled in tap water according to (Aiboon, 2011).

Orange and mango juices

Orange fruits were sorted, washed, cut into halves, pressed by hydraulic laboratory press, then the resultant juices were strained through a nylon sieve, then water was added to crude orange juice at a ratio 1:1 of water:crude juice (wt:wt). Mango fruit were washed blended with electric pulper. Water was added to the portions at a ratio 3:1 of water:pulp (wt:wt), then screened through a nylon sieve.

Preparation of packing media

Sucrose solution concentrations of 40% (wt of sucrose/wt of water) as control. The resultant of orange and mango juices were raised by sucrose to 40% of total soluble solids (T.S.S.). Citric acid and potassium sorbate were added to each solution at levels (0.6% and 0.1%) for the filling of pumpkin and (0.2% and 0.1%) for the filling of pineapple, respectively.

Preparation of canned pumpkin and pineapple with different fruit juices

Pumpkin and pineapple cubes were divided into three parts for each. Each part of pumpkin as well as pineapple was packed individually with one the previously prepared with solutions (40%) mainly sucrose, orange and mango juices at a ratio 2:1 of cubes:solution (wt:wt). The canned pumpkin and pineapple were pasteurized at 90 °C for 5 min, cooled and stored at room temperature for analysis.

Analytical methods

Physical and chemical analysis

Total soluble solids (T.S.S), pH value, moisture content, total acidity, fiber, ash, ascorbic acid, reducing, non-reducing and total sugars were determined according to A.O.A.C (2005). Browning was measured (absorbance at 420 nm) as mentioned by Ranganna (1977) as follows: To 10 g of the sample, 10 ml. of water and 30 ml. of alcohol were added, mixed thoroughly and filtered using filter paper (Whatman No. 1). The absorbance of the solution was measured against 60% aqueous alcohol as blank. The total carotenoids were determined in the samples according to Askar and Treptow (1993). Total phenols were determined using the Folin–Ciocalteu method according to George et al. (2005). Firmness was measured using Qc-Tech Universal Testing Machine (model B-type, Cometech Ltd, Taiwan) with a flat knife probe (2.5 mm thickness) at a crosshead speed of 100 mm min^{-1}. The results were reported as Newton (N) according to the method described by Silva et al. (2011).

Sensory evaluation

The canned pumpkin and pineapple were sensory evaluated according to the method described by Watts et al. (1989).

Statistical analysis

The obtained data of sensory evaluation of canned pumpkin and pineapple were statistically analyzed according to

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