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Development of jam from tea infusion and tropical fruit dietary fibre

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Abstract

Purpose The purpose of this experiment is to develop a functional food by combining tropical fruits dietary fibre from pawpaw, grape and pineapple with a tea infusion to make jam.

Methodology Tropical fruit dietary fibre (TFDF) was obtained from pawpaw, pineapple and grape after juice extraction. Equivalent amounts of juice extract was replaced by a tea infusion from Mambilla Highlands (Nigeria) to produce jam. Samples of jam produced without tea infusion served as the control. Jams were produced in duplicates. Physicochemical parameters examined included vitamin C content, total soluble solids (BxO), titratable acidity (TTA), crude fibre, % moisture content, % ash and colour characteristics.

Findings The nutritional effects of both the tea infusion and the RFDF were complementary on the tea jam produced. Vitamin C in the tea infusion caused an increase in the vitamin C content of the tea jam while the quantity of pulp used increased its crude fibre. The colour of the tea jam improved significantly ($p<0.05$). Sensory evaluation of the jam into which the infusion was added did not differ in sensory rating in comparison to other conventional jams in taste, flavour, colour and general acceptability.

Practical implications This project reduces wastage from juice extracted fruits and allows the use of the bagasse (sugar pulp fibre) in the production of health foods.

Originality/value Many jams have been made from fruit juices and their pulp, but the introduction of tea infusion to jam-making showed that tea infusion can replace juice from tropical fruit to develop a dietetic jam suitable for diabetics.

Keywords Tea infusion, Pawpaw, Pineapple, Dietetic, Jam

Introduction

Tea (Camellia sinensis, family Theaceae) is consumed worldwide and is second only to water in its popularity as a beverage. Many health benefits have been ascribed to consumption of this beverage, including reduction in cholesterol and protection against cardiovascular disease and cancer (Zuo et al., 2002). The beneficial effects of tea have been attributed to the string antioxidative activity of its phenolic compounds known as tea catechins. Tea catechins possess strong antioxidative properties, i.e. they may protect the body from damage caused by free radical-induced oxidative stress (Manzocco et al., 1998). In addition, many reports (e.g. Chou et al., 1999; Yam et al., 1997) have presented data regarding the antimicrobial activity of different types of tea extracts on various pathogenic organisms. Hence, the consumption of tea has been associated with reduced risk of major diseases like cancer, coronary heart disease and stroke (Benzie et al., 1999; Langley-Evans, 2000; Leenen et al., 2000; Ramarathnam et al., 1995; Robinson et al., 1997).

Recently, there has been increasing interest in the use of natural food additives and incorporating health-promoting substances into the diet (Varga, 2006). Tea has been consumed widely as a beverage and value addition has not been popular, hence diversification of its use is increasing. Jaziri et al. (2009) has used both green and black tea in yogurt production to study the characteristics of microflora in the yogurt during fermentation and refrigerated storage. In an attempt to expand the use of tea infusion (green and black tea), several other new products have been developed, including tea wine (Aroyeun et al., 2005). Earlier, Akinwale et al. (2000) blended tea and mistletoe to develop a health-promoting tea. The health benefits of tea have necessitated inclusion of other health-benefiting food ingredients to develop novel foods. The importance of food fibre has led to the development of a large and potential market for fibre-rich products and nowadays, there is a trend to find new uses for dietary fibre. Dietary fibre has acquired additional importance related to its use as a functional ingredient (Heredia et al., 2002). The importance of a significant fibre intake is addressed in official dietary guidelines (Schaafsma, 2004). Since tea and dietary fibres have many health benefits, developing appealing processed foods such as jam from tea and dietary fibre would be a way of increasing awareness among consumers as well as expanding their utilization. The objective of this work was to produce jam from a blend of tea infusion and dietary fibre from pawpaw, grape and pineapple (tropical fruits) and to evaluate its quality using physicochemical and sensory parameters.

Materials and methods

Infused tea was made using black tea (as tea bags) from the Mambilla Highland, Taraba State, Nigeria. Tropical fruits (pawpaw, grape and pineapple) were purchased from an open market in Nigeria. The fruits were washed, sliced and pulverized into slurry with a sterilized blender (Kenwood blender, mixer, Licandora model A1515). The fruit pulp extract was obtained from the slurry filtered with the use of cheesecloth. Tea was boiled at 100OC

and cooled under cold water. An equivalent amount of infused tea to extracted juice was used to mix the different pulps (DF) from the fruit to make jam according to Lespinard et al. (2012). Quality indices

Physicochemical properties

Moisture content was determined using the AOAC 20103 method (1980). Soluble solids were determined by measuring the ◦Brix at 25◦C (Bellingam-Stanley Limited refractometer) and for pH analysis a pH-meter with a puncture electrode (HANNA Inc., pH 211) was used. The pH-meter was standardized by a two-point method against standard buffers of pH 4.0 and 7.0. Each analysis was carried out in triplicate.

Vitamin C, TTA (citric acid), were also measured using (AOAC, 1980) methods.

Colour measurements

A CIE 1976 L*a*b* system was used to describe the spatial 3D colour representation with a Minolta CR300 colorimeter. The colour measurements were taken at the surface by placing the colorimeter at several points on the jars surface. The volumetric colour (inner filling) was measured first by mixing the jam and then creating a 3 cm film on a Petri dish. The L* (lightness); a* (redness) and b* (yellowness) parameters were determined using the formula:

$$\Delta E = \sqrt{\Delta L*^2 + \Delta a*^2 + \Delta b*^2}$$

where ΔL*, Δa* and Δb*, are the differences in L*, a* and b* parameters of the jam during the thermal process.

Sensory analysis

Sensory analysis of the jam was carried out using a panel of 15 people. The panelists compared the jam for flavour, taste, colour, viscosity and general acceptability.

Results and discussion

Table 1 shows the physicochemical parameters of the TFDF jam. The TFDF jam had varying sugar contents, as shown by the values obtained for the total soluble solids (BxO).

Table 1. *The physicochemical characteristics of pineapple, grape and pawpaw used in formulating jam from TFDF and infused tea*

Tropical fruit	Botanical name	pH	Specific gravity	%total soluble solid	% titratable acidity	Vitamin Cmg/100ml of juice	%moisture content
Pawpaw	Carica papaya	3.60	1.42	16.24	0.58	40.24	82.3
Grape	Citrus paradis	3.05	1.04	10.50	1.65	45.00	55.6
Pineapple	Ananas cosmosus	3.80	1.73	17.00	0.67	36.70	88.5

Although the amount of sugar added was the same, the variation may be due to the Brix of the staring material. All the jams were acidic. Jam made with TFDF had lower vitamin C contents than jam into which tea infusion had been added. The effect of tea infusion on the DF is complementary. Jam cannot be made from tea infusion alone and as such the use of TFDF gave the jam characteristic properties that are within those reported for jam from tropical fruit for viscosity and texture. The use of tea infusion had a significant effect on the % moisture content, although there was a reduction in % moisture content from the initial moisture content of all the fruits used due to the heat treatment during processing (see Figure 1).

There were no significant differences amongst all the tea jams in viscosity, but significant differences occurred in others between the jams in which no tea was added. The acidic nature of the jam is noteworthy, although there was a slight difference in acidity when the tea infusion was added. The reduction in vitamin C content may be attributed to the heating method employed during processing, although the effect of tea infusion on the vitamin C increase was still significant. The total soluble solids were within standard levels for tropical fruit jam (Figure 2).

Figure 1. *Effect of black tea infusion on % moisture content and crude fibre of tropical fruit jam*

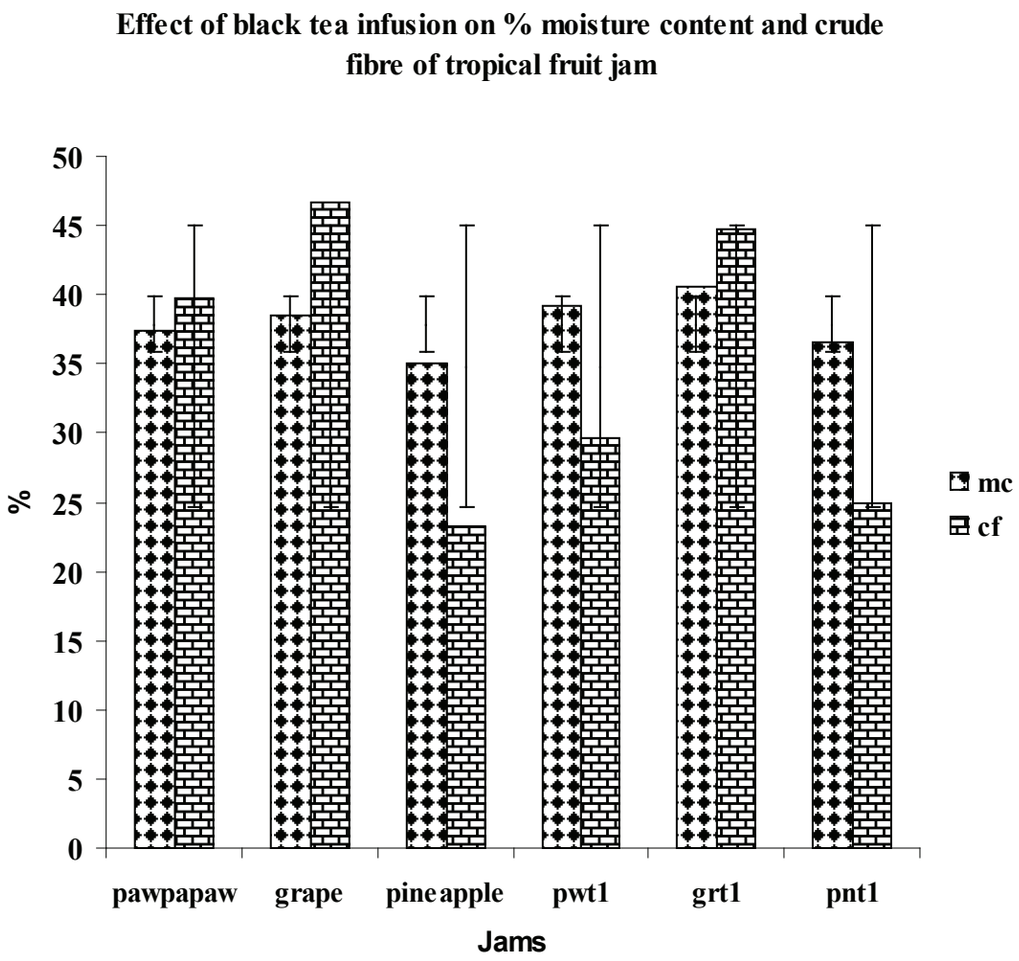
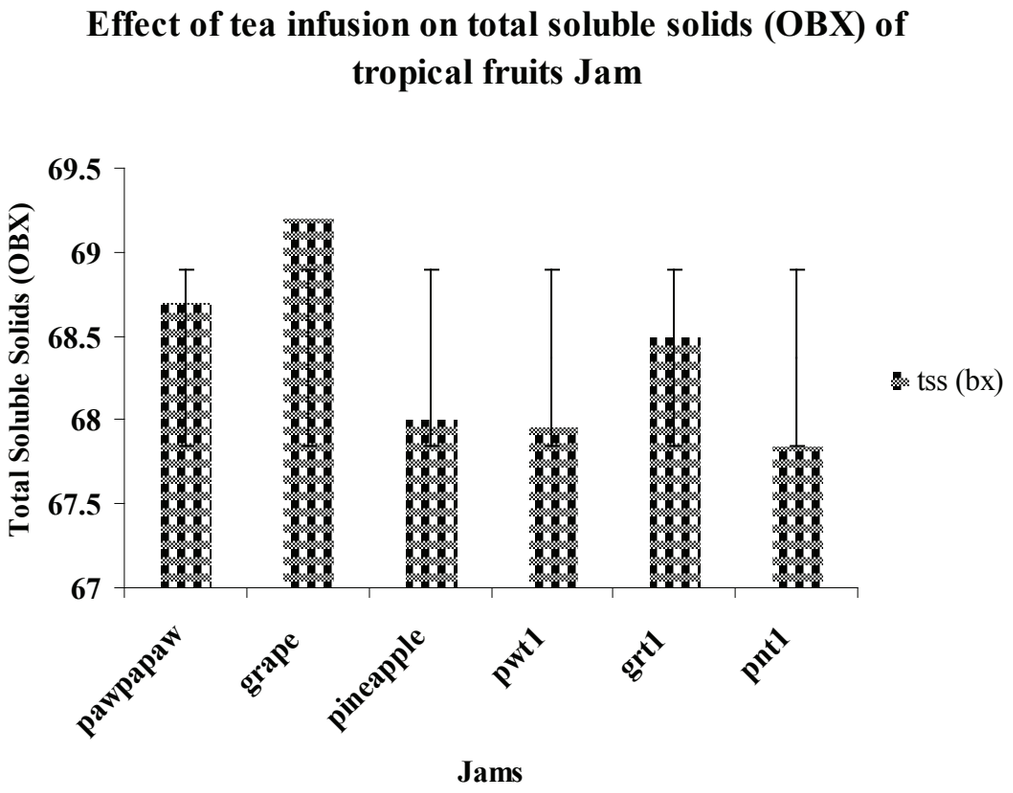


Figure 2. *Effect of tea infusion on total soluble solids (OBX) of tropical fruits jam*



In all the samples, colour characteristics and aesthetic values increased in all the jams in which tea was added (Table 2).

Table 2. *Colour profiles of jam produced from tropical fruits and infusion-based TFDF jam*

Jam	L1	L2	a*	b*	a*/ b*
Pawpaw	0.86	0.67	0.01	0.11	0.09
Grape	0.78	0.44	0.04	0.50	0.09
Pineapple	0.99	0.88	0.01	0.16	0.0.6
Pw + T1	1.12	1.01	0.02	0.30	0.07
Gr +T1	1.15	1.20	0.10	0.90	0.11
Pn + T1	1.23	1.09	0.025	0.32	0.08

The ax and bx values for grape-tea jam seemed to be higher than for the other jams. This means that the tea flavonoids imparted more of the golden brown colour in the grape-tea jam. The result of the sensory evaluation showed that at $p<0.05$ there were no significant differences in all the desirable attributes of taste, colour, flavour, and overall acceptability (Table 3).

Table 3. *Sensory analyses of jams produced from tea infusion and TFDF*

Jam	Taste	Colour	Flavour	General acceptability
Pw + T1	0.01±8.00a	0.21±7.32a	0.01±7.20a	0.00±8.00a
Gr +T1	8.10±0.00a	0.01±7.21a	0.22±6.90a	0.00±7.56a
Pn + T1	0.01±8.62a	0.11±7.08a	0.31±7.08a	0.01±8.40
Control Jam	8.80±0.01	0.22±7.40a	0.11±7.12a	0.00±8.11a

(±) – standard deviation

a,b- values in the same column with different letters are significantly different at $p < 0.05$

Conclusions

This study showed that black tea infusion can be used to replace juice to produce jam with good sensory quality.

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