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PREPARING THE FORMULATION OF CARBONATE BEVERAGE CONTAINING PINEAPPLE EXTRACT, DATE JUICE AND GINGER EXTRACT

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ABSTRACT

Due to healthy effects of plant extracts, there is extreme interest in using these extracts in beverages. Beverages have various functions on human body such as mandating the body water in an appropriate rate or hydration. The present study was aimed to prepare useful beverages based on pineapple, date juice, and ginger extract with different proportion of pineapple (10, 12, 14, 16, 18, and 20 percent), date juice (0.5, 1, 2, 3, 4, and 5 percent), ginger extract (0.3, 0.6, 0.9, 1.2, 1.5, and 2 percent). Physicochemical test included turbidity, density, total solids during a 30-day period. Duncan test was used to mean comparison in randomized complete design with seven treatments and three replications. Sensory evaluation was done in day 1, day 15 and day 30 by 9 experts. Turbidity and total solids were significantly decreased during the storage period, while density was significantly increased. The results showed there was no significant difference during the 30-day period of the study. Sensory evaluation showed F_6 with formulation of 20% pineapple extract, 5% date juice, and 2% ginger extract was selected as the most appropriate treatment.

Keywords: Pineapple Extract, Date Juice, Ginger Extract, Functional Drinks

INTRODUCTION

Vegetables and fruits are useful for health and certainly are one of the significant materials that are important in the diet. Pineapple is one of the most popular tropical fruit. In 2006, Thailand was the first country to produce more than 2.7

million tons pineapple in the world. Nutrients and beneficial compounds in pineapples including vitamin C, carotenoids and phenolic compounds, which reduce the risk of different types of cancer, cardiovascular disease and neurological diseases, are extremely eminent to health. Pineapple (Ananas comosus) contains an enzyme called bromelain which first was found in 1981. Pineapple has a high nutritional value containing mineral salts, calcium, phosphorus, magnesium, potassium, sodium, copper, iodine and protein and fat of less than 0.5%. Pineapple was recorded in English for the first time in 1998, when it was originally used to describe the reproductive organs of conifers. The original name of the fruits of Nanas means the excellent fruit (Anon et al., 1971). Pineapple is belonged to Bromeliaceae family, which includes 50 genera and 2000 species. The tropical fruit is native to Central and South America, especially South Brazil and Paraguay (Correia et al., 2004). Pineapple production around the world between 16 and 19 million tons, which mainly consists of water, carbohydrates, sugars, vitamins A, C and beta-carotene. Pineapple production around the world is between 16 and 19 million tons, which mainly consists of water, carbohydrates, sugars, vitamins A, C and beta-carotene. Besides, pineapple contains a small amount of protein, fat, ash, fiber and antioxidants such as flavonoids and also contains citric acid, malic and ascorbic. Pineapple also helps to normal function of some necessary enzymes in human beings (Tortoe et al., 2012). It physiologically protects the body and has significant impacts on different cancers with its antioxidant function. Vitamin C, as an important water-soluble antioxidant, protects cells of the inside and outside spaces and reduces the tocopherol conversion to its active form (Adzahan et al., 2011). There are two forms of vitamin C in pineapple including L- ascorbic acid and L -Dehydroascorbic acid (Tortoe et al., 2012).

Palm is one of the primary plants which grows in tropical and subtropical regions such as Iran. Iran always has been one of the palm-producing countries. According to the statistical data of 2006 for date, Iran with annual production of 880000 tons has a significant role on its global use. 30% of date producing in Iran, due to its inappropriate quality, directly was not used for consuming and should be convert to valuable products such as date juice. Date juice is one of the most valuable secondary products which is full of natural sugars such as glucose and fructose, but the percentage of sucrose in it is low. Fructose

physiologically does not require insulin to absorb; so it is an appropriate sugar for diabetics and has great energy. Also, date juice has a lot of potassium, calcium, phosphorus and iron, and is a useful food to feed the kids and breast-feeding women and the elderly. Replacing date juice in the formulation of food not only is a good alternative to harmful sugar or artificial sweeteners, but also can improve the nutritional properties of food. One kg of date with 20% of moisture generates 3000 kcal of energy which the most of this energy is obtained by its sugars. Date sugars are a mixture of sucrose, glucose and fructose, which fructose and glucose are converted to sucrose after deformation (Shafie et al., 2014). Protein and fat values inside the date is very low. Fat is concentrated in the skin and its importance in the maintenance and preservation of the fruit is physiological more valuable than its nutritional value. One to three percent protein is found in dates, but because of the lack of amino acids in the date, it can't be used as a food source of protein (Qureshi et al., 1989). In commercial dates, between 2 to 6 percent of the date meat is fiber. Despite a variety of vitamins A, B6, B3, and folate, as well as significant amounts of potassium, the most important role of dates is the provision of food fiber. Date has 25% sucrose, 50% glucose, albuminoidal materials, pectin and water. In addition, a variety of vitamins, including vitamins A, B, C, E and some minerals (Salah et al., 2007).

Ginger is one of the oldest and most important spices which is prepared from dried or fresh roots of Ginger plant. Ginger is cultivated in many tropical countries and is produced from ancient times in India. The difference in the pattern of cultivation, harvesting method and climatic conditions has caused a different commercial value. Because of its pleasant taste and smell, is widely used as a condiment. It was used as a drug to treat a variety of diseases such as headache in traditional medicine. Ginger is used as a carminative, appetizer, and antiemetic. Many scientists have studied and found that Ginger oil contains 50 compounds which are mainly aroma, starch, volatile oil, oleoresin, acetone and ether extract. (Bruneton, 1995). The plant has more than 1,200 species and 53 genera. Zingiber genus is about 85 species of aromatic plants from East Asia to tropical areas of Australia. Zingiber is a Sanskrit word that has been named according to the ginger rhizome and means "horned" (Haghigi Kavoli, 2012). The significant use of Ginger was discovered in the 13th century. It has been used as flavoring and additives in food more than 4,000 years and more than 2500 years for medical purposes

(Anonymous, 1997). Ginger is native to tropical regions of Asia (Southeast) and wildly grows in India and Zingi and Gingi areas of China. Ginger traditionally had been known by Greeks and ancient Romans and then was introduced to Europeans. Increasing its consumption has led to cultivate this species widely in different regions including Asia (Taiwan, etc.), Africa (Sierra Leone, Nigeria), America (Florida, Jamaica), Oceania (Australia). This plant can not grow in Iran and is imported mostly from India (Fulder, 1993; Awang, 1992; Trease, 1990). Ginger contains 4 - 7.55% oleoresin, non-volatile phenolic substances, non-aromatic compounds (fats and waxes) and volatile components.

Besides the extracted oil, ginger contains fat, oil, carbohydrates, vitamins and minerals. The approximate breakdown of ginger shows its carbohydrates, mainly starch (40-60%), protein (9-10%), lipids (6-10%), about 5% ash, free fatty acid (palmitic, Caprylic , capric, lauric, Myristic, stearic) that most of them are oleic, stearic and linoleic acid and vitamins (niacin, and vitamin A), minerals (Zn, Mg, K, Na) and free amino acid (Khodadadi, 1385; Kathi, 1999; Romm et al., 2010).

MATERIAL AND METHODS

Materials

Pineapple extract and date juice were purchased from companies of Synergy and Kimiagostar, respectively. Extracting the ginger; ginger rhizomes were washed with sterile distilled water and dried in the open air for an hour. Gingers were washed twice and the samples were extracted according to following instruction; 200 mg of fresh ginger rhizomes were combined in 100 ml cold distilled water for 24h. Subsequently, the obtained product was put in a dark distilled glass to reach the appropriate extract. After that the obtained extract was maintained as long as used (moemeni, 2010).

Formulation

The study was conducted in the treatments of pineapple juice, date juice, ginger juice, rose water, lemon juice, vitamin C, citric acid, water, and sugar.

Analysis of the sample characteristics:

Physical tests

Density: density was measured based on the densimetery method (National Standard of Iran, No. 2685).

Chemical tests

Measurement of total solids (dry residue): measuring dry residue was done using an oven (memmert, model UFE500 of Germany) and was performed based on National Standard No. 2685.

Turbidity: turbidity meter, made by Memmert Company of German, was used to measure turbidity of samples according to Nephelometric turbidity unit (NTU) (National Standard No. 1053).

Microbial tests

After venting of samples, sterile conditions were performed according to Table 2. The plates were analyzed and mean of two plates were reported as the number of micro-organisms per ml of sample (National Standard No. 2837).

Studying the sensory features of the beverage

To analyze the sensory features of the beverage, 9 experts of food science were selected (Ghazizadeh and Razagi, 1999). For this purpose, 9 levels were used which No. 9 and 1 were belonged to maximum and minimum values, respectively.

Statistical analyses

The data were analyzed in a randomized complete design with six treatments with control and three replications. The data were submitted into SPSS 20. Duncan test was applied to mean comparison.

Table 1: the treatment used in the study

treatment	Palm extract g	Ginger g	Pineapple extract %	Sugar g	Water %	Citric acid mg	Vitamin c mg	Lemon extract ml	Rosewater ml
F_1	0/5	0/3	10	0	78	0/1	0/03	0/1	0/3
F_2	1	0/6	12	0	78	0/1	0/03	0/2	0/6
F_3	2	0/9	14	0	78	0/1	0/03	0/3	0/9
F_4	3	1/2	16	0	78	0/1	0/03	0/4	1/2
F_5	4	1/5	18	0	78	0/1	0/03	0/5	1/5
F_6	5	2	20	0	78	0/1	0/03	0/6	2
Control sample	0	0	0	10	78	0/1	0/03	0/6	2

Table 2: the guidance of microbiological tests of carbonated fruit drink

Incubation time	Incubation temperature	Specific culture area / methods	Microbiological test	Number
48 h	37 °C	Plate Count Agar/ Pour Plate	Mesophilic aerobic bacteria	1
5 days	30°C	Orang-Serum Agar/ Pour Plate	Acid resistant microorganisms	2
5 days	25°C	Dichloran Rose-Bengal(DRB)/ Pour Plate	Mold and yeast	3

RESULTS AND DISCUSSION

Density: The effects of storage time on density have been shown by Figure 1. The density has increased from day 1 to day 30. The maximum and minimum density was respectively found in F_6 and F_1. This increasing trend of density can be observed for all treatments during 30 days.

The effect of storage on total solids (dry residue) has been presented in figure 2. The maximum and minimum total solids were respectively found in F_6 and F_1. The

changes in total solids in 30 days were approximately same and showed a slight increase. The effect of storage on turbidity of beverage has been presented in figure 3. The highest and lowest turbidity were observed in F_6 and F_5, respectively. Besides, figure 7 has shown the increase trend in all treatments in a 30-day period of storage. This trend in F_5 was more than that in others which is due to the fact that increasing color during storage resulted in turbidity increase.

Sensory evaluation of beverage

Figure 4 shows the sensory evaluation of beverage. Among all treatments, the lowest value was belonged to control, while the best beverage was F_6 with formulation of 20% pineapple extract, 5% date juice, and 2% ginger extract. After that, F_5 containing 18% pineapple extract, 4% date juice, and 2% ginger extract was selected as a valuable treatment.

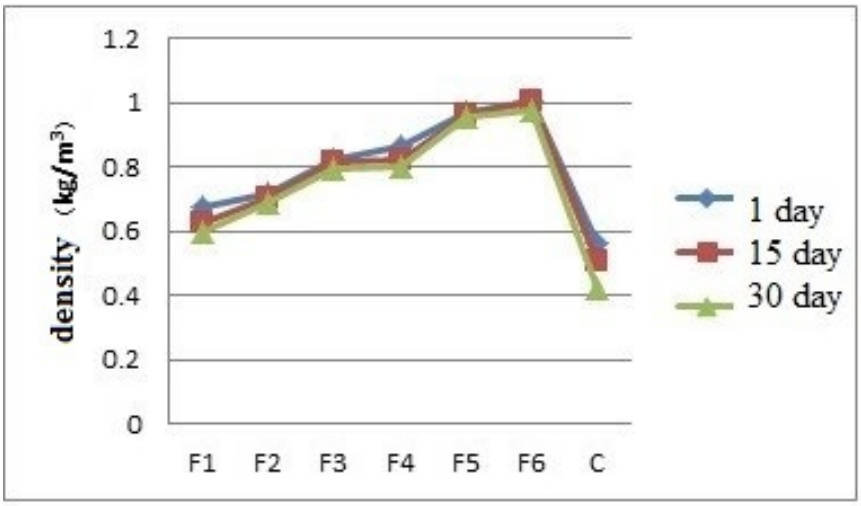

Figure 1: The effects of 30-day on density Measurement of total solids (dry residue)

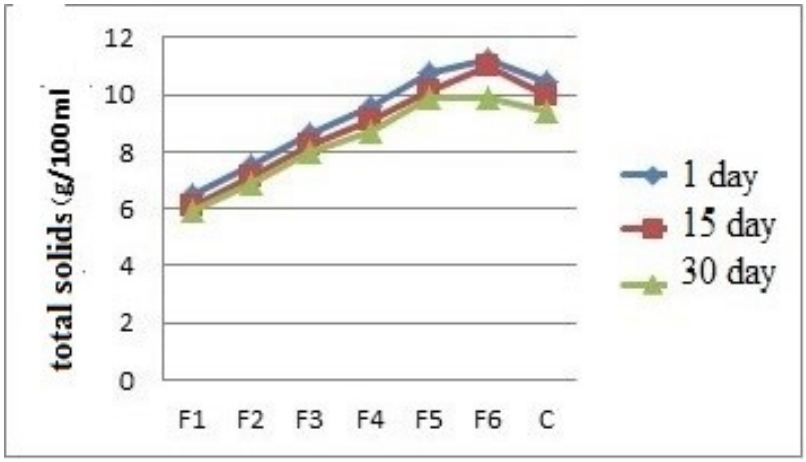

Figure2: The effects of a 30-day period on total solids Turbidity

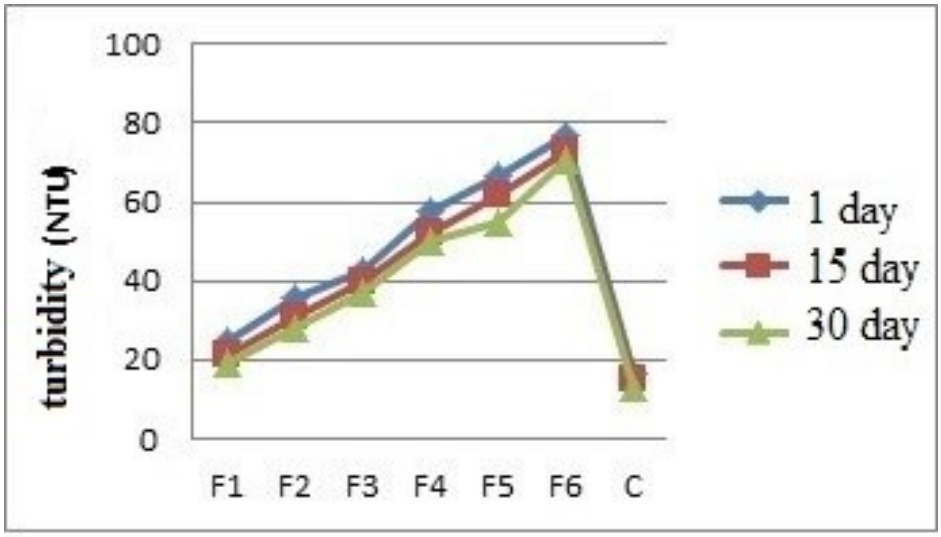

Figure 3: the effect of a 30-day period of storage on turbidity

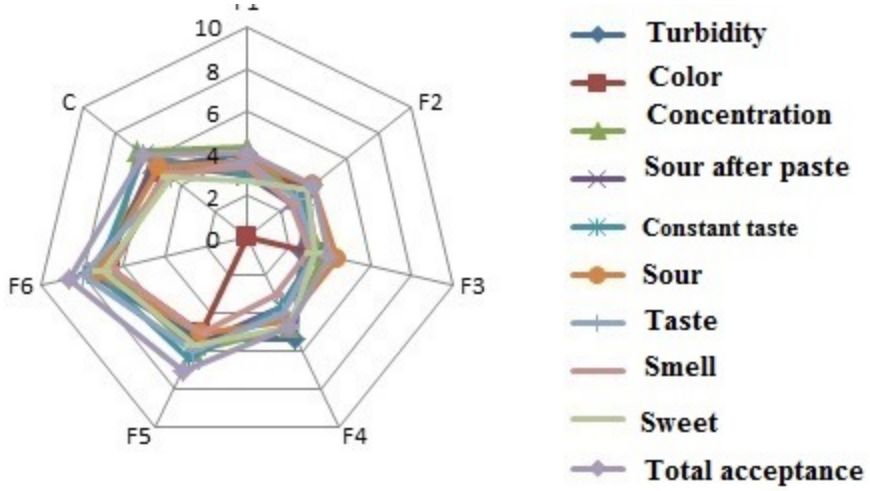

Figure 4: sensory evaluation of beverage

Table 3: sensory evaluation in different treatments (SD±mean)

Treatment	Total acceptance	Color	Turbidity and appearance	Sour after paste	Concentration	Constant taste	Sweet	Sour	Taste	Smell
F_1	3/000±1/000 ^{c}	3/000±1/000 ^{c}	3/666±1/154 ^{bcd}	2/333±1/154 ^{c}	4/666±0/577^{ab}	3/000±1/000 ^{c}	2/333±0/577 ^{d}	3/333±0/577 ^{b}	2/666±0/577 ^{b}	2/333±1/154 ^{c}
F_2	2/000±00/000 ^{c}	3/000±1/000 ^{c}	3/333±0/577 ^{cd}	2/333±0/577 ^{c}	3/666±1/527 ^{b}	3/333±0/527 ^{c}	3/000±1/000 ^{cd}	3/333±1/154 ^{b}	3/000±0/000^{b}	2/666±0/577 ^{c}
F_3	3/333±1/541 ^{bc}	3/333±0/577 ^{c}	2/666±0/577 ^{d}	2/666±0/577 ^{c}	3/333±1/154^{b}	3/333±1/527 ^{c}	3/333±0/577^{bcd}	3/666±0/577 ^{ab}	3/333±1/154 ^{ab}	3/000±1/000 ^{c}
F_4	3/333±0/577 ^{bc}	4/333±0/577^{bc}	4/000±0/577 ^{bcd}	3/333±0/577^{bc}	4/666±1/527 ^{ab}	3/666±2/081 ^{bc}	4/333±0/577^{abc}	4/000±1/000 ^{ab}	3/666±0/577 ^{ab}	3/000±1/000 ^{c}
F_5	4/666±0/577^{ab}	5/000±1/000 ^{ab}	4/666±0/577^{abc}	4/666±0/577^{ab}	5/666±1/154 ^{ab}	6/333±2/081 ^{ab}	5/666± 0/577^{a}	4/000±1/000 ^{ab}	4/333±1/154 ^{ab}	5/000±1/000 ^{d}
F_6	5/333±0/577^{a}	6/333±1/154 ^{a}	6/333±1/527 ^{a}	5/333±1/527^{a}	6/666±1/154 ^{a}	7/333±1/154 ^{a}	5/333±1/154 ^{a}	5/333±1/154 ^{a}	5/000±1/000 ^{a}	6/666±1/154 ^{a}
Control sample	5/000±1/000 ^{d}	4/666±0/577 ^{bc}	5/333±0/577^{ab}	4/333±0/577^{ab}	5/666±1/154 ^{a}	6/333±1/527 ^{ab}	4/666±0/577^{ab}	3/333±0/577 ^{b}	3/666±1/154 ^{ab}	5/000±1/000 ^{d}

Microbial tests

The microbial tests showed that there was found no micro-organisms resistant to acid, mesophilic aerobic bacteria, molds and yeast and also the beverage didn't have any microbial problem.

CONCLUSION

The results of present study showed that there was an increasing trend for all treatments on density during a 30-day period of storage. The turbidity was significantly increased with increasing ginger extract which is due to carbohydrates and turbidity of ginger. Besides, total solids slightly increased during a 30-day period. The analyses indicated that the final product had no useless microorganisms. Sensory evaluation showed F_6 with formulation of 20% pineapple extract, 5% date juice, and 2% ginger extract was selected as the most appropriate treatment.

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