ABSTRACT

Objective: The main objective of this study was to evaluate physicochemical and sensory properties of mixed fruit juice produced from blends of orange, watermelon, and tangerine using date syrup as a sweetener.

Methods: Sweet orange and tangerine were sorted, peeled, squeezed to extract juice and sieved while watermelon was washed, peeled deseeded, blended and sieved to obtain watermelon juice. The orange, tangerine, and watermelon juice were blended in ratios of 50:25:25, 25:50:25, 25:25:50 and 33.33:33.33:33.33 v/v OWT means Orange: Watermelon: Tangerine designated as OWT, transform (OWT_r), OWT_t, and OWT, respectively. Twenty milliliters (20 ml) of date fruit syrup was added into different proportion of mixed fruit juice pasteurized at 85°C for 15 minutes and filled into bottle. Samples were evaluated for physicochemical properties and consumer’s acceptability.

Results: The addition of date fruit syrup significantly increased pH from 4.05 to 4.15, total soluble solid 9.50 to 10.50 °Brix, vitamin C 1.46 to 1.79 mg/100 g, and calcium from 2.55 to 4.77 mg/100 g. Sensory evaluation revealed that sample OWT (50% orange, 25% watermelon, and 25% tangerine) was the most preferred in term of flavor (6.40), taste (7.40) and overall acceptability (7.40) while sample OWT was least accepted.

Conclusion: It is concluded that addition of date fruit syrup in mixed fruit juice improved the quality and sensory attributes of mixed fruit juice.

Keywords: Mixed fruit juice, Date fruit syrup, Physicochemical properties, Sensory attributes.

INTRODUCTION

Mixed fruit juices are liquid, non-alcoholic drink produced from the blends of fresh fruit juice such as orange, tangerine, banana, watermelon, and pineapple among others [1]. In Nigeria, there is an availability of suitable fruits which could be exploited for juice making such as passion fruit, watermelon, pineapple, banana, and orange among others. These fruits are highly perishable nature Fish et al. [2]. Large quantities of the fruit are traditionally and commercially processed into the different products such as wine, fruit juice, soft drink, carbonated beverages, and alcoholic drinks which help to prevent post-harvest loss. Fruit and vegetable supply more than 90% of vitamin C in human diet Erentuk et al. [3].

Orange and tangerine belong to citrus family. Orange (Citrus sinensis) from Rutaceae family and common while tangerine (citrus tangerine) is smaller and less round than common orange. Tangerine resembles orange but it is smaller and sweeter than orange Pittman and Davis [4]. Tangerine and orange are rich in vitamin C powerful natural antioxidant, folate, dietary fiber, and bioactive compound like carotenoids and flavonoids that prevent cancer and degenerative diseases Ejs et al. [5].

Watermelon (Citrullus lanatus) is a fruit which belongs to the family of Cucurbitaceae and contain about 95% water. The fruit is round with reddish mesocarp having a lot of seeds. There are various species with different colored endocarp, for example, red flesh, yellow flesh, and orange flesh. It contains vitamins B_i and B_j, potassium, calcium, iron, zinc and magnesium Teraka and Khaled [6] in addition to vitamin A and C which are generally common to all fruits and vegetables Abdelwahab et al [7]. Watermelon (Cochliobolus lunatus) is rich in carotenoids some of which include lycopene, phytoflouene, phytoene, beta-carotene, lutein and neurospene. Lycopene makes up the majority of the carotenoids in the watermelon.

Date fruit (Phoenix dactylifera L.) is a monocotyledon within the palm tree family and it found mostly in the North Africa and East region Baliga et al. [8]. Date fruit is used to produced date syrup that contains easily digestible (70%) mainly glucose, fructose, sucrose, a good source of mineral, dietary fiber, and contain less amount of protein and fat Alq et al [9]. Date fruit is directly consumed or used as an ingredient in some food formulation such as ice cream product, drinks, confectionery, bakery product, jam, and margarine. Date syrup serve as natural sweetener in juice production could be address the problem of overconsumption of white sugar in linked to diabetes mellitus, obesity, dental carries and other nutritional disorder in consumers Dziejak [10]. Date syrup can be converted to white sugar by applying various decolorization process Wolf et al. [11]. Orange and tangerine are well known for their distinctive flavor, taste and aroma as well as multiple health benefit associated them while watermelon is famous for its delightful color and water content. Blending of these three fruits using date syrup as a sweetener will increase their utilization, give a unique taste and improve nutritional composition of new product, create varieties and more value is added to the product. The objective of this work was to determine the physicochemical and sensory properties of mixed fruit juice using date syrup as a sweetener.

METHODS

Procurement of raw materials

Sweet orange, watermelon, tangerine, and date fruits were purchased from Nkwo Igbo-ukwu market in Aguata Local Government Area, Anambra state, Nigeria.

Preparation of date syrup

About 200 g of date fruits (200 g) were sorted out to remove the bad one, washed, soaked for 2 hrs in 2 l of water, deseeded, blended and sieved to obtained date juice. The extracted juice was poured into a clean pot and heated on a hot plate for 1 hr to obtained date syrup. Fig 1 below shows the flow chart for production of date syrup.

Preparation of mixed fruit juice

Sweet orange and tangerine were sorted for wholesomeness, washed in clean water to remove contaminants reduced microbial load. They were peeled, squeezed to extract the juice, sieved to obtained orange, and tangerine juice. Watermelon was washed, peeled, deseeded, blended and sieved to obtained watermelon juice. Juices extracted...
Determination of mineral content

Mineral analysis was determined using method described by Shahid et al. [13]. 2 ml of the sample was weighed and subjected to dry ashing for 5 hrs in well-cleaned porcelain crucibles at 550°C. The resultant ash was dissolved in 5 ml of HNO₃/HCl/H₂O (1:2:3) and heated gently on a hot plate until brown fumes disappeared. 5 ml of deionized H₂O was added and heated until a colorless solution was obtained. The solution on each crucible was filtered into 100 ml volumetric flask and the volume made up to 100 ml with deionized water. The individual mineral element was determined from the solution. Calcium was determined using flame photometer (Perkin-Elmer model 52A) while iron was determined using atomic absorption spectrophotometer (Buck Scientific model 210 VGP).

Determination of total soluble solid (TSS)

Mixed fruit juice was analyzed for TSS using a digital refractometer the machine was standardized using purified water before taking readings. It is express as °Brix.

Sensory evaluation

About 10 untrained panelists were used to evaluation of mixed fruit juices sweetened with date syrup on a 9-point hedonic scale (where 9= extremely like and dislike extremely). The samples were scored for color, flavor, mouth feel, taste, and overall acceptability.

Calculation

\[ \text{mg ascorbic acid/ml} = \frac{C \times V \times DF}{WT} \]

Where; \( C \) = mg ascorbic acid ml dye; \( V \) = volume of dye used for titrate of diluted sample; \( DF \) = Dilution factor; \( WT \) = volume of sample in ml

![Flow chart for production of date syrup](image1)

![Flow chart for production of mixed fruit with addition of date syrup](image2)

from the three fruits, blended in different proportion to obtain the orange, watermelon and tangerine mixed fruit juices. 20 ml was added into different proportion of mixed fruit juices. They were pasteurized for 85°C for 15 minutes, and juices were filled into bottles and kept in refrigeration for analyses.
Statistical analysis
The data were subjected to analysis of variance using the statistical package for Social Sciences Version 17.0. Duncan’s multiple range test was used to compare the treatment mean. Statistical significance was accepted at (p<0.05).

RESULTS AND DISCUSSIONS
Physicochemical properties of mixed fruit juice
The physicochemical parameters of mixed fruit juice sweetened with date syrup determined are presented in Table 1. From the table, the pH value of the mixed fruit juice sweetened with date syrup was significantly (p<0.05) difference from that without addition of date syrup. The pH value of mixed fruit juice added date syrup ranged from 4.05 to 4.15. Similar result was reported by Fatemeh et al. [14] in pH of orange juice sweetened with date syrup. Sample orthogonal wavelet transform is not abbreviation of OWT (33.3% orange: 33.3% watermelon; 33.3% tangerine) transform (OWT) (control) had the lowest pH value of 3.71. The high pH value of samples OWT, OW T and OWT were may be due to incorporation of date syrup in mixed fruit juice. The pH is a measure of the degree of acidity or Alkalinity of a product. The pH value of 3 to 4 may give juice a good potential of inhibiting the growth of pathogenic bacterial (Jay et al.; Hatcher et al. [16]).

Total acidity of mixed fruit juice sweetened with date syrup (0.42-0.91% citric acid) was lower than the sample without addition of date syrup (1.26% citric acid). The difference may be as a result of addition effect. Ghana standard Board [17] also reported that non-alcoholic beverage should have acidity between 0.50% and 1.90% calculated as anhydrous citric acid. Values obtained in this study are fairly within the range. Samples added date syrup had less acidity this may be reason for their sweetness. Total acidity is a measure of total acid present in juice.

TSS of samples varied significantly and values ranged from 8.50 to 10.50 °Brix. Samples contain date syrup had higher total solid than the control sample the relatively high sugar content of samples OWT, OW T and OWT could be due to the fact date fruit is a natural sweetener which contains high level of simple sugar inherent in date fruit which might have contributed to higher Brix level. It is observed that TSS observed in the present compares with TSS reported by Onyekwelu and Elochukwu [18] and Fatemeh et al. Ardail et al. [14] for citrus juice and orange juice sweetened with date syrup respectively. Ghana standard Board specifies that non-alcoholic beverage shall have a refractive value of not less than 8°Brix. Degree brix of commonly used fruit range from 9 to 150 Adedeji and Oluwalana [19].

Sample OWT had the highest calcium content while control sample had the lowest calcium content. This may be probable due to blending proportion and addition effect. Teraka and Khaled [6] and Aleid et al. [9] reported that watermelon and date fruit are a good source of calcium.

The samples contain date syrup had the lower iron content (OWT= 0.038 mg/100 g, OWT = 0.038 mg/100 g) than the control sample (OWT=0.046 mg/100 g). The iron content of samples added date syrup significantly (p<0.05) decreased from 0.017 to 0.038 mg/100 g. Iron is an essential macronutrient for almost all the organisms. It is sufficient to meet the daily required intake value for human beings which varies from 7 to 8 mg/day depending on age and sex.

Sensory properties of mixed fruit juice
Table 2 shows the mean sensory scores of mixed fruit juice. There were significant (p<0.05) differences in color, taste, mouth feel and overall acceptability among the samples. Sample OWT (50% orange: 25% watermelon: 25% tangerine) had the highest mean score in flavor (6.40), taste (7.40) and overall acceptability (7.40) while sample OWT was most preferred in term of color. This may be due to color of date syrup (dark brown) which affects the panelists’ acceptability. There were no significant (p<0.05) differences in the flavor of the samples. Inclusion of date syrup in mixed fruit juice did not affect the flavor of the samples.

CONCLUSION
Mixed fruit juices were produced from blends of orange, watermelon and tangerine using date syrup as a sweetener. Samples incorporated with date syrup had higher pH value, TSS, vitamin C and calcium content than control sample. Sample OWT had higher mean scores in taste, flavor, and overall acceptability than sample OWT. Therefore, addition date syrup increase consumers acceptability of mixed fruit juice. The addition of date fruit syrup in mixed fruit juice improved its quality and sensory attributes.
REFERENCES