Syed et al., 1:6
http://dx.doi.org/10.4172/scientificreports.311

Open Access Scientific Reports

Research Article Open Access

Studies on Preparation of Squash from Sweet Orange

Syed HM[1], Pravin Udhavrao Ghatge[1]*, Girish Machewad[2] and Sharad Pawar[1]

[1]*Department of Food Chemistry and Nutrition, College of Food Technology, Marathwada Krishi Vidyapeeth, Parbhani – 431 402, India*
[2]*Department of Food and Industrial Microbiology, College of Food Technology, Marathwada Krishi Vidyapeeth, Parbhani – 431 402, India*

Abstract

The value added products (squash) was prepared from sweet orange (*Mosambi*) fruits. The physical characteristics of sweet orange fruit were determined. The physicochemical characteristics of sweet orange juice were found pH (3.7), total soluble solids (10^{0}Bx), acidity (0.41%), moisture (88.4%), protein (0.6%), fat (0.05%), carbohydrate (10.5%), fiber (0.12%) and ash (0.3%). The pH, TSS, acidity and ascorbic acid of the squash stored at room and refrigerated temperature were significantly ($P < 0.05$) decreased. The coliforms were found absent in the squashes for the storage period (60 days). The yeast and mold colony appeared after storage period (60days) and total plate count (TPC) after storage period (30 days) in squash stored at ambient temperature. The squash stored (30days) were found no colony for TPC, yeast and mold and coliforms at refrigerated temperature. The sensory quality of sweet orange squash was acceptable till the storage period (60 days) at refrigerated temperature and room temperature. The sweet orange can be very well utilized for preparation of squash.

Keywords: Sweet orange; Physicochemical characteristics; Total plate count; Coliforms; Sensory quality

Introduction

The sweet orange (*Citrus sinensis* L. Osbeck.) belongs to citrus fruits. Among all the citrus fruits produced either for export or local market. The sweet orange contributes 71% of the total citrus production in the world. Brazil is largest producer of sweet orange. India ranks 3rd in production of sweet orange with annual production of 4266.9 million tonnes. In Maharashtra the citrus is grown in district of Ahmednagar, Nasik, Pune. The *nucellar mosambi, mukhed* seedless and *raja poyi* are the major cultivars of sweet orange cultivated in Maharashtra. In Parbhani district, *nucellar mosambi* and *rajapimpari* are the major cultivars of sweet orange.

The chemical composition of sweet orange shows that it contains water (86-92%), sugar (5-8%), pectin (1-2%), glycosides (0.1-1.5%), pentosans (0.8-1.2%), citric acid (0.4 to 1.5%), fibre (0.6-0.9%), proteins (0.6-0.8%), fat (0.2-0.5%), minerals (0.5-0.9%) and essential oils (0.2-0.5%) [1]. The sweet orange fruit is processed commercially in to various forms mainly juice, frozen concentrates, squash, RTS drinks, nectar, dry mixes, canned segments, juice blends, marmalades and other value added products like pectin and essential oil from peel, natural colors, candied peel, feed yeast etc. Fresh juice of sweet orange is an important nutritious product providing 45 kcal, moderate quantity of vitamin C, potassium, bioflavonoid and folic acid and essential items of breakfast. It is refreshing, thirst quenching and energizing drink of breakfast. It is refreshing, thirst quenching and energizing drink that improves health and nutritional requirements.

Citrus fruits and citrus juices have several beneficial health and nutritive properties. They are fat free, sodium free and cholesterol free. In addition they contain potassium, calcium, folate, thiamin, niacin, vitamin B6, phosphorus, magnesium and copper. They may help to reduce the risk of heart diseases and some types of cancer. They are also helpful to reduce the risk of pregnant women to have children with birth diseases. Citrus fruit processing produces many byproduct with significant value. These by-products are considered to be rich source of edible and health promoting agents as polymethoxylated flavonoids, many of which are found exclusively in citrus peel [2]. The sweet orange peel contain sugars, edible fiber and many other components that offer excellent opportunities as value-added products, particularly those components that have biological activities (antioxidant, anti-cancer, cardio-protective, and food/drug-interactions) or other attributes that are useful in the development of high-value food products from citrus peel [3]. Therefore the morphological characteristics, juice extraction of sweet orange and storage study of squash at room and refrigerated temperature were carried out.

Materials and Methods

The whole sweet orange fruits (variety Nucellar) were procured from Sweet Orange Research Scheme, Marathwada Krishi Vidyapeeth, Badnapur, Jalna, Maharashtra. The oranges were washed and wiped.

Physical characteristics

The physical characteristics such as weight of fruit, peel, albedo, flavedo, juice, pomace, seeds, diameter, thickness of peel, number and weight of were determined.

Component proportion in fruit

The proportion of each part is calculated and presented in percent to the whole fruit.

Juice extractions

The sweet orange juice was extracted using multi fruit juice extracting machine.

Determination of chemicals characteristics of sweet orange juice

The chemicals characteristics of sweet orange juice such as moisture content, protein, fat, carbohydrate, ash and fiber were determined as per standard procedure [4].

***Corresponding author:** Pravin Udhavrao Ghatge, Department of Food Chemistry and Nutrition, College of Food Technology, Marathwada Krishi Vidyapeeth, Parbhani–431 402, India, Tel: +91-02452-222468; Fax: +91-02452-234150; E-mail: pughatge@indiatimes.com

Received September 12, 2012; **Published** September 24, 2012

Citation: Syed HM, Ghatge PU, Machewad G, Pawar S (2012) Studies on Preparation of Squash from Sweet Orange. 1:311. doi:10.4172/scientificreports.311

Preparation of squash

The recipe of sweet orange squash was strained juice (250 ml), water (750 ml), citric acid (9 g), sugar (418 g) and potassium metabisulphite (350 ppm) (Figure 1).

Storage studies of orange squash

The sweet orange squash were stored at room (25-30^{0}C) and refrigerated (5-8^{0}C) temperature for the period (60 days). The effects of room and refrigerated temperatures on physicochemical, microbial and sensory quality were studied.

Preparation of Squash

Sweet orange

↓

Peeled

↓

Juice extracted

↓

Syrup preparation → Filtered (56^{0}Bx) ↓

Mixed with strained syrup

↓

Added preservative (Potassium metabisulphite)

↓

Filled into sterile bottles

↓

Crown corking

↓

Stored

Figure 1: Flow sheet for preparation of sweet orange squash.

Characteristics	Value
Color	Greenish yellow
Wt of fruits(g)	199.00
Diameter(mm)	84.06
Thickness of peel (mm)	2.34
Wt. of peel (g)	47.10
Wt of albedo (g)	31.69
Wt of Flavedo (g)	15.39
Wt of fruit without peel (g)	167.25
Wt of juice (g)	77.65
Wt of Pomace (g)	66.00
Wt. of seeds (g)	12.60
No. of seeds	17

Each value is average of ten determinations.

Table 1: Physical characteristics of sweet orange.

Parameters	Quantity	Per cent
Whole Fruit (g)	199.0	100.00
Peel (g)	47.1	23.66
Juice (ml)	81.0	37.95
Pomace (g)	63.9	32.09
Seed (g)	12.6	6.30

Each value is average of ten determinations.

Table 2: Percent proportion of each part of sweet orange.

Sensory evaluation of sweet orange squash

The sensory evaluation of sweet orange squash was carried by a penal of ten trained judges using 9-point Hedonic scale score [5].

Microbial quality of sweet orange squash

The total plate count, yeast and mold and coliform count of sweet orange squash were carried as per standard procedure [6].

Result and Discussion

Physical characteristics of sweet orange

The physical characteristics of sweet orange were found skin color (greenish yellow), average weight (199 g), average diameter (84.06 mm), thickness (2.34 mm), weight of peel (47.1 g), weight of flavedo (15.39 g), albedo layer (31.69 g), weight of fruit without peel (167.25 g), weight of 81 ml extracted juice (77.62 g), weight of pomace (66 g), weight of seed (12.6 g) and total number of seeds (17) (Table 1).

Proportion of each part of sweet orange

The sweet orange fruits were found weight of peel (23.66%), juice (37.95%), pomace (32.09%) and seed (6.3%) (Table 2).

Physico-chemical characteristics of sweet orange juice

The physicochemical characteristics of sweet orange juice were

Parameters	Value
pH	3.7
TSS (0Bx)	10.0
Total Acidity (%)	0.41
Moisture (%)	88.4
Protein (%)	0.6
Fat (%)	0.05
Carbohydrate (%)	10.5
Fiber (%)	0.12
Ash (%)	0.3
Ascorbic Acid (mg/100 ml)	43.0

Each value is average of three determinations.

Table 3: Physicochemical characteristics of sweet orange juice.

Days	pH	Total soluble solids (0Bx)	Acidity (%)	Ascorbic acid (mg/100 ml)
Room temperature				
0	3.55	45.2	0.41	14.5
15	3.50	41.5	0.39	13.9
30	3.46	40.3	0.38	12.6
45	3.43	40.1	0.38	11.85
60	3.40	40.1	0.37	11.25
Refrigerated temperature				
0	3.55	45.2	0.41	14.5
15	3.53	45	0.41	14.4
30	3.51	44	0.41	14.4
45	3.51	44	0.41	14.3
60	3.49	44	0.40	14.3

Each value is average of three determinations.

Table 4: Effect of ambient temperature on physicochemical attributes of the orange squash.

Days	Sensory score (overall acceptability)	Total plate count (cfu/ml)	Yeast and Mould count	Coliform count
Room Temperature				
0	8.65	ND	ND	ND
15	8.65	ND	ND	ND
30	8.60	ND	ND	ND
45	8.60	2×10^2	ND	ND
60	8.60	3×10^2	1×10^2	ND
Refrigerated temperature				
0	8.80	ND	ND	ND
15	8.80	ND	ND	ND
30	8.75	ND	ND	ND
45	8.75	ND	ND	ND
60	8.75	1×10^2	ND	ND

Each value is average of ten determinations.

Table 5: Sensory and microbial quality of orange squash stored at ambient temperature.

found pH (3.7), total soluble solids (10^0Bx), acidity (0.41%), moisture (88.4%), protein (0.6%), fat (0.05%), carbohydrate (10.5%), fiber (0.12%) and ash (0.3%) (Table 3).

Storage study of the sweet orange squash

The sweet orange squash was kept at room temperature (25-30^{0}C) and refrigerated temperature (5-8^{0}C). The squash was found to be stable for a period (60 days) (Table 4). The pH, total soluble solids (TSS), acidity of the squashes stored at room temperature were significantly ($P < 0.05$) decreased and the ascorbic acid content were non-significantly ($P > 0.05$) decreased with increase in storage period. The pH, TSS, acidity and ascorbic acid content of the squashes stored at refrigerated temperature were significantly ($P < 0.05$) decreased with increase in storage period. The similar results with respect to ascorbic acid content were reported [7].

Microbial quality and sensory quality of sweet orange squash stored at ambient and refrigerated temperature

The microbiological examination of sweet orange squash revealed that coliforms were found absent during room and refrigerated storage conditions (Table 5). The yeast and mold colony were present after storage period (60 days) at refrigerated conditions and at storage period (60 days) ambient storage. The sweet orange squash stored for period of 45 days showed no colony for any microbiological examination at refrigerated temperature. The sensory quality the sweet orange squash were acceptable for storage period (60 days) for room and refrigerated storage conditions. A shelf life of kinnow squash of over 90 days [8]. The storage period studied were in consonance with the findings [9].

Conclusions

The value added products (squash) was prepared from sweet orange (*Mosambi*) fruits. The pH, TSS, acidity and ascorbic acid of the squash stored at ambient and refrigerated temperature were significantly ($P < 0.05$) decreased. The coliforms were found absent in the squashes for the storage period (60 days). The yeast and mold colony appeared after storage period (60days) and total plate count (TPC) after storage period (30 days) in squash stored at ambient temperature. The squash stored (30days) were found no colony for TPC, yeast and mold and coliforms at refrigerated temperature. The sensory quality of sweet orange squash was acceptable till the storage period (60 days) at refrigerated temperature and room temperature. No observable differences in organoleptic properties were found among the sweet orange squashes at two different temperatures. The effect of storage temperatures on physicochemical, microbiological and sensory quality was more or less similar trend the storage period (60 days). The sweet orange fruit can be very well utilized for preparation of squash.

References

1. Siddiqi NA (2005) Debittering of sweet orange by resin. M. Tech. Thesis, College of Food Technology. Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India.
2. Hatamipour MS, Majidi SM, Abdi M, Farbodnia (2004) Potentials for industrial utilization of citrus byproducts, CHISA 2004. Proceeding of the 16th International Congress for Chemical and Process Engineering, August 22-26, 2004, Prague, Czech Republican. pp. 9263.
3. Widmer WW, Montanari AM (1994) Citrus waste steams as a source for phytochemical. Proceeding of the Florida State Horticultural Society 284-288.
4. AOAC (2000) Official Methods of Analysis (17th Edn.) Official Methods of Analysis of Association of Official Agricultural Chemists International, Gaithersburg, MD.
5. Amerine MA, Pangborn RM, Roessler EB (1965) Principles of sensory evaluation of food. Academic press, New York.
6. Ranganna S (1986) Handbook of Analysis and Quality Control For Fruit and Vegetable Product, Tata McGraw Hill publishing company, New Delhi.
7. Kansal (2003) Studies on processing of kinnow juice extracted through modified method of bitterless kinnow juice extraction. M.Sc Thesis, Thapar Institute of Engineering and Technology, Patiala, Punjab, India.
8. Kamaljeet K (2002) Application of novel juice extraction methods and bacterial utilization of limonin for control of bitterness in kinnow juice. M.Sc Thesis Thapar Institute of Engineering and Technology, Patiala, Punjab, India.
9. Kaur C and Kapoor HC (2001) Antioxidant in fruits and vegetables-the millennium's health. Int J Food Sci Technol 36: 703-725.