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Effect of Sucrose and Glucose Mixture on the Quality Characteristics of Osmotically Dehydrated Banana Slices

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Abstract: The research was conducted to investigate the combined effect of sucrose - glucose solution on banana slices in ratio 1:1 and 7:3 sucrose glucose combination for 72 hrs and after every dipping slices were tested for pH, T.S.S, acidity moisture and ascorbic acid content, and organoleptic properties like colour, flavour and texture was also assessed. The observed results showed that pH decreased after 72 hrs. T.S.S increased from 21-30, in 36E brix, acidity also increased from 0.53-1.2. The moisture content decreased from 74.44% - 63% increase in T.S.S. Ascorbic acid content decrease color and flavor remain acceptable but texture decrease at 60° brix after 72 hrs.

Key words: Banana slices, glucose, osmotic dehydration

Introduction

The banana belongs to the genus *Musa* of the monocot family Musaceae. Two available species are *Musa cavendishi* (drawf banana), and *Musa sapientum* (tall banana). Banana is a typical tropical fruit grown only in the frost free and hot regions of the world. Dry weather and strong winds are equally destructive to it. Some important Banana growing countries are Mexico, Jamaica, Brazil, Malaysia, Costa Rica and India. In Pakistan Sindh provide quite suitable condition for banana growing while dry hot summer and forest winter of the Punjab, NWFP and Baluchistan is generally unfavourable except in some localities along the rivers and lakes. In Pakistan total area under banana cultivation is 28.0 thousands hectares and the production in session 2001-2002 in Pakistan was 125.2 thousand tons (Anonymous, 2002). Osmotic dehydration is a useful technique for the concentration of fruits and vegetables realized by placing the solid food, whole or in pieces in sugar or salt aqueous solution (Danila, 1993). Ripe Banana slices were treated osmotically in 35, 50 and 65° brix sugar solutions at 25°C for 36 hrs during which thickness decrease from 10-9,6 and 5mm. The total soluble solids contents of the slabs increased from 15° brix to 26, 34 and 37°brix (Sankat *et al.*, 1996). Intermediate moisture sweetened products were prepared blached guava slices in to stage partia osmotic dehydration using dry crystalline sweeteners [either commercial grade sucrose or sucrose glucose 7:3 where by in 72 hrs the moisture content of the slices decreased from 90-32% while the DM content of the agent decrease from 100-67% (Ayub *et al.*, 1995)]. Cubes cut from osmotically dehydrated with a 4:1 excess of sucrose solution (615g/l) or starch syrup (675g/l) at 30 or 30°C to water solid ratio of 7:5 and 3g/g after surface drying the cubes were convection dried at

70°C with air speed 1.5m/s to constant weight (Lenert and Cerkoviniok, 1996) osmotic dehydration of Apple rings was studied at 1996 40,50 and 60°C using as osmotic agent as sucrose solution or a mixture of syrup Maize starch the variable studies were weight loss, solids content uptake and Brix in corn syrup. The weight loss was higher and solids uptake was lower than in sucrose. (Mercado *et al.*, 1993). Samples of apple banana and Kiwi fruit were osmotically dehydrated by immersion in 30, 40, 50% sucrose solution for 0.5, 2, 6 or 16 hrs at 20, 40, 60°C. An emperical model to predict the water loss and solid gain was developed (Panagistou *et al.*, 1998).

Materials and Methods

Fresh, healthy and matured bananas were purchased from the local market of Peshawar city. Fruit was transported in wooden cates to the food processing and analytical laboratory of the department of Food Science and Technology, NWFP Agricultural University Peshawar, where the research work was conducted. The fruit was washed, dried and peeled, cut in disc shape slices in citric acid solution (1%) to avoid products enzymatic browning and vitamin loss due to oxidation and slices were dipped into 100% sucrose 1:1 sucrose + glucose and 7:3 sucrose + glucose and control. These were analyzed for ascorbic acid, titratable acidity, pH, moisture according to the methods AOAC (1984), and organoleptic evaluation according to Larmond (1977).

Results and Discussion

The effect of osmosis as a pretreatment mainly related to the improvement of nutritional, sensorial and functional properties of the product. The aim of the present work was to improve the nutritional as well as sensorial properties of banana through osmotic

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Table 1: Effect of Solutions on pH of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means	%increase
T ₀	5.06	4.89	4.86	4.93	3.95
T ₁	4.84	4.81	4.76	4.80	1.65
T ₂	4.86	4.74	4.62	4.74	4.93
T ₃	4.30	4.55	4.72	4.52	1.52

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose T₃ = 100% Sucrose

Table 2: Effect of Solutions on Total Soluble Solids of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means	%increase
T ₀	21.3	21.6	22	21.63	3.18
T ₁	24.2	26	34	28.06	28.82
T ₂	24.2	29	36	29.73	32.77
T ₃	24.3	28.9	31	28.06	27.76

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose, T₃ = 100% Sucrose

Table 3: Effect of Solutions on Acidity of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means	%increase
T ₀	0.536	0.69	0.804	0.67	33.33
T ₁	0.67	0.85	1.005	0.84	33.33
T ₂	0.603	0.97	1.2	0.92	49.75
T ₃	0.518	0.427	0.319	0.42	45.75

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose, T₃ = 100% Sucrose

Table 4: Effect of Solutions on Moisture of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means	%Decrease
T ₀	74.41	71.26	69.22	71.63	6.97
T ₁	71.5	69.18	65	68.56	9.09
T ₂	70.86	68.45	63	67.43	11.09
T ₃	68.45	66.35	65.21	66.67	9.08

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose T₃ = 100% Sucrose

Table 5: Effect of Solutions on Ascorbic Acid of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means	%Decrease
T ₀	5.8	5.75	5.5	5.68	5.17
T ₁	5.9	5.84	5.8	5.84	1.69
T ₂	5.9	5.85	5.81	5.85	1.52
T ₃	5.56	5.43	5.36	5.45	1.42

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose, T₃ = 100% Sucrose

solutions. The results pertaining to the response of osmotic solution on the pH are given in Table 1. With the passage of time and increase in brix the minimum pH value was 4.30 in T₃ and maximum was 4.86 and 4.93 in T₂ and T₀ respectively the other regarding results between these values. The means are given in Table 1 and maximum percent increase for pH is 4.93 and minimum 1.52 for T₂ and T₃ respectively.

The total soluble solids results are given in Table 2. The TSS in raw Banana was 21.3 which increase to 36^o brix due to absorption. T₀ transfer solute molecules across the membrane the results showed that maximum increase 36^o brix for T₂ and minimum for T₀ (3.18%). These results match with Sankat *et al.* (1996). They reported that TSS increase after dipping. The results of titratable acidity of banana chips are given in Table 3.

This shows increase in acidity that is the maximum acidity 1.2 and minimum 0.63 for T₂ after 72 and 24 hrs. Maximum percent increase in acidity was 49.75 and minimum increase 33.3. This shows gradual increase in acidity.

The moisture content is an important parameter because it plays main role in food. The initial value for moisture content is 74.41% which decrease in 72 hrs upto 63% and moisture value range in between this. The mean values for moisture 68.56, 67.43 and 66.67 for T₁, T₂ and T₃ respectively. This increase is due to the increase in TSS. These results are agree with Alamzeb *et al.* (1994) they find decrease of moisture content in osmotic solution. The ascorbic acid is a light sensitive vitamin there was gradual decrease in ascorbic acid content range between 5.90 and 5.36 in T₁ after 24 hrs

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Table 6: Effect of Solutions on Color of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means
T ₀	6.15	5.43	5.12	5.56
T ₁	7.12	6.81	6.53	6.82
T ₂	7.15	6.91	6.67	6.91
T ₃	7.8	6.5	6	6.77

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose, T₃ = 100% Sucrose

Table 7: Effect of Solutions on Flavor of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means
T ₀	5.45	5	4.39	4.94
T ₁	7.31	7.12	6.98	7.13
T ₂	7.43	7.24	7.03	7.23
T ₃	7.5	6	5.4	6.3

T₀ = Control, T₁ = 50% Sucrose + 50% Glucose, T₂ = 70% Sucrose + 30% Glucose, T₃ = 100% Sucrose

Table 8: Effect of Solutions on Texture of Banana Slices

Treatments	30 brix ^o	45 brix ^o	60 brix ^o	Means
T ₀	6.23	6.01	5.26	5.83
T ₁	7.26	7.06	6.89	7.07
T ₂	7.31	7.13	6.95	7.13
T ₃	7.7	6.3	5.3	6.44

T₀ = Control, T₁ = 50% Sucrose+50% Glucose, T₂ = 70% Sucrose + 30% Glucose, T₃ = 100% Sucrose

and T₃ after 72 hrs. The mean value for ascorbic acid is in between 5.45 and 5.84 and maximum decrease is 5.17% in T₀. All the physico-chemical parameters are significant. All the samples of Banana slices were analyzed subjectively for colour, flavour and texture after 24, 48, 72 hrs. The increase in time and concentration of solids resulted in decrease of colour score from 7.15 - 6.53. Maximum score was 7.15 and minimum was 6.53. Statistical analysis of the data shows that the results were significant, results given in Table 6. The results shows maximum flavour score is 7.43 and minimum score is 4.39, others are in between them, results are given in Table 7. The statistical analysis of the data shows that the results were significant.

The results of the texture score of Banana slices are presented in Table 8. The increase in time and solution concentration decrease the texture of Banana slices. The maximum score was 7.31 which was for T₂ at 30° brix and minimum for T₁ which was 6.89 after 72 hrs in 60° brix. Statistical analysis of data shows that results were significant.

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