

Effect of Osmotic Dehydration on drying method and physicochemical Properties of Pineapple (*Ananas comosus*.var.*Queen*)

Abstract: Osmotic dehydration in pineapple cubes by using sucrose solution is able to improve the quality like colour, aroma, texture, appearance as well as overall acceptability. The physicochemical properties of the product were evaluated during the experiment. There were significant differences among different treatments. The range of recovery % (13.210%-14.780%), TSS°Brix (54.52°Brix-75.40°Brix), reducing sugars % (30.14%-39.80%), non-reducing sugars % (14.67%-43.70%), total sugars (50.20%-73.85%), acidity% (1.45%-1.67%), pH (3.32-3.95), ascorbic acid % (25.1%-35.1%) moisture% (9.95-15.90%), weight loss % (10.25%-32.04%), solid gain % (11.87%-18.65%), dehydrated yield % (13.02%-14.95%), dehydration ratio (6.75-7.77), rehydration ratio (1.23-1.71) were observed.

Keywords: Pineapple, drying method, Osmosis, dehydration

Introduction:

Pineapple (*Ananas comosus*.var.*Queen*) is one of the commercially important fruit crops of tropical world belong to the family Bromeliaceae. According to Baker and Collins (1939), it probably originated in central and southern Brazil, northern Argentina and Paraguay. It lends itself very well to processing. Due to this, it has become the most important commercial fruit of the world. In India pineapple is cultivated in 1, 16,000 ha with a production of 1980 million tonnes. According to Giovanonni (2004), Pineapple fruit is non-climacteric in nature and has characteristic pleasant flavor., distinct aroma, exquisite taste and absence of seeds qualifies it as one of the choicest fruits throughout the world. Pineapple is a good source of vitamin A, vitamin C and is fairly rich in vitamin B. It also contains phosphorus and minerals like calcium, magnesium, potassium and iron (Lodh *et al.* 1973). The cultivar Queen is rich yellow in colour, weighing about 1-1.5 kg. The flesh is deep golden-yellow, less juicy than Kew, crisp textured with a pleasant aroma and flavour. Eyes are small and deep requiring a thicker cut when removing the skin. It is generally grown in India, Australia and South Africa. Osmotic dehydration is a water removal process that is based on placing the materials, such as fruits, into a concentrated solution of soluble solutes, having a high osmotic pressure and lower water activity. By doing so, a major part of water from the fruits is removed and the time needed for the relatively high temperature air drying decreased. Some other advantages of osmotically pre-drying product when compared to directly air drying the product are a lower drying time, better product quality, better textural quality, vitamin retention, flavor enhancement and color stabilization without sulphite addition. Hence, osmotic treatments have been studied in combination with drying method and addition of preservatives. Dehydration is the process of water removal from the food under controlled conditions like temperature, relative humidity, air flow, etc. The main objective of dehydration is to reduce the bulk weight and to reduce water activity. This process is best suited for developing countries with poor thermal processing facilities.

Materials and Methods:

This study was conducted in the Post Harvest Laboratory, Department of Fruit science at college of Horticulture, Rajendranagar, Hyderabad, SKLTSHU during the year 2017-2018. This experiment was conducted in factorial Complete Randomised Design (CRD) with six treatments and four replications. Matured, fully ripe of uniform size, free from pest and disease damage and bruises pineapple fruits cv. Queen were procured from Navsari Fruit Market. The selected fruits were peeled using stainless steel knife. The edible fruit portion was cut into cubes after removing the core. Three different concentrations of sugar syrup *i.e.* 50, 60 and 70°Brix were prepared. During heating of the sucrose syrup solution, 0.3% per cent of citric acid was added. After adjusting the concentration of sucrose syrup, 0.1% of potassium metabisulphite (KMS) and 0.1% Sodium benzoate was added as preservative in sucrose syrup in dissolved form when the syrup got cooled (Chavan *et al.* 2010). During osmosis process, water flows from the fruit pieces to the syrup and solute was moved into the fruit pieces. The prepared fruit pieces were put in sucrose syrup solution and left for 24 h for osmosis. After 24h, the fruit pieces were drained out of the osmotic solution (Rashmi *et al.* 2005). Osmosed pineapple cubes were drained and loaded uniformly over stainless steel trays. Before loading, the cubes are shade dried to avoid browning. Inner and bottom of the tray was wiped with glycerin to avoid metal contact. Loaded stainless steel trays were kept in a cabinet tray drier and hot air oven for dehydration with intermittent turning of cubes for quick drying (Chavan *et al.* 2010). Fruit pieces were dried at 60°C temperature until constant weight is obtained. The data was recorded on Moisture (%), Weight loss (%), Solid gain (%), Dehydrated yield (%), Dehydration ratio, Rehydration ratio, TSS (°brix), Reducing sugars (%), Non reducing sugars (%), Total sugars (%), Acidity (%), pH and Ascorbic acid (mg/100g⁻¹) after osmosis. The details of factors and different treatments were given below.

Factor- I: (Sucrose °Brix): Three

S₁:50°Brix

S₂:60°Brix

S₃:70°Brix

Factor- II: (Drying method): Two

D₁: Cabinet tray drier

D₂: Hot air oven drying

Treatment combinations:

1. S₁D₁-Sucrose concentration 50°Brix. + Cabinet tray drying
2. S₁D₂-Sucrose concentration 50°Brix. + Hot air oven drying
3. S₂D₁-Sucrose concentration 60°Brix. + Cabinet tray drying
4. S₂D₂-Sucrose concentration 60°Brix. + Hot air oven drying
5. S₃D₁-Sucrose concentration 70°Brix. + Cabinet tray drying
6. S₃D₂-Sucrose concentration 70°Brix. + Hot air oven drying

Results and Discussions:

The observations on physico-chemical composition of fresh pineapple fruits are presented in Table 1. average fruit weight (1.23 kg), average crown weight (0.128 kg), average peel with discarded weight (0.430 kg), average core weight (0.170 kg), yield of the fruit cubes (0.528 kg), average moisture content (88.2%), average TSS (14.8 °Brix), average ascorbic acid (35.56 mg/100g), average acidity (1.02%), average total sugars (13.20%), average reducing sugars (6.08%), average non-reducing sugars (7.12%), and average pH (3.94) .Similar results

found by Surabhi *et al.* (2007) and Nazaneen *et al.* (2015) in pineapple. After the preparation of osmo-dehydrated pineapple cubes, physico-chemical parameters was evaluated at initial stage in respect of moisture content, water loss, solid gain, dehydrated yield, dehydration ratio, rehydration ratio, TSS (°Brix), reducing sugars (%), non-reducing sugars (%), total sugars (%), acidity (%), pH and ascorbic acid (mg/100g) which are described as below.

Moisture (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on moisture content of pineapple cubes was presented in Table 4 . Significant differences was recorded in moisture content of osmosed pineapple as influenced by sucrose syrup, drying method and their interaction. The maximum moisture content (14.82%) was recorded in S₁(50°Brix) and minimum moisture content(9.97 %) was recorded in S₃(70°Brix) with respect to factor sucrose syrup concentration. In factor drying method, the maximum moisture content (12.28%) was observed in D₂ (hot air oven drying) and minimum moisture content (11.55%) was observed in D₁(cabinet tray drying). The interaction among S×D showed significant results. The treatment combination S₁D₂ (50°Brix syrup concentration with hot air oven drying) recorded significantly highest moisture content (15.90%). While, significantly lowest moisture content was found in S₃D₂ (70°Brix syrup concentration with hot air oven drying) *i.e.*, (9.95%). The result indicated that moisture content of osmo-dehydrated pineapple cubes was decreasing with increase in sucrose syrup concentration. This might be due to the increased diffusional changes and osmotic pressure exerted on the fruit cell structure which consequently resulted in greater moisture reduction in higher concentration solutions. However, the minimum moisture content was found in S₃D₂ (70°Brix syrup concentration with hot air oven drying) followed by S₃D₁ (70°Brix syrup concentration with cabinet tray drying) and the maximum moisture content found in S₁D₂ (50°Brix syrup concentration with hot air oven drying). Similar results was observed by Khanom *et al.* (2014) in pineapple.

Weight loss (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on weight loss (%) of pineapple cubes was presented in Table 3. Significant differences was recorded in per cent weight loss of osmosed pineapple as influenced by sucrose syrup, drying method and their interaction. The maximum weight loss (31.083%) was recorded in S₃ (70°Brix) and minimum weight loss (15.17%) was recorded in S₁ (50°Brix) with respect to factor sucrose syrup concentration. In factor drying method, the maximum weight loss (26.08%) was observed in D₁ (cabinet tray drying) and minimum weight loss (21.50%) was observed in D₂ (hot air oven drying). The interaction among S×D showed significant results. The treatment combination S₃D₁ (70°Brix syrup concentration with cabinet tray drying) *i.e.*, (32.04%) recorded significantly highest weight loss. While, significantly lowest weight loss was found in

S₁D₂ (50°Brix syrup concentration with hot air oven drying) *i.e.*, (10.25%). The result indicated that weight loss of osmo-dehydrated pineapple cubes was increasing with increase in sucrose syrup concentration. The reason was that the viscosity of hyper tonic solution was lowered and the diffusion coefficient of water increased at high temperature. The maximum weight loss was found in S₃D₁ (70°Brix syrup concentration with cabinet tray drying) followed by S₃D₂ (70°Brix syrup concentration with hot air oven drying) and the minimum weight loss found in S₁D₂ (50°Brix syrup concentration with hot air oven drying). Similar results was observed by Khanom *et al.* (2014) in pineapple.

Solid gain (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on solid gain (%) of pineapple cubes was presented in Table 4. Significant differences was recorded in per cent solid gain of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum solid gain (18.33%) was recorded in S₃ (70°Brix) and minimum solid gain (13.46%) was recorded in S₁ (50°Brix) with respect to factor sucrose syrup concentration. In factor drying method, the maximum solid gain (15.88%) was observed in D₁ (cabinet tray drying) and minimum solid gain (15.36%) was observed in D₂ (hot air oven drying). The interaction among S×D showed significant results. The treatment combination S₃D₁ (70°Brix syrup concentration with cabinet tray drying) *i.e.*, (18.65%) recorded significantly highest solid gain. While, significantly lowest solid gain was found in S₁D₁ (50°Brix syrup concentration with cabinet tray drying) *i.e.*, (11.87%). The result indicated that solid gain of osmo-dehydrated pineapple cubes was increasing as increase in sucrose syrup concentration. However, the maximum solid gain was found in S₃D₁(70°Brix syrup concentration with cabinet tray drying) followed by S₃D₂ (70°Brix syrup concentration with hot air oven drying) and the minimum solid gain was found in T₁C₁ (50°Brix syrup concentration with Cabinet tray drying) during osmotic dehydration. These results was in harmony with experiments of Fito *et al.*, (2001)

Dehydrated yield (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on dehydrated yield (%) of pineapple cubes was presented in Table 4. Significant differences was recorded in percent dehydrated yield of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum dehydrated yield (14.62%) was recorded in S₂(60°Brix) and minimum dehydrated yield (13.47%) was recorded in S₁ (50°Brix) with respect to factor sucrose syrup concentrations. In factor drying method, the maximum dehydrated yield (14.16%) was observed in D₁ (cabinet tray drying) and minimum dehydrated yield (13.98%) was observed in D₂(hot air oven drying). The interaction among S×D showed significant

results. The treatment combination S_2D_1 (60°Brix syrup concentration with Cabinet tray drying) recorded significantly highest dehydrated yield (14.95%). While, significantly lowest dehydrated yield was found in S_1D_2 (50°Brix syrup concentration with hot air oven drying) *i.e.*, (13.02%). The increase in recovery of dehydrated yield may be attributed to the transfer of sugars from syrup to fruit slices through osmosis during period of osmo-dehydration.

Dehydrated ratio

The data pertaining to the effect of sucrose syrup concentration and drying method on dehydrated ratio of pineapple cubes was presented in Table 5. Significant differences was recorded in per cent dehydrated ratio of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum dehydrated ratio (7.50) was recorded in S_1 (50°Brix) and minimum dehydrated ratio (6.84) was recorded in S_2 (60°Brix) with respect to factor sucrose syrup concentration. In factor drying method, the maximum dehydrated ratio (7.28) was observed in D_2 (hot air oven drying) and minimum dehydrated ratio (7.11) was observed in D_1 (cabinet tray drying). The interaction among $S \times D$ showed significant results. The treatment combination S_1D_2 (50°Brix syrup concentration with hot air oven drying) recorded significantly highest dehydrated ratio (7.77). While, significantly lowest dehydrated ratio was found in S_2D_1 (60°Brix syrup concentration with cabinet tray drying) *i.e.*, (6.75). These results was in harmony with experiments of Fito *et al.*, (2001).

Rehydrated ratio

The data pertaining to the effect of sucrose syrup concentration and drying method on rehydrated ratio of pineapple cubes was presented in Table 5. Significant differences was recorded in rehydrated ratio of osmosed pineapple as influenced by sugar concentration, drying method and their interaction. The maximum rehydrated ratio (1.68) was recorded in S_2 (60°Brix) and minimum rehydrated ratio (1.35) was recorded in S_3 (70°Brix) with respect to factor sugar concentrations. In factor drying method, the maximum rehydrated ratio (1.50) was observed in D_1 (Cabinet tray drying) and minimum rehydrated ratio (1.44) was observed in D_2 (hot air oven drying). The interaction among $S \times D$ showed significant results. The treatment combination S_2D_2 (60°Brix syrup concentration with hot air oven drying) recorded significantly highest rehydrated ratio (1.71). While, lowest rehydrated ratio was found in S_1D_2 (50°Brix syrup concentration with hot air oven drying) *i.e.*, (1.23). Presence of more tissues might have helped in more absorption of water resulting higher rehydration ratio. In contrast, presence of very higher sugars adversely affected water uptake by osmotically dehydrated samples. Similar results was reported Mascheroni (2012).

TSS

The data pertaining to the effect of sucrose syrup concentration and drying method on TSS (%) of pineapple cubes was presented in Table 6. Significant differences was

recorded in TSS of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum TSS (75.25°Brix) was recorded in S₃ (70°Brix) and minimum TSS (55.06°Brix) was recorded in S₁ (50°Brix) with respect to factor sucrose syrup concentrations. In factor drying method, the maximum TSS (66.63°Brix) was observed in D₂ (hotair oven drying) and minimum TSS (66.26°Brix) was observed in D₁ (cabinet tray drying). The interaction among S×D showed significant results. The treatment combination S₃D₁ (70°Brix syrup concentration with cabinet tray drying) recorded significantly highest TSS(75.40°Brix). While, lowest TSS was found in S₁D₁ (50°Brix syrup concentration with cabinet tray drying) *i.e.*, 54.52°Brix. The result indicated that TSS of osmo-dehydrated pineapple cubes was increasing as increase in sucrose syrup concentration. However, the maximum TSS was found in S₃D₁ (70°Brix syrup concentration with cabinet tray drying) followed by S₃D₂ (70°Brix syrup concentration with hotair oven drying) and the minimum TSS was found in S₁D₁ (50°Brix syrup concentration with cabinet tray drying) during osmotic dehydration.

Reducing sugars (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on reducing sugars (%) of pineapple cubes was presented in Table 6. Significant differences was recorded in percentreducing sugars of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum reducing sugars (37.66 %) was recorded in S₁(50°Brix) and minimum reducing sugars (30.70%) was recorded in S₃(70°Brix) with respect to factor sucrose syrup concentrations. In factor drying method, the maximum reducing sugars (35.92%) was observed in D₁ (Cabinet tray drying) and minimum reducing sugars (33.08%) was observed in D₂(hotair oven drying). The interaction among S×D showed significant results. The treatment combination S₁D₁ (50°Brix syrup concentration with cabinet tray drying) *i.e.*, recorded significantly highest reducing sugars(39.80%). While, significantly lowest reducing sugars was found in S₃D₁ (70°Brix syrup concentration with Cabinet tray drying) *i.e.*, 30.15%. The result indicated that reducing sugars of osmo-dehydrated pineapple cubes was decreasing with increase in sucrose syrup concentration. The maximum reducing sugars was found in S₁D₁ (50°Brix syrup concentration with cabinet tray drying) followed by S₂D₁ (60°Brix syrup concentration with Cabinettray drying) and the minimum reducing sugars was found in S₃D₁ (70°Brix syrup concentration with cabinet tray drying) during osmotic dehydration. reducing sugars were higher in dehydrated pineapple cubes than fresh one owing to removal of water leading to concentration of sugars. Similar observations was found earlier by Singh *et al.* (2007) in Aonla.

Non reducing sugars (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on non-reducing sugars (%) of pineapple cubes was presented in Table 7. Significant differences were recorded in non-reducing sugars of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum non-reducing sugars (42.80%) was recorded in S₃ (70°Brix) and minimum non-reducing sugars (15.73 %) was recorded in S₁ (50°Brix) with respect to factor sucrose syrup concentrations. In factor drying method, the maximum non-reducing sugars (30.35%) was observed in D₁ (cabinet tray drying) and minimum non-reducing sugars (29.425) was observed in D₂ (hot air oven drying). The interaction among S×D showed significant results. The treatment combination S₃D₂ (70°Brix syrup concentration with hot air oven drying) (41.90%) recorded significantly highest non-reducing sugars (41.90%). While, significantly lowest non-reducing sugars was found in S₁D₂ (50°Brix syrup concentration with hot air oven drying) *i.e.*, (14.67%). The result indicated that non-reducing sugar of osmo-dehydrated pineapple cubes was increasing as increase in sucrose syrup concentration. However, the maximum non-reducing sugars was found in S₃D₁ (70°Brix syrup concentration with cabinet tray drying) followed by S₃D₂ (70°Brix syrup concentration with hot air oven drying) and the minimum non-reducing sugars was found in S₁D₂ (50°Brix syrup concentration with hot air oven drying) during osmotic dehydration. Similar types of observations were also recorded by Meenakshi *et al.* (2017) in Aonla

Total sugars (%)

The data pertaining to the effect of sucrose syrup sugar concentration and drying method on total sugars (%) of pineapple cubes was presented in Table 7. Significant differences were recorded in percent total sugars of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum total sugars (73.50 %) was recorded in S₃ (70°Brix) and minimum total sugars (53.40 %) was recorded in S₁ (50°Brix) with respect to factor sucrose syrup concentrations. In factor drying method, the maximum total sugars (66.29%) was observed in D₁ (cabinet tray drying) and minimum total sugars (62.51%) was observed in D₂ (hot air oven drying). The interaction among S×D showed significant results. The treatment combination S₃D₁ (70°Brix syrup concentration with cabinet tray drying) recorded significantly highest total sugars (73.85%). While, significantly lowest total sugars was found in S₁D₁ (50°Brix syrup concentration with cabinet tray drying) *i.e.*, (56.60%). The result indicated that total sugar of osmo-dehydrated pineapple cubes was increasing as increase in sucrose syrup concentration. The maximum total sugars was found in S₃D₁ (70°Brix syrup concentration with cabinet tray drying) followed by S₃D₂ (70°Brix syrup concentration with hot air oven drying) and the minimum total sugars was found in S₁D₂ (50°Brix syrup concentration with hot air oven drying) during osmotic dehydration. The increment of total sugar content was due to the solute gain action during osmosis. . Similar types of observations were also recorded by Relekar (2010) in osmo-dehydration of sapota.

Acidity (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on acidity (%) of pineapple cubes was presented in Table 8. The maximum acidity (1.66%) was recorded in $S_2(60^\circ\text{Brix})$ and minimum acidity (1.46%) was recorded in $S_3(70^\circ\text{Brix})$ with respect to factor sucrose syrup concentrations. In factor drying method, the maximum acidity (1.60%) was observed in D_1 (cabinet tray drying) and minimum acidity (1.53%) was observed in D_2 (hot air oven drying). The interaction among $S \times D$ showed significant results. The treatment combination S_1D_1 (50°Brix syrup concentration with cabinet tray drying) recorded significantly highest acidity (1.67%). While, significantly lowest acidity was found in S_3D_2 (70°Brix syrup concentration with hot air oven drying) *i.e.*, (1.45%). The result indicated that acidity of osmo-dehydrated pineapple cubes was decreasing as increase in sucrose syrup concentration. The maximum acidity was found in S_1D_1 (50°Brix syrup concentration with cabinet tray drying) followed by S_2D_1 (60°Brix syrup concentration with cabinet tray drying) and the minimum acidity was found in S_3D_2 (70°Brix syrup concentration with hot air oven drying) during osmotic dehydration. The decrease in acidity might be attributed to leaching of acid from fruit slices to hypertonic solution through a semi-permeable membrane. The similar results was reported Nazaneen *et al.* (2015) in Pineapple.

P^H

The data pertaining to the effect of sucrose syrup concentration and drying method on P^H of pineapple cubes was presented in Table 8 and. Significant differences was recorded in P^H of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum P^H (3.68) was recorded in S_3 (70°Brix) and minimum P^H (3.32) was recorded in S_1 (50°Brix) with respect to factor sucrose syrup concentration. In factor drying method, the maximum P^H (3.57) was observed in D_1 (cabinet tray drying) and minimum P^H (3.39) was observed in D_2 (hot air oven drying). The interaction among $S \times D$ showed significant results. The treatment combination S_3D_1 (70°Brix syrup concentration with cabinet tray drying) recorded significantly highest P^H (3.95). While, significantly lowest P^H was found in S_1D_1 (50°Brix syrup concentration with cabinet tray drying) *i.e.*, (3.32). The result indicated that P^H of osmo-dehydrated pineapple cubes was increasing as increase in sucrose syrup concentration. However, the maximum P^H was found in S_3D_1 (70°Brix syrup concentration with cabinet tray drying) followed by S_2D_1 (60°Brix syrup concentration with cabinet tray drying) and the minimum P^H was found in S_1D_1 (50°Brix syrup concentration with cabinet tray drying) during osmotic dehydration.

Ascorbic acid (%)

The data pertaining to the effect of sucrose syrup concentration and drying method on ascorbic acid (%) of pineapple cubes was presented in Table 9. Significant differences

was recorded in per cent ascorbic acid of osmosed pineapple as influenced by sucrose syrup concentration, drying method and their interaction. The maximum ascorbic acid (32.65%) was recorded in S₂(60°Brix) and minimum ascorbic acid (26.40 %) was recorded in S₃(70°Brix) with respect to factor sucrose syrup concentrations. In factor drying method, the maximum ascorbic acid (30.43%) was observed in D₁ (Cabinet tray drying) and minimum ascorbic acid (27.60 %) was observed in D₂(hotair oven drying). The interaction among S×D showed significant results. The treatment combination S₂D₁ (60°Brix syrup concentration with cabinet tray drying) recorded significantly highest ascorbic acid(31.10%). While, significantly lowest ascorbic acid was found in S₃D₂ (70°Brix syrup concentration with hotair oven drying) *i.e.*, (30.21%). The result indicated that ascorbic acid of osmo-dehydrated pineapple cubes was increasing with increase in sucrose syrup concentration. However, the maximum ascorbic acid was found in S₂D₁ (60°Brix syrup concentration with cabinet tray drying) followed by S₂D₂ (60°Brix syrup concentration with hotair oven drying) and the minimum ascorbic acid was found in S₃D₂ (70°Brix syrup concentration with hotair oven drying) during osmotic dehydration. Similar type of observations was recorded by Relekar (2010) in osmo-dehydration of sapota.

Conclusion

This study presented the effect of Osmotic Dehydration on drying method and physicochemical Properties of Pineapple. The primary goal of dehydration is to reduce bulk weight and water activity. Osmotic treatments have been studied in combination with drying method and addition of preservatives. This method is best suited for developing countries with limited thermal processing capacity. The product's physico-chemical characteristics were thoroughly assessed.

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Table 1. Physico-chemical parameters of fresh pineapple fruit.

S.No	Physical parameters	Results
1.	Avg. weight of fruit (g)	1.23 kg
2.	Crown	0.128 kg
3.	Peel with discarded	0.430 kg
4.	Core	0.170 kg
5.	Yield of the fruit cubes	0.528 kg
	Chemical parameters	Results
1.	Moisture content (%)	88.2%
2.	TSS (^o Brix)	14.8 ^o
3.	Ascorbic acid (mg/100g ⁻¹)	35.56 mg 100g ⁻¹
4.	Acidity (%)	1.02%
5.	Total sugars (%)	13.20%
6.	Reducing sugars (%)	6.08%
7.	Non-reducing sugars (%)	7.12%
8.	p ^H	3.94

Table-2: Recovery (%) of fruit cubes after osmotic dehydration

Treatments	Drying method		
	Recovery (%)		
Sugar syrup concentration	D₁	D₂	Mean
S₁	13.850	13.210	13.530
S₂	14.780	14.660	14.720
S₃	14.183	13.700	13.941

Mean	14.271	13.857	
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	S	D	S x D
SE(m)	0.140	0.114	0.197
C.D.	0.418	0.341	0.581
	2.808		

Table 3: - Effect of sucrose syrup concentration and drying method on Moisture loss (%) and Weight loss (%) of osmo - dehydrated pineapple cubes

Treatments	Drying method					
	Moisture (%)			Weight loss (%)		
	D ₁	D ₂	Mean	D ₁	D ₂	Mean
S ₁	15.210	18.320	16.765	20.090	10.250	15.170
S ₂	13.110	14.418	13.764	26.130	24.153	25.141
S ₃	10.558	11.240	10.899	32.040	30.125	31.083
Mean	12.959	14.659		26.087	21.509	

	S	D	S x D	S	D	S x D
SE(m)	0.145	0.179	0.309	0.260	0.213	0.368
C.D.5 %	0.435	0.119	0.926	0.780	0.637	1.103
C.V.	2.977			3.095		

Table 4: - Effect of sucrose syrup concentration and drying method on Solid gain(%) and dehydration yield(%) of osmo - dehydrated pineapple cubes

Treatments	Drying method					
	Solid gain (%)			Dehydrated yield (%)		
	D ₁	D ₂	Mean	D ₁	D ₂	Mean
S ₁	11.875	15.050	13.463	13.920	13.020	13.470
S ₂	17.125	13.025	15.075	14.953	14.300	14.626
S ₃	18.65	18.025	18.338	13.623	14.153	13.888
Mean	15.883	15.367		14.165	13.981	

	S	D	S x D	S	D	S x D
SE(m)	0.154	0.126	0.218	0.131	0.107	0.185
C.D. 5%	0.218	0.377	0.653	0.391	0.320	0.554
C.V.	2.794			2.642		

Table 5: - Effect of sucrose syrup concentration and drying method on Dehydration ratio and Rehydration ratio of osmo - dehydrated pineapple cubes

Treatments	Drying method					
	Dehydration ratio			Rehydration ratio		
Sugar syrup concentration	D ₁	D ₂	Mean	D ₁	D ₂	Mean
S ₁	7.233	7.770	7.501	1.688	1.230	1.459
S ₂	6.753	6.930	6.841	1.660	1.713	1.686
S ₃	7.348	7.140	7.244	1.303	1.405	1.354
Mean	7.11	7.280		1.50	1.449	

	S	D	S x D	S	D	S x D
SE(m)	0.069	0.056	0.097	0.020	0.016	0.029
C.D. 5%	0.205	0.168	0.291	0.060	0.049	0.085
	2.697			3.802		

Table 6: - Effect of sucrose syrup concentration and drying method on TSS(TSS °Brix) and reducing sugars (%) of osmo - dehydrated pineapple cubes

Treatments	Drying method					
	TSS(TSS °Brix)			Reducing sugars (%)		
Sugar syrup concentration	D ₁	D ₂	Mean	D ₁	D ₂	Mean
S ₁	54.520	55.618	55.069	39.800	35.513	37.656
S ₂	68.855	69.198	69.026	37.800	32.503	35.151
S ₃	75.408	75.100	75.254	30.148	31.253	30.700
Mean	66.261	66.638		35.916	33.089	

	S	D	S x D	S	D	S x D
SE(m)	0.655	0.535	0.926	0.324	0.265	0.459
C.D.5%	1.961	1.654	1.968	0.971	0.793	1.373
	2.788			2.658		

Table 7: - Effect of sucrose concentration and drying method on Non reducing sugars (%) and total sugars (%) of osmo - dehydrated pineapple cubes

Treatments	Drying method					
	Non Reducing sugars (%)			Total sugars (%)		
Sugar syrup concentration	D ₁	D ₂	Mean	D ₁	D ₂	Mean
S ₁	16.800	14.675	15.738	56.600	50.200	53.400
S ₂	31.573	30.700	31.138	68.425	64.200	66.313
S ₃	43.700	41.900	42.800	73.850	73.150	73.500
Mean	30.358	29.425		66.292	62.517	

	S	D	S x D	S	D	S x D
SE(m)	0.302	0.247	0.427	0.608	0.497	0.860
C.D.5%	0.905	0.739	1.280	1.821	1.487	2.575
	2.860			2.671		

Table 8: - Effect of sucrose concentration and drying method on acidity (%) and P^H of osmo - dehydrated pineapple cubes

Treatments	Drying method					
	Acidity(%)			P ^H		
Sugar syrup concentration	D ₁	D ₂	Mean	D ₁	D ₂	Mean
S ₁	1.700	1.550	1.625	3.325	3.325	3.325
S ₂	1.550	1.550	1.550	3.450	3.425	3.438
S ₃	1.475	1.450	1.463	3.950	3.425	3.688
Mean	1.575	1.517		3.575	3.392	

	S	D	S x D	S	D	S x D
SE(m)	0.018	0.015	0.026	0.034	0.028	0.049
C.D.5%	0.054	0.044	0.077	0.103	0.084	0.145
	3.323			2.790		

Table 9: - Effect of sucrose syrup concentration and drying method on Ascorbic Acid (%) of osmo - dehydrated pineapple cubes

Treatments	Drying method		
	Ascorbic Acid (%)		
Sugar syrup concentration	D ₁	D ₂	Mean
S ₁	28.500	27.525	28.013
S ₂	35.100	30.200	32.650
S ₃	27.700	25.100	26.400
Mean	30.433	27.608	

	S	D	S x D
SE(m)	0.241	0.197	0.341
C.D 5 %.	0.723	0.590	1.022
	2.352		