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Effect of different Drying Methods on Dehydration Ratio of osmo-treated Pear Slices

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Abstract—*The aim of this study was to evaluate the effect of drying methods on dehydration ratio of osmo-treated unpeeled and peeled pear slices. Pear slices pretreated with different osmotic solutions (60% Glucose, 60%Sucrose and 60%Glycerol) and antibrowning agents (0.5% Ascorbic acid, 0.5%KMS and 0.25%KMS+0.25%Ascorbic acid) were subjected to different drying methods(sun drying, cabinet drying at 50°C and 60°C). Drying methods and pretreatments had a significant effect (P≤0.05) on pear slices. The highest dehydration ratio was found in pear slices cabinet dried at 50°C and lowest in sundried ones. Peeled pear slices pretreated with 60% Glucose+0.5%KMS recorded the higher dehydration ratio. The effect of type of slice(peeled/unpeeed) and variety on dehydration ratio was found to be statistically significant.*

Key words*: Cabinet drying, Dehydration ratio, osmodehydration, Sun drying.*

1. INTRODUCTION

Pear is seasonal and perishable fruit which after maturation ripens rapidly and is thus subjected to heavy post harvest losses. Many processing techniques can be employed to preserve fruits and vegetables. Drying is a complex process involving transient heat and mass transfer. It is one of the most important operations that is widely practiced for preservation of pears [2]. Osmotic dehydration has gained attention recently due to its potential application in the food processing industry. It is a useful technique for the production of safe, stable, nutritious, and concentrated food obtained by placing the solid food, whole or in pieces in sugar or salt aqueous solution of high osmotic pressure [4]. Pre-treatment improves nutritional, sensorial and functional properties of the dehydrated food without changing its integrity. The drying methods and physicochemical changes that occur during drying seems to affect the quality of the dehydrated product. A study of dehydration characteristics can be used to ascertain the extent of injuries sustained by food material during dehydration and pretreatments. the present study was conducted to study the effect of drying methods on the dehydration ratio of pear.

2. MATERIAL AND METHODS

Freshly harvested Pear varieties (Wikar of winkfield and Bartlett) were selected for the study. Peeled and unpeeled slices from both the varieties of 10mm thickness were treated with different osmotic solutions and anti browning agents for 18 hrs. Pretreated slices were then subjected to sundrying and cabinet drying at 50°C and 60°C. Samples were dried till 11-12 percent moisture was achieved. Following is the detail of pretreatments used.

T_1= control,

T_2= 60% Glucose+0.5% Ascorbic acid,

T_3= 60% Glucose +0.25%KMS+0.25% Ascorbic acid,

T_4=60% Glucose+0.5%KMS,

T_5= 60% Sucrose+0.5% Ascorbic acid,

T_6=60%Sucrose+0.25%KMS+0.25% Ascorbic acid,

T_7= 60% Sucrose+0.5% KMS,

T_8= 60% Glycerol+ 0.5% Ascorbic acid,

T_9=60%Glycerol+0.25%KMS+0.25% Ascorbic acid,

T_{10} = 60% Glycerol+0.5% KMS

2.1. Dehydration ratio

Known weight of samples was dried and the weight of dried sample was recorded [3]. Dehydration ratio was calculated using equation:

$$\text{Dehydration ratio} = \frac{\text{Weight of prepared material}}{\text{Weight of dried material}}$$

3. RESULTS AND DISCUSSION

Table 1 depicts the effect of drying methods on the dehydration ratio of osmotreated pear samples. Drying methods exhibited a significant effect on dehydration ratio of pear slices. The highest overall drying mean of 9.59 was recorded in D_3 (cabinet dried at 50°C) and lowest 9.25 in D_1 (sundried) pear slices. At the completion of drying, maximum dehydration ratio of 10.30 was recorded in peeled pear slices cabinet dried at 50°C (D_3) of variety V_2 (Bartlett) from treatment T_4 60% (Glucose+0.5% KMS) and the lowest 8.80 in unpeeled sundried pear slices (D_1) of variety V_1 (Wikar of winkfield) from treatment T_8 (60% Glycerol+0.5% Ascorbic acid) compared to 8.82 in control (T_1) from the same variety. The highest overall mean dehydration ratio of 9.94 was recorded in slices of variety V_2 (Bartlett) from treatment T_4 (60% Glucose+ 0.5% KMS) and the lowest 9.15 in variety V_1 (Wikar of Winkfield) from treatment T_8 (60% Glycerol+ 0.5% Ascorbic acid) compared to 9.10 in control (T_1) from variety V_1.

The type of slice exhibited a significant effect on dehydration ratio with the higher slice mean of 9.46 and lower 9.38 in peeled and unpeeled pear slices.

The two varieties differed significantly in mean dehydration ratio with maximum 9.52 and minimum 9.36 recorded in variety V_2 (Bartlett) and V_1 (Wikar of Winkfield) respectively.

The effect of interactions among various factors was also evaluated. Some interactions were statistically significant and some were statistically non-significant.

Cabinet dried pear slices recorded higher dehydration ratio than sun dried ones due to faster drying rate. In cabinet dried samples water was removed more efficiently and quickly. The results are in conformity with the observations of Rama and Jacob [7, 5]. Further potassium metabisulfite appears to maintain the structural integrity of the cell walls. Similar observations were recorded by [1] Because of the preparation losses due to peeling and coring in case of peeled dried pears there was an obvious difference in dehydration ratio of peeled and unpeeled dried pears regardless of variety and method of drying. Similar results were reported by Mohammad [6] in dried pears of different varieties.

Table 1: Effect of drying methods on dehydration ratio of osmo-treated pear slices

Treat-ments*	Var.	P1 (Unpeeled)	P2 (Peeled)	Overall mean	Drying Mean								
		D1	D2	D3	Mean	D1	D2	D3	Mean		D1	D2	D3
T1	V1	8.82	9.16	9.22	9.06	8.90	9.22	9.32	9.14	9.10	8.86	9.19	9.27
	V2	8.88	9.20	9.25	9.11	9.10	9.32	9.38	9.26	9.18	8.99	9.26	9.31
	Mean	8.85	9.18	9.23	9.08	9.00	9.27	9.35	9.20	9.14	8.92	9.22	9.29
T2	V1	9.02	9.32	9.42	9.25	9.15	9.45	9.50	9.36	9.30	9.08	9.38	9.46
	V2	9.22	9.48	9.50	9.40	9.42	9.52	9.58	9.50	9.45	9.32	9.50	9.54
	Mean	9.12	9.40	9.40	9.32	9.28	9.48	9.54	9.43	9.37	9.20	9.44	9.50
T3	V1	9.25	9.65	9.72	9.54	9.35	9.76	9.80	9.63	9.58	9.30	9.70	9.76
	V2	9.45	9.95	10.00	9.80	9.65	10.05	10.10	9.93	9.86	9.55	10.00	10.00
	Mean	9.35	9.80	9.86	9.67	9.50	9.90	9.95	9.78	9.72	9.42	9.85	9.90
T4	V1	9.32	9.76	9.85	9.64	9.40	9.90	10.00	9.76	9.70	9.36	9.83	9.92
	V2	9.50	10.05	10.12	9.89	9.70	10.17	10.30	10.0	9.94	9.60	10.11	10.21
	Mean	9.41	9.90	9.98	9.76	9.55	10.00	10.15	9.88	9.82	9.48	9.96	10.06
T5	V1	9.00	9.26	9.30	9.18	9.12	9.32	9.40	9.28	9.23	9.06	9.29	9.35
	V2	9.20	9.35	9.42	9.32	9.35	9.40	9.45	9.40	9.36	9.27	9.37	9.43
	Mean	9.10	9.30	9.36	9.25	9.23	9.36	9.42	9.34	9.29	9.16	9.33	9.39
T6	V1	9.10	9.54	9.62	9.42	9.25	9.65	9.72	9.54	9.48	9.17	9.59	9.67
	V2	9.30	9.70	9.80	9.60	9.54	9.72	9.85	9.70	9.65	9.42	9.71	9.82
	Mean	9.20	9.62	9.71	9.51	9.39	9.68	9.78	9.62	9.56	9.29	9.65	9.74
T7	V1	9.16	9.62	9.70	9.49	9.28	9.70	9.75	9.57	9.53	9.22	9.66	9.72
	V2	9.38	9.78	9.84	9.66	9.58	9.80	9.90	9.76	9.71	9.48	9.79	9.87
	Mean	9.27	9.70	9.77	9.57	9.43	9.75	9.82	9.66	9.62	9.35	9.72	9.79
T8	V1	8.80	9.20	9.25	9.09	9.05	9.26	9.36	9.22	9.15	8.92	9.23	9.30
	V2	8.90	9.28	9.30	9.16	9.20	9.36	9.41	9.32	9.24	9.05	9.32	9.35
	Mean	8.85	9.24	9.27	9.12	9.12	9.31	9.38	9.27	9.19	8.98	9.27	9.32
T9	V1	8.99	9.25	9.29	9.17	9.11	9.31	9.39	9.27	9.22	9.05	9.28	9.34
	V2	9.20	9.34	9.41	9.31	9.34	9.40	9.44	9.39	9.35	9.27	9.37	9.42
	Mean	9.09	9.29	9.35	9.24	9.22	9.35	9.41	9.30	9.28	9.15	9.32	9.38

T10	V1	9.06	9.38	9.50	9.31	9.18	9.48	9.56	9.40	9.35	9.12	9.43	9.53
	V2	9.26	9.52	9.56	9.44	9.48	9.54	9.60	9.54	9.49	9.37	9.53	9.58
	Mean	9.16	9.45	9.53	9.37	9.33	9.51	9.58	9.47	9.42	9.24	9.48	9.55
Mean	V1	9.00	9.41	9.48	9.30	9.17	9.50	9.58	9.41	9.36	9.25	9.52	9.59
	V2	9.22	9.56	9.62	9.46	9.43	9.62	9.70	9.58	9.52			
	D × P	9.13	9.48	9.55	9.38	9.30	9.56	9.64	9.46				
	D × V	9.11	9.45	9.53		9.32	9.59	9.66					

CD(P≤0.05) (T) Treatment :0.35; TXD : 0.62; TXV :0.50; PXV :NS, (D) Drying : 0.19; TXP : 0.50; DXV :NS; TXPXV :NS; (P) Type of slice :0.16; DXP :0.27; TXDXV :0.87; DXPXV : 0.39; (V) Variety :0.16; TXDXP :0.87 TXDXPXV :0.12; V_1 = Wikar of Winkfield, V_2= Bartlett, P_1 = Unpeeled, P_2= Peeled, D_1 = Sundrying, D_2 = cabinet drying 60^{o}C, D_3 = Cabinet drying at 50^{o}C

4. CONCLUSION

It was concluded that the mechanical drying give the higher dehydration ratio than sun drying. Pear slices cabinet dried at 50°C gave higher dehydration ratio. Peeled pear slices pretreated with 60% Glucose+0.5% KMS from Bartlett variety recorded the higher dehydration ratio than other treatments.

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