

Standardization of techniques for aonla sour pickle with varietal difference

■ B.A. KARAPATIYA, N.R. RAY, A.D. PATEL AND H.C. PATEL

SUMMARY : The experiment on standardization of techniques for aonla (*Emblica officinalis* Gaertn.) sour pickle with varietal difference (Gujarat Aonla-1 and Chakaiya varieties) was carried out at Fruit Processing Center, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during winter 2009-2010 by using factorial completely randomized design (FCRD) with two independent variables viz., varieties and four treatments with three replications. The treatments comprising different combinations of varieties (Gujarat Aonla-1 and Chakaiya) with fresh and blanched (at 75°C and 80°C temperature up to 10 and 5 minutes, respectively) aonla fruit segments cured in 10 per cent dry salt solution with or without 0.1% sodium benzoate preservative and ingredients. The result indicated that to prepare aonla sour pickle with the fresh segments of Chakaiya variety + 10 per cent dry salt for 2-3 days + ingredients + 0.1 per cent sodium benzoate was good for consumers performance and it retained physico-chemical parameters like ascorbic acid (73.17 mg/100g), pH (3.06), acidity (2.64 %), crude fibre (2.09 %), reducing sugar (9.82 %), non-reducing sugar (1.93 %) and total sugar (12.72 %) and also organoleptic score (out of nine) like colour (8.10), flavour (8.05), taste (7.65), softness (7.01) and overall performance (7.67) during four months storage period.

Key Words : Aonla, Pickle, Recipes, Sodium benzoate, Glass bottle, Organoleptic evaluation

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Among the fruits, aonla (*Emblica officinalis* Gaertn.) is one of the oldest Indian fruit having a richest source of vitamin-C. The pulp of the fresh fruit has contained 200–900 mg/100g of vitamin-C in fruit (Bajpai and Shukla, 1985). This nutritious fruit delivered to the ultimate consumer through post-harvest system without any nutritional and quality losses. Hence, attention has been focused on the preparation of different valuable aonla products such as pickle, preserves (murabba), jam, jelly, dried chips, tablets, powder, etc. Aonla sour pickle contains rich amount of nutrients like ascorbic acid, proteins, fat, minerals, fiber, carbohydrate, calcium, phosphorus,

iron, nicotinic acid, carotene, thiamine, reducing sugar, non-reducing sugar, total sugar etc. Aonla sour pickle is greatly sought after in the market owing to their tangy taste and wonderful aroma.

EXPERIMENTAL METHODS

The research was carried out at Fruit Processing Center, Department of Horticulture, B. A. College of Agriculture, AAU, Anand in year 2009-2010 by using factorial completely randomized design (FCRD) with two independent variables viz., varieties and four treatments with three replications. Materials used during experimentation were aonla fruits cvs. Gujarat Aonla-1 and Chakaiya procured from the Horticulture Research Farm, BACA, AAU, Anand. Other raw materials such as spices, condiments, groundnut oil etc. were purchased from the local market. The aonla fruits were washed with clean water. According to treatments aonla fruits blanched at 75°C and 80°C temperature up to 10 and 5 minutes with use of gas stove,

MEMBERS OF THE RESEARCH FORUM

Author for Correspondence :

B.A. KARAPATIYA, Department of Horticulture, B.A. College of Agriculture, Anand Agricultural University, ANAND (GUJARAT) INDIA

Coopted Authors:

N.R. RAY, A.D. PATEL AND H.C. PATEL, Department of Horticulture, B.A. College of Agriculture, Anand Agricultural University, ANAND (GUJARAT) INDIA

respectively. The fresh and blanched aonla fruit's seeds and segments removed by manually.

Pretreatments for pickling:

Standardization of techniques for preparation of aonla sour pickle, the aonla fruit segments were preserved in four different ways. The pretreatment for both the varieties were as followed:

P₁: Fresh segments + 10 per cent dry salt for 2-3 days + ingredients (Control)

P₂: Fresh segments + 10 per cent dry salt for 2-3 days + ingredients + 0.1 per cent sodium benzoate

P₃: Blanched aonla fruit segments at 75°C upto 10 minutes + 10 per cent dry salt for 2-3 days + ingredients + 0.1 per cent sodium benzoate

P₄: Blanched aonla fruit segments at 80°C up to 5 minutes + 10 per cent dry salt for 2-3 days + ingredients + 0.1 per cent sodium benzoate.

The prepared aonla sour pickle was filled in glass jars and stored at ambient room temperature (24°C- 30°C). The processed product was subjected to physico-chemical analysis and organoleptic quality test at initial, after two and four months of storage period. Physico-chemical analysis was carried out by the method of Ranganna (1997). Organoleptic evaluation was carried out by a panel of seven judges. The samples of pickle were evaluated for colour, flavour, taste, softness and overall organoleptic score using a nine point hedonic scale (Amerine *et al.*, 1965).

EXPERIMENTAL FINDINGS AND ANALYSIS

The data presented in Table 1 indicated that the aonla sour pickle containing with interaction of V₁P₂ recorded the highest ascorbic acid (*i.e.* 84.99, 80.55 and 75.68 mg/100g), pH

(*i.e.* 2.65, 2.95 and 3.25) and crude fibre (*i.e.* 3.09, 2.97 and 2.92 %) at initial, after two and four months of storage period, respectively. The loss of ascorbic acid during storage period might be due to oxidation of vitamin-C which resulted in to formation of dehydroascorbic acid and also loss of pH values decreased the formation of organic acids during processing and storage (Premi *et al.*, 2002). The crude fibre per cent during storage decreased due to hydrolysis of these components during fermentation (Daisy and Gehlot, 2006).

The interaction of V₂P₄ observed the lowest acidity (*i.e.* 1.95, 2.36 and 2.16 %) at initial, after two and four months of storage period, respectively. The increase in the acidity during storage might be due degradation of pectin substances of aonla fruit pulp into soluble solids might have contributed towards an increase in acidity of aonla sour pickle. While, acidity increased up to two months of storage than after declined towards the end of storage might be due to non-enzymatic reaction such as, organic acid with sugars (Kumar and Singh, 2001).

The interaction of V₂P₂ showed the maximum reducing sugar (*i.e.* 8.49, 9.74 and 9.82 %), non-reducing sugar (*i.e.* 3.35, 2.51 and 1.93 %) and total sugar (*i.e.* 11.84, 12.25 and 12.72 %) at initial, after two and four months of storage period, respectively (Table 2). Increased in reducing sugar content during storage might be due to gradual inversion of non-reducing sugar to reducing sugar by hydrolysis process during storage and due to inversion process of sucrose to glucose and fructose by acid of the aonla sour pickle. The decrease in non-reducing sugar content during storage period might be attributed to the conversion of non-reducing sugars into the reducing sugars by hydrolysis process during storage. Increase in the total sugar content during storage might be due to the accelerated hydrolysis of insoluble polysaccharides and other carbohydrates polymer and increased degree of inversions of

Table 1: Effect of different treatment combinations and storage periods on ascorbic acid (mg/100g), pH, acidity (per cent) and crude fibre (per cent) in aonla sour pickle

Treatments	Storage period											
	Ascorbic acid			pH			Acidity			Crude fibre		
	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃
V ₁ P ₁	82.28	78.13	71.09	2.34	2.59	2.94	2.60	3.05	2.85	3.04	2.93	2.88
V ₁ P ₂	84.99	80.55	75.68	2.65	2.95	3.25	2.54	2.88	2.68	3.09	2.97	2.92
V ₁ P ₃	75.75	69.26	62.86	2.61	2.85	3.19	2.28	2.72	2.57	3.02	2.91	2.86
V ₁ P ₄	75.79	68.10	60.86	2.45	2.71	2.98	2.16	2.60	2.43	3.01	2.88	2.83
V ₂ P ₁	79.45	75.08	69.00	2.46	2.73	3.05	2.45	2.89	2.67	2.24	2.16	2.12
V ₂ P ₂	82.01	77.05	73.17	2.51	2.76	3.06	2.40	2.84	2.64	2.25	2.19	2.09
V ₂ P ₃	75.24	68.29	61.85	2.52	2.78	3.08	2.16	2.59	2.36	2.22	2.12	2.05
V ₂ P ₄	73.58	67.07	59.97	2.55	2.81	3.16	1.95	2.36	2.16	2.20	2.07	1.97
S. E. ±	0.66	0.65	0.70	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.05	0.05
C.D. (P=0.05)	NS	NS	NS	0.02	0.04	0.02	0.02	0.03	0.02	0.14	NS	NS
C.V. %	1.45	1.55	1.82	0.94	0.77	0.64	0.76	0.54	0.42	2.93	3.36	3.38

NS=Non-significant

sugar on account of higher fixed acidity (Kalra, 1988).

Pickle was subjected to organoleptic evaluation like colour, flavour, taste, softness and overall organoleptic score (out of nine). Colour and flavour score of the interaction of V_2P_2 was found the best and accepted by panelists (8.10) and (8.05) after four months of storage period. Softness score of the interaction of V_1P_2 noted the best and accepted by panelists (7.25) after four months of storage period (Table 3). At initial storage period taste and overall organoleptic score of the interaction V_2P_4 was found best and accepted by panelists (*i.e.* 7.03 and 7.06), the score showed like very much whereas after four months of storage period the score like very much by the panelists were recorded for the interaction of V_2P_2 was found

best and accepted by panelists (*i.e.* 7.65 and 7.67), respectively. It can be concluded that the aonla sour pickle containing fresh segments of Chakaiya variety + 10 per cent dry salt for 2-3 days + ingredients + 0.1 per cent sodium benzoate was most accepted by the panelists.

Based on the overall findings of the present study, it can be concluded that variety V_2 (Chakaiya), treatment P_2 (fresh segments + 10% dry salt for 2-3 days + ingredients + 0.1% sodium benzoate) and also the interaction of V_2P_2 (fresh aonla segments of Chakaiya variety + 10% dry salt for 2-3 days + ingredients + 0.1% sodium benzoate) was found most acceptable. The product can be stored up to four months with acceptable quality and can be used for commercial purpose.

Table 2 : Effect of different treatment combinations and storage periods on reducing sugar (per cent), non-reducing sugar (per cent) and total sugar (per cent) in aonla sour pickle

Treatments	Storage period								
	Reducing sugar			Non-reducing sugar			Total sugar		
	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃
V ₁ P ₁	7.16	8.35	8.93	2.87	2.09	1.57	10.03	10.44	10.50
V ₁ P ₂	7.25	8.47	9.05	3.21	2.17	1.72	10.46	10.65	10.77
V ₁ P ₃	4.52	4.97	5.50	1.46	1.40	1.49	5.98	6.37	6.99
V ₁ P ₄	3.77	4.83	5.33	1.35	1.31	1.38	5.12	6.15	6.71
V ₂ P ₁	8.39	9.36	9.48	3.25	2.37	1.77	11.65	11.74	12.07
V ₂ P ₂	8.49	9.74	9.82	3.35	2.51	1.93	11.84	12.25	12.72
V ₂ P ₃	4.96	6.05	6.55	1.85	1.64	1.58	6.81	7.70	8.13
V ₂ P ₄	4.65	5.75	6.32	1.74	1.60	1.40	6.39	7.35	7.72
S. E. ±	0.11	0.05	0.05	0.05	0.01	0.03	0.13	0.05	0.05
C.D. (P=0.05)	NS	NS	0.15	NS	NS	NS	NS	NS	0.16
C.V. %	3.15	1.12	1.13	3.55	1.30	3.16	2.55	0.98	1.00

NS=Non-significant

Table 3 : Effect of different treatment combinations and storage periods on colour, flavour, taste, softness and overall organoleptic score (out of nine) in aonla sour pickle

Treatments	Storage period														
	Colour			Flavour			Taste			Softness			Overall organoleptic score		
	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃	M ₁	M ₂	M ₃
V ₁ P ₁	5.72	4.29	2.57	5.63	4.21	2.55	5.66	4.25	2.48	4.87	6.52	2.96	5.72	4.28	2.56
V ₁ P ₂	6.20	7.03	7.15	6.09	6.88	7.03	6.01	6.90	7.19	6.34	7.65	7.25	5.90	6.78	6.92
V ₁ P ₃	7.42	8.12	7.87	6.82	7.57	7.22	6.50	7.15	6.68	6.93	7.85	7.15	6.90	7.58	7.28
V ₁ P ₄	7.10	7.33	7.49	6.50	6.83	6.29	6.53	6.83	6.18	6.65	6.95	6.44	6.61	6.94	6.39
V ₂ P ₁	5.75	4.46	2.65	5.64	4.25	2.55	5.34	4.00	2.46	4.65	6.71	3.25	5.55	4.16	2.08
V ₂ P ₂	6.63	7.59	8.10	6.84	7.86	8.05	6.55	7.45	7.65	7.20	7.35	7.01	6.67	8.05	7.67
V ₂ P ₃	6.82	7.60	7.35	6.25	6.85	6.71	6.17	6.78	6.64	6.58	6.85	6.25	6.38	7.02	6.87
V ₂ P ₄	7.00	7.31	7.06	7.09	7.27	6.87	7.03	7.35	7.08	6.15	6.43	4.81	7.06	7.41	7.13
S. E. ±	0.09	0.10	0.12	0.04	0.02	0.05	0.04	0.05	0.09	0.06	0.09	0.34	0.06	0.06	0.06
C.D. (P=0.05)	0.26	0.31	0.36	0.13	0.06	0.16	0.13	0.14	0.27	0.17	NS	NS	0.17	0.17	0.17
C.V. %	2.27	1.51	3.34	1.16	1.54	1.56	1.23	1.24	2.66	1.59	2.20	1.48	1.59	1.51	1.67

M₁: Initial storage period

M₂: After two months of storage period

M₃: After four months of storage period

Inducing in the overall organoleptic quality up to two months is might be due to better equilibration of all the ingredients during curing of pickle. Loss in organoleptic quality and storage stability of product after two months of storage period is obvious. Temperature plays important role in inducing certain biochemical changes in the product, which leads to non-enzymatic browning, and thus masking the original organoleptic quality of the product.

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