



## Preparation and Evaluation of Processed Products Squash, Syrup and Ready-To-Serve from Seedless Lemon (*Citrus limon* Burm) Fruits

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### Abstract

A laboratory experiment was conducted for "Preparation and evaluation of processed products Squash, Syrup and Ready-To-Serve from seedless lemon (*Citrus limon* Burm) fruits." The experiment was conducted in order to avoid the postharvest losses, glutand utilize the surplus during the season, it is necessary to process lemon fruits it in various products. The products were analyzed for chemical composition and organoleptic qualities. The total soluble solids remained constant, acidity and ascorbic acid was found to decline and pH showed slightly an increasing trend at ambient temperature storage condition. The sensory score of palatability of the product prepared was found to be organoleptically acceptable for the storage period of 12 month. Amongst lemon products, the lemon syrup recorded highest average organoleptic score (7.61) followed by, squash (7.34) and minimum score was recorded by RTS (7.02).



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### Introduction


India ranks sixth in the world in Citrus production. While in India, Citrus ranks third in the production after Mango and Banana. Lemon is important citrus fruit having a richer source of vitamin C (28.32 mg/100 gm). The present world trend is to prefer natural fruit juices, beverages over synthetic beverages, since the natural fruit beverages are most nutritive and palatable than synthetic one.

They are good source of vitamins and minerals. Lemons are also good source of vitamin A and B. It is very useful in case of prevention of the capillary bleeding and very useful in the case of teeth, hands, face and as a hair rinse. These studies are essential in view of increasing the processing and export of lemons. There are 20-25 per cent postharvest loss in citrus fruits necessitating to develop a method to increase the storability of the fruit.<sup>6</sup>

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Lemons are acidic in nature not consumed as fresh but fruits can be used for in the preparation of syrup, squashes, Ready-To-Serve etc. In order to avoid the postharvest glut and utilize the surplus during the season, it is necessary to handle the lemon fruit properly for preventing losses and also process it in various products.<sup>5</sup>

### Material and Methods

The experiment was conducted at the Department of Horticulture, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli-415 712, District Ratnagiri, Maharashtra state, India. Seedless lemon fruits were obtained from the healthy trees of Konkan lemon grown on lateritic soil in the experimental farm of the nursery. The products like 1) Lemon squash, 2) Lemon syrup, 3) Lemon Ready-To-Serve (RTS) were prepared from the lemon cv. Konkan lemon fruits under study.

### Preparation of Lemon Squash

Sound, healthy fully ripe fruits were selected and washed with water. After washing cut the fruits into halves. The juice was extracted with hand squeezer and filtered through musline cloth. The T.S.S. and acidity of the juice was determined. Then the required quantities of sugar and water were added in the juice to raise its brix to 45<sup>o</sup> and acidity to 1.5 per cent.

### Preparation of Lemon Syrup

For preparing syrup all operations were done as per the procedure followed for preparation of Squash. The TSS and acidity of the pulp were recorded. Then required quantities of sugar and water were added in the juice to raise the brix to 65<sup>o</sup> and acidity to 1.5 per cent. Finally the product had minimum of 65 brix 25% juice and 1.5% acidity.

### Preparation of Lemon Ready-To-Serve (RTS)

For Preparing Ready-To-Serve (RTS) all operations were done as per the procedure followed for preparation of Squash. The TSS and acidity of the juice were recorded. Then required quantities of sugar and water were added in the juice to raise the brix to 200 and acidity to 0.3 per cent. Finally product had 20 % fruit juice, 20 % TSS and 0.3 % acidity. The products were then filled in sterilized glass bottles and crown corked. After pasteurization, the bottles were labeled and stored at a cool and

dry place. The products were analyzed for 12 month storage for chemical composition mainly for TSS, titratable acidity, ascorbic acid and pH and organoleptic qualities.

### Organoleptic Evaluation

The products were evaluated for their organoleptic qualities by scoring for the colour, flavour and texture. Organoleptic score and Rating is as follows, 8-Like very much, 7-Like moderately, 6-Like slightly, 5-Neither like nor dislike, 4-Dislike slightly, 3-Dislike moderately, 2-Dislike very much, 1-Dislike extremely. The overall rating was obtained by averaging the score of evaluation. The products with score 5.5 and above were rated as acceptable.

### Statistical Analysis

The data recorded in the experiment were analyzed statistically by following standard procedure in completely randomized design.<sup>2</sup>

### Results and Discussion

#### Changes in Chemical Composition of Lemon Products During Storage

It is evident from the data presented in Table 1 that, the TSS content in squash, syrup and ready to serve did not show much change during storage. This could be due to the airtight sealing of the products allowing no air to enter in the products and bring about some oxidative degradation.<sup>3,4,8</sup> The titratable acidity found that gradual decline towards the end of storage period. The decline in acidity during storage could be attributed to degradation of organic acids, during storage.<sup>4</sup> The decline in ascorbic acid during storage could be attributed to degradation of organic acids during storage.<sup>1</sup> The increase in pH content during storage could be attributed to degradation of organic acid component and changes is corresponding titratable acidity of lemon squash during storage.<sup>4</sup>

#### Lemon Squash

##### TSS(°B)

The significant differences were observed in TSS of squash during 12th month storage period. The data revealed that the squash exhibited significantly maximum TSS of squash at initial month recorded 45.0<sup>o</sup> Brix which was increases and recorded 46.8<sup>o</sup> Brix at 12 months storage.<sup>3</sup>

**Table 1: Changes in chemical composition of products prepared from Konkan lemon fruits during storage at ambient temperature condition (24 to 320C, 80% R.H.)**

Sr. No.	Product	Storage period (months)	Chemical constituents			
			TSS (°B)	Acidity (%)	Ascorbic acid (mg/100gm)	pH
1	SQUASH	Initial	45.0	1.50	16.30	3.62
		4 Months	45.5	1.48	15.68	3.67
		8 Months	46.2	1.45	13.81	3.71
		12 Months	46.8	1.40	10.86	3.78
		G.Mean	45.89	1.45	14.16	3.69
		SE ±	0.18	0.02	0.55	0.02
		CD at 5%	0.39	0.05	1.17	0.05
2	SYRUP	Initial	65.0	1.50	19.26	3.76
		4 Months	65.5	1.44	18.25	3.79
		8 Months	66.3	1.41	14.63	3.83
		12 Months	67.0	1.37	11.65	3.93
		G.Mean	65.93	1.42	15.95	3.82
		SE ±	0.17	0.02	0.54	0.02
		CD at 5%	0.37	0.04	1.14	0.04
3	RTS	Initial	20.0	0.30	20.75	4.50
		4 Months	20.4	0.28	19.48	4.60
		8 Months	21.3	0.26	15.46	4.65
		12 Months	22.2	0.22	12.21	4.70
		G.Mean	20.97	0.26	16.97	4.61
		SE ±	0.17	0.01	0.63	0.02
		CD at 5%	0.38	0.04	1.34	0.04

**Titrateable Acidity (%)**

There was slightly decline in acidity of squash from initial month (1.50 per cent) to 12<sup>th</sup> month storage (1.40 per cent).<sup>4,8</sup>

**Ascorbic Acid (mg/100 gm)**

It could be revealed that ascorbic acid of lemon squash at initial month recorded 16.30 mg/100 gm which was gradually decreases and recorded 10.86 mg/100 gm at 12<sup>th</sup> month storage.

**pH**

The data showed that there was slight increase in pH of squash from initial month (3.62) to 12 month storage (3.78).

**Lemon Syrup****TSS(°B)**

The average TSS of syrup was 65.93° Brix during 12 months storage period while significantly

maximum was recorded (67.0° Brix) at 12<sup>th</sup> month storage period.<sup>4</sup>

**Titrateable Acidity (%)**

Initially acidity content in syrup was 1.50 per cent then decreased to 1.37 per cent upto 12 months storage.

**Ascorbic Acid (mg/100 gm)**

The ascorbic acid of lemon syrup at initial month recorded 19.26 mg/100 gm which was gradually decreases and recorded 11.65 mg/100 gm at 12<sup>th</sup> month storage.

**pH**

The data revealed that there was slight increase in pH of syrup from initial month (3.76) to 12 months storage period (3.93).

**Lemon Ready to Serve (RTS)****TSS(°B)**

The TSS slightly increases from initial (20.0° Brix) to 12 months storage period (22.2° Brix). The average T.S.S. of RTS was recorded 20.970 Brix during 12 months storage period.<sup>4,8</sup>

**Titrateable Acidity (%)**

Initially acidity of lemon RTS was 0.30 per cent which was gradually decreases to 0.28, 0.26 and 0.22 per cent at 4<sup>th</sup>, 8<sup>th</sup> and 12<sup>th</sup> month storage period respectively.

**Ascorbic Acid (mg/100 gm)**

Initially ascorbic acid of RTS was 20.75 mg/100 gm which was gradually decreases to 19.48, 15.46 and 12.21 mg/100 gm at 4<sup>th</sup>, 8<sup>th</sup> and 12<sup>th</sup> month storage period respectively.

**pH**

There was slight increase in pH of lemon RTS from initial month (4.50) to 12 months storage period (4.70).

**Organoleptic Evaluation of Konkani Lemon Products**

The changes in organoleptic qualities are presented in Table 2.

**Lemon Squash**

The maximum average organoleptic score recorded at initial stage (7.80) of evaluation followed by 4 months of storage (7.45) and was minimum (6.85) at 12 month of storage. With reference to the colour and flavour of the product, the maximum score was recorded at initial stage of evaluation (8.1 and 7.5 respectively).

**Table 2: Changes in Organoleptic qualities of products prepared from lemon cv. Konkani lemon fruits during storage at ambient temperature condition (24 to 32°C, 80% R.H.)**

Sr. No.	Product	Storage period (months)	Organoleptic qualities (score)		
			Colour	Flavour	Average
1	SQUASH	Initial	8.1	7.5	7.80
		4 Months	7.7	7.2	7.45
		8 Months	7.5	7.1	7.30
		12 Months	7.0	6.7	6.85
		G.Mean	7.57	7.12	7.34
		SE ±	0.50	0.30	0.40
		CD at 5%	1.06	0.65	0.85
		Initial	8.1	8.2	8.15
2	SYRUP	4 Months	7.8	7.6	7.70
		8 Months	7.5	7.4	7.45
		12 Months	7.1	7.2	7.15
		G.Mean	7.62	7.60	7.61
		SE ±	0.32	0.38	0.35
		CD at 5%	0.69	0.82	0.75
		Initial	7.7	7.5	7.60
		3	RTS	4 Months	7.1
8 Months	7.0			6.8	6.90
12 Months	6.2			6.7	6.45
G.Mean	7.00			7.05	7.02
SE ±	0.42			0.21	0.31
CD at 5%	0.90			0.46	0.68

### Lemon Syrup

The maximum average organoleptic score recorded 8.15 at initial stage of evaluation followed by 4 months of storages with a score of 7.70 and minimum at 12 months of storage with a score of 7.15. With reference to colour and flavour of the products, the maximum score recorded 8.1 and 8.2 respectively at initial stage of evaluation.

### Lemon Ready-To-Serve (RTS)

The maximum average organoleptic score recorded 7.60 at initial stage of evaluation followed by 4 months of storages with a score of 7.15 and minimum at 12 months of storage with a score of 6.45. With reference to colour and flavour of the products, the maximum score recorded 7.7 and 7.5 respectively at initial stage of evaluation. During storage the organoleptic score of the products gradual decreases could be attributes to the decline in flavouring and other Chemical components and degradation of colour pigments of the products during storage.<sup>7</sup>

### Conclusion

The TSS of the beverages remained constant whereas the acidity and ascorbic acid was found

to decline and pH showed slightly an increasing trend at ambient temperature storage. The sensory score of palatability of lemon squash, lemon syrup and lemon RTS was found to be organoleptically quite acceptable throughout the storage period of 12 month. However, amongst these lemon products, the lemon syrup recorded highest average organoleptic score (7.61) followed by squash (7.34) and minimum score was recorded by RTS (7.02). From the Konkan lemon fruits the product such as squash, syrup and Ready-To-Serve could be successfully prepared and stored at ambient temperature condition.

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### Conflict of Interest

The authors do not have any conflict of interest.

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