

PHYSICO-CHEMICAL CHARACTERISTICS OF APRICOT VARIETIES OF KUMAON REGION AND THEIR SUITABILITY FOR CANNING

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Summary

Ten varieties of apricots grown in the Kumaon region of U.P. were studied for their physico-chemical composition and suitability for canning. Fresh fruits of varieties *Charmaghz* and *Turkey* were observed to be good organoleptically. Varieties *Turkey*, *Parine Apple*, *Frogmore Early* and *St. Ambroise* can well in 40° Brix syrup without disintegration. Organoleptically, canned *Turkey* was satisfactory. Other varieties found suitable were *St. Ambroise*, *Charmaghz* and *Frogmore Early*.

Introduction

Apricots are grown in the Kumaon region of Uttar Pradesh as well as in Kashmir and Himachal Pradesh. Area devoted to cultivation of apricots in Uttar Pradesh is 1600 hectares. *New Large Early*, *Shipley Early*, *Charmaghz*, *Turkey*, *Moorpark*, *Kaisha*, *St. Ambroise* and *Royal* are commonly cultivated varieties in this region¹.

In India, the fruit is mostly eaten fresh and being highly perishable it is generally consumed in regions where it is grown. Only a very small quantity (7445 kg in 1966) is processed¹. No study has been conducted so far on the canning suitability of the different apricot varieties grown in this region. Work was, therefore, initiated at

the CFTRI Experiment Station, Lucknow, on this aspect and the results of the study are reported in this paper.

Materials and Methods

Fruits of ten varieties of apricots, *Seedling*, *Parine Apple*, *Frogmore Early*, *New Large Early*, *Turkey*, *Moorpark*, *St. Ambroise*, *Charmaghz*, *Kaisha* and *Royal*, picked at commercial maturity, were obtained from Govt. Fruit Research Station, Chaubatia (District Almora). Fruits of uniform visual ripeness were sorted and used in the study.

Physical data such as fruit length, diameter and circumference, fruit weight, flesh thickness, fruit skin and flesh colour were recorded from a group of 20 fruits taken at random. The colour description was done according to Maerz and Paul². For the determination of moisture, acidity, sugars, ascorbic acid and alcohol insoluble solids, standard AOAC methods were used³. Total soluble solids (T.S.S.) content in the fruit flesh homogenate was recorded using a hand refractometer. Determination of pH of the homogenate was done with the aid of a pH meter using glass electrode.

Preparation and canning: The fruits were washed thoroughly in running water. They were then cut along the suture with the help of stainless steel knives and stones removed.

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TABLE 1-A. *Physical characteristics of fresh apricots*

Sl. No.	Variety	Height (cm)	Diameter (cm)	Circumference (cm)	Fruit weight (g)	Thickness of flesh (cm)	Edible portion (flesh) (%)
1.	Seedling ...	3.13	3.16	10.43	17.45	0.72	87.5
2.	Parine Apple ...	3.70	3.62	11.90	27.65	0.85	83.7
3.	New Large Early ...	4.98	4.71	14.46	52.60	1.03	90.0
4.	Frogmore Early ...	3.44	3.58	11.39	24.80	0.81	90.6
5.	Turkey ...	3.70	4.09	12.94	34.71	0.92	89.1
6.	Moorpark ...	4.62	4.34	13.95	43.15	0.98	90.2
7.	St. Ambroise ...	5.55	4.87	15.80	64.40	1.08	89.1
8.	Charmaghz ...	3.63	3.52	11.40	25.20	0.86	90.7
9.	Kaisha ...	3.97	4.01	12.35	31.95	0.91	88.2
10.	Royal ...	4.21	3.94	12.31	35.75	0.95	85.4

(Mean values for 20 fruits taken at random, done in duplicate)

TABLE 1-B. *Physical characteristics of fresh apricots (continued)*

Sl. No.	Variety	Fruit size	Fruit shape	Flattened laterally or not	Cavity and suture	Fruit colour*	Flesh colour*
1.	Seedling ...	Small	Round	Flattened	Shallow	Yolk yellow† (10 L5)	Golden yellow (10 L7)
2.	Parine Apple ...	Medium small	Round ovate	Flattened	Distinct	Light chrome yellow‡ (10 L4)	Cadmium yellow (9 L8)
3.	New Large Early ...	Large	Oblong ovate	Flattened	Distinct	Apricot§ (10 F7)	Indian orange (1 D12)
4.	Frogmore Early ...	Medium small	Ovate	Flattened	Distinct	Straw yellow† (10 F2)	Straw yellow (10 F2)
5.	Turkey ...	Medium	Globose	V. slightly flattened	Shallow	Buff§ (11 K7)	Primrose yellow (10 J4)
6.	Moorpark ...	Medium large	Round ovate	No	Shallow	Saffron yellow‡ (10 K8)	Saffron yellow (10 K8)
7.	St. Ambroise ...	Large	Oblong	Flattened	Distinct	Golden yellow§ (10 L7)	Golden yellow (10 L7)
8.	Charmaghz ...	Medium small	Round oblong	Flattened	Distinct	Naples yellow‡ (10 F3)	Cream (9 D2)
9.	Kaisha ...	Medium	Round	No	Shallow	Yellow ochre‡ (11 L7)	Chinese yellow (10 K6)
10.	Royal ...	Medium	Squarish	V. slightly flattened	Shallow	Cadmium yellow† (9 L8)	Deep chrome (9 L7)

* According to 'Dictionary of colour' by Maerz and Paul²

† Crimson lake (4 K6) blush on shoulders and portions of fruit exposed to sun

‡ Crimson (2 L5) blush

§ China rose (5 A6) blush

TABLE 2. *Quality assessment of different apricot varieties*

Sl. No.	Variety	Texture of flesh	Taste	Aroma	Flavour appraisal score*	Eating quality
1.	Seedling	Soft, fibrous	Sour	Mild	4.25	Poor
2.	Parine Apple	Firm and tender, fibrous	Sub-acid	Mild	6.13	Good
3.	New Large Early	Soft	Sl. sour	Pleasant	5.75	Average
4.	Frogmore Early	Soft, fibrous	Sl. sour	Mild	5.25	Average
5.	Turkey	Soft and juicy	Sweet	Pleasant, aromatic	8.00	Excellent
6.	Moorpark	Soft	Sub-acid	Pleasant	6.13	Good
7.	St. Ambroise	Firm and tender	Sweet	Mild	6.75	Good
8.	Charmaghz	Firm and crisp, sl. fibrous	Sweet	Pleasant	8.67	Excellent
9.	Kaisha	Soft and mealy, fibrous	Sour	Pleasant	4.17	Poor
10.	Royal	Firm and juicy	Sour	Mild	3.83	Poor

Sl.—slightly.

* Out of maximum 10; averages of 4 values (Sl. No. 1 to 7) and 3 values (Sl. No. 8 to 10) respectively.

260 g of prepared halves were filled into 1 lb butter can and covered with 250 g boiling 40° Brix syrup. The cans were exhausted to 185°F can centre temperature, sealed and processed for 8 minutes in boiling water. Cut-out examination of canned apricots were conducted at regular intervals of storage at room temperature. Data for 3 months storage alone are, however, presented in this paper.

Organoleptic evaluation of canned apricots was done according to hedonic scale by a panel of judges. This score, however, has been converted suitably, depending upon the relative importance of the aspects studied, for correct and easy assessment of the suitability of the variety for canning.

The study was repeated the succeeding year with the same varieties. As the observations recorded the second year closely agreed with the observations made in the first year, only one year's data are presented.

Results and Discussion

Data recorded on physical dimensions and other observations on the different varieties are given in Tables 1-A and 1-B. The flesh colour closely followed the skin colour of the fruit and all the varieties exhibited crimson or china rose blush on shoulders and portions exposed to the sun. The thickness of flesh followed the size of the fruit.

Table 2 gives the results of quality assessment of the different varieties. Fruits of varieties *Seedling*, *Parine Apple*, *Frogmore Early* and *Kaisha* contained fibrous flesh. *Seedling*, *Kaisha* and *Royal* were rather acidic to taste. Varieties *Charmaghz* and *Turkey* were sweet with very good flavour. These two varieties ranked best in the flavour appraisal test followed by variety *St. Ambroise*. In an overall assessment of the varieties, *Turkey* and *Moorpark* were seen to be the best. *Charmaghz*, although

TABLE 3. Chemical composition of fresh apricot fruits

Sl. No.	Variety	T.S.S.* °Brix	pH*	Total solids %	Alcohol insol. solids %	Ascorbic acid mg/100g	Acidity as malic %	Reducing sugars %	Total sugars %	T.S.S.
										acidity ratio
1.	Seedling	10.63	3.13	14.93	3.46	8.26	2.42	2.41	5.23	4.41
2.	Parine Apple	11.88	3.53	14.34	3.98	9.50	1.99	1.75	8.13	5.97
3.	New Large Early	12.13	3.23	15.40	3.15	18.15	2.33	2.36	6.96	5.18
4.	Frogmore Early	12.75	3.35	15.65	4.07	8.90	2.31	2.47	8.44	5.55
5.	Turkey	14.13	3.48	17.00	2.99	12.04	1.76	1.64	9.25	8.05
6.	Moorpark	12.25	3.40	15.51	2.87	13.64	2.04	1.93	8.87	6.00
7.	St. Ambroise	12.13	3.53	16.20	3.24	12.62	1.90	1.53	7.81	6.38
8.	Charmaghz	18.17	4.88	21.04	3.61	9.47	0.49	0.76	15.18	37.09
9.	Kaisha	12.50	3.13	15.86	3.65	8.36	2.85	2.62	8.65	4.39
10.	Royal	12.83	3.23	16.29	3.45	9.29	2.62	2.28	8.22	4.90

* Mean of 4 values (Sl. No. 1 to 7) and 3 values (Sl. No. 8 to 10) respectively. Other constituent analysis was done in duplicate.

a choice variety, is a shy bearer. Variety *St. Ambroise* was seen to be moderately good.

Results of chemical analysis are presented in Table 3. All the varieties except *Charmaghz* had constituents falling within a narrow range. Variety *Charmaghz* was low in acid content and high in sugar and soluble solids content. In all the varieties the ascorbic acid content was moderate. The varieties reported to be fibrous in the earlier para were observed to have higher A.I.S. content than varieties low in fibre. The taste of the fruit was seen to be related to the soluble solids-acid ratio (SS-A ratio). Those varieties with SS-A ratios upto 5 were sour, those with ratios between 5 and 6 sub-acid and varieties with ratios above 6 were sweet to taste.

B. Suitability of the varieties for canning

Results of the cut-out examination of canned apricot are given in Tables 4-6. Except *Turkey*, *Charmaghz*, *St. Ambroise*

and *Frogmore Early*, the other varieties gave slightly or severely mashed product on canning. The clarity of the syrup depended upon fruit texture on canning, varieties retaining shape and texture of the pieces on canning gave clear syrups. Again, varieties *Turkey*, *St. Ambroise*, *Charmaghz* and *Frogmore Early* alone gave products acceptable in taste and flavour; i.e., the products were sweet with good flavour. Varieties *Seedling* and *Charmaghz* were rather fibrous. The fibrous texture to a lesser degree was also noticed in the varieties *Parine Apple*, *Frogmore Early* and *Kaisha*.

In the physical and organoleptic evaluation of the product, the variety *Turkey* was seen to give a product excellent in all respects followed by *St. Ambroise*, *Charmaghz* and *Frogmore Early* (Table 5). Four of the 10 varieties studied, *Seedling*, *Moorpark*, *New Large Early* and *Royal*, did not give products of acceptable quality either due to

TABLE 4. *Cut-out examination of canned apricots after 3 months of storage at room temperature*

Sl. No.	Variety	Drained wt. %	Fruit colour	General appearance	Taste	Flavour	Texture	Syrup colour	Syrup clarity
1.	Seedling	52.6	Golden corn (9 I6)	Mashy	Sl. acidic	Moderate	Soft, fibrous	Yellow ochre (11 L7)	Sl. turbid
2.	Parine Apple	54.0	Cadmium yellow (9 L8)	Intact	Mod. sweet	Pleasant	Sl. fibrous	Bronze yellow (11 L8)	Sl. turbid
3.	New Large Early	51.8	Mandarin red (2 F12)	Sl. mashy	Sl. acidic	Moderate	Soft	Capucine orange (9 I8)	Turbid
4.	Frogmore Early	53.5	Straw yellow (10 F2)	Intact	Mod. sweet	Pleasant	Soft, sl. fibrous	Capucine yellow (9 K8)	Sl. turbid
5.	Turkey	51.9	Amber yellow (10 J3)	Intact	Sweet	Pleasant	Firm	Golden corn (9 I6)	Clear
6.	Moorpark	54.9	Cadmium orange (9 L10)	Sl. mashy	Sl. acidic	Moderate	Soft	Apricot (10 F7)	Sl. turbid
7.	St. Ambroise	52.5	Golden yellow (10 L7)	Intact	Sweet	Pleasant	Soft	Golden yellow (10 L7)	Sl. turbid
8.	Charmaghz	54.1	Cream (9 D2)	Intact	Sweet	Pleasant	Firm, fibrous	Cream buff (10 E3)	Sl. turbid
9.	Kaisha	55.7	Chinese yellow (10 K6)	Mashy	Acidic	Moderate	Soft, sl. fibrous	Yellow ochre (11 L7)	Turbid
10.	Royal	56.8	Cadmium yellow (9 L8)	Sl. mashy	Acidic	Moderate	Soft	Golden yellow (10 L7)	Sl. turbid

Sl.—slightly;

Mod.—moderately

TABLE 5. *Quality assessment of canned apricots after 3 months of storage*

Sl. No.	Variety	Clarity of syrup (Max. 10)	Fruit colour and general appearance (Max. 20)	Fruit texture and mouth feel (Max. 30)	Aroma and taste (Max. 40)	Total (Max. 100)	Quality of canned product
1.	Seedling	4.6	12.4	12.5	18.4	48.0	Not acceptable
2.	Parine Apple	5.4	14.0	18.6	18.0	56.0	Just acceptable
3.	New Large Early	3.6	10.4	14.4	16.8	45.2	Not acceptable
4.	Frogmore Early	5.8	14.8	22.2	22.4	65.2	Moderately good
5.	Turkey	7.2	16.4	25.8	31.2	80.6	Excellent
6.	Moorpark	3.5	11.0	15.0	20.0	49.5	Not acceptable
7.	St. Ambroise	5.0	14.4	23.4	26.4	69.2	Good
8.	Charmaghz	4.8	16.5	15.9	31.2	68.4	Good
9.	Kaisha	3.8	11.0	11.4	26.4	52.6	Just acceptable
10.	Royal	5.3	12.5	14.4	16.8	49.0	Not acceptable

Figures given above are means of scores awarded by 5 judges (for serial Nos. 1 to 5 and 7) and 4 judges (Sl. Nos. 6, 8 to 10) respectively.

TABLE 6. *Chemical analysis of canned apricots after 3 months of storage*

Sl. No.	Variety	Soluble solids °Brix	pH	Acidity as malic %	Reducing sugars %	Total sugar %	Sol. solids Acid/ratio
1.	Seedling	30.5	2.95	1.38	26.06	26.89	22.1
2.	Parine Apple	30.5	3.15	1.29	26.68	28.81	23.6
3.	New Large Early	28.0	3.15	1.33	24.55	26.06	21.1
4.	Frogmore Early	27.5	3.40	1.08	25.10	26.54	25.5
5.	Turkey	28.5	3.55	0.93	24.19	25.85	30.6
6.	Moorpark	29.0	3.20	1.43	25.91	26.55	20.3
7.	St. Ambroise	28.5	3.40	1.19	24.82	26.63	24.0
8.	Charmaghz	28.0	4.60	0.19	18.58	26.19	147.4
9.	Kaisha	28.0	3.00	1.53	24.56	25.75	18.3
10.	Royal	28.5	3.25	1.49	26.75	27.31	19.1

disintegration of the pieces or due to fibrous texture.

Results of the chemical analysis of the product after 3 months of storage are presented in Table 6. In an earlier part, the relative sweetness of the canned product from different varieties was reported (Table 4). From Table 6, it can be seen that sweeter varieties have higher Brix-acid ratio. Canned products giving Brix-acid ratio below 20 were acidic, between 20 and 25 moderately sweet and above 25 sweet.

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