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Studies on the suitability of cling-stone and free-stone low chilling peach cultivars for canning and other processed products

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Abstract

Two cling stone peach cultivars "Shan-i-Punjab" and "Tropic Beauty" and one free stone cultivar "Florda Grande" were processed for canning (whole and halves) and beverages (squash and nectar). Fruits of Shan-i-Punjab were found to have the best characteristics for canning (as whole) and for making pulp based beverages (nectar and squash) with maximum ascorbic acid content (17 mg/100 g) and pulp yield (47.62%). Organoleptically Shan-i-Punjab fruits were found to have the highest acceptability scores *i.e.* 8.50 for canned peaches, 8.58 for squash and 8.38 for nectar among all the cultivars studied on a 9-point Hedonic scale judged by eight semi-trained panelists and general consumers. Florda Grande also received the higher acceptability scores (8.50) for its canned peach halves because of its tough texture. The fruits of Florda Grande were not much suitable for pulp based beverages, whereas those of Tropic Beauty were found acceptable for canning as well as for making beverages at zero time and also after six months storage.

Key words: Cling stone, peach, Shan-i-Punjab, cultivar, canning

Introduction

Peach (*Prunus persica* (L) Batsch.) is a popular temperate zone fruit, but with the introduction of high quality and heavy bearing low chilling peach cultivars, it has become possible to grow it in subtropical areas of Punjab, Haryana, Delhi and Western U.P. In Punjab, peach is grown over an area of 1367 hectares with the production of 20505 metric tones of fruit annually (Anonymous, 2007). In India, stone fruits are cultivated on nearly 0.31 million ha area with annual production of 2.52 million tonnes and average productivity of 8.13 tonnes/ha (2002-03). As per FAO production data 2006, peach production in India was 1.5 lakhs tonnes.

The demand for stone fruits and their processed products has increased because of rise in health concerns and nutritional awareness. The demand of these fruits is expected to improve further in near future. Peach is an excellent source of minerals like potassium, phosphorus and iron and a good source of vitamins and low calorific diet (Gopalan *et al.*, 1996). Peach comes in the market for a short period of time from end of April to May and moreover the fruit is highly perishable at ambient temperature. Its palatability and utilization can be increased by processing fruit either into canned form or into different processed products. Some work has been done on canning of peaches (Aggarwal *et al.,* 1992, Srivastava and Arora, 1994) but the studies are not available on the processing suitability of these cultivars into canned and pulp based products.

Therefore, the present investigation was carried out with the objective to find out the suitability of cling stone and free stone peach varieties for canning and other processed products. Selected varieties may be propagated on a wider scale for distribution to the farmers for sufficient production to supply processing industry and to develop some new products from peaches for domestic and export markets.

Materials and methods

Peach varieties, two cling stone "Shan-i-Punjab" and "Tropical Beauty" and one free stone "Florda Grande", were procured from Department of Horticulture, PAU, Ludhiana and were processed into canned peaches (whole and halves) and beverages (squash and nectar).

Canning: Selected hard matured and well riped fruit of all the peach varieties weighing 20 and 25 kg each were washed under running water with gentle rubbing of the skin with hands. The fruit was lye peeled in 1% solution for 1 minute (which was pre standardized by using various concentrations of lye solution *i.e.* 0.5, 1.0, 1.5 and 2% for 1 and 2 minutes of boiling. After 1 minute treatment of fruit in boiling lye solution, it was immediately cooled under running water followed by a dilute acid treatment. Peeled fruits were filled in pre sterilized A 2-1/2 tall cans. The fruits were covered with hot syrup (40 and 50°B). Cans were steam exhausted until the temperature in the center of the cans reached 85°C and sealed immediately. Cans were boiled in water for 30 minutes and were quickly cooled after processing under running water.

Pulp: Pulp from all the peach varieties was extracted by superfine pulper (Raylons, India). Two extractions were made from each variety to have better pulp yield, which was stored for further use with 2000 ppm of potassium meta bisulphite. The pulp was further used for making squash and nectar.

Nectar: Sugar syrup was prepared in a stainless steel jacketed kettle. Pulp (20%) was added into the sugar syrup which was then strained through a muslin cloth. Total soluble solids were adjusted to 15° B. Acidity of nectar was adjusted to 0.32 % with the addition of citric acid. 200 mL capacity bottles were filled with peach nectar at the temperature of 80-82°C. Bottles were corked

and processed in boiling water for 20 minutes. These were then air cooled and stored at room temperature for use.

Squash: Syrup was prepared by mixing and heating sugar, acid and water. Total soluble solids were adjusted to 45°B. The mixture was filtered through muslin cloth. Pulp was added to the sugar syrup after cooling. Potassium meta bisulphite was added in the squash after dissolving in small amount of squash and then mixing in bigger lot. Squash was filled into 650 mL capacity bottles and crown corked. The following recipes were used for the preparation of squash and nectar from the pulp of all the peach varieties.

Standardized recipes for peach squash and peach nectar

Sr. No.	Ingredients	Quantity (Approx)	
		Squash	Nectar
1	Juice	1.00 kg	1.00 kg
2	Sugar	1.70 kg	0.65 kg
3	Water	1.25 kg	3.30 kg
4	Citric acid	41.0 g	9.00 g
5	Potassium meta bisulphite	700 ppm	-

Analytical Methods: Peach pulp of all the varieties was analysed for total solids, total soluble solids, acidity, ascorbic acid, total sugars and reducing sugars (Ranganna,1994). Cut out analysis of canned peaches was done. Canned peaches, squash and nectar were analysed for their sensory parameters by a panel of eight semi-trained judges periodically on the basis of 9 point hedonic scale (Amerine *et al.*, 1965). Sensory evaluation was also done by general consumers on a simple format. Results were analysed statistically for their interpretation using completely randomized design experiment as discussed by Cochran and Cox (1957).

Results and discussion

All the varieties *i.e.* Shan-i-Punjab, Florda Grande and Tropical Beauty were processed into canned and bottled products. Data regarding the various chemical and sensory parameters of the peach products are presented in Tables 1 to 5.

Canned peaches: In cut out analysis of canned peaches, external and internal conditions of the cans were found satisfactory (Table 1). No swelling and rusting was observed in any can. Vacuum in cans ranged between 10 inch to 11 inch Hg. Head space was also within permissible limits. Drained weight of the fruit ranged from 64.4 to 50 per cent, thus meeting the FPO specifications.

Canned whole peaches from variety Shan-i-Punjab were scored the highest for appearance (8.63) whereas peach halves from variety Florda Grande (free stone variety) were scored the highest for its texture (8.63) and taste (8.50) by a panel of eight semi-trained judges at zero time. Fruits of Shan-i-Punjab were quite big and of bright yellow colour which was liked by most of the consumers (semi-trained panel and general consumers). After six months storage the texture of the two varieties Shan-i-Punjab and Florda Grande was found the same, and both the varieties were very much liked by the panel. A simple proforma was prepared to take the views of general consumers. Excellent remarks were received for Florda Grande and Shan-i-Punjab and good for Tropical Beauty.

Table 2. Effect of variety and storage on the organoleptic evaluation* of canned peaches

Variety	Storage (months)	Appearance	Texture	Taste	Overall mean
Shan-i- Punjab	0	8.63	8.50	8.38	8.50
	3	8.50	8.38	8.25	8.38
	6	8.38	8.38	8.25	8.34
	Mean	8.50	8.42	8.29	8.41
Tropical Beauty	0	7.38	7.50	7.50	7.46
	3	7.25	7.38	7.38	7.34
	6	7.25	7.13	7.25	7.21
	Mean	7.29	7.33	7.38	7.34
Florda Grande	0	8.38	8.63	8.50	8.50
	3	8.50	8.50	8.38	8.46
	6	8.25	8.38	8.25	8.29
	Mean	8.38	8.50	8.38	8.42
LSD (*P*=0.05)					
Varieties		0.33	0.34	0.35	0.09
Storage		NS	NS	NS	0.09

*Mean values of eight panelists.

Table 3. Effect of varieties on the yield and *bio-chemical parameters of peach pulp

Variety	Yield (%)	TS (%)	TSS (°B)	Acidity (%)	Ascorbic acid (mg/100g)	Total sugars (%)	Reducing sugars (%)
Shan-i-Punjab	47.62	10.04	8.2	0.75	17.00	5.61	5.08
Tropical Beauty	46.06	13.41	11.5	0.76	5.00	7.56	6.69
Florda Grande	30.0	14.25	11.5	0.73	3.10	6.78	6.14

* Mean of three values.

Pulp: Shan-i-Punjab gave the highest percentage of pulp yield *i.e.* 47.62% among all the varieties (Table 3). Ascorbic acid was found to be maximum in Shan-i-Punjab *i.e.* 17.00 mg/100g. Florda-Grande gave the lowest pulp yield *i.e.* 30% because it was quite hard textured variety, which was not found much suitable for making pulp.

Squash: Squash prepared from Shan-i-Punjab had bright yellow colour whereas Florda Grande was pale yellow which caused lowering of scores for appearance (Table 4). Squash from Shan-

Table 1. Cut out analysis* of canned peaches from different varieties

Variety	Can wt (g)	Drained wt (g)	Syrup wt (g)	Drained wt (%)	Syrup wt (%)	Vacuum (Hg")	Head space (cm)	TSS (°B)	Acidity (%)
Shan-i-Punjab	986.50	561.5	309.00	64.40	35.50	11	1.20	27.2	0.50
Tropical Beauty	955.70	421.1	420.60	50.05	49.95	11	1.45	27.2	0.44
Florda Grande	961.30	421.9	467.70	50.25	49.74	10	1.40	27.2	0.37

*Average of three values.

Table 4. Effect of variety and storage on the organoleptic quality* of squash

Variety	Storage (months)	Appearance	Flavour	Texture	Overall mean
Shan-i- Punjab	0	8.50	8.75	8.50	8.58
	3	8.25	8.50	8.25	8.33
	6	8.38	8.25	8.38	8.25
	Mean	8.38	8.50	8.46	8.42
Tropical Beauty	0	8.13	8.25	8.25	8.21
	3	8.00	8.13	8.13	8.09
	6	7.75	7.88	8.25	7.96
	Mean	7.96	8.08	8.21	8.09
Florda Grande	0	7.00	8.25	8.25	7.83
	3	6.88	8.00	8.38	7.75
	6	6.13	7.63	8.25	7.34
	Mean	6.67	7.96	8.29	7.64
LSD(P=0.05)					
Varieties		0.27	0.29	NS	0.52
Storage		0.27	0.29	NS	NS

*Mean values of eight panelists.

Table 5. Effect of variety and storage on the organoleptic quality* of peach nectar

Variety	Storage (months)	Appearance	Texture	Flavour	Overall mean
Shan-i- Punjab	0	8.38	8.25	8.38	8.50
	3	8.21	8.00	8.25	8.38
	6	8.17	7.75	8.25	8.50
	Mean	8.25	8.00	8.29	8.45
Tropical Beauty	0	8.00	8.00	7.88	8.38
	3	8.04	8.25	7.63	8.25
	6	7.83	7.50	7.75	8.25
	Mean	7.99	7.92	7.75	8.29
Florda Grande	0	7.96	7.38	8.00	8.50
	3	7.63	6.25	8.25	8.38
	6	7.21	5.50	7.75	8.38
	Mean	7.60	6.38	8.00	8.42
LSD(P=0.05)					
Varieties		0.32	0.27	NS	NS
Storage		0.32	NS	NS	NS

*Mean values of eight panelists.

i-Punjab was scored the highest for its appearance (8.50) and flavour (8.75). Other two varieties were also found acceptable by a panel of eight judges with 8.21 overall mean scores for Tropical Beauty and 7.83 scores for Florda Grande. During storage of squash, appearance scores were found to decrease significantly ($P \leq 0.05$) in case of Florda Grande and Tropical beauty. Appearance of squash prepared from Florda Grande was not appreciable therefore scored the lowest with 6.13 scores after six months storage whereas Shan-i-Punjab was very much acceptable with 8.38 scores for appearance and 8.25 for flavour. Squash from Tropical Beauty was also liked by the panel with 7.75 score for appearance and 7.88 for flavour even after six months storage. There was no significant ($P \leq 0.05$) change in the body of the squash prepared from three cultivars neither as fresh nor during storage.

Table 6. Cost of products (cost per can/ bottle in Rs)

Ingredients	Can	Nectar	Squash
Fruit	6.0	0.80	3.25
Sugar	4.0	0.60	4.80
Citric-acid and other chemicals	0.10	0.10	0.10
Empty bottles / can	10.00	1.70	5.00
Processing charges including depreciation cost	1.00	0.30	0.30
Total	21.10	3.50	13.45

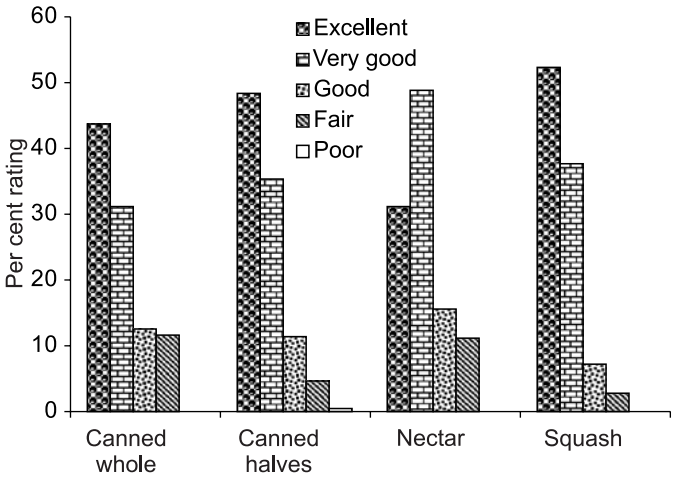

Fig.1. Percent rating of general consumer acceptance for peach products

Nectar: Significant ($P \leq 0.05$) difference in appearance and flavour scores of the nectar prepared from three cultivars of peach was found. Nectar prepared from Shan-i-Punjab had highest scores *i.e.* 8.25 for appearance and 8.38 for flavour. Nectar from Florda Grande was scored the lowest in its appearance (7.38) because of its dull yellow colour. Tropical Beauty was also liked very much with 8.0 scores for appearance and 7.88 for flavour by the panel of eight judges. Storage showed significant ($P \leq 0.05$) decrease in the appearance scores of nectar prepared from three cultivars, however it remained acceptable during six months storage. Nectar from Shan-i-Punjab was liked very much even after six months storage with 8.25 scores for flavour and 7.75 for appearance. After six months storage nectar from Florda Grande was scored quite low for its appearance *i.e.* 5.5 but it was acceptable due to its flavour with 7.75 scores. Nectar from Tropical Beauty did not show much decrease in sensory scores during storage. However. the maximum liking was for nectar prepared from Shan-i-Punjab. No significant effect of storage was found on the flavour, body and overall acceptability of nectar prepared from three cultivars.

General consumer acceptance: Samples of canned peach halves of Florda grande, canned whole peaches, nectar and squash of cultivar Shan-i-Punjab were fed to around 200 general consumers to judge their preferences for the products. Canned peach halves and wholes were rated excellent by 48.3, 43.75%, very good by 35.28, 31.25% and good by 11.37, 12.5 % and fair by 4.55, 11.60% consumers. 52.3 and 31.1 % consumers rated squash and nectar as excellent drinks, respectively. None of the consumers rated squash and nectar as a poor drink (Fig 1.). Cost of the products was

calculated as 21.10, 3.50, 13.45 rupees/ can or bottle respectively for can, nectar and squash (Table 6).

Therefore, it is concluded that commercially grown variety Shan-i-Punjab has a very good potential for making squash, nectar and canning as whole peaches. Other free stone variety Florda Grande which was found excellent for making canned peach halves was found very attractive and convenient to eat by all the taste panel and general consumer. All the products showed very good acceptability even after six months of storage.

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