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ORIGINAL ARTICLE

Effect of blending and storage on quality characteristics of blended sand pear-apple juice beverage

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Abstract Juice from sand pear and apple was extracted by grating the fruits following extraction using hydraulic press. The juice after extraction was filtered, heat pasteurized and packed in glass bottles followed by processing. Suitability of blending sand pear juice with apple juice was evaluated. Blending of sand pear juice (SPJ) with apple juice (AJ) in the proportion of 50:50 to 60:40 gave better quality with higher sensory score. With the increase in the level of SPJ in the AJ mix there was gradual increase in the level of polyphenols. Brix to acid ratio of the beverage was optimum when SPJ and AJ were blended in the ratio of 50:50 to 60:40. Storage of blended beverage containing 50–60% SPJ was found more shelf stable during 6 months storage.

Keywords Sand pear juice · Apple juice · Blending ratio · Quality · Storage

The sand pear (*Pyrus pyrifolia* L.) is an important pome fruit of the family rosaceae extensively grown in the temperate and sub tropical regions of the world because of its wider climatic and soil adaptability. In India, it is an important fruit crop of Northern regions. The oriental pear or sand pear 'Pathernakh' is grown wildly in temperate and semi-temperate regions of Himachal Pradesh, Punjab, Haryana, UP and North Eastern region. The fully mature sand pear fruit has high nutritional value. Edible portion of the fruit contains good amounts of carbohydrates, minerals, vitamins and polyphenol and the level of polyphenols in sand pear fruits is found greater than that of apple fruits (Kumar and Ghuman 2007). Fruits of commercially cultivated pear are mostly used for table or processing purpose however, sand pear fruits, which are grown wildly, possess attributes like grittiness, higher acidity and astringent taste. Therefore, owing to presence of such attributes, these fruits are rarely used as fresh or in processing and hence fetch low price to the grower. Even, the juice extracted from sand pear fruits being too acidic and astringent is not accepted by the consumers. Beside sand pear, apple (*Malus domestica* Borkh) is the most important fruit of the rosaceae family in the temperate region and Himachal Pradesh. Hence, there is a need to develop appropriate technology for utilizing sand pear juice in blending with apple juice for preparation of acceptable quality beverage. Hence this work has been carried out.

Materials and methods

Mature fruits of sand pear (*Pyrus pyrifolia*) and apple (*Malus domestica*) were procured from local orchard of Solan and Shimla districts, respectively and brought to the laboratory. Juice from sand pear and apple was extracted by grating the fruits following extraction using hydraulic press. The sand pear juice (SPJ) after extraction and filtration was blended with apple juice (AJ) in ratios of 10:90, 20:80, 30:70, 40:60, 50:50. 60:40, 70:30, 80:20 and 90:10 followed by heat pasteurization at 95°C for 5 min. immediately after pasteurization, the juice was packed in 200 ml pre-sterilized glass bottles followed by processing

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Table 1 Quality of fresh sand pear and apple fruits and their juice used for blending

	Sand Pear	Apple
Fruit		
Length, mm	53.5±2.04	70.5±4.2
Breadth, mm	58.9±2.50	73.1±3.2
Fruit weight, g	105.5±12.61	181.5±10.71
Moisture,%	86.1±0.30	85.5±0.45
Dry matter,%	13.9±0.30	14.5±0.45
Juice yield,%	63.8±0.40	69±0.35
Juice		
TSS, °Brix	8.0±1.2	10.8±0.8
Acidity,%	0.406±0.05	0.235±0.06
Total Phenols, mg%	362±7.5	295±8.2
NEB, $_{OD\ 440\ nm}$	0.28±0.03	0.377±0.02
Sensory score		
Colour	8.0±0.20	8.5±0.10
Taste and aroma	5.0±0.15	8.5±0.18
Body	5.5±0.08	8.4±0.11
Overall acceptability	6.2±0.10	8.5±0.13

TSS Total soluble solids (n=3), *NEB* Non-enzymatic browning

in boiling water for 30 min. The samples followed by labeling were stored for 6 months and analyzed at regular intervals for physico-chemical as well as sensory attributes. The experiment was carried out by using completely randomized design including 9 treatments each with 3 replications.

Morphological parameters of a sample of ten sand pear and apple fruits were recorded with the help of electronic Vernier callipers. Average weight of fruits was determined gravimetrically. The moisture and dry matter was estimated by drying the weighed samples in hot air oven at 70±2°C to a constant weight (AOAC 1984). The yield of the juice was calculated after extraction of the juice and expressed in percentage. The total soluble solids (TSS) of juices were determined with the help of hand refractometer and expressed as °Brix (Ranganna 1986). Polyphenols content of juices was determined by the method described by Sadasivam and Manickam (1996). The titratable acidity and non-enzymatic browning (NEB) of juices was determined by method as detailed by Ranganna (1986). The blended SPJ-AJ beverages were evaluated for sensory qualities on the basis of colour (appearance), taste and aroma, body and overall acceptability by a panel of 10 judges on a 9 - point Hedonic scale (Amerine et al. 1965).

The data pertaining to physico-chemical characteristics of juice/blended beverage were analyzed statistically by following complete randomized design (Cochran and Cox 1967). Data on sensory quality of juice/blended beverage were analyzed according to randomized block design as described by Mahony (1985).

Results and discussion

The quality of fresh sand pear and apple fruits and their juices is presented in Table 1. The overall acceptability of the SPJ and AJ were recorded 6.2±0.10 and 8.5±0.13 respectively on 9 point Hedonic scale. The results of sand pear and apple fruits and their juices were in agreement as reported earlier by Shrestha and Bhatia (1982), Attri et al.

Table 2 Effect of blending of sand pear juice (SPJ) and apple juice (AJ) on quality during storage

SPJ:AJ Blends	TSS, °Brix			Acidity, %			Polyphenols, mg%			NEB, $_{OD\ 440\ nm}$		
	Storage			Storage			Storage			Storage		
	0	3	6	0	3	6	0	3	6	0	3	6
Physico-Chemical (n=3)												
10:90	10.4	11.4	10.6	0.21	0.22	0.24	302	281	263	0.356	0.370	0.382
20:80	10.2	11.0	10.6	0.22	0.23	0.24	318	295	280	0.340	0.354	0.368
30:70	10.0	10.8	10.4	0.25	0.27	0.28	322	301	285	0.345	0.356	0.364
40:60	9.8	10.4	9.6	0.27	0.28	0.30	330	313	304	0.325	0.333	0.345
50:50	9.6	10.4	9.8	0.29	0.30	0.31	332	320	307	0.305	0.310	0.320
60:40	9.4	10.2	9.8	0.31	0.32	0.33	333	325	305	0.308	0.312	0.322
70:30	9.0	9.5	8.4	0.34	0.36	0.39	346	330	325	0.304	0.310	0.318
80:20	8.5	9.2	8.0	0.37	0.39	0.41	350	340	334	0.305	0.314	0.322
90:10	8.2	9.2	7.6	0.38	0.41	0.42	355	346	339	0.295	0.310	0.312
$CD_{0.05}$	B=0.25, S=0.17 B × S=0.63			B=0.011, S=0.008 B × S=0.023			B=9.5, S=11.6 B × S=21.2			B=0.005, S=0.008 B × S=0.012		

B Blend, *S* Storage (in months)

(1998), Chang et al. (2000), and Kumar and Ghuman (2007). The slight variation in different characteristics might be attributed to the variation in weather condition and cultural practices that might have affected the fruit quality.

The TSS among different SPJ-AJ blends ranged from 8.3 °Brix to 10.8 °Brix, with maximum TSS in beverage containing SPJ-AJ in 10:90 ratio and minimum in 90:10 ratio (Table 2). With the increase in the level of AJ in SPJ there was increase in the TSS contents of the blended beverage which is due to high initial TSS of AJ. During storage, there was an increase in TSS of the beverage after 3 months. After 6 months storage, the TSS content declined. During initial stage, increase in TSS might be attributed to breakdown of the complex carbohydrates into simple soluble carbohydrates. During 6 months storage, the decline in the TSS of the beverage might be due to utilization of sugars in NEB reactions. SPJ-AJ blends in the ratio of 50:50 to 60:40 showed little variations in TSS during storage and is more shelf stable. The acidity among different SPJ-AJ blends ranged from 0.22 to 0.40%, with maximum acidity in blended beverage containing SPJ-AJ in 90:10 ratio and minimum in 10:90. During storage period of 6 months, there was gradual increase in acidity of beverages from 0.29 to 0.32%. During storage period minimum change in the acidity was observed in beverage containing SPJ-AJ in 50:50 to 60:40 ratios. Polyphenol contents among different SPJ-AJ blends ranged from 282 to 347 mg%, with maximum polyphenol in blended beverage containing SPJ-AJ in 90:10 ratio and minimum in 10:90. During storage period of 6 months, there was gradual decline in polyphenol contents from 332 to 305 mg%. The decline in the phenol contents during storage was reported earlier by Duda-Chodak et al. (2008) and El-Sheikha et al. (2009). The NEB of blended beverages measures in term of optical density at 440 nm ranged from 0.306 to 0.369, with maximum NEB in blended beverage containing SPJ-AJ in 10:90 ratio and minimum in 90:10. During storage period of 6 months, the increase in NEB was from 0.320 to 0.339. Such increase in NEB during storage of processed products was reported by Raj and Lal (2008) and Sagar and Kumar (2009).

The sensory scores for colour, taste and aroma, body and overall acceptability on 9 point Hedonic scale among different SPJ-AJ blends ranged from 7.7 to 8.6, 5.0 to 8.6, 5.2 to 8.5 and 5.9 to 8.7 respectively, with maximum scores for sensory characteristics in blended beverage containing SPJ-AJ in 50:50 to 60:40 ratio and minimum in 90:10 (Table 3). Increase in the level of SPJ in the blends beyond 60% resulted in decreased sensory score which might be due to increase in the titratable acidity of the blends. Beverages containing SPJ-AJ in 10:90, 20:80, 30:70 and 40:60 ratios were sweeter while those containing SPJ-AJ in 70:30, 80:20 and 90:10 ratios were too acidic in taste. So, Brix: acid ratio of the beverage was observed highly acceptable when SPJ-AJ were blended in the ratio of 50:50 to 60:40. Blended SPJ-AJ beverages in the ratio of 50:50 to 60:40 have observed minimum changes in sensory scores during storage period of 6 months. Increase in sensory score of blended beverage of apple, pear and grape juices was reported earlier by Siler and Morris (1993) and Saxena et al. (1996).

Conclusion

Blending of SPJ with AJ in the proportion of 50:50 to 60:40 gave better nutritional quality beverage with higher

Table 3 Effect of blending of sand pear juice (SPJ) and apple juice (AJ) on sensory quality of the beverage during storage

SPJ:AJ Blends	Colour			Taste and Aroma			Body			Overall acceptability		
	Storage			Storage			Storage			Storage		
	0	3	6	0	3	6	0	3	6	0	3	6
10:90	8.5	8.4	8.3	8.5	8.3	8.2	8.4	8.2	8.0	8.5	8.3	8.2
20:80	8.5	8.4	8.2	8.6	8.4	8.1	8.4	8.2	8.1	8.5	8.3	8.1
30:70	8.6	8.5	8.3	8.6	8.5	8.3	8.5	8.4	8.2	8.6	8.5	8.3
40:60	8.6	8.5	8.3	8.7	8.6	8.4	8.5	8.5	8.3	8.6	8.5	8.3
50:50	8.7	8.7	8.5	8.8	8.8	8.7	8.6	8.5	8.5	8.7	8. 7	8.6
60:40	8.7	8.6	8.5	8.9	8.8	8.7	8.6	8.5	8.4	8.7	8.6	8.5
70:30	8.0	7.8	7.6	5.5	5.5	5.2	5.8	5.5	5.5	6.4	6.3	6.1
80:20	8.0	7.5	7.5	5.3	5.2	5.1	5.5	5.4	5.0	6.3	6.0	5.9
90:10	8.0	7.5	7.5	5.0	5.0	5.0	5.4	5.3	5.0	6.1	5.9	5.8
$CD_{0.05}$	B=0.14, S=0.14 B × S=NS			B=0.15, S=NS B × S=0.23			B=0.12, S=NS B × S=0.27			B=0.25, S=NS B × S=0.67		

* Storage in months, * B and S: See Table 2

sensory score. Storage of blended beverage containing 50–60% SPJ remained more shelf stable when stored for 6 months. So blending of sand pear juice with apple juice can prove a boon to the growers in getting a good remunerative for their produce and to consumers in getting antioxidant rich beverage at reasonable price.

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