

STUDIES ON PEAR JUICE

Part-I. Preparation of Enzymatically Clarified Juice and Its Concentration to Produce High Degree Brix Concentrate

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Three varieties of pears Leconte, Kieffer and Batang were analyzed for their physio-chemical composition. Juice yield was found to be 83.8, 81.7 and 83.6% respectively in Leconte, Kieffer and Batang. Maximum ascorbic acid was found in the Leconte and minimum in the Kieffer. Pectolase enzyme was used to obtain clear pear juice. Physio-chemical changes during concentration of the juice were noted. The clear pear juice and concentrate was organoleptically evaluated. On overall quality, juice and concentrate obtained from Leconte was rated superior.

Key words: Pear varieties, Juice concentrate, Enzymatic clarification, Sensory evaluation.

Introduction

Pears are one of the important fruits grown in North West Frontier Province (NWFP) of Pakistan. Because of their wide soil adaptability and their insect and disease resistance their popularity is increasing. Leconte is the most commonly planted variety. Its fruits is medium size, yellow, sweet and tasty when ripe which is usually the first week of September. Kieffer pears are larger in size and harder than Leconte. The fruit skin is yellow with some reddish plush near maturity. The fruit is ready for picking in the first week of October. Batang is a round sweet pear with dots on the skin. Batang is ready for harvesting in September [1-5]. Total production of pears in NWFP (Pakistan) was 31012 tonnes during 1987-88.

Enzyme preparations are playing an important role in modern food processing. Pectolytic enzymes have been employed in the extraction and clarification of juices [7,8]. In the preparation of juice and concentrates, colour deterioration is due to the action of an endogenous enzyme, polyphenol oxidase (PPO) [9-14]. SO_2 possesses bactericidal properties and inhibits enzymatic and non enzymatic darkening [15,16]. Embs and Markakis [15] found that the mechanism by which SO_2 inhibits browning caused by PPO is a reaction with substrate compounds such as the enzymatically produced o-quinones from the existing polyphenols. There is also direct enzyme inactivation by the SO_2 . Addition of ascorbic acid has been shown to be an effective and safe, but temporary means of inhibiting PPO action in fruits [17-19].

Concentration of any fruit or pulp is of great economic advantage from the point of view of packaging, storage and transportation. It is a method for utilization of excess produce during peak season. Studies on the preparation of apple, orange, pineapple, banana, guava and mango concentrates have been reported [20]. Little information is available on the preparation and concentration of enzymatically clarified pear

juice. This paper reports the studies on the preparation of enzymatically clarified pear juice concentrate.

Material and Methods

Three varieties of pears, Kieffer, Leconte and Batang were purchased from the local market. The fruit was washed in running water to remove adherent dust, trimmed, hand peeled and passed through a pulper. The pulp was divided into two lots. One lot was treated with 0.1% ascorbic acid and the other with 0.1% potassium metabisulphite. Pectolytic enzyme (0.1%) was added to both the lots and mixed well. The pulps were then kept at room temperature, $30^\circ \pm 4^\circ$ for 16 hrs. The treated samples were pressed in a cloth and the juice filtered through a cellite bed. The clear juice obtained was pasteurized at $75-80^\circ$ for 2 min. The enzymatically clarified juices of each variety were concentrated separately in a rotary evaporator under vacuum at $50-55^\circ$ to 77° Brix and scored at $2-4^\circ$ in a cooled incubator over night. Fresh clarified pear juice was added as a cut back to the concentrate and final Brix adjusted to 75° .

Analytical methods. Total soluble solids were measured by Abbe refractometer, moisture, titratable acidity as malic acid, ascorbic acid and sugars were determined by standard AOAC methods [21]. Non-enzymatic browning was measured by extracting a 2 g sample with 60% alcohol filtered through Whatman filter paper No. 41 and reading as optical density (OD) in a spectrophotometer (Erma Model LS7) at 440 nm. All the analytical measurements were made in replicates. Organoleptic quality was evaluated by a panel of 25 panelists for colour, flavour and taste of the ready to serve drinks on a 5 point Hedonic scale [22].

Results and Discussion

Average fruit weight and recovery of juice from the different varieties of pears is given in Table 1. The chemical

composition of the different varieties of pears is shown in Table 2. The mean, standard deviation (SD) and coefficient of variation (CV) of the results were also determined. Maximum ascorbic acid (2.72 mg/100g) was found in the leconte and minimum (1.61 mg/100g) in the Kieffer. Maximum reducing sugar (8.83%) and total sugar (9.33%) were noted in Kieffer and minimum (6.75%) reducing sugar and (7.14%) total sugar in the Batang. The total soluble solids pH, acidity as malic acid, reducing sugar, total sugar and colour of clear pear juice (ascorbic acid and potassium metabisulphite treated samples) is given in Table 3. The total sugar was comparatively higher in the juice of Kieffer and lower in Batang. The optical density (OD) of the juice of Batang was high when compared to Kieffer and Leconte (Table 3). SO₂ treated samples showed decrease in OD as compared to ascorbic acid treated samples. Wide variations were observed in the mean, SD and CV of the results. Increase in optical density (OD) was found with increasing concentration. Maximum increase in the OD was shown in the concentrate of Batang and minimum in Leconte (Table 4). Sugars were also high in the concentrate of Kieffer when compared to Leconte and Batang juice concentrates. The mean SD and CV of the results revealed wide variations. The sensory evaluation of pear juice and concentrate is given in Table 5. The mean, SD and CV of the results were also measured. The organoleptic evaluation of the clear pear juice and concentrates was done by 25 Panelist on a 5 point Hedonic scale for colour, flavour and taste. Ready to serve drinks were prepared by reconstituting the concentrates and compared with those prepared from freshly extracted juices. The colour

TABLE 1. AVERAGE WEIGHT AND RECOVERY OF JUICE OF DIFFERENT VARIETIES OF PEARS.

Pear varieties	Average weight (g)	Enzyme (%)	Juice (%)
Kieffer	275.0	0.1	88.3
Leconte	87.5	0.1	81.7
Batang	90.1	0.1	83.6

TABLE 2. CHEMICAL COMPOSITION OF DIFFERENT VARIETIES OF PEAR.

Pear varieties	Moisture (%)	Total soluble (%)	pH	Total acidity as malic acid	Reducing sugar (%)	Total sugar (%)	Ascorbic acid (mg/100 g)
Kieffer	85.05	16.00	4.71	0.20	8.83	9.33	1.61
Leconte	85.66	15.00	4.62	0.21	7.81	9.04	2.72
Batang	85.73	15.00	4.72	0.19	6.75	7.14	1.99
Mean	85.48	15.33	4.68	0.20	7.79	8.50	2.106
SD	0.304	0.471	0.045	0.191	0.849	0.971	0.460
CV	0.355	3.075	0.961	95.50	10.90	11.423	21.87

SD = Standard deviation; CV = Coefficient of variation

TABLE 3. CHEMICAL COMPOSITION OF CLARIFIED PEAR JUICE.

Pear varieties	Total soluble solids (%)	pH	Total acidity as malic acid (%)	Reducing sugar (%)	Total sugar (%)	Colour OD
Kieffer						
A	14.5	3.28	0.87	9.48	9.71	0.030
M	15.0	3.91	0.70	7.89	8.88	0.030
Leconte						
A	13.0	3.31	0.84	8.88	9.48	0.010
M	13.0	3.81	0.71	8.19	8.88	0.001
Batang						
A	11.0	3.36	0.86	6.76	7.33	0.045
M	10.5	3.87	0.70	6.26	9.98	0.005
Mean	12.83	3.59	0.78	7.91	9.04	0.020
SD	1.618	0.275	0.077	1.123	0.366	0.015
CV	12.611	7.84	9.903	14.205	9.581	79.341

A = Ascorbic acid treated; M = Potassium metabisulphite treated; OD = Optical density

TABLE 4. CHEMICAL COMPOSITION OF PEAR JUICE CONCENTRATE.

Pear varieties	Total soluble solids (%)	pH	Total acidity as malic acid (%)	Reducing sugar (%)	Total sugar (%)	Colour OD
Kieffer						
A	75	3.30	4.51	65.43	67.03	0.23
M	75	5.35	2.50	64.14	65.76	0.13
Leconte						
A	75	3.31	4.30	61.55	64.62	0.22
M	75	5.48	2.05	60.42	63.52	0.045
Batang						
A	75	3.39	4.23	63.25	65.29	0.26
M	75	5.44	2.46	59.20	61.57	0.22
Mean	75	4.37	3.34	62.33	64.63	0.18
SD	-	1.046	1.014	2.155	1.735	0.091
CV	-	23.938	30.371	3.457	2.685	50.555

TABLE 5. SENSORY EVALUATION OF PEAR JUICE AND CONCENTRATE.

Parameters	Kieffer		Leconte		Batang		Mean	SD	CV
	A	M	A	M	A	M			
<i>Pear Juice</i>									
Colour	3.65	3.65	3.75	3.85	3.34	3.60	3.64	0.157	4.314
Flavour	3.18	3.00	3.45	3.36	2.9	2.60	3.08	0.287	9.320
Taste	3.56	3.40	3.80	3.50	3.21	3.19	3.44	0.210	6.104
Overall quality	3.54	3.36	3.67	3.56	2.95	2.85	3.32	0.310	9.353
<i>Pear Juice Concentrate</i>									
Colour	3.1	3.56	1.80	3.10	2.20	2.75	2.75	0.592	21.527
Flavour	2.85	2.80	2.90	2.90	2.80	2.75	2.83	0.039	1.411
Taste	2.90	2.95	3.0	3.01	2.80	2.80	2.91	0.085	2.942
Overall quality	2.92	3.00	2.97	3.18	2.72	2.75	2.92	0.123	4.211

score for Leconte was lower to Kieffer and higher to Batang. The flavour and taste score of Leconte was higher when compared to Kieffer and Batang. The analysis of variance showed wide variations. Differences in quality of concentrate among varieties, based on sensory evaluation score are significant to justify the superior rating of Leconte. The juice and concentrate of Leconte were rated superior by the panelists, in colour, flavour and taste (Table 5). The potassium metabisulfite treated samples gave better results.

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