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Combine Effect of Potassium Sorbate and Sodium Benzoate on Individual and Blended Juices of Apricot and Apple Fruits Grown in Azad Jammu and Kashmir

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Abstract: This study was carried out to find the influence of chemical preservative of potassium sorbate on the preservation and overall quality of individual and blended juices of apricot and apple fruits. Ten different treatments were prepared from these juices. They were analyzed for physio-chemical properties (ascorbic acid, acidity, pH reducing and non-reducing sugars). Ascorbic acid reduced minimal in T₁ (3.64) while maximum in T₁₀ (4.94), acidity of samples increased minimum in T₅ (0.39), while maximum in T₁ (0.48). pH of sample reduced minimum in T₂ (3.40) while maximum in T₁ (4.00). Reducing sugar increased minimum in T₂ (6.47), while maximum in T₁₀ (6.96) and non-reducing sugar increased minimum in T₃ (1.08), while maximum in T₉ (2.83) all the samples remain acceptable during storage period.

Key words: Potassium sorbate, sodium benzoate, apricot, apple

Introduction

The taste of same kind of fruits depends upon the variety, area of cultivation and environmental factors where fruits plants exists, in Azad Kashmir many kinds of fruits are produced among these fruits ratio of apricot and apple production is more. Due to lack of cold storage facilities and lack of awareness among the growers about its preservation (through conversion of different products). The large quantities of these fruits are spoiled before reaching consumers. Although apricot and apple is used in fresh form, but at the peak harvesting season. The production of apricot and apple is high and become abundant in the local market. The perishable nature of fruits could result in several losses if not properly processed. In Azad Kashmir total product of apple and apricot are 44.980 and 25.66 tons respectively (Anonymous, 2003). Apple contain 83.1% moisture 9.2% sugar and 1.87% protein, while mineral content is Na 2.0mg K 8.7mg Ca 2.7mg, Fe 0.22mg, Cu 0.11mg and sulphur 2.8mg per 100mgs of whole fruits (MaCance and Widdowson, 1960). Apricot contains 85.3g moisture of 0.9g protein 11.6g carbohydrates 1.0g fiber 0.7g ash and 10mg ascorbic acid (Hussain, 1985). Strong acid juices blends well with low acid fruit juices and they are greatly improved by blending with juices of higher acidity. Apple juice because of its mild flavor blends well with many strong flavored juices such as cherry. Raspberry and cranberry (Hayes *et al.*, 1948) orange juices blends well with apple, apricot, boysenberry grape, grape fruit lemon, lime, pineapple, raspberry and tangerine juices (Anonymous, 1956). Food preservation by additives is a low cost as well either to be used into the products. The salts of sorbic acid are used frequently in foods due to their greater solubility in water. The primary inhibitory action of sorbates is against yeasts and moulds. While the activity

against bacteria is not comprehensive and appears to be selective overall sorbates appears to be the safest food preservatives for juices preservation (Shew *et al.*, 1975). Luck (1980) Stated that potassium sorbate is used to inhibit chemical, enzymatic or microbiological deterioration. Concentration as low as 0.1-2.0% are adequate in improving preservation of soft drinks. Sodium benzoate is much more soluble in water for this reason it is preferred for use in many cases, it is one of the oldest chemical preservative use in cosmetic and in food industries. Rusul and Ang (1994) investigated the effects of different concentration of sodium sorbate, sodium benzoate and sodium bisulphate on the microbiological and chemical quality and color of star fruit juices during storage at ambient temperature. Aerobic mesophils moulds, yeast and lactic acid bacteria were determined together with titratable acidity, pH, ascorbic acid, total soluble solids. The juices were stored at 26-28°C for 12 weeks. Pasteurization at 75°C for 20 minutes at pH 3.5 reduced initial browning. Juice did not undergo microbial spoilage during storage at room temperature. The soluble solid increased and browning occurred during storage. Main *et al.*, 2001 investigated the blueberry juice blended with apple grape and cranberry juice with ratio of 25, 50, 75. The 25% concored and venus blends were the only blend that resulted in blueberry flavor. Apple and cranberry juice when blended with blueberry juice produced several blends with good flavor. Juice samples were evaluated initially and after three months storage period at 37°C. After storage all blends had decreased red color.

Shukla *et al.* (2003) blended juice/pulp from apples, bananas, guavas, litchis and mangoes in four different concentrations (100, 200, 300 and 400g/L) with separated and reconstituted skim milk. Organoleptic

Hussain *et al.*: Potassium Sorbate and Sodium Benzoate

Table 1: Combine effect of potassium sorbate and sodium benzoate on ascorbic acid of apricot and apple juice stored at 4°C

Treatments	Storage Period (Days)							Mean	% Dec.
	Initial	15	30	45	60	75	90		
T ₁	5.6	5.0	4.2	3.5	2.8	2.6	1.8	3.64 ^d	67.85
T ₂	7.6	7.0	6.0	4.8	4.0	3.1	2.0	4.92 ^b	73.68
T ₃	6.5	5.8	5.0	4.2	3.4	2.6	1.7	4.17 ^{c,d}	73.84
T ₄	6.8	6.0	5.1	4.3	3.4	2.4	1.6	4.22 ^c	76.47
T ₅	6.9	6.0	5.1	4.2	3.3	2.4	1.5	4.20 ^c	78.26
T ₆	5.5	5.0	4.6	4.2	3.8	3.2	2.8	4.15 ^{c,d}	49.09
T ₇	7.6	7.2	6.6	6.0	5.3	4.5	3.4	4.78 ^a	55.26
T ₈	6.8	6.5	5.6	5.2	4.5	3.9	3.2	4.05 ^b	52.94
T ₉	6.7	6.2	5.5	5.0	4.3	3.7	3.0	4.91 ^b	55.22
T ₁₀	6.8	6.3	5.7	5.1	4.3	3.5	2.9	4.94 ^b	75.35
Mean	6.68 ^{ab}	6.10 ^{bc}	5.34 ^{de}	4.26 ^{gh}	3.91 ^{def}	3.19 ^{bc}	2.39 ^{ab}		

The values in column and row followed by different small letters are significantly (p<0.05) different

evaluation of the beverages showed that apple juice and guava pulp could be blended up to level of 300 and 100g/L in milk products respectively. Beicjat (1983) design experiment to determine effect of food preservation by using potassium sorbate in sodium benzoate and reported that yeasts were more rapidly inactivated in juices containing comparable concentration of potassium sorbat and sodium by sulphate on the microbiological and chemical quality of fruits and juice stood at ambient temperature. Due to lack of enough storage facility in this region huge quantity of these fruits is lost annually. In this project planning, was made to prepare juices of the individual fruit of apples apricot and their blend in various proportions with and without application of potassium sorbate.

Materials and Methods

Fresh mature ripe and healthy apple and apricot were purchased from the local fruit market and were transported in wooden boxes to the laboratory where the research work was conducted. After washing, sorting, stoning (apricot), coring (apple) and cutting of the fruit, the juices were extracted by electronic pulper and collected in washed buckets and then strained through single fold muslin cloth. The juice was pasteurized at 150°F for 20 minutes (Awan, 1999). Apple and apricot blends were prepared in the 100%, 75%, 50%, 25% concentrations. All the juices sample were filled in cleaned sterilized glass bottles and stored for period of 3 months at refrigeration temperature (4°C). The chemical constituents like ascorbic acid acidity, pH, reducing and non-reducing sugars were estimated by use of A.O.A.C (1984) methods at each 15 days interval of the storage period.

Results and Discussion

Apple and apricot juices treated with chemical preservatives were analyzed for ascorbic acid content during storage period of three months. Results regarding the effect of treatments and storage intervals the ascorbic acid content of apple and apricot juices are

presented in Table 1. Maximum mean values was recorded for T₁₀ (4.94) followed by T₉ (4.91), T₂ (4.92) while minimum mean value was recorded for T₁ (3.64). Results indicated that during storage there was gradual decrease in ascorbic acid content of apple and apricot juices from (6.68mg/100ml (Initial day) to (2.39mg/100ml (45 days). Results showed that minimum percent decrease in ascorbic acid content in T₆ (49.09%) while maximum percent decrease in ascorbic acid was observed in sample T₅ (78.25%). All the treatments are significant at (p<0.05). Ascorbic acid is the least stable constituent its quality is affected in the product during pasteurization and storage. Similar results have been observe by Khattark and Roghani (1978) studied the effect of temperature, type of container, length of storage different method for preservation of ascorbic acid content of grape fruit juice. Sustaintial loss of ascorbic acid occurred during storage in canned and bottled grape juice. Kalra *et al.* (1987) observed gradual decrease of ascorbic acid Iqbal *et al.* (2001) reported gradual decrease of ascorbic acid in guava nectar during storage.

Acidity play important role in the flavor and taste of the products preserved apple and apricot juices were analyzed for titratable acidity and results presented in Table 2. The results revealed that maximum mean acidity values were observed for T₂ (0.51) followed by T₁ (0.48) and minimum for the T₅ and T₁₀ (0.39). The mean acidity values increase with passage of time 0.33 (initial day) 0.56 (90 days). Maximum increased was observed in T₁ (46.87%) and T₂ (46.61%) while minimum percent increase was observed in T₇ (35.84%) and T₁₀ (37.25%). Results are in agreement with Goldith *et al.* (1961) and Plawaiswany *et al.* (1974) working on different mango products. Safdar *et al.* (1999) observed gradual increase in acidity during storage of tomato concentrate at three different temperatures. The rise in acidity may be explained by the fact that the concentration of weakly ionized acid and their salts increased during storage. This increased in acidity might also be due to formation of acid by degradation of polysaccharides and oxidation

Hussain *et al.*: Potassium Sorbate and Sodium Benzoate

Table 2: Combine effect of potassium sorbate and sodium benzoate on acidity of apricot and apple juice stored at 4°C

Treatments	Storage Period (Days)							Mean	% Inc.
	Initial	15	30	45	60	75	90		
T ₁	0.34	0.38	0.42	0.48	0.52	0.58	0.64	0.48 ^{bc}	46.87
T ₂	0.36	0.40	0.45	0.55	0.58	0.63	0.65	0.51 ^a	46.61
T ₃	0.32	0.36	0.37	0.41	0.45	0.50	0.58	0.42 ^{efgh}	44.82
T ₄	0.30	0.34	0.38	0.43	0.48	0.52	0.56	0.43 ^{efg}	46.42
T ₅	0.31	0.33	0.36	0.39	0.42	0.45	0.49	0.39 ^j	36.73
T ₆	0.35	0.38	0.41	0.44	0.47	0.52	0.57	0.44 ^{cdef}	38.59
T ₇	0.34	0.37	0.40	0.43	0.46	0.50	0.53	0.43 ^{efg}	35.84
T ₈	0.36	0.40	0.45	0.48	0.51	0.55	0.60	0.47 ^{bcd}	40.00
T ₉	0.33	0.38	0.42	0.45	0.49	0.51	0.54	44 ^{ef}	38.88
T ₁₀	0.32	0.32	0.35	0.38	0.41	0.44	0.51	0.39 ^j	37.25
Mean	0.33 ^a	0.37 ^b	0.40 ^a	0.44 ^{de}	0.48 ^{def}	0.52 ^{gh}	0.56 ⁱ		

The values in column and row followed by different small letters are significantly (p<0.05) different

Table 3: Combine effect of potassium sorbate and sodium benzoate on pH of apricot and apple juice stored at 4°C

Treatments	Storage Period (Days)							Mean	% Dec.
	Initial	15	30	45	60	75	90		
T ₁	4.3	4.24	4.23	4.15	4.00	3.8	3.3	4.00 ^{ab}	23.25
T ₂	3.8	3.72	3.61	3.5	3.3	3.00	2.9	3.40 ^j	23.68
T ₃	4.00	3.94	3.93	3.8	3.5	3.33	3.00	3.64 ^{efgh}	25.02
T ₄	3.85	3.81	3.80	3.7	3.5	3.00	2.9	3.50 ^{hi}	23.37
T ₅	3.95	3.92	3.98	3.8	3.4	3.2	3.00	3.60 ^{gh}	24.00
T ₆	4.2	4.02	4.01	4.00	3.9	3.86	3.7	3.95 ^{abc}	11.90
T ₇	3.8	3.74	3.70	3.6	3.4	3.3	3.2	3.53 ^{ghi}	15.78
T ₈	3.9	3.85	3.84	3.8	3.6	3.5	3.4	3.69 ^{defg}	12.82
T ₉	4.2	4.03	3.76	3.7	3.5	3.3	3.1	3.65 ^{efgh}	14.28
T ₁₀	4.3	4.22	3.94	3.9	3.82	3.75	3.66	3.94 ^{abc}	14.88
Mean	4.03 ^a	3.95 ^b	3.88 ^{abc}	3.80 ^{de}	3.59 ^{def}	3.40 ^j	3.22 ^{abc}		

The values in column and row followed by different small letters are significantly (p<0.05) different

of reducing sugars or by breakdown of pectic substances. Similar views were expressed by Hummel and Okay (1950), Jones (1951) and Iqbal *et al.* (2001), who reported that gradual increase in acidity, which may be due to degradation of pectic substances and formation of uronic acid. Statistical analysis of the data revealed significant (p<0.05) effect of various treatments and storage period on titrateable acidity of apple and apricot juices.

pH play an important role in the flavor of the juice product and also acts as a factor of preservation. The results pertaining to the response of storage and different treatments on pH of apple and apricot juices are present in Table 3. The maximum mean pH values were recorded for T₁ (4.00) and T₆ (3.95), while minimum pH value recorded for T₄ (3.50). It was found that pH decreased with passage of storage time initial mean pH value was 4.03 while after three months of storage it decreased to 3.22. Maximum percent decrease in pH of apple and apricot juices were recorded in T₂ (23.68%) and T₃ (25.02%), while minimum percent decrease in pH value with increase in acidity during storage 10.7% for T₁. Bajwa *et al.* (2003), Bajwa *et al.* (2002). Similar results were reported by Ali (1965) that acidity in citrus juices increased and pH decreased during processing and storage. Safdar *et al.* (1999) reported decrease in

pH during storage tomato concentrate at three different temperatures. Statistical analysis shows that the results of different treatment and storage period were significant.

Sugars are important constituent of the fruit product and play an important role in the flavor of the product and also act as a food preservative. Results regarding the effects of different treatments of apple and apricot juices stored at refrigeration temperature are shown Table 4. Results showed that reducing sugar increased from 6.61 (initial day) to 7.70 (90 days). Maximum mean values for treatments were observed for T₁₀ (6.96) and minimum mean values were T₂ (6.47), T₄ (6.69). Maximum percent increase in reducing sugars was recorded for T₂ (8.82%) followed by T₄ (8.30%). Minimum percent increase in reducing sugar in apple and apricot juice was observed in T₁ (2.71%). These results are an agreed with findings of Bajwa *et al.* (2003), who showed increase in glucose and fructose contents in strawberry fruits during storage. Results regarding the effects of different treatments on non-reducing sugars of apple and apricot juice stored at refrigeration temperature showed Table 5. That non-reducing sugars decreased from 2.56 (initial day) to 1.88 (90 days) during storage period of three months. The maximum mean values for treatments were recorded for T₁ (2.68)

Hussain *et al.*: Potassium Sorbate and Sodium Benzoate

Table 4: Combine effect of potassium sorbate and sodium benzoate on reducing sugars of apricot and apple juice stored at 4°C

Treatments	Storage Period (Days)								Mean	% Inc.
	Initial	15	30	45	60	75	90			
T ₁	6.80	6.86	6.86	6.9	6.94	6.97	6.99	6.90 ^{abcd}	2.71	
T ₂	6.2	6.3	6.4	6.45	6.5	6.7	6.8	6.47 ^b	8.82	
T ₃	6.6	6.7	6.75	6.8	6.9	6.95	6.99	6.81 ^{de}	5.00	
T ₄	6.4	6.5	6.6	6.7	6.8	6.9	6.98	6.69 ^f	8.30	
T ₅	6.7	6.8	6.85	6.9	6.99	7.00	7.1	6.90 ^{abcd}	5.63	
T ₆	6.85	6.9	6.95	6.97	7.1	7.1	7.2	6.98 ^a	3.52	
T ₇	6.4	6.5	6.6	6.7	6.8	6.86	6.95	6.68 ^f	7.91	
T ₈	6.7	6.8	6.85	6.9	6.94	6.96	6.99	6.87 ^{bcd}	4.14	
T ₉	6.6	6.7	6.83	6.87	6.92	6.96	6.98	6.83 ^{de}	3.80	
T ₁₀	6.8	6.9	6.95	6.98	6.99	7.00	7.1	6.96 ^{abc}	4.22	
Mean	6.61 ^{ab}	6.70 ^{bc}	6.76 ^{de}	6.82 ^{ef}	6.89 ^{gh}	6.93 ^j	7.70 ^k			

The values in column and row followed by different small letters are significantly (p<0.05) different

Table 5: Combine effect of potassium sorbate and sodium benzoate on non-reducing sugars of apricot and apple juice stored at 4°C

Treatments	Storage Period (Days)								Mean	% Dec.
	Initial	15	30	45	60	75	90			
T ₁	2.9	2.8	2.75	2.7	2.6	2.55	2.1	2.68 ^{ab}	27.58	
T ₂	2.00	1.9	1.8	1.75	1.64	1.54	1.44	1.77 ^b	28.00	
T ₃	2.5	2.3	2.1	2.00	1.95	1.9	1.85	1.08 ^b	26.00	
T ₄	2.6	2.3	2.2	2.00	1.95	1.9	1.85	2.10 ^{ab}	30.00	
T ₅	2.8	2.5	2.4	2.3	2.00	1.96	1.85	2.25 ^{ab}	33.92	
T ₆	2.6	2.3	2.2	2.1	2.18	2.15	2.13	2.23 ^{ab}	18.07	
T ₇	2.7	2.4	2.35	2.3	2.25	2.23	2.00	2.31 ^{ab}	25.92	
T ₈	2.9	2.5	2.45	2.4	2.35	2.3	2.25	2.45 ^{ab}	22.41	
T ₉	2.6	2.3	2.1	2.00	1.97	1.95	1.9	2.83 ^a	26.92	
T ₁₀	2.8	2.4	2.3	2.25	2.21	2.18	2.14	2.32 ^{ab}	23.57	
Mean	2.64 ^{bc}	2.39 ^{be}	2.27 ^{de}	2.18 ^g	2.11 ^{cd}	2.07 ^{def}	1.95 ^f			

The values in column and row followed by different small letters are significantly (p<0.05) different

and while minimum mean values were recorded for T₂ (1.77) and T₉ (2.83). Maximum percent decrease in non-reducing sugars apple and apricot juice was observed T₅ (33.92%) and T₄ (30%), while minimum percent decrease was recorded for T₆ (18.07%). The results are in accordance with the findings of Javed (1988) and Bajwa *et al.* (2003). Similar results were obtained by Karim (1966), who worked on canning of citrus fruits and concluded that reducing sugars increased during canning and storage at room temperature. Ali (1965) reported that increase in reducing sugars in canned orange juice might be due to conversion of non-reducing sugar to reducing sugars.

References

- A.O.A.C., 1984. Official methods of analysis association of official chemists 13th Ed. Washington DC.
- Ali, M., 1965. Effect of canning qualities of juices from different varieties of oranges. M.Sc. (Hons) Agri. Thesis, Dept. Food Tech. Agri. Uni. Faisalabad.
- Anonymous, 1956. Blended fruit juices and mixed fruit drinks Circ. Hoffmanla Roche, Nutley, N.J.
- Anonymous, 2003. Azad Kashmir statistical Year Book Planning and Development Department Azad Govt. of the State of Jammu and Kashmir.
- Awan, J., 1999. Elements of Food Science and Technology Publishing Company Virgos. Is. Ed., pp: 123.
- Bajawa, E.E., Z.P. Naeem, G. Abdul and M.S. Bhatti, 2002. Development, standardization and storage studies on grape fruit apple marmalade Pak. J. Food Sci., 13: 11-15.
- Bajawa, E.E., Z. Naeem, J. Anjum and Nazir, 2003. Development, standardization and storage studies on watermelon-lemon. Pak. J. Food Sci., 12: 21-24.
- Beicjat, L.R., 1983. Combine effects of food preservatives and organic acid on thermal inactivation of yeast in fruit juices. Lebernmitteld wissenschaftund - technologic, 16: 51-54.
- Goldblith, S.A., M.A. Joslyn and T.T.R. Nickerson, 1961. Interaction of thermal processing of foods. The AVI Pub. Co. Inc. Concertient U.S.A.
- Hayes, K.M., W.B. Esselen and C.R. Fellers, 1948. Apple - cranberry juice. Fruit Prod. J., 27: 308-329.
- Hummel, M. and R. Okey, 1950. Relation of canned tomato products to storage losses of ascorbic acid Food Res., 15: 405-414.
- Hussain, T., 1985. Food composition for Pakistan Department of Agriculture Chemistry and Human Nutrition N.W.F.P Agri. Uni. Peshawar, pp: 10-11.
- Iqbal, S.A., Yasmin, S. Wadud and W.H. Shah, 2001. Production storage packing and quality evaluation of Gouva Nectoir Pak. J. Food Sci., 11: 33-36.

Hussain *et al.*: Potassium Sorbate and Sodium Benzoate

- Javed, A., 1988. Manufacture of different flavored kinow juices based drink, M.Sc. (Hons). Thesis Department, Food Technology, University, of Agriculture, Faisalabad.
- Jones, J.K.N., 1951. The chemical composition Industry, 6: 430-432.
- Kalra, S.K., D.K. Tandon and H.C. Lohani, 1987. Preservation of discoloration in guava beverage during storage. Indian Food Packer, 47: 21-24.
- Karim, A., 1966. Canning of citrus juices effect of blending and canning on juice of Lyallpure grown grape storage M.Sc. (Hons) Thesis. Agri. Uni. Faisalabad.
- Khattark, S. and M.S. Roghani, 1978. Preparation and preservation of grape fruit juice. Effect of different methods of preservation on the single strength grape fruit juice. Kar. Uni. J. Sci., 6: 2.
- Luck, 1980. Antimicrobial Food additions characteristics uses, effects springerveriage Berlin.
- Main, G., M. Fauppel, J. Moriss and R. McNew, 2001. Quality and slability of blueberry juice blended with apple grapes and cranberry juice J. Food Pul. Food. Nut. Press Inc. Trumbull USA, 24: 111-125.
- McCance, R.A. and E.M. Widdowson, 1960. The composition of foods, H. Maj. Stationary Office London, England.
- Plawaiswany, R.P.C.R., Mukhurishman and K.G. Shamugandw, 1974. Studies on the evaluation of certain mango varities of fina Navi of pulp and squash Ind. Food Pakers, 28: 509.
- Rusul, G. and P.Y. Ang, 1994. Keeping quality of pasteurized bottled star fruit juice preserved by sodium, sodium sorbate and sodium bisulphate. ASEAN Food J., pp: 77-82.
- Safdar Naeem, M., M. Asrar, N. Abdullah Zia-ur-Rehman and W.H. Shah, 1999. Studies on the effect of storage condition on ascorbic acid acidity and pH of tomato concentrate. Pak. J. Food Sci.
- Shew, C.W., D. Salomon, J.L. Simons, T. Sreeualson and E. Freese, 1975. Inhibitory compounds on bacteria and mammalian Ceff. Antimicrob Agents Chemoth, 7: 349.
- Shukla, F.C., A. Sharma and B. Singh, 2003. Studies on two developments of beverages using fruits juices/pulp separated milk and reconstituted skim milk. Int. Ltd. Oxforoxon Eng., pp: 110-114.