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EFFECTS OF SODIUM BENZOATE ON THE QUALITY EVALUATION OF MANGO PULP DURING THE STORAGE INTERVALS

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ABSTRACT
This research was conducted to study the effects of sodium benzoate (0.1%) on mango pulp which was stored in transparent plastic jars at ambient temperature (25 to 30°C) for three months. Mangoes "Chaunsa" varieties were selected for research work and research was conducted in analytical laboratory of FSPDI. NARC, Islamabad. The treatments were T_0 (Mango pulp without preservative) and T_1 (0.1% sodium benzoate). The samples were analyzed for physicochemical (0. pH, TSS and % acidity) and sensory analysis (color, flavor and overall acceptability) after 15 days of intervals. The data showed that the pH decreased from 3.85 to 3.44, TSS increased from 13.00 to 14.50° and titratable acidity increased from 0.29 to 0.34% during storage. Organolaptically T_1 was found better then the T_0. Sample T_1 (0.1% Sodium benzoate) was found more acceptable as compare to T_0 (mango pulp without preservative) after three months of storage.

Key words: Quality, Storage, Mango Pulp, Sodium Benzoate, TSS, Acidity

INTRODUCTION
Mango *(Mangiferaindicae L.)* commonly called "King of fruits", is native to Southern Asia,, especially Burma and Eastern India. Mango is considered as fruit of excellence and thus has prominent position among commercial fruits grown in Pakistan. It is famous for its excellent flavor, attractive fragrance and nutritional value. Mango plays an important role in balancing the diet of human being by providing about 64-86 calories energy. Mango as an emerging tropical export crop is produced in about 90 countries in the world with a production of over 25.1 million tones. Asia is the main producer with 76.9% of the total world production, followed by America with 13.38%, Africa with 9% and less than 1% each for Europe and Oceania. Pakistan stands at 5th position among main mango producing countries with production of 938 thousand tones with a share of 7.6% in the world market (Sauco, 2002).

Mango pulp was preserved with the help of chemical preservatives as potassium metabisulphite (KMS), sodium benzoate (SB) and potassium sorbate (PS) singly or in various combinations. The pulp samples were partially pasteurized at 82 ± 2 °C for 30 minutes and placed in a high-density polyethylene bags with addition of chemicals and kept at 30-45 °C for 150 days. The pulp was tested for physicochemical, microbiological and sensory characteristics. It was found that chemical treatment containing KMS 1000 ppm, SB 500 ppm and PS 400 ppm were effective

against microorganisms and no colonies were formed up to 90 days of storage period. These samples were also physically and organoleptically normal even after 270 days. It was found that pasteurized mango pulp could be stored for extended period of time without any major changes in chemical composition and sensory characteristics (Sarfraz. *et al.,* 2003).

Mango juices were packaged in polyethylene films, polyethylene tetraphthalate (PET or plastic) bottles and transparent glass bottles and stored at 6 °C, 26 ^{a}C and 34 °C. Percentage ascorbic acid loss, browning index, titratable acidity, pH and soluble solids were evaluated at 2-week intervals for 8 weeks. Percentage ascorbic acid good source of energy and provides u vitamins A, C and minerals like iron and phosphorus (Malik, *et al.* 1994).

MATERIALS AND METHODS

Fresh matured "chaunsa"mangoes were purchased from Islamabad fruit market and were analyzed at food processing and analytical laboratory of FSPDI. NARC,where the research work was carried out.

Preparation of sample

After thoroughly washing the mangoes pulp was extracted with mango pulper machine this was used for the research.

Storage

Preserved mango pulp was stored for a period of 3 months at ambient temperature (25-30°C). Samples were tested at 15 days interval for a total storage period of 90 days.

Total Soluble Solids (TSS)

The total soluble solids were determined by standard method of AOAC (2000).

Procedure

Titrateable Acidity (%)

Titratable acidity was determined by standard method of AOAC (2000), by titrating against standard alkali solution.

Sensory evaluation

The selectedsamples will be organolaptically judged for flavor, color, overall acceptability and texture by the panels of 15 judges. The evaluation will be carried out by using 9 points hedonic scale of Larmond (1977).

Statistical analysis

All the data will be analyzed statistically by using Complete Randomized Design (CRD) two factorial experiments and means will be separated by LSD test as recommended by (steel and Torrie 1980,).

RESULTS AND DISCUSSION

The samples were tested for physicochemical and organoleptic properties (pH, TSS, acidity, color, flavor and overall acceptability)

pH

Initially the pH value of samples (T_0&T_1) was 3.37 and 3.41, which were gradually decreased to 1.25and 2.89 respectively during storage. The mean pH value decreased from 3.39 to 2.07 during storage. Maximum decrease in pH was observed in T_0(62.90%) than T_1(15.24%).These results are in agreement with the finding of Cecilia and Maia. (2002), who observed a decrease in pH of high pulp content mango pulp.

Table 1. Effect of sodium benzoateand storage intervals on pH of mango pulp

Treatments	Storage interval (Days)								
	1	15	30	45	60	75	90	%Decrease	Mean
T_0	3.37	3.15	2.30	2.25	1.85	1.55	1.25	62.90	2.24
T_1	3.41	3.30	2.99	2.97	2.95	2.93	2.89	15.24	3.06
Mean	3.39	3.22	2.64	2.61	2.4	2.24	2.07		

TSS

Initially TSS of both samples (T_0&T_1) was 15.2 °brix, which was gradually increased to 27.3 °brix and 20.0°brix respectively during storage. For treatments maximum mean value was recorded in sample T_0 (22.1) thanT_1(17.81). The mean TSS value increased from 15.2to 23.65 during storage. Maximum increase in total soluble solids was observed in T_0(79.60%) than T_1(31.57%). This increase in TSS may be due to high temperature and inversion of sucrose in to glucose and fructose. These results are in agreement with the findings of Kinh*et al,* (2001). Who reported an increase in TSS of mango pulp preserved with chemical preservatives.

Table 2. Effect of sodium benzoateand storage intervals on TSS of mango pulp

Treatments	Storage interval (Days)								
	1	15	30	45	60	75	90	%Increase	Mean
T_0	15.2	18.4	20.6	22.3	24.7	26.2	27.3	79.60	22.1
T_1	15.2	16.4	16.9	17.8	18.9	19.5	20.0	31.57	17.81
Mean	15.2	17.4	18.75	20.05	21.8	22.8	23.65		

Titratable acidity:

Initially titratable acidity of samples (T_0&T_1) was 1.23, which were gradually increased to 2.30 and 1.55 respectively during storage. For treatments maximum mean value was recorded in sampleT_0 (1.52) thanT_1(1.37). The mean value increased from 1.23 to1.92.during storage. Maximum increase in percent acidity was observed in T_0 (86.99%) than T_1 (26.01%). Cecilia and Maia (2002) reported that increase in acidity might be due to high storage temperature and formation of acidic compounds by degradation and oxidation of reducing sugars.

Table 3. Effect of sodium benzoateand storage intervals on titratable acidity of mango pulp

Treatments	Storage interval (Days)								
	1	15	30	45	60	75	90	%Increase	Mean
T_0	1.23	1.32	1.46	1.49	1.00	1.89	2.30	86.99	1.52
T_1	1.23	1.28	1.32	1.36	1.41	1.48	1.55	26.01	1.37
Mean	1.23	1.3	1.39	1.42	1.20	1.68	1.92		

Organoleptic evaluation

The samples were sensory evaluated for colourflavour and overall acceptibility at the storage interval of 15 days for a total period of 90 days by a panel of 10 judges. The evaluation was carried out by using 9 point hedonic scale of Larmond (1977).

Color

Initially the score of judges for color of mango pulp samples (T_0&T_1) was 8.0, which was decreased to 1.6and 3.8 respectively during storage.For treatments maximum mean value was recorded in sampleT_1 (5.81) thanT_0 (5.58). The mean value decreased from 8.00 to 4.2 during storage. Maximum decrease in color was observed in T_0 (80.00%) than T_1 (52.5%). Brenndor*et al,* (1985) reported that SO2 reduces browning of fruits and vegetables.The reduction in color might be due to maillard reaction accelerated during storage.

Table 4. Effect of sodium benzoateand storage intervals on color of mango pulp

Treatments	Storage interval (Days)								
	1	15	30	45	60	75	90	%Decrease	Mean
T_0	8.0	7.7	6.5	5.3	4.0	3.0	4.6	80.0	5.58
T_1	8.0	7.9	6.8	5.7	4.5	4.0	3.8	52.5	5.81
Mean	8.0	7.8	6.65	5.5	4.25	3.5	4.2		

Flavor

Initially the score of judges for flavor of mango pulp samples (T_0&T_1) was 8.5and 8.8, which was decreased to 1.9 and 4.0respectively during storage.For treatments maximum mean value was recorded in sampleT_1 (6.47) thanT_0 (4.64). The mean value decreased from 8.65 to 2.95during storage. Maximum decrease in flavor was observed in T_0 (77.64%) than T_1 (54.54%). Similar results obtained by Chauhan*et al.* (1993), who observed that apricot preserved with chemical preservatives maintained good flavor during storage.

Table 5. Effect of sodium benzoateand storage intervals onflavor of mango pulp

Treatments	Storage interval (Days)								
	1	15	30	45	60	75	90	%Decrease	Mean
T_0	8.5	6.0	5.0	4.7	3.6	2.8	1.9	77.64	4.64
T_1	8.8	8.0	7.5	6.4	5.7	4.9	4.0	54.54	6.47
Mean	8.65	7.0	6.25	5.55	4.65	3.85	2.95		

Overall acceptability

Initially the score of judges for overall acceptability of mango pulp samples (T_0&T_1) was 8.0 and 8.0, which was decreased to1.7 and 5.0 respectively during storage.For treatments maximum mean value was recorded in sampleT_1 (6.57) thanT_0 (4.51). The mean value decreased from 8.0 to 3.35 during storage. Maximum decrease in overall acceptability was observed in T_0 (78.75%) than T_1 (37.5%).These results are in agreement with the findings of Kinh*et al.* (2001), who observed that pulp preserved with chemical preservatives either individually or in combination with other preservatives retain maximum overall acceptability due to maximum nutrients stability, negligible microbes and maximum sensory value during storage at ambient temperature.

Table 6. Effect of sodium benzoateand storage intervals onoverall acceptability of mango pulp

Treatments	Storage interval (Days)								
	1	15	30	45	60	75	90	%Decrease	Mean
T_0	8.0	6.4	5.1	4.7	3.2	2.5	1.7	78.75	4.51
T_1	8.0	7.8	7.2	6.5	6.0	5.5	5.0	37.5	6.57
Mean	8.0	7.1	6.15	5.6	4.6	4.0	3.35		

LITERATURE CITED

Agricultural Statistics of Pakistan.(2003-2004). Govt. of Pakistan, Agricultural and Livestock (Economic Wing) Islamabad.

Alaka,. O, J. O. Aina and K. O. Flade. 2003. Effect of storage condition on the chemical attributes of Ogbomoso mango juice. Deptt.Food Tech. Uni. Ibadan, Nigeria. J. European Food Res. And Tech. 218: 79-82.

Andres, S. C., L. Giannuzzi and N. E. Zaritzky. (2006). Mathematical modeling ofmicrobial growth in packaged refrigerated orange juice treated with chemicalpreservatives. J. of Food Sci. 66(5): 724-728.

Brenndor, Kennedy C.O. Oswin, D.S. Trim, G.C. Mrema and C. Werek.(1985). Bobby solar driers. Their role in post harvest processing. Common Wealth Sci. Council: 78-83.

Carbal and C. Sonia.(2002). Cashew apple juice stabilization by microfiltration.Food Tech. Deptt. UFRRJ, Av. das Americas.148(1-3): 61-65.

Chaudhry, M. I. (1994). Fruit crops in horticulture. Malik, M. N. (editor) 1st edition National Book Foundation Islamabad: 471-473

Chauhan, S.K., V.K. Joshi and B.B. Lal.(1993). Apricot soy fruit bar. A new protein enriched product. J. of Food Sci. and Tech. 30(6): 45-48.

E. and G.A. Maia.(2002). Storage stability of cashew apple juice preserved by hot fill and aseptic process.Deptt.of Food Tech. Univ. of Ceara, Brazil CEP. 605: 11-110.

Fernandez, E., T.A. Centeno and F. Stoeckli. (2001).Chars and activated carbons prepared from apple pulp. J. of Adsorption Sci. and Tech. 19(8): 645-653.

Gossinger, M., F. Mayer, N. Radocha, M. Hofler, A. Boner, E. Groll, E. Nosko, R. Bauer and E. Bergofer. 2008. Consumers color acceptance of Strawberry nectars from puree. J. of Sensory Studies. 24: 78-92.

Hashmi, M.S., S. Alam, A. Riaz and A.S. Shah.(2007).Studies on microbial and sensory quality of mango pulp storage with chemical preservatives. Pak. J. of Nutri. 6 (1): 85-88.

Hussain, I., A. Zeb and M. Ayub. (2010). Quality Attributes of apple and apricot blend juice preserved with potassium sorbate during storage at low temperature. Internet. J. of Food Safety.12:80-86.

Hussain, I., S. N. Gilani, M. R. Khan,† M. T. Khan and I.Shakir.(2005). Varietal suitability and storage stability of mango squash. Internet J. of Agri. and Biology. 6: 1038-1039.

Hussain, S., S. Rehman, M. A. Randhawa and M. Iqbal. (2003).Physico-chemical microbiological, and sensory evaluation of mango pulp storage with chemical preservatives. J. of Research (Science), BahauddinZakariya University, Multan.14(1): 1012-1021.

Iagtiani, J., H. T. Chan and S. S. Welliam. 1988. Tropical fruit processing. Acadmic press INC. Harcourt Brace Javanovich, Publishers San Deigo, New York, Berkly, Boston London, Sydeny, TokyoandToranto. 52-73.

Kinh, Shearer A.E.H., C.P. Dunne and D.G. Hoover.(2001). Preparation and preservation of apple pulp with chemical preservatives, and mild heat. J. of Food Prot. 28 (6): 111-114.

Larmond, E. (1977). Laboratory methods of survey evaluation of food publication on Canada.Deptt.of Agric. Ottawa: 103-106.

Malik, M., M. A. Haq and N. Muhammad. 1994. Prospectus of mango processing in Pakistan. In: A. Saeed (Ed.), Mango, A Brochure of the Horticulture Foundation Of Pakisan, Islamabad.

Margareta, C., F. Lanar and E. Barbj. (2000). Sensory and physico-chemical properties of membrane filtered apple juices. J. of Food Quality. 23(2):171 – 184.

Onimawo, I. A., F. Oteno. G.Orokpo and P. I. Akubor. 2005. Physicochemical and nutrient evaluation of African bush seeds and pulp. J. Plant Foods. Human Nut. 58(3): 1-6.

Pandey, A.K. and I. S. Singh. (1999). Preparation and preservation of ready-to-serve guava beverage. Indian J. of Horti. 56(2): 130-132.

Sakhale, B.K., V.N. Pawar and R.C. Ranveer.(2012). Studies on effect of chemical preservatives on keeping quality of kesar mango pulp.Indian J. of Food Sci. 1: 184.

Saleem, N., M. Kamran, A. S. Shagufta, M. T. Omer and J. Khalid. (2011). Processing and preparation of pesach squash. Pak. J. Biochem. Mol. Biol. 44(1): 12-17.

Sarfraz, N., M. Kamran, A. S. Shagufta, M. T. Omer and J. Khalid.(2011). Processing and preparation of peach squash. Pak. J. Biochem. Mol. Biol. 44(1): 12-17.

Sauco, V. G., 2002. Magazine of ChronicaHorticulturae. Int. Soc. Hort. Sci., 42: 14-17.

Westwood, N. H. (1978). National composition of decidious fruits and nuts.Temperate Zone Pomology. 4th edition: 280-281.