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Sensory Evaluation and Microbial Analysis of Apple and Pear Mixed Fruit Jam Prepared from Varieties Grown in Azad Jammu and Kashmir

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Abstract: A comparative study was carried out on mixed fruit jam of (Apple + Pear) pulp incorporated within the ratio of 50:50 (T1), 60:40 (T2) 40:60 (T3) 100% apple (T4) 100 % pear (T5). All jam samples were stored in sterilized glass jars at ambient temperature and evaluated for total fungal count (TFC) and sensorically observed for colour, taste texture and overall acceptability for interval of 15 days during 3 months storage period. All the samples were significantly different at ($p<0.05$) during storage. The results regarding to total fungal count showed a gradual increase in TFC, where as the maximum mean value was recorded A comparative study was carried out on mixed fruit jam of (apple + pear) for (T_5) and minimum for (T_4). Result showed a decrease in color score Maximum mean score for color was obtained by T_4 (7.529) and minimum by (T_5). A decrease in taste score was recorded, where as maximum means score was obtained by T_4 (6.729) and minimum by T_5 (6.257). Texture of the samples also decreased during storage maximum means score was obtained by T_4 (7.929) and minimum by T_5 (7.086). Results regarding to overall acceptability showed a gradual decrease. Maximum mean score was obtained by T_4 (7.929) and minimum by T_5 (7.086). It was concluded that the (mixed apple and pear) jam was successfully prepared and remain acceptable for 90 days.

Key words: Microbiological · Sensory · Evaluation · Mixed · Jam · Apple and pear

INTRODUCTION

Apple (*Malus Sylvestris*) belongs to the family rosaceae and subfamily pomoideae. It is one of the most important tree fruit of the world, which was originated in the Central and South/Western Asia. In Pakistan its cultivation is limited to the northern hilly areas of Punjab,NWFP and Balochistan. Some important varieties grown in various regions of Pakistan are: Kashmiri, Kashmir Amri, Kandhari, Kulu, Kalat Special, Red Beauty of Bath, Golden Delicious, Banki and Sky Spur. In addition, some low chilling new varieties have been introduced like Tropical Beauty, Enna and Einsheimer. Enna is reported to perform well at lower altitudes [1]. The total area under apple cultivation in Pakistan is 110.8 thousand hectares which include 0.4 Punjab, 0.1 Sindh, 8.8 NWFP and 101.5 thousand hectare Balochistan while total production in Pakistan is 333.8 thousand tons which includes 3.6 Punjab 0.1 Sindh, 106.3 NWFP and 223.8 thousand tons Balochistan [2]. The pear, is also an important fruit which is grown in temperate zone throughout the world. Out of the several species the European pear (*Pyrus communis)* is most widely grown. The European pear is considered by many to be among the most delicious of all species. It contains a better juicy texture with a delicate flavor and aroma. The common varieties of pear are *pyrus pyrifolia, pyrus bretschneideri, pyrus pashia and pyrus communis* [3]. The total area under cultivation of pear in Pakistan is 2.4 thousand hectares which include 0.1 Punjab, 2.4 NWFP and 0.1 thousand hectares Balochistan while the total production of pear in Pakistan is 30.7 thousand tons which includes 1.2 Punjab, 29.0 NWFP, 0.5 thousand ton in Balochistan [2]. In Azad Kashmir, total pear production is 2546 tons [4]. In Azad Kashmir three varieties of pear are produced which locally called as Nashpati, Kotonal and Nakh, among these varieties the Nashpati is most delicious and having fleshy and juicy texture. Among other two varieties Nakh are very delicious and owing to their perishability a huge production goes wasted and needs to be preserved. Commercial production of jam is subjected to standard formulations of fruit pulp, sugar content, adjusted acidity and pectin content. Jam is a semisolid food made from not less than 45% (by weight) fruit and

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55% (by weight) sugar This substrate is concentrated to about 65% or above soluble solids. Flavoring and coloring agents are added to overcome the deficiencies that occur in the fruit it self standard formulations are developed according to their end use, consumer preferences, market demand, food laws, buyers specifications and economic utilization of inputs required [5,6] studied jams mad from fruit and sugar mixed in proportions so that the final product contains a minimum fruit content of 30% and 45° brix minimum. In this work the production of kiwi and orange jam by using osmotically dehydrated fruits mixed with osmotic solution, without thermal treatment, has been studied. Physical (color and mechanical properties) and physico-chemical properties (a_w °brix, moisture content, pH, % acidity) of obtained product have been analyzed and compared with those determined for commercial available products.

Anjam *et al*. [7] prepared dried apricot jam by incorporating a suitable combination of sorbitol, cyclamate and aspartame instead of sucrose and glucose syrup on the equivalent solid basis. The eatments were analyzed for physico-chemical and sensory evaluation for two months. Prestamo *et al.* [8] described that high pressure is an alternative to thermal processing and is used to preserve food. Liste monocyto genes is a bacterium, which grows at low temperature, is able to multiply under vacuum and is responsible for food poisoning. Ricardo *et al.* [9] studied samples of guava jams purchased from retail markets in Maracay, Cagua and Turmero, Venezuela. Molds, Yeast and aerobic plate counts were lower than CFU/g it reveals and excellent microbiological quality of the product, the present research work was carried out by keeping in view the loss of apple and pear in Azad Jammu and Kashmir due to improper handling and preservation techniques. Mix fruit jam of (apple and pear) with different pulp ratios was prepared to reduce this problem.

MATERIALS AND METHODS

Fresh, mature and healthy apple and pear fruit was purchased from the Rawalakot Azad Jammu and Kashmir fruit market and transported in wooden boxes to the laboratory of Food Science and Technology Department, Faculty of Nutrition Sciences N.W.F.P Agricultural University Peshawar. After washing, sorting, peeling and coring the fruit pieces were made with the help of stainless steel knife and dipped in 0.2 % citric acid solution already prepared to avoid browning. Fruit pulp was extracted. Pulp was incorporated within the ratios given below.

Preparation of Jam Samples: Different ratios of fruit pulps were taken and used for jam preparation according to the formula and procedure Awan *et at.* [10]. The jam samples were cooked into the open steel kettles. The mixture was cooked till required (68 - 70 °brix). Fruit jam was allowed to cool and then packaged in sterilized glass jars.

Total Fungal Count: All the samples were kept at room temperature for period of 90 days and analyzed for Total Fungal count (TFC) by the plate count method, described by Diliello [11].

Organoleptic Evolution: Organoleptic Evolution for color, taste, texture and overall acceptability deter mined by the method as described by Larmond [12].

Statistical Analysis: Statistically analyzed by RCBD and means were separated by applying LSD test as recommended by Steel and Torrie, [13].

RESULTS AND DISCUSSIONS

Total Fungal Count (TFC): Total plate count of microbial population is considered as an index of quality of food products .Results regarding to total fungal count showed a gradual increase in TFC the mean values recorded were 42.14 (T_4) to 57.7 (T_1) and 61.1 (T_2), 69.71 (T_3), 76.43 (T_5) respectively. The maximum mean value was recorded for (T_5) and the minimum for (T_4) results are presented in Table 2. Statistical analysis revealed that treatment and storage effect on all the samples were significant ($p<0.05$). These results are in accordance with the Felco *et al*. [14] Who showed reduction of microbial count in all the jam samples due to the use of sodium benzoate and potassium sorbate. Awan and Rehman, [10] recommended use of 0.1% sodium benzoate in apricot and apple jam Ricardo *et al.* [9] studied Samples of guava jams purchased from retail markets in Maracay, Cagua and Turmero, Venezuela. Moulds, yeast and aerobic plate counts were lower than 70 CFU/g, it reveals an excellent microbiological quality of the product. Con *et al*. [16].

Table 1: Different ratios of apple and pear pulp

Treatments	Apple	Pear
T_1	50	50
T_2	60	40
T_3	40	60
T_4	100	0
T_5	0	100

Table 2: Effect of Storage period and Treatments on the total fungal count (cfu/g) of Jam samples

Treatments	Initial	15	30	45	60	75	90	Mean
T_1	6	18	35	60	84	95	106	57.71b
T_2	7	20	41	64	87	98	111	61.14b
T_3	8	23	48	72	95	112	130	69.71ab
T_4	7	15	33	48	63	78	91	42.14c
T_5	9	25	51	77	103	125	145	76.43a
Mean	7.400e	20.20e	41.60d	64.20c	86.40b	101.6ab	108.6a	

Values are mean of three replications

Values followed by different letters are significantly ($p<0.05$) different from each other

Table 3: Mean score of judges for color of jam samples

Treatments	Initial	15	30	45	60	75	90	Mean
T_1	7.4	7.3	7.1	7.0	6.9	6.9	6.8	7.057c
T_2	7.6	7.5	7.3	7.2	7.1	7.0	6.9	7.229b
T_3	7.2	7.0	6.9	6.8	6.7	6.6	6.5	6.814d
T_4	7.9	7.8	7.6	7.5	7.4	7.3	7.2	7.529a
T_5	7.0	6.9	6.6	6.5	6.4	6.3	6.1	6.543e
Mean	7.420a	7.300b	7.100c	7.000d	6.900e	6.820f	6.700g	

Values are mean of three replications

Values followed by different letters are significantly ($p<0.05$) different from each other

Table 4: Mean score of judges for taste of jam samples

Treatments	Initial	15	30	45	60	75	90	Mean
T_1	6.8	6.8	6.7	6.6	6.5	6.4	6.3	6.643b
T_2	6.9	6.9	6.8	6.7	6.6	6.5	6.4	6.700ab
T_3	6.7	6.7	6.6	6.4	6.3	6.2	6.1	6.429c
T_4	7.0	7.0	6.9	6.7	6.6	6.5	6.4	6.729a
T_5	6.5	6.4	6.4	6.3	6.2	6.1	5.9	6.257d
Mean	6.780a	6.760a	6.680b	6.580c	6.460d	6.360e	6.240f	

Values are mean of three replications

Values followed by different letters are significantly ($p<0.05$) different from each other

Table 5: Mean score of judges for texture of jam samples

Treatments	Initial	15	30	45	60	75	90	Mean
T_1	7.8	7.6	7.5	7.4	7.3	7.3	7.2	7.443c
T_2	8.0	7.9	7.8	7.7	7.6	7.5	7.5	7.714b
T_3	7.6	7.5	7.3	7.2	7.1	7.1	7.0	7.257d
T_4	8.2	8.1	8.0	7.9	7.8	7.8	7.7	7.929a
T_5	7.4	7.3	7.2	7.0	7.0	6.9	6.8	7.086e
Mean	7.800a	7.680b	7.560c	7.440d	7.360e	7.320e	7.240f	

Values are mean of three replications

Values followed by different letters are significantly different ($p<0.05$) from each other

Table 6: Mean score of judges for overall acceptability of jam samples

Treatments	Initial	15	30	45	60	75	90	Mean
T_1	8.4	8.3	8.1	8.1	8.0	7.9	7.8	8.086c
T_2	8.5	8.4	8.2	8.2	8.1	8.0	7.9	8.186b
T_3	8.3	8.2	8.1	8.1	8.0	7.9	7.8	8.057c
T_4	8.6	8.5	8.3	8.3	8.2	8.1	8.0	8.286a
T_5	8.2	8.1	8.0	8.0	7.9	7.8	7.7	7.957d
Mean	8.400a	8.300b	8.140c	8.140c	8.040d	8.940e	7.840f	

Values are mean of three replications

Values followed by different letters are significantly ($p<0.05$) different from each other

Organoleptic Evaluation: Result showed a decrease in color mean values for color of jam samples were T_1 (7.057), T_2 (7.229), T_3 (6.814), T_4 (7.529) and T_5 (6.543). Maximum mean score for color was obtained by T_4 (7.529) and minimum by T_5 (6.543) Table 3. Statistical analysis revealed that treatment and storage effect on all the samples were significant ($p<0.05$). This result was in accordance with Wasim [15] reported maximum score of 7.8 and minimum of 4.0 during 15 and 30 days of storage while working on mango jam. Ehsan *et al.* [16] who reported decrease in color from 7.8 to 6.8 after 150 days during storage of grape fruit apple marmalade.

Results showed a decrease in taste. The mean values for taste of jam samples were T_1 (6.643), T_2 (6.700), T_3 (6.429), T_4 (6.729) and T_5 (6.257). Maximum mean score were obtained by T_4 (6.729) and minimum by T_5 (6.257) Table 4. Statistical analysis showed that treatment and storage effect on all the samples were significant. This result was in agreement with Ehsan *et al*. [16] reported decrease in taste of watermelon and lemon jam from 6.2 to 4 during initial and 150 days of storage.

Texture of the samples also decreased during storage. The mean values for taste of jam samples were T_1 (7.443), T_2 (7.714), T_3 (7.257), T_4 (7.929) and T_5 (7.086) Table 5. Statistical analysis showed that treatment and storage effect on all the samples were significant. This result was in accordance with Eshan *et al.* [17] who reported decrease in texture from 8.80 to 7.96 in grape fruit apple marmalade.

Results regarding to overall acceptability showed a gradual decrease. The mean values for taste of samples were T_1 (8.086), T_2 (8.186), T_3 (8.057), T_4 (8.286) and T_5 (7.957). Maximum mean score were obtained by T_4 (8.286) and minimum by T_5 (7.957) Table 6. Statistical analysis revealed that treatment and storage effect on all the samples were significant. This result was in agreement with Ehsan *et al.* [18]. Who reported the decrease in overall acceptability during storage of watermelon and lemon jam.

It was concluded that mixed (apple and pear) jam will be successfully prepared and remain accepted for the consumer for 90 days at ambient temperature.

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