International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(2): 450-454

Received: 03-01-2017
Accepted: 04-02-2017

NR Rangare
Ph.D. Scholar Horticulture Fruit Science Jawaharlal Nehru Krishi Vishwa Vidyalaya Jabalpur (M.P) India.

PK Jain
Hod. Horticulture, Fruit Science Jawaharlal Nehru Krishi Vishwa Vidyalaya Jabalpur (M.P) India.

Bharat Kumar
M.Sc. Fruit Science, Dept. of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya Jabalpur (M.P) India.

Correspondence
NR Rangare
Ph.D. Scholar Horticulture Fruit Science Jawaharlal Nehru Krishi Vishwa Vidyalaya Jabalpur (M.P) India.

Effect of various recipes on chemical characteristics of mixed Fruit Jam

NR Rangare, PK Jain and Bharat Kumar

Abstract
The present investigation was carried out at the Post Harvest laboratory of the Department of Horticulture, College of Agriculture, JNKVV Jabalpur (M.P) during the year 2014-15. Among the twelve treatments three level of pulp 125, 166, 250gm of each fruit (Banana, Apple, Mango, Papaya) and 500ml of extract wood apple pectin mixed with the 1 kg of sugar were used for preparation of the Jam. The qualitative parameters were significantly influenced by the various treatments TSS, pH, acidity, and ascorbic acid. All the samples were significantly different at storage. TSS the higher rating with T_7 i.e., (74.52 ^{0}brix) whereas minimum with T_6 (68.87 ^{0}brix), pH the higher rating with T_8 i.e., (4.797) whereas minimum with T_{12} (3.710), Acidity the higher rating with T_{12} i.e., (0.549%) whereas minimum with T_8 (0.564%) and Ascorbic acid the higher rating with T_{12} i.e., (74.52mg/100g) whereas minimum with T_6 (68.87mg/ 100g) during evaluation.

Keywords: Wood apple, Jam, Storage Period, TSS, Quality Characters

1. Introduction
Fruits are important ingredient in the human dietaries due to their high nutritive value. They make significant nutritional contribution to human wellbeing. They are the cheaper and better source of the protective foods. If they can be supplied in a fresh or preserved form throughout the year for human consumption, the national picture will be improved greatly. India is the second largest producer of Fruits after China. Wood apple (*Feronia limonia* L.) belongs to the Family Rutaceae is one of the hardy fruit grown in arid and semi-arid region of the country. Wood apple being hardy in nature is grown in neglected and marginal areas of tropical and sub-tropical regions. Wood apple fruit consists of 64.2% moisture, 7.1% protein, 3.7% fat, 1.9% minerals, 5.0% fiber and 18.1% carbohydrates per 100 grams. They are rich in oxalic acid, malic acid, citric acid and a concentrated tannic acid. Mango (*Mangifera indica* L.) belons to the Family Anacardiaceae. Approximately 50% of all tropical fruits produced worldwide are mangoes. Mango is an important fruit crop in India and popularly called the 'king of fruits'. Mango is the most widely cultivated fruit in India. India is the major Mango growing country. It is a rich source of vitamin A and C. Raw fruits are used for preparing various traditional products like raw slices in brine, amchur, pickle, murabba, jam, chutney, panhe (sharabat) etc. Banana (*Musa* sp.) belonging to the Family Musaceae banana and plantains are grown in about 120 countries. India leads the world in banana production with an annual output of about 14.2 million tones. (Anonymous, 2014) [2]. other leading producers are Brazil, Eucador, China, Philippines and Indonesia. Production is the highest in Maharashtra (3924.1 thousand tones) followed by Tamil Nadu (3543.8 thousand tones), in India. It is a rich source of carbohydrate and vitamins particularly vitamin B. Apple (*Malus domestica*) belonging to the Family Rosaceae, is commercially the most important temperate fruit and is fourth among the most widely produced fruits in the world after banana, orange and grape. It is mostly grown in the states of Jammu & Kashmir, Himachal Pradesh and Uttaranchal. Papaya (*Carica papaya*) belonging to the Family Caricaceae is a tropical fruit. The area under papaya cultivation in India.

2. Material and Methods
The present investigation entitled "Effect of various recipes on chemical characteristics of mixed Fruit Jam was" conducted during the year 2014-15. The Wood apple fruits local cultivars were collected from Almoda village Sehora near Jabalpur. The fruits were collected in monsoon season (2014) and Mango (Totapuri), Banana, Apple, Papaya fruits cultivar were

collected from "Fruit Mandi, Jabalpur (M.P.)" and used for experimentation. The unripe, shorted diseased, damaged and off type fruits were discarded. The selected fruits were thoroughly washed with tap water to remove dirt and dust particles adhering to the surface of fruit and were allowed for surface drying. The good quality/shorted fruits were picked up and used for the purpose of experimentation.

Table 1: Detail of various treatment combinations

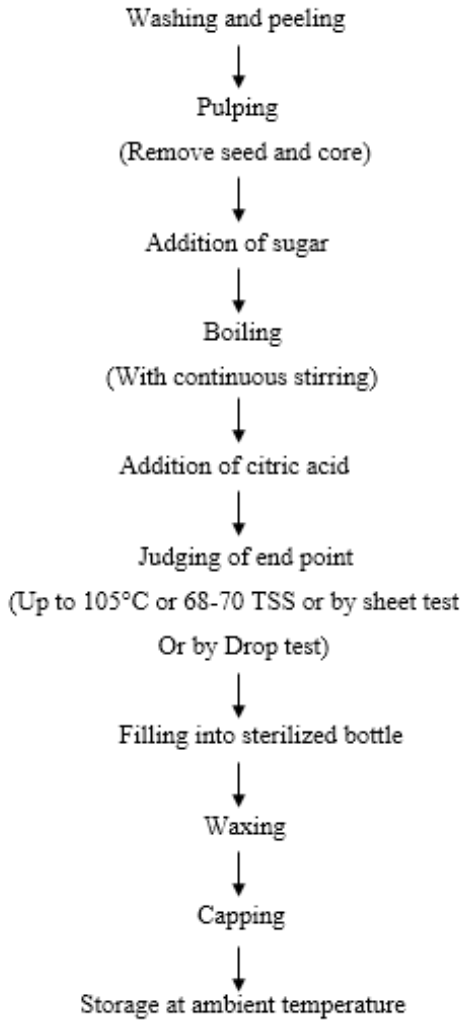
Treatments	Fruit Pulp [in g.]				Extract Wood apple pectin	Sugar In g.
	Banana	Apple	Mango	Papaya		
T_1	125	125	125	125	500 ml	1000
T_2	166	166	166	-	500 ml	1000
T_3	166	166	-	166	500 ml	1000
T_4	-	166	166	166	500 ml	1000
T_5	166	-	166	166	500 ml	1000
T_6	250	250	-	-	500 ml	1000
T_7	250	-	250	-	500 ml	1000
T_8	250	-	-	250	500 ml	1000
T_9	-	250	250	-	500 ml	1000
T_{10}	-	250	-	250	500 ml	1000
T_{11}	-		250	250	500ml	1000
T_{12}	-	-	-	-	1000ml	1000

2.1 Procedure for preparation of Jam

Unripe and ripe fruits of wood apple and mature fruit of mango, banana, apple, papaya were collected and used for preparation of jam. The fruits of wood apple, mango, banana, apple and papaya were washed and graded to select fruit to treatment having uniform maturity.

Ripe firm fruit.

Technological flow sheet for preparation of wood apple based mixed fruit jam:



2.2 Extraction of pulp from wood apple mango, Banana, Apple and papaya

The fruit of wood apple were broken into small pieces with the help of small hammer and scoop out with the help of spoon after that some quantity of water was added and steamed for pulp preparation. The steamed pulp was prepared with the help of mixercum grinder. In case of mango, Banana, Apple and Papaya were washed and peeled off separately and cut into small pieces. After removal of seeds (stones) some quantity of water added and steamed for pulp preparation. The steamed pulp was prepared with the help of mixer cum grinder.

2.3 Physico-chemical analysis

The present investigation was carried out in the Post-Harvest Laboratory, Department of Horticulture, JNKVV, Jabalpur **(**M.P.) The mango, banana, apple, papaya and wood apples pulp and prepared jam was evaluated for various physic-chemical properties like Fruit weight in g, Skull / peel weight in g, Pulp weight in g, Core weight in g, Stone weight in g, Seed weight in g, Total sugar %, Reducing sugar % and Non reducing sugar %, Total soluble solids (%), Acidity (%), Ascorbic acid (mg. /100g.) and pH. (A.O.A.C., 1990) [1] Ascorbic acid and acidity as per the standard method suggested by (Ranganna, 1997) [8] methods. The data obtained in the study were subjected to statistical analysis.

3. Results and Discussion

3.1 Physicochemical characteristics of the wood apple, mango, papaya, apple and banana

The data related to the physico-chemical characteristics of the wood apple, mango, papaya, apple and banana fruits are presented in Table 2 It was further noted that the fruit weight in g, skull/peel weight in gm, stone/seed weight in gm and average weight of pulp in gm. On chemical analysis, per cent TSS of Banana Apple Mango Papaya and woo apple 20, 14.25, 16.6, 35.5, 10.5 respectively was found with per cent acidity 0.3%, 0.12%, 0.46%, 0.33% and 1.07%. And the ascorbic acid content 8.7, 4.6, 15.85, 58.5, and 5.76 mg/100g of fruit pulp and pH 5.28, 4.84, 4.20, 4.57, and 4.50 respectively of fruits. Similar results were reported by (Mancheker *et al.*, 2011) [6] and (Safdar *et al.*, 2012) [9] and Reducing sugar of Banana Apple Mango Papaya and woo apple are 13.63, 11.0, 2.29, 6.92and 1.23 respectively, Non

reducing sugar of Banana Apple Mango Papaya and woo apple are 7.o47, 1.50, 10.51, 3.58 and 0.89 respectively and total sugar of Banana Apple Mango Papaya and woo apple are 20.67, 12.50, 12.80, 10.50 and 2.12 respectively are observed.

Table 2: Physicochemical characteristics of the wood apple, mango, papaya, apple and banana

Physical Composition					
Contents	**Banana**	**Apple**	**Mango**	**Papaya**	**Wood apple**
Av. wt. of fruit (gm)	118	126	341.9	830	185
Skull/peel wt. (gm)	75	23	36.9	77	69
Pulp wt (gm)	45	100	261.48	749	88
Stone/seed wt.(gm)	-	3	43.52	4	25
Chemical characteristics of the fruit pulp					
T.S.S	20	14.25	16.6	13.5	10.5
Ph	5.28	4.84	4.20	4.57	4.50
Acidity (%)	0.3	0.12	0.46	0.33	1.07
Ascorbic acid	8.7	4.6	15.85	58.5	5.76
Reducing sugar (%)	13.63	11.0	2.29	6.92	1.23
Non reducing sugar (%)	7.047	1.5	10.51	3.58	0.89
Total sugar (%)	20.67	12.50	12.80	10.50	2.12

3.2 TSS

As per results recorded from the present investigation shows in Table 3. it was found that the highest score for TSS (72.58 ^{0}Brix) of jam was recorded in T_7 (i.e., 250gm banana + 250gm mango + 500ml wood apple pectin) which showed significant difference from other treatments and this effect on TSS persisted till 120 days of storage. As the period of storage increased, the TSS values increased significantly up to 120 days of storage. The increase in TSS of jam during storage might be due to conversion of polysaccharides into soluble sugars. Similar inference was drawn from findings of (Sreemathi *et al.,* 2008) [11] who reported the increase in TSS of fruit bar (sapota 50: papaya 50) throughout the storage of 3 months. (Baramanray *et al.,* 1995) [3] Reported that TSS of guava nectar increased with the increase of storage period.

3.3 pH

The overall pH score of mixed fruit jam was observed to be less than 7.0 i.e., acidic. The highest pH value (4.797) in jam was recorded in T_8 (i.e., 250gm banana + 250gm papaya + 500 ml of wood apple pectin) and minimum (3.710) pH value was record in T_{12} (1000ml wood apple pectin). It was observed that as the quantity of sugar is increased the pH values, it can be easily seen that as the proportion of wood apple pectin increased in treatment combination, the value of pH decreased. In table 4. It was also observed that as the storage period was prolonged, the pH values decreased with a small variation. This may be due to increase in acidity. By (Zambare *et al.,* 2009) [13] reported that the acidity of the samples increased while the pH of the samples decreased as the storage period increase. These results supported by the results obtained by (Datey and Raut, 2009) [4] and Panday and Singh (1999) [7] also reported that the higher acidity may account due to lower pH value.

3.4 Acidity

In case of acidity. It was found that the higher value (0.565) in treatment T_{12} (1000ml wood apple pectin) while, minimum value (0.549) in T_8 (i.e., 250gm banana + 250gm apple + 500 ml of wood apple pectin). The reason for high acidity in T_{12} was their lower pH value as possessed an inverse relation i.e., increase in value of one factor, decreases the value of other factor automatically. Increase in acidity during storage might be due to the formation of organic acid by degradation of ascorbic acid (Sethi and Jindal, 1997) [10] reported that the acidity increased with corresponding decrease in pH. Here, the increase in acidity might be due to formation of organic acid from ascorbic acid degradation as suggested by Panday and singh (1999) [7 It was observed that the acidity of jam slightly increases with increase in storage period. Increase in acidity during storage was also reported by Baramanray *et.al.* (1995) [3] in guava nectar.

3.5 Ascorbic acid

The result clearly indicated in Table 6. That the higher proportion of papaya pulp in comparison to other fruit pulp had a pronounced effect on the ascorbic acid content of mixed fruit jam. The reason for higher ascorbic acid content (59.79 mg/100g) in treatments T_{12} (1000ml wood apple pectin) and minimum value in treatment T_6 (250gm banana + 250gm apple + 500ml wood apple pectin) mean value showed i.e., (59.59 mg/ 100 gm). The wood apple fruit possess more vitamin C (approx. 60mg/100g) in comparison to banana (nearly 10.3mg/100g), apple (nearly 8.4mg/100g) and mango (nearly 27.7mg/100g) which is responsible for high ascorbic acid.

It was also observed that as the period of storage increased, the value of ascorbic acid decreased. The slight reduction in ascorbic acid might be due to oxidation of residual oxygen in glass bottles. Similar result were reported by Karla and Revanthi (1983) [5], Vidhya and Narain (2011) [12]

4. Conclusion

The experiment was conducted to standardize the recipe for the preparation of wood apple based mixed fruit jam where the observations like colour and appearance, flavour, taste, texture and overall acceptability, T.S.S, pH acidity and ascorbic acid were used as milestone to standardize the best recipe for making mixed fruit jam. The mixing of 250gm banana, 250gm mango and 500ml of wood apple pectin was found the best with recipe T_7 followed by 250g apple, 250g papaya and 500ml wood apple pectin Hence, it is clear that the combination of banana, mango and wood apple pectin is suitable for the preparation of mixed fruit jam having good quality and high nutritive value. The cost for the preparation was also very low. Therefore, this recipe can be recommended for making wood apple based mixed fruit jam.

Table 3: Effect of fruit pulp ratio on TSS of mixed fruit jam during storage

Symbol	**Ratio of fruit pulp B+A+M+P (in g)**	**Wood apple pectin (In ml.)**	**0 Days During Storage Period**	**30 Days During Storage Period**	**60 Days During Storage Period**	**90 Days During Storage Period**	**120 Days During Storage Period**
			Recipe	**Recipe**	**Recipe**	**Recipe**	**Recipe**
T_1	125+125+125+125	500	71.777	72.027	72.053	72.060	72.070
T_2	170+170+170+0	500	71.900	72.107	72.113	72.157	72.160
T_3	170+170+0+170	500	71.160	71.423	71.433	71.433	71.440
T_4	0+170+170+170	500	70.210	70.487	70.510	70.527	70.550

T_5	170+0+170+170	500	71.570	71.847	71.850	71.880	71.890
T_6	250+250+0+0	500	72.087	72.180	72.223	72.267	72.333
T_7	250+0+250+0	500	72.580	72.823	72.860	72.873	72.883
T_8	250+0+0+250	500	70.913	70.943	70.953	70.960	70.967
T_9	0+250+250+0	500	69.900	70.087	70.127	70.163	70.193
T_{10}	0+250+0+250	500	68.943	69.113	69.170	69.220	69.253
T_{11}	0+0+250+250	500	68.960	69.133	69.193	69.233	69.253
T_{12}	0	1000	69.100	69.357	69.363	69.397	69.433
Mean			70.758	70.961	70.987	71.014	71.035
SEm±			0.042	0.041	0.052	0.043	0.040
CD at 5% level			0.124	0.121	0.154	0.125	0.117

*B= Banana, A=Apple, M=Mango, P=Papaya

Table 4: Effect of fruit pulp ratio on pH of mixed fruit jam during storage

Symbol	Ratio of fruit pulp B+A+M+P (in g)	Wood apple pectin (in ml.)	0 Days During Storage Period	30 Days During Storage Period	60 Days During Storage Period	90 Days During Storage Period	120 Days During Storage Period
			Recipe	Recipe	Recipe	Recipe	Recipe
T_1	125+125+125+125	500	4.643	4.610	4.577	4.533	4.500
T_2	170+170+170+0	500	4.517	4.483	4.450	4.447	4.427
T_3	170+170+0+170	500	4.677	4.643	4.610	4.600	4.567
T_4	0+170+170+170	500	4.507	4.473	4.440	4.397	4.363
T_5	170+0+170+170	500	4.467	4.433	4.400	4.357	4.323
T_6	250+250+0+0	500	4.510	4.477	4.443	4.403	4.370
T_7	250+0+250+0	500	4.740	4.707	4.673	4.630	4.597
T_8	250+0+0+250	500	4.797	4.763	4.730	4.687	4.653
T_9	0+250+250+0	500	4.440	4.407	4.373	4.330	4.297
T_{10}	0+250+0+250	500	4.573	4.540	4.507	4.467	4.433
T_{11}	0+0+250+250	500	4.620	4.587	4.553	4.510	4.477
T_{12}	0	1000	3.710	3.677	3.643	3.600	3.567
Mean			4.590	4.557	4.523	4.487	4.455
SEm±			0.132	0.135	0.129	0.124	0.119
CD at 5% level			0.388	0.397	0.379	0.365	0.350

*B= Banana, A=Apple, M=Mango, P=Papaya

Table 5: Effect of fruit pulp ratio on acidity of mixed fruit jam during storage

Symbol	Ratio of fruit pulp B+A+M+P (in g)	Wood apple pectin (In ml.)	0 Days During Storage Period	30 Days During Storage Period	60 Days During Storage Period	90 Days During Storage Period	120 Days During Storage Period
			Recipe	Recipe	Recipe	Recipe	Recipe
T_1	125+125+125+125	500	0.558	0.559	0.560	0.561	0.563
T_2	170+170+170+0	500	0.554	0.555	0.556	0.558	0.559
T_3	170+170+0+170	500	0.557	0.558	0.559	0.561	0.562
T_4	0+170+170+170	500	0.559	0.560	0.561	0.562	0.565
T_5	170+0+170+170	500	0.557	0.557	0.558	0.560	0.561
T_6	250+250+0+0	500	0.555	0.556	0.558	0.559	0.564
T_7	250+0+250+0	500	0.552	0.553	0.555	0.558	0.560
T_8	250+0+0+250	500	0.549	0.551	0.554	0.556	0.557
T_9	0+250+250+0	500	0.560	0.562	0.563	0.565	0.567
T_{10}	0+250+0+250	500	0.556	0.557	0.558	0.559	0.563
T_{11}	0+0+250+250	500	0.557	0.558	0.559	0.560	0.562
T_{12}	0	1000	0.565	0.567	0.570	0.572	0.573
Mean			0.557	0.558	0.559	0.561	0.563
SEm±			0.001	0.000	0.000	0.001	0.001
CD at 5% level			0.002	0.001	0.001	0.002	0.004

*B= Banana, A=Apple, M=Mango, P=Papaya

Table 6: Effect of fruit pulp ratio on ascorbic acid of mixed fruit jam during storage

Symbol	Ratio of fruit pulp B+A+M+P (in g)	Wood apple pectin (In ml.)	0 Days During Storage Period	30 Days During Storage Period	60 Days During Storage Period	90 Days During Storage Period	120 Days During Storage Period
			Recipe	Recipe	Recipe	Recipe	Recipe
T_1	125+125+125+125	500	59.71	59.70	59.67	59.66	59.65
T_2	170+170+170+0	500	59.68	59.67	59.66	59.65	59.63
T_3	170+170+0+170	500	59.70	59.69	59.68	59.66	59.64
T_4	0+170+170+170	500	59.67	59.67	59.65	59.63	59.62
T_5	170+0+170+170	500	59.69	59.67	59.65	59.63	59.62
T_6	250+250+0+0	500	59.59	59.58	59.56	59.54	59.52

T_7	250+0+250+0	500	59.67	59.66	59.61	59.60	59.59
T_8	250+0+0+250	500	59.70	59.68	59.63	59.60	59.59
T_9	0+250+250+0	500	59.63	59.62	59.60	59.59	59.59
T_{10}	0+250+0+250	500	59.70	59.69	59.66	59.65	59.64
T_{11}	0+0+250+250	500	59.72	59.71	59.69	59.68	59.65
T_{12}	0	1000	59.79	59.79	59.77	59.75	59.69
Mean			59.69	59.68	59.65	59.64	59.62
SEm±			0.004	0.007	0.018	0.012	0.016
CD at 5% level			0.013	0.020	0.054	0.035	0.046

*B= Banana, A=Apple, M=Mango, P=Papaya

5. References

1. A.O.A.C. Method of Analysis of the Association of Official Agricultural Chemists, Washington, D.C., USA. 1990.
2. Anonymous. Indian Horticulture Database, published by NHB Gurgaon. 2014, 4.
3. Baramanray A, Gupta OP, Dhawan SS. Composition of guava hybrids with commercial cultivars for making jelly. Haryana Journal of Horticultural Sciences. 1995; 24(4):196-204.
4. Datey SP, Raut VU. Physico-chemical changes in mango pulp at ambient storage in glass containers. Green Far. 2009; 2(10):713-714.
5. Karla SK, Revanthi G. Chemical and microbial evolution of storage guava pulp in P.C.V. container. J. Food Sci. High Tech. Vinogradarstvo. 1983; (1):11-13.
6. Manchekar MD, Mokashi AN, Hegde RV, Venugopal CK, Byadgi AS. Clonal variability studies in alphonso mango (Mangifera indica L.) bygenetic divergence (D2) analysis. Karnataka J. Agric. Sci. 2011; 24(4):490-492.
7. Pandey AK, Singh JS, Studies on preparation and preservation of guava ready-to-serve beverage. Indian J. Hort. 1999; 56(2):130-132.
8. Ranganna S. Handbook of Analysis and Quality control for fruit and vegetable products. 2nd edn. Tata Mc graw. Hill publishing Co. Ltd, New Delhi. 1997.
9. Safdar MN, Mumtaz A, Hameed T, Siddiqui N, Khalil S, Amjad M, *et al*. Storage studies of jam prepared from different mango varieties. Pakistan Journal of Nutrition. 2012; 11(7):555-561.
10. Sethi V, Jindal PC. Evaluation of new grape hybrid juice for processing. Haryana J of Horti Sci. 1997; 26(3-4):208.
11. Sreemathi M, Sankaranarayanan R, Balasubramanyan S. Sapota-papaya bar. Madras Agric. J. 2008; 95(1-6):170-173.
12. Vidhya R, Narain AA. Formulation and evaluation of preserved products utilizing under exploited fruit, wood apple (Limoniaacidissima). American-Eurasian J. Agric. & Environ. Sci. 2011; 10(1):112-118.
13. Zambare AV, Patkar SU, Kharde YD, Birajdar SA, Deshpande MM, Patil SR *et al.* Studies on Storage of Wood Apple Ready-to-serve Beverage. J of Agric Engi. 2009; 46(3):102-105.