International Journal of Multidisciplinary Research and Development 2014; 1(5): 127-131

IJMRD 2014; 1(5): 127-131
www.allsubjectjournal.com
Received: 26-09-2014
Accepted: 08-10-2014
e-ISSN: 2349-4182
p-ISSN: 2349-5979

Nguyen Phuoc Minh
Tra Vinh University, Vietnam

Correspondence:
Nguyen Phuoc Minh
Tra Vinh University, Vietnam

Various factors affecting to the production of marian plum (*Thanh Tra*) jam

Nguyen Phuoc Minh

Abstract
Marian plum is called the king of fruits not just for its taste and super flashy yellow color, but also for the array of health benefits it offers. We utilize this valuable fruit to produce a new marian plum jam. By mixing marian plum fruit with 55% sugar, 7% gelatin and 0.2% citric acid we conduct the heating at 75 ºC within 5 minutes to get the best elasticity and sensory score of jam. Potassium sorbate 0.04% is enough to prolong jam shelf-life.

Keywords: *Marian plum, gelatin, elasticity, potassium sorbate, jam, shelf-life*

1. Introduction
Bouea macrophylla (Bouea macrophylla Griff) is a tropical fruit tree native to Southeast Asia. The tree belongs to the familyAnacardiaceae, and is related to the mango. The Marian plum is a cousin of the mango in miniature. Marian plums ripen in March to May. It has an oval shape, with green skin, and ripe to a bright yellow or orange skin. Marian plum have two species: sweet and sour. Sweet marian plum is eaten when ripe, while sour marian plum is used for making chili dip or eaten with a sweet and salty sauce.
Research has shown antioxidant compounds in Marian plum fruit have been found to protect against colon, breast, leukemia and prostate cancers. These compounds include quercetin, isoquercitrin, astragalin, fisetin, gallic acid and methylgallat, as well as the abundant enzymes. The high levels of fiber, pectin and vitamin C help to lower serum cholesterol levels, specifically Low-Density Lipoprotein. It can be used both internally and externally for the skin. Marian plum clears clogged pores and eliminates pimples. The tartaric acid, malic acid, and a trace of citric acid found in the fruit help to maintain the alkali reserve of the body. Marian plum has a lot of vitamins and nutrients that help the body feel fuller. Also, the fibrous fruit boosts the digestive function of the body by burning additional calories, helping in weight loss. Marian plum has aphrodisiac qualities and is also called the 'love fruit'. Marian plum increases the virility in men. Marian plum contains enzymes that help in breaking down protein. The fibrous nature of Marian plum helps in digestion and elimination.
Jam has most of the health benefits of fruit, most notably, heart healthy, cancer fighting antioxidant power. It can help reduce the chance of and developing various cancers, particularly mouth, stomach, and colon-rectum cancer. In pregnant women, reduce risk of neural tube defects, spina bifida, and anencephaly during fetal development. Jam is a mixture of sugars, pulp and a pure drop of one or more kinds of fruit and water brought to a suitable gelled consistency (Fugel *et al.*, 2005). Jam should contain more than 68.5% total soluble solids (TSS) and at least 45% fruit (Santanu 2010), whereas, the Codex Alimentarius Commission specifies that the finished jam should contain more than 65% TSS. Sugar constitutes more than 40% of total weight and 80% of total solids in jam (Lal *et al.*, 1998, Santanu 2010). Commercial jam usually has an extremely variable composition. Nearly all manufacturers have a formula of their own which differs in some respects from those of other manufacturers. The ingredients affect the jam quality in terms of both subjective (sensory) and objective (textural and rheological) attributes (Xin Gao *et al.*, 2011). There are several researches mentioned to mango jam (Germain Kansci *et al.*, 2003; Santanu Basu, U.S. Shivhare, 2010; P. Kerdsupa, P. Nakneana, 2013), a family of marian pulm, but there isn't any studies mentioned to this marian plum fruit. So this is the reason we decide to

choose this fruit for making jam. From that we can enhance its added value for rural people living the Mekong river delta, Vietnam.

2. Material & Method

2.1 Material

Marian plum fruits are collected in Vinh Long and Tra Vinh Province, Vietnam

Fig 1: Ripe marian plum fruit

2.2 Research method

2.2.1 Experiment #1: Effect of gelatin, sugar and acid ratio to product quality

Factor A: Ratio of gelatin (%) A_1: 6%; A_2: 7%; A_3: 8%.
Factor B: Ratio of sugar (%) B_1: 50%; B_2: 55%; B_3: 60%
Factor C: Ratio of acid (% acid citric) C_1: 0.1%; C_2: 0.2%; C_3: 0.3%

Table 1: Experiment #1 arrangement

Factor A	Factor B	Factor C		
		C_1	C_2	C_3
A_1	B_1	$A_1B_1C_1$	$A_1B_1C_2$	$A_1B_1C_3$
	B_2	$A_1B_2C_1$	$A_1B_2C_2$	$A_1B_2C_3$
	B_3	$A_1B_3C_1$	$A_1B_3C_2$	$A_1B_3C_3$
A_2	B_1	$A_2B_1C_1$	$A_2B_1C_2$	$A_2B_1C_3$
	B_2	$A_2B_2C_1$	$A_2B_2C_2$	$A_2B_2C_3$
	B_3	$A_2B_3C_1$	$A_2B_3C_2$	$A_2B_3C_3$
A_3	B_1	$A_3B_1C_1$	$A_3B_1C_2$	$A_3B_1C_3$
	B_2	$A_3B_2C_1$	$A_3B_2C_2$	$A_3B_2C_3$
	B_3	$A_3B_3C_1$	$A_3B_3C_2$	$A_3B_3C_3$

Total testings: 3 x 3 x 3 = 27. Testing parameters include sensory evaluation and structure measurement

2.2.2Experiment #2: Effect of heating time and temperature to product quality

Factor D: Heating temperature (^{0}C) D_1: 65^{o}C; D_2: 75^{o}C; D_3: 85 ^{0}C
Factor E: Heating time (minutes) E1: 3 minutes; E2: 5 minutes; E3: 7 minutes

Table 2: Experiment #2 arrangement

Factor D	Factor E		
	E_1	E_2	E_3
D_1	D_1E_1	D_1E_2	D_1E_3
D_2	D_2E_1	D_2E_2	D_2E_3
D_3	D_3E_1	D_3E_2	D_3E_3

Total testings: 3 x 3 = 9. Testing parameters include sensory evaluation and structure measurement

2.2.3 Experiment #3: Effect of preservative to product shelf life

Factor F: Ratio s potassium sorbate (%) F1: 0%; F2: 0.01%; F3: 002%; F4: 0.03%; F5: 0.04%; F_6: 0.05%. Testing parameters include the total sugar, acidity and bacteria cell density during preservation.

2.3 Statistical analysis

All data are processeed by Excel 2003.

3. Result & Discussion

3.1 Chemical composition in raw material

Table 1: Chemical composition in Marian plum

Chemical composition	Percentage (%)
Moisture	98.32
Acidity (citric acid)	0.061
Sugar (%)	0.2

3.2 Effect of gelatin, sugar and acid to product quality

Table 2: Effect of gelatin, sugar, acid to elasticity of marian plum jam, gf

Gelatin (%)	Sugar (%)	Acidity (%)		
		0.1	0.2	0.3
6	50	98	92	87
	55	113	108	102
	60	125	120	114
7	50	126	119	113
	55	135	128	120
	60	142	138	133
8	50	134	128	124
	55	160	153	146
	60	177	172	167

Table 3: Effect of gelatin to elasticity of marian plum jam, gf

Gelatin (%)	Elasticitity (gf)
6	108^c
7	129^b
8	151^a

Table 4: Effect of sugar to elasticity of marian plum jam, gf

Sugar (%)	Elasticitity (gf)
50	113^c
55	131^b
60	144^a

Table 5: Effect of acidity to elasticity of marian plum jam, gf

Acidity (%)	Elasticitity (gf)
0.1	134^c
0.2	129^b
0.3	125^a

From table 3, 4 and 5 we see that gelatin, sugar and acidity significantly affect to jam elasticity.

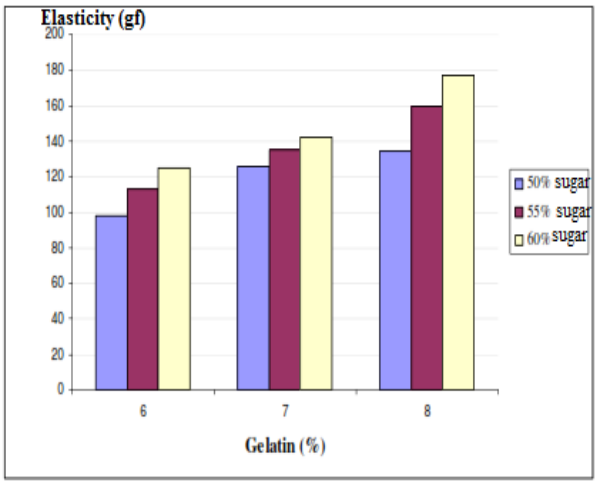

Fig 2: Effect of gelatin and sugar to elasticity of marian plum jam at acidity 0.1%

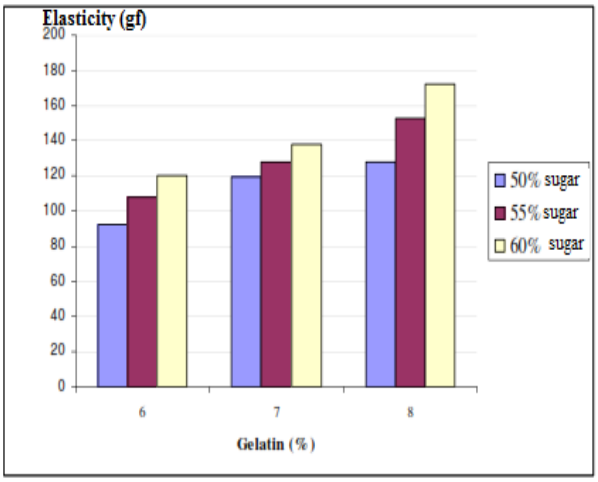

Fig 3: Effect of gelatin and sugar to elasticity of marian plum jam at acidity 0.2%

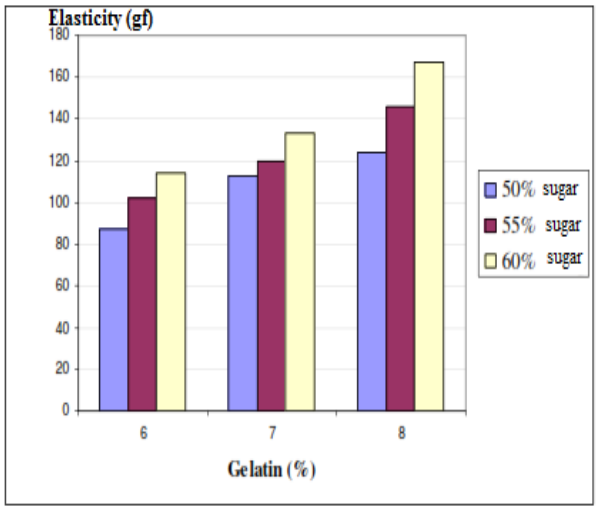

Fig 4: Effect of gelatin and sugar to elasticity of marian plum jam at acidity 0.3%

Table 6: Sensory score about the effect of gelatin, sugar and acidity to marian plum jam elasticity

Gelatin (%)	Sugar (%)	Acidity (%)		
		0.1	**0.2**	**0.3**
6	50	2.20	2.15	2.05
	55	2.90	2.80	2.70
	60	3.40	3.35	3.30
7	50	3.50	3.40	3.30
	55	4.75	4.65	4.50
	60	4.30	4.25	4.15
8	50	4.25	4.00	3.90
	55	3.95	4.05	3.70
	60	3.55	3.50	3.35

Table 7: Sensory score about the effect of gelatin to marian plum jam elasticity

Sugar (%)	Sensory score about elasticitity (gf)
50	3.19^{b}
55	3.78^{a}
60	3.68^{a}

Table 8: Sensory score about the effect of sugar to marian plum jam elasticity

Sugar (%)	Sensory score about elasticitity (gf)
50	3.19^{b}
55	3.78^{a}
60	3.68^{a}

Table 9: Sensory score about the effect of acidity to marian plum jam elasticity

Acidity (%)	Sensory score about elasticitity (gf)
0.1	3.64^{a}
0.2	3.57^{a}
0.3	3.44^{b}

From table 7, 8, & 9 we see the highest sensory score when using gelatin 7%, sugar 55%, acidity 0.1% or 0.2%.

Table 10: Sensory score about the effect of gelatin, sugar and acidity to marian plum jam flavour

Gelatin (%)	Sugar (%)	Acidity (%)		
		0.1	**0.2**	**0.3**
6	50	3.80	4.00	3.90
	55	4.00	4.35	4.25
	60	3.95	4.00	4.05
7	50	3.65	3.85	3.60
	55	3.75	3.95	3.85
	60	3.70	3.80	3.75
8	50	3.45	3.50	3.30
	55	3.40	3.60	3.50
	60	3.20	3.25	3.05

Table 11: Sensory score about the effect of sugar to marian plum jam flavour

Sugar (%)	Sensory score about flavour
50	3.67^{b}
55	3.85^{a}
60	3.64^{b}

Table 12: Sensory score about the effect of acidity to marian plum jam flavour

Acidity (%)	Sensory score about flavour
0.1	3.66^{b}
0.2	3.81^{a}
0.3	3.67^{b}

From table 13, sensory evaluation about the effect of acidity to marian plum jam flavour is noticed at gelatin 7%, sugar 55-60%; citric acid 0.2%.

3.3 Effect of temperature and heating time to product quality

Table 13: Effect of temperature and heating time to product elasticity, gf

Temperature (°C)	Heating time (minutes)			Average
	3	**5**	**7**	
65	127	133	129	129^{b}
75	135	140	132	136^{a}
85	130	129	122	127^{b}
Average	131^{b}	134^{a}	127^{c}	

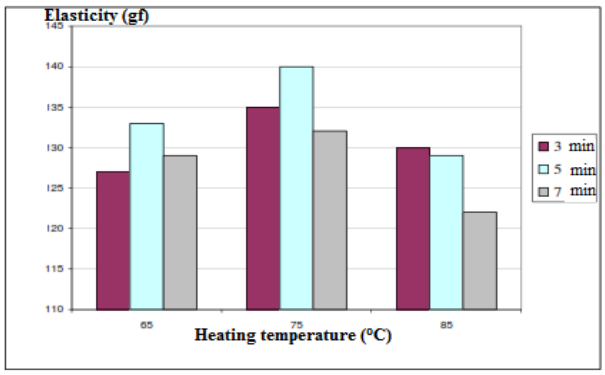

Fig 5: Effect of temperature and heating time to product elasticity

Heating time at 75 ^{0}C within 5 minutes is enough to mix particles well, keep gel stability so we choose these values for further experiments.

Table 14: Sensory score about the effect of temperature and heating time to product elasticity

Temperature (^{0}C)	Heating time (minutes)			Average
	3	**5**	**7**	
65	3.65	3.85	3.75	3.75^{b}
75	4.15	4.35	4.05	4.20^{a}
85	3.80	3.65	3.50	3.65^{b}
Average	3.87^{ab}	3.95^{a}	3.77^{b}	

Table 15: Sensory score about the effect of temperature and heating time to product flavour

Temperature (°C)	Heating time (minutes)			Average
	3	**5**	**7**	
65	3.85	4.10	3.90	3.95^{a}
75	4.10	4.30	3.90	4.10^{a}
85	3.50	3.40	3.25	3.40^{b}
Average	3.82^{ab}	3.93^{a}	3.70^{b}	

From table 14, heating time slightly affects to product elasticity. Meanwhile, heating temperature strongly affects to product elasticity. Heating at 75°C in 5 minutes is enough to get high sensory score about elasticity.

3.4 Effect of preservative potassium sorbate to product shelf-life

Table 16: Effect of potassium sorbate to bacterial cell density, CFU/ml

Potassium sorbate (%)	Shelf-life (week)					
	0	**1**	**2**	**3**	**4**	**5**
0	$1.1x10^{2}$	$5.0x10^{2}$	$1.0x10^{3}$	$3.8x10^{3}$	$4.5x10^{3}$	$>10^{4}$
0.01	$1.1x10^{2}$	$5.6x10^{2}$	$7.0x10^{2}$	$2.5x10^{3}$	$3.6x10^{3}$	$5.9x10^{3}$
0.02	$1.2x10^{2}$	$5.0x10^{2}$	$5.5x10^{2}$	$1.0x10^{3}$	$1.6x10^{3}$	$2.4x10^{3}$
0.03	$1.2x10^{2}$	$3.9x10^{2}$	$2.2x10^{2}$	$3.7x10^{2}$	$6.0x10^{2}$	$8.6x10^{2}$
0.04	$1.2x10^{2}$	$1.1x10^{2}$	$7.0x10^{1}$	$5.2x10^{1}$	$5.0x10^{1}$	$5.0x10^{1}$
0.05	$1.1x10^{2}$	$1.6x10^{2}$	$1.2x10^{1}$	$1.1x10^{1}$	$1.0x10^{1}$	$1.0x10^{1}$

When using potassium sorbate 0.04% and 0.05%, microorganism is strongly inactivated. Number of bacteria is reduced significantly at week 2nd and 3rd; stable at week 4th and 5th.

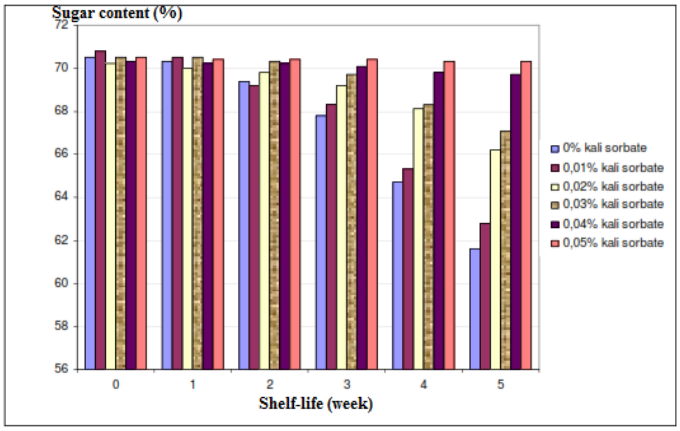

Fig 6: Sugar fluctuation in marian plum jam during preservation

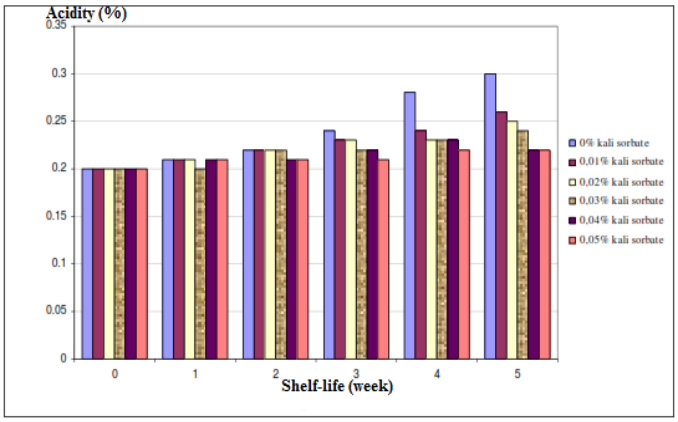

Fig 7: Acidity fluctuation in marian plum jam during preservation

Using potassium sorbate 0.04% and 0.05% is appropriate. We recommend using 0.04% for safety and productivity.

4. Conclusion

Marian plum is relative of mango, small yellow fruit 2.5cm long. Pulp eaten fresh (green or ripe), cooked in jam, chutney. It has flavour sour, pleasant; no commercial potential. Good source of vitamins A and C. We have successfully exploited this fruit for jam making. Marian plum jam is rich in sugar and a great source of energy and

fiber. Jam made with chunks of healthy fruit can help reduce the risk of stroke, heart attack and all other potential cardiovascular diseases. Jams do not contribute to the cholesterol and fat content of your body. Jam helps maintain a healthy weight when following recommended serving sizes.

5. Reference

1. Fugel R, Carle R, Schieber A. Quality and authenticity control of fruit purees, fruit preparations and jams-a review, Trends Food Sci. Technol., 2005; 16:433-441.
2. Germain Kansci, Koubala BB, Lape IM. Effect of ripening on the composition and the suitability for jam processing of different varieties of mango (Mangifera indica). African Journal of Biotechnology 2003; 2(9):301-306.
3. P. Kerdsupa, P. Nakneana. Effect of sorbitol substitution on physical, chemical and sensory properties of low-sugar mangojam. Proceeding - Science and Engineering 2013, 12-18.
4. Lal G, Siddappaa GS, Tandon GL. Preservation of Fruit and Vegetables. ICAR Publication, New Delhi, India, 1998, 51-58.
5. Santanu Basu, U.S. Shivhare. Rheological, textural, micro-structural and sensory properties of mango jam. Journal of Food Engineering 2010; 100(2):357-365.
6. Santanu B, Shinhare US. Rheological, textural, micro-structural and sensory properties of mango jam. J. Food Eng., 2010; 100:357-365.
7. Xin Gao, Yu T, Zhang ZH, Xu JC, Fu XT. Rheological and sensory properties of four kinds of Jams. Journal of Stored Products and Postharvest Research 2011; 2(11):227-234.