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## Standardization of recipe different guava (*Psidium guajava* L.) varieties for candy preparation

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### Abstract

The present investigation Standardization of recipe different guava (*Psidium guajava* L.) varieties for candy preparation was conducted at Horticulture Processing Laboratory Fruit Science, Department of fruit science, College Of Agriculture, Indira Gandhi Krishi Vishwavidyalaya Raipur during the year 2020 – 2021. An experiment was conducted to evaluate the effect of different guava varieties for candy preparation. The experimental data consisted of 05 treatments and 4 replications under Factorial completely randomized design (F-CRD). The chemical composition, the TSS was recorded 12.40° Brix, 13.28° Brix and 11.70° Brix, pH 4.10, 3.61 and 4.21, Acidity per cent 0.40%, 0.48% and 0.5%, Ascorbic acid (mg/ 100g) 198.54 mg, 241 mg and 181.12 mg, TSS: Acid ratio 31, 27.66 and 22.94, Sugar acid ratio 27.15, 21.41 and 19.23, Total sugar per cent 10.86%, 10.28% and 9.81%, Reducing sugar per cent 6.62%, 4.77% and 5.81%, Non-reducing sugar per cent 4.24%, 5.51% and 4.0%. The quality parameters of T<sub>3</sub> – (KMS 0.5%) significantly maximum total soluble solids (75.75° Brix) Allahabad Safeda followed by Sweta 73.15° Brix and Lalit 72.20° Brix. Maximum pH T<sub>3</sub> – (KMS 0.5%) 7.90 Allahabad safeda followed by 6.20 Sweta T<sub>3</sub> – (KMS 0.5%) and 5.43 Lalit T<sub>3</sub> – (KMS 0.5%). Minimum acidity 0.23 under T<sub>3</sub> (KMS 0.5%) Lalit followed by 0.25 T<sub>2</sub> (KMS 0.2%) Lalit and Sweta 0.26 T<sub>3</sub> (KMS 0.5%). Maximum Ascorbic acid (mg/100g) T<sub>3</sub> – (KMS 0.5%) 55.54 mg Allahabad Safeda, 39.56 mg Sweta and 34.11 mg Lalit. significantly maximum TSS: acid ratio 317.04 (T<sub>3</sub> KMS 0.5%) Lalit followed by 287.56 (T<sub>2</sub> KMS 0.2%) Lalit and 277.11 (T<sub>3</sub> KMS 0.5%) Sweta. maximum sugar: Acid ratio 278 (T<sub>3</sub> KMS 0.5%) Lalit followed by 251.40 (T<sub>2</sub> KMS 0.2%) Lalit and 250.76 (T<sub>3</sub> KMS 0.5%) Sweta. Significantly maximum Total sugar per cent 70.75% (T<sub>3</sub>- KMS 0.5%) followed by 69.73% (T<sub>2</sub> KMS 0.2%) and 68.85% (T<sub>1</sub> Honey 10%) Allahabad Safeda. Maximum reducing sugar per cent 28.90% (T<sub>3</sub>- KMS 0.5%) followed by 28.60% (T<sub>2</sub> KMS 0.2%) and 27.19 (T<sub>1</sub> Honey 10%) Lalit. Maximum Non-reducing sugar per cent 38.15% (T<sub>3</sub>- KMS 0.5%) followed by 37.18% (T<sub>2</sub> KMS 0.2%) and 37.11 (T<sub>1</sub> Honey 10%) Allahabad Safeda.

**Keywords:** Guava candy, sugar, KMS, Ascorbic acid, Citric acid, Lalit, Allahabad Safeda and Sweta

### Introduction

Guava (*Psidium guajava* L.) is a tropical fruit Popularly known as ‘Apple of Tropics’ grows well under sub-tropical conditions. It belongs to the Myrtaceae family and is a native of tropical and sub-tropical regions. In India it is considered as the fourth most important fruit in area and production after mango, banana and citrus. Guava is hardy, prolific bearer and highly remunerative fruit. It is highly favoured fruit crop by the fruit growers due to its wide adaptability and higher return per unit area.”

“Guava is an important commercial fruit of India known for its excellent digestive and nutritive value, pleasant flavour, high palatability and availability in abundance at moderate price. India is the second largest guava producing country in the world with a production of 4359’000 MT from an area of 290 thousand ha (Anon 2019 - 2020) [2]. In India, guava is widely cultivated in Maharashtra, Bihar, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Odisha, West Bengal, Gujarat, Andhra Pradesh, Punjab, Tamil Nadu, Karnataka and Assam. In Chhattisgarh, it occupies 21.016 thousand hectare area and from this area production of 192.005 MT was obtained (Anon 2019-2020.) [2] and is mainly cultivated in districts namely Raipur, Durg, Dhamtari, kawardha, bemetara, rajnandgoan and bilaspur. Popular variety of guava fruit, include ‘Lucknow 49’, ‘Allahabad Safeda’ and ‘Lalit’.”

“The antioxidants in guava are believed to help in reducing the risk of cancer. The vitamin C (200-300 mg/100g) in guava makes absorption of vitamin E much more effective in reducing the oxidation of the cholesterol. It is rich in pectin, fiber, folic acid, minerals like potassium, copper, manganese, calcium, iron, phosphorus and vitamins like ascorbic acid, thiamine,

riboflavin, nicotinic acid and vitamin A. The fiber in guavas promotes digestion and ease bowel movements. The insoluble fiber in the guava fruit is a beneficial in preventing and treating diverticulitis. The high content of vitamin A in guava plays an important role in maintaining the quality and health of eyesight, skin, teeth, bones and the mucus membranes.”

### Materials and Methods

The experiment was undertaken at post-harvest and Processing Laboratory of Department of Fruit Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya Raipur during the year 2020 – 2021. The experiment was carried out to find out the suitable variety for candy preparation and to study the qualitative and sensory parameters of guava candy when stored at ambient condition. Details are mentioned in this chapter regarding the materials used and the techniques used throughout the course of investigation.

**Treatment combinations:** Lalit + Honey 10% V<sub>1</sub>T<sub>1</sub>, Lalit + KMS 0.2% V<sub>1</sub>T<sub>2</sub>, Lalit + KMS 0.5% V<sub>1</sub>T<sub>3</sub>, Lalit + Citric Acid 0.5% V<sub>1</sub>T<sub>4</sub>, Lalit + Ascorbic Acid 0.5% V<sub>1</sub>T<sub>5</sub>, Allahabad Safeda + Honey 10% V<sub>2</sub>T<sub>1</sub>, Allahabad Safeda + KMS 0.2%

V<sub>2</sub>T<sub>2</sub>, Allahabad Safeda + KMS 0.5% V<sub>2</sub>T<sub>3</sub>, Allahabad Safeda + Citric Acid 0.5% V<sub>2</sub>T<sub>4</sub>, Allahabad Safeda + Ascorbic Acid 0.5% V<sub>2</sub>T<sub>5</sub>, Sweta + Honey 10% V<sub>3</sub>T<sub>1</sub>, Sweta + KMS 0.2% V<sub>3</sub>T<sub>2</sub>, Sweta+ KMS 0.5% V<sub>3</sub>T<sub>3</sub>, Sweta + Citric Acid 0.5% V<sub>3</sub>T<sub>4</sub>, Sweta + Ascorbic Acid 0.5% V<sub>3</sub>T<sub>5</sub>.

### Preparation of candy

After preparation of fruit slices, equal quantity of prepared fruits were immersed in 5 different soaking solutions, viz., 10% honey solution, 0.2% solution of potassium meta bisulphite, 0.5% solution of potassium meta bisulphite, 0.5% citric acid solution and 0.5% ascorbic acid solution for 10 minutes. Then fruits were washed properly with the fresh water to remove the traces of chemical solutions and blanched in boiling water for 4 minutes. Then all five samples were steeped in sugar syrup at 55% TSS in different containers for 24 hours. Thereafter, pieces were drained and concentration of syrup was raised up to 65% TSS and pieces were again impregnated into syrup. Final steeping was done next day by same process at 70% TSS and left for 7 days. Then the pieces were drained and washed to remove adhering layer of sugar with dipping into hot water for few seconds. Dried in hot air oven at 50 °C for 12 hours.

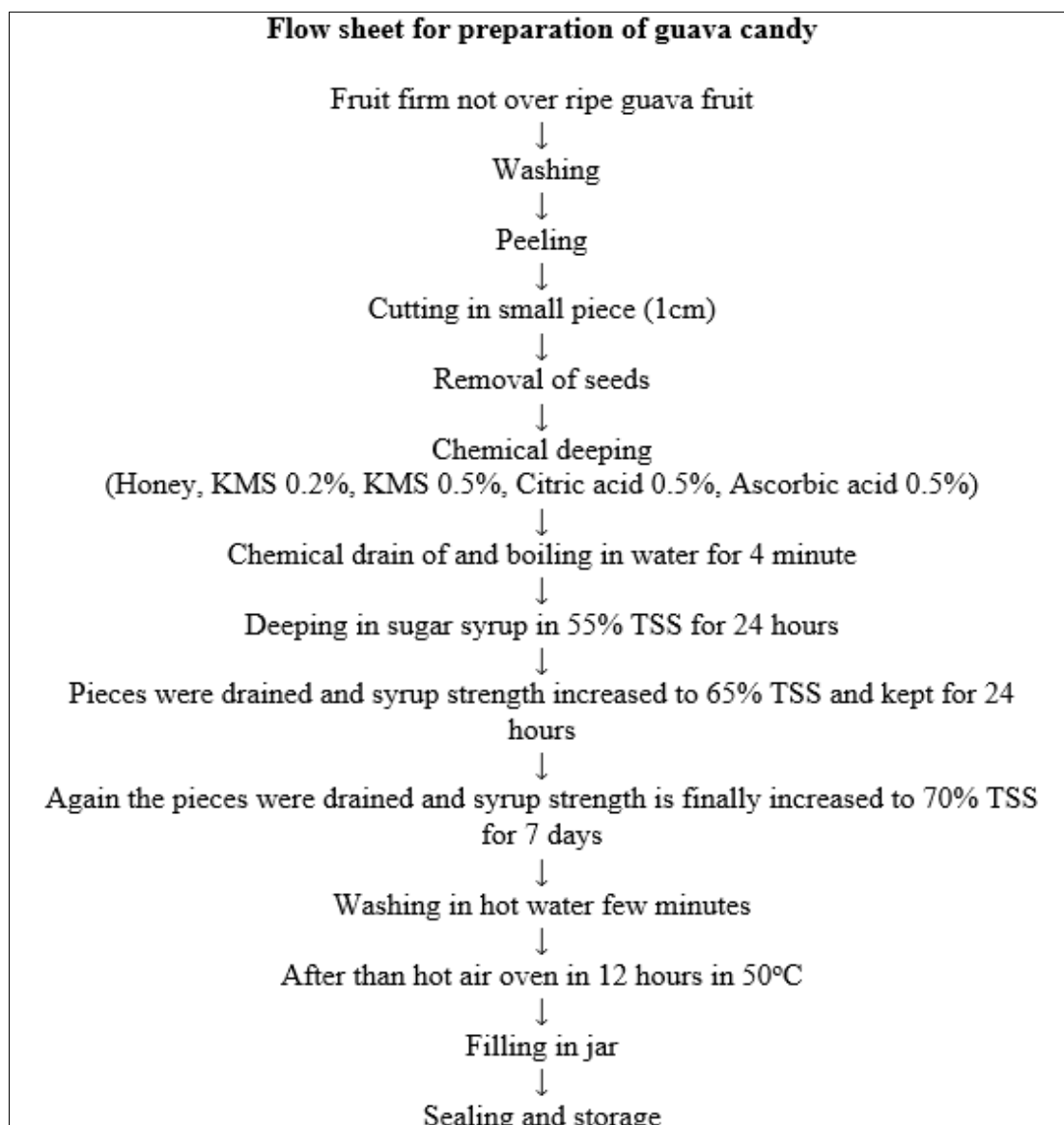


Fig 1: Flow chart of Guava candy

**Table 1:** Physical & Chemical composition of guava varieties Lalit, Allahabad Safeda and Sweta fruits and its pulp.

S. No.	Physical compositions	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	Chemical composition	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>
1.	Fruit weight (g)	126.89	159.78	135.26	Total Soluble Solid (° Brix)	12.4	13.28	11.7
2	Fruit value (cc)	420	480	500	pH	4.10	3.61	4.21
3.	Polar diameter (cm)	5.7	6.6	6.6	Titration Acidity (%)	0.40	0.48	0.51
4.	Equatorial diameter (cm)	6.0	7.1	6.7	Ascorbic Acid (mg/100g)	198.54	241	181.12
5.	Fruit shape index	round	round	spherical	TSS: Acid ratio	31	27.66	22.94
6.	Seed weight (g)	4.89	5.83	3.67	Sugar: Acid ratio	27.15	21.41	19.23
7.	Pulp weight (g)	119.23	152.99	128.11	Total sugar (%)	10.86	10.28	9.81
8.	Pulp colour	Pink	White	White	Reducing sugar (%)	6.62	4.77	5.81
9.	Seed: Pulp ratio	24.38	26.24	34.90	Non reducing sugar (%)	4.42	5.51	4.00

**Table 2:** Chemical Properties (quality) of guava candy varieties Lalit, Allahabad Safeda and Sweta fruits

Treatments	TSS (° Brix)						pH					
	Storage period											
	0	30	60	90	120	150	0	30	60	90	120	150
V1T1	70.20	70.40	70.53	71.52	71.79	71.70	3.65	3.81	4.11	4.36	4.71	5.03
V1T2	70.53	70.73	70.98	71.43	71.92	71.89	3.78	3.96	4.13	4.58	4.91	5.23
V1T3	70.60	70.80	71.20	71.90	72.20	72.92	3.98	4.23	4.78	4.98	5.13	5.43
V1T4	69.10	69.80	70.20	70.35	70.55	70.60	3.61	3.80	4.10	4.02	4.50	5.01
V1T5	70.30	70.41	70.71	71.20	71.35	71.35	3.75	3.98	4.25	4.60	4.95	5.27
V2T1	68.30	69.31	70.12	71.59	73.30	72.84	5.11	5.23	5.44	5.91	6.21	6.53
V2T2	69.20	70.45	72.43	73.12	74.50	73.60	6.53	6.66	6.78	7.10	7.65	7.10
V2T3	72.33	74.12	74.31	75.11	75.23	75.50	7.10	7.50	7.81	7.85	7.85	7.90
V2T4	71.54	71.89	72.44	75.51	74.62	72.29	6.12	6.34	6.56	6.78	7.10	7.20
V2T5	70.11	72.44	73.10	74.21	74.65	74.25	6.33	6.54	6.66	6.81	7.18	7.21
V3T1	67.10	68.54	69.11	70.51	72.22	72.29	3.58	3.96	4.23	4.73	5.20	5.37
V3T2	68.53	68.63	69.09	71.53	72.54	71.58	4.11	4.76	5.12	5.83	6.07	6.18
V3T3	67.18	68.90	69.10	70.12	73.15	72.05	3.22	4.87	5.23	5.43	6.11	6.20
V3T4	68.13	69.11	69.55	69.81	71.13	70.60	3.46	3.79	4.13	4.76	5.11	5.18
V3T5	68.54	68.53	69.05	70.11	71.15	71.94	3.29	3.85	4.17	4.63	4.96	5.35

Treatments	Acidity (%)						Ascorbic acid (mg/100g)					
	Storage period											
	0	30	60	90	120	150	0	30	60	90	120	150
V1T1	0.26	0.25	0.24	0.22	0.21	0.20	30.25	29.15	28.95	28.15	27.85	27.13
V1T2	0.25	0.24	0.23	0.22	0.21	0.21	35.13	35.02	34.95	37.58	34.13	33.80
V1T3	0.23	0.22	0.22	0.21	0.20	0.20	35.63	35.62	35.10	34.98	34.53	34.11
V1T4	0.28	0.27	0.25	0.24	0.23	0.22	29.45	29.13	28.94	28.55	28.19	27.85
V1T5	0.27	0.26	0.25	0.23	0.22	0.21	31.65	31.55	30.82	30.82	30.15	29.95
V2T1	0.38	0.35	0.31	0.33	0.31	0.30	45.52	46.23	47.51	48.25	49.63	50.98
V2T2	0.35	0.40	0.39	0.42	0.32	0.31	46.11	47.63	48.28	49.10	50.40	52.23
V2T3	0.38	0.33	0.32	0.32	0.30	0.24	46.31	47.52	48.54	49.22	50.91	55.54
V2T4	0.37	0.31	0.30	0.30	0.39	0.31	46.94	45.76	46.63	48.52	49.73	51.74
V2T5	0.38	0.31	0.30	0.32	0.36	0.32	45.66	47.31	48.52	49.73	50.12	53.23
V3T1	0.29	0.28	0.24	0.25	0.24	0.23	31.03	32.15	33.45	34.61	33.11	36.28
V3T2	0.27	0.26	0.25	0.23	0.21	0.21	35.93	34.51	35.46	36.18	37.40	38.29
V3T3	0.26	0.25	0.24	0.23	0.22	0.21	34.81	35.41	36.11	37.50	38.23	39.56
V3T4	0.30	0.29	0.28	0.27	0.25	0.24	32.34	32.19	33.23	34.86	35.66	36.19
V3T5	0.28	0.27	0.26	0.26	0.25	0.23	31.96	35.46	34.51	35.64	36.13	36.98

Treatments	Total Sugar (%)						Reducing sugar (%)					
	Storage period											
	0	30	60	90	120	150	0	30	60	90	120	150
V1T1	60.11	60.33	60.02	61.43	61.63	62.25	24.98	25.83	25.98	26.69	27.08	27.19
V1T2	60.43	60.83	61.53	61.58	62.23	62.85	25.52	26.20	26.80	27.13	28.02	28.60
V1T3	62.13	62.50	62.84	63.39	63.64	63.94	25.63	26.33	26.81	27.27	28.10	28.90
V1T4	58.86	59.05	59.38	59.68	59.92	60.20	24.58	24.96	25.13	26.23	26.23	26.85
V1T5	61.01	61.77	61.86	65.05	62.15	62.35	24.08	24.85	25.10	26.56	26.56	26.95
V2T1	66.23	66.54	67.11	67.53	68.70	68.85	13.11	14.98	15.54	16.53	17.03	18.23
V2T2	68.13	68.43	68.68	69.21	69.55	69.73	13.90	14.23	15.31	16.11	17.45	19.89
V2T3	68.10	68.54	69.23	69.81	70.53	70.75	14.30	15.43	16.89	17.54	19.11	20.83
V2T4	65.14	65.54	65.92	66.21	66.81	67.23	13.10	14.29	15.68	16.68	17.23	18.19
V2T5	66.33	66.49	66.70	67.13	67.59	68.11	13.54	14.59	17.73	16.94	17.89	19.10
V3T1	60.02	61.72	62.89	62.97	63.11	64.19	17.98	18.41	19.92	20.41	21.42	23.50
V3T2	59.09	60.06	61.13	62.33	63.12	64.15	18.11	19.12	20.52	21.13	22.23	23.19

V3T3	59.28	60.11	61.23	62.44	63.19	65.20	19.18	20.15	21.45	22.23	23.04	25.18
V3T4	58.81	59.36	60.41	61.70	62.81	64.10	17.92	18.46	19.53	20.51	21.42	22.56
V3T5	58.91	59.40	60.49	61.65	62.92	64.15	18.07	19.52	20.68	21.11	23.01	23.18

## Results and Discussion

**TSS:** An increased in TSS content (Table: 2) may possibly be due to hydrolysis of polysaccharides and oligosaccharides into monosaccharides (reducing sugar) and evaporation of moisture during storage while significant effect of metabisulphite soaking treatment on reducing and total sugar may possibly be the region of higher TSS content in sodium metabisulphite treatment similar observation where recorded in ber candy (Kumar *et al.* 1992) <sup>[13]</sup> and bael candy (Mishra, 2005) <sup>[15]</sup>.

**pH:** There was a negligible increase (Table: 2) in pH of guava fruit candy was noticed in all the treatments, which might be due to formation of free acids and hydrolysis of pectin (Imran *et al.*, 2000) <sup>[9]</sup>. Parallel results were obtained on mango pulp by Durrani *et al.* (2010) <sup>[6]</sup> and wood apple bar by Vidhya and Narain (2011) <sup>[22]</sup>.

**Acidity:** A close perusal of data indicates that there was a slight decrease (Table: 2) in titrable acidity with the advancement of storage period. Change in pH is directly related to change in acidity of samples. With the slight decrease in acidity of fruit candy negligible increase in pH was noticed. There was a slight decrease in acidity during storage might be due to salt formation i.e., due to acid base reactions (Kuchi *et al.*, 2014) <sup>[11]</sup>. Similar results were recorded on apricot fruit candy by Sharma *et al.* (2013) <sup>[20]</sup> and papaya candy and leather by Attri *et al.* (2014) <sup>[3]</sup>.

**Ascorbic acid (mg/100g):** Guava candy resulted in significant increase (Table: 2) in ascorbic acid content in guava candy. There was significant effect of different treatments and storage on ascorbic acid content of guava candy. Ascorbic acid is sensitive to heat, light and is oxidized quickly in the presence of oxygen, hence, it might have been destroyed during processing and subsequently during storage period. Similar reduction in ascorbic acid content was also recorded by Kumar *et al.* (2009) <sup>[14]</sup> in guava candy and Hemalatha *et al.* (2014) <sup>[8]</sup>.

**Total sugar:** The total sugars content was observed up to six months of storage period thereafter, it increased (Table: 2) gradually during storage. An increase in the total sugars might be due to hydrolysis of polysaccharides like pectin, starch etc. into simple sugars as well as evaporation of moisture during storage. Among soaking treatments significantly highest total sugars content was found in sodium metabisulphite treatment. It may be due to prevention of the involvement of reducing sugars in carbonyl amino reaction by sodium metabisulphite as well as in non-enzymatic browning. Similar findings were reported in cheese and toffee of - guava blends (Reena., 2007) <sup>[18]</sup> and intermediate moisture guava slices (Harsimrat and Dhawan, 2002) <sup>[7]</sup>.

**Reducing sugar:** It may possibly be due to high inversion of non-reducing sugar to reducing sugars because of high content of organic acid (citric acid). According to Wedzicha (1984) sulphur dioxide is supposed to block the carbonyl group of the reducing sugars involved in carbonyl amino

reaction, which is responsible for non- enzymatic browning and thereby prevents the degradation of reducing sugars. Similar results were reported in dried chilli (Take, 2012) <sup>[21]</sup> and guava leather (Jain and Mandal, 2007) <sup>[10]</sup>.

## Conclusion

- From the results it is concluded that for most of the chemical parameters *viz.*, TSS, acidity, TSS: Acid, sugar: Acid, reducing sugar and non reducing sugar guava candy prepared from Lalit by applying KMS 0.5% is best and for rest of the chemical parameters guava candy prepared from Allahabad Safeda treated with KMS@0.5% is best.
- As far as the suitable variety for candy preparation is concerned guava cv. Allahabad Safeda is best.
- Guava slices treated with KMS @ 0.5% is best for preparation of candy.
- Organoleptically the candy prepared from Allahabad Safeda treated with KMS@0.5% records maximum score for all the parameters and was preferred most.

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