Study the phyisco-chemical properties of value-added papaya candy from different herbal extracts in term of quality and shelf life

ABSTRACT

The present experiment was carried out during June 2022 to September 2022 in post- harvest laboratory of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in (CRD) completely randomized design, with thirteen treatments which were replicated thrice. The treatments were T_0 Control (standard recipe), T_1 Cardamom syrup (1.0%), T_2 Cardamom syrup (1.5%), T_3 Ginger syrup (1.0%), T_4 Ginger syrup (1.5%), T_5 Tulsi syrup (1.0%), T_6 Tulsi syrup (1.5%), T_7 Lemongrass syrup (1.0%), T_8 Lemongrass syrup (1.5%), T_9 Rose syrup (1.0%), T_{10} Rose syrup (1.5%), T_{11} Mint syrup 1.0%) T_{12} Mint syrup (1.5%). The Papaya candy was stored for 45 days at ambient temperature. From the present investigation it is found that treatment T_4 is superior in respect of phyisco-chemical parameters like total soluble solids, titratable acidity, ascorbic acid, P^H, total sugar. Treatment T_4 is also found superior in organoleptic scoring of Papaya candy. In terms of benefit cost ratio the net return, was also found T_4 and minimum was recorded in T_0 in all the parameters.

Keywords: *Papaya; candy physico-chemical properties; economics.*

1. INTRODUCTION

The papaya, also known as pawpaw or papaw, is the fruit of the plant *Carica papaya L*. and genus (Carica). It was first domesticated in Mexico several millennia before the traditional Mesoamerican cultures emerged. It is a native of the tropics of America [1]. that papayas are excellent sources of Vitamin A and other vitamins, such as nicotinic acid, thiamine, and riboflavin [2]. Additionally, the fruit contains proteolytic enzymes (papain and chymopapain) that aid in the digestion of proteins and are used as meat tenderizers and digestive medicines in the pharmaceutical, brewing, and tanning industries [3]. Although unripe green papaya may not contain carotene, it contains a lot of nutrients which is used for vegetable along with products like puree, candy, syrup, concentrate, jam, pickle, fruit bar, and jellies. The skin, pulp, and seeds of both mature and unripe C. papayas demonstrated potential antibacterial activity against the different microorganisms [4]. India ranks second for fruits and vegetables producer in the world followed by China. India, during 2017-18 has produced about 97358 thousand MT fruits and 184394 thousand MT vegetables in about 6506 thousand Ha and 10259 thousand Ha respectively (Horticulture statistics at a glance, 2018, MoA & FW GoI). In spite of this, the per capita availability of fruit in India is 107 g/day which is below the recommended 120 g/day. India's share of global exports of fresh fruits and processed fruit products is also quite major compared to other major fruit producers of the world (Bung, 2012). Unfortunately,fruits and vegetables being perishable in nature get wasted to the tune

of 20-30 % in the supply chain due to improper handling, transportation and poor post-harvest management; and only 2 % of them are processed in to value added products and the rest is consumed fresh. the world produces an estimated three million tons of agro-industrial papaya waste each year, of which 70% are seeds. One of the classic methods for preserving fruits is the preservation of fruit in the form of candy or the use of high concentrations of sugar in the form of sugar [5].

Candy is a sweet food made from fruits or vegetables impregnated with sugar syrup, which is drained, and then dried to ensure shelf stability [6]. The primary goal of food preservation is to remove water, which lowers the moisture content to a level that permits secure storage for a long time because moisture can cause degradation [7]. Therefore, this study suggests that turning unripe papaya into sweets as a substitute for composting papaya trash could be another way to use fruit.

2. MATERIALS AND METHODS

The present investigation entitled "the phyisco-chemical properties of value added papaya candy from different herbal extracts in term of quality and shelf life" was laid out in the Post Harvest Lab Department of Horticulture, Prayagraj in the year 2022-2023.

The treatments were **T_0**: Control, **T_1**: Cardamom syrup (1.0%) ,**T_2**: Cardamom syrup (1.5%), **T_3**: Ginger syrup (1.0%), **T_4:** Ginger syrup (1.5%), **T_5**: Tulsi syrup (1.0%), **T_6**: Tulsi syrup (1.5%), **T_7**: Lemongrass syrup (1.0%), **T_8**:Llemongrass syrup (1.5%), **T_9**: Rose syrup (1.0%), **T_{10}**: Rose syrup (1.5%), **T_{11}**: Mint syrup(1.0%), **T_{12}**: Mint syrup (1.5%).

3. RESULTS AND DISCUSSION

TSS of papaya candy was observed to increase continuously up to the end of research under ambient storage conditions. total soluble solid (^{0}Brix) observed was (86.79) with the treatment T_4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the lowest total soluble solid (^{0}Brix) observed was (73.54) with the treatment control. After 30 days storage of papaya candy highest total soluble solid (^{0}Brix) observed was (87.45) with the treatment T_4 Sugar 70%+ Ginger 1.5%,, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the minimum total soluble solid (^{0}Brix) observed was (73.96) with the treatment control.This findings correlates the findings of Ahmad and Tariq [8], Manivasaganet et al. [9] and Mall and Tandon[10].

PH of papaya candy was observed to decrease continuously up to the end of research under ambient storage conditions. lowest pH observed was (4.170) with the treatment T4 Sugar 70%+ Ginger 1.5%,, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the lowest pH highest was (6.203) with the treatment control. After 45 days storage of papaya candy lowest pH observed was (4.280) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the maximum pH observed was (6.313) with the treatment control. This findings correlates the findings of Braimwelland Badrie[11], Siddiqui [12]and Khushbu et al. [13].

Acidity of papaya candy was observed to decrease continuously up to the end of research under ambient storage conditions. lowest acidity (%) observed was (0.207). with the treatment T_0 Control, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the maximum acidity (%) observed was (3.21) with the treatment T_{11} Sugar 70%+mint 1.0%. After 45 days storage of papaya candy lowest acidity (%) observed was (0.195) with the treatment T_0 Control, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the maximum acidity (%) observed was (0.310) with the treatment T_{11} Sugar 70%+mint 1.0%. This findings correlates the findings of Rathoreet al.[14]and Khushbuet al.[13].

Ascorbic acid (mg/100g) of papaya candy was observed to decrease continuously up to the end of research under ambient storage conditions. maximum ascorbic acid (mg/100g)

observed was (19.05) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the lowest ascorbic acid (mg/100g) observed was (13.82) with the treatment control. After 45 days storage of papaya candy maximum ascorbic acid (mg/100g) observed was (18.45) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the lowest ascorbic acid (mg/100g) observed was (13.16) with the treatment control. Ascorbic acid in any food commodity plays important role in deciding its shelf life. Similar results were reported by Daisy and Gehlot [15] in Aonla preserve and Neelesh (2014) in papaya candy.

Reducing sugar (%) of papaya candy was observed to increase continuously up to the end of research under ambient storage conditions. maximum reducing sugar (%) observed was (14.31) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the lowest reducing sugar (%) observed was (10.15) with the treatment control. After 45 days storage of papaya candy maximum reducing sugar (%) observed was (18.30) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the lowest reducing sugar (%) observed was (13.64) with the treatment control.Reducing sugar in any food commodity plays important role in deciding its shelf life. Usually, high sugar content makes the moisture unavailable for the growth of microorganisms, thus improves the shelf life of food. Similar results were reported by Daisy and Gehlot [15] in Aonla preserve.

Non-reducing sugar (%) of papaya candy was observed to increase continuously up to the end of research under ambient storage conditions. lowest non-reducing sugar (%) observed was (4.26) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the maximum non-reducing sugar (%) observed was (6.19) with the treatment control. After 45 days storage of papaya candy lowest non-reducing sugar (%) observed was (4.92) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the maximum non-reducing sugar (%) observed was (7.18) with the treatment control.Non-reducing sugar in any food commodity plays important role in deciding its shelf life. Usually, high sugar content makes the moisture unavailable for the growth of microorganisms, thus improves the shelf life of food. Similar results were reported by Daisy and Gehlot [15] in Aonla preserve.

Total sugar (%) of papaya candy was observed to increase continuously up to the end of research under ambient storage conditions. maximum total sugar (%) observed was (18.56) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the minimum total sugar (%) observed was (16.340) with the treatment control. After 45 days storage of papaya candy maximum total sugar (%) observed was (23.21) with the treatment T4 Sugar 70%+ Ginger 1.5%, followed by treatment T_3 Sugar 70%+Ginger 1.0%, While the minimum total sugar (%) observed was (20.82) with the treatment control.high sugar content makes the moisture unavailable for the growth of microorganisms, thus improves the shelf life of food. Similar results were reported by Krishnaveni et al. (2001) in jack fruit RTS, Jain et al. [16] in

papaya cubes.

Colour and Appearance (sensory score) of papaya candy was observed to decrease continuously up to the end of research under ambient storage conditions. highest score of colour was noted (8.73) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of colour was noted (6.58) with the treatment T_0 Control. After 45 day storage, highest score of colour was noted (8.19) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of colour was noted (5.92) with the treatment T0 Control.

Colour and in any food commodity plays important role in deciding its market value. colour is an attribute of food quality and loss of colour by osmotic dehydration process is one of the most significant changes. Similar results were reported by Heredia (2004) and Singh et al., (2012) in ber candy.

Texturer (sensory score) of papaya candy was observed to decrease continuously up to the endof research under ambient storage conditions. highest score of texture was noted (8.18) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of texture was noted (6.14) with the treatment T0 Control. After 45 day storage, highest score of texture was noted (7.64) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of texture was noted (5.48) with the treatment T_0 Control. Texture in any food commodity plays important role in deciding its market value. This might be due to degradation of volatile substance and flavour constituents. Similar results were reported by Ames [17] and Chavan [18] in Jackfruit products.

Flavour (sensory score) of papaya candy was observed to decrease continuously up to the endof research under ambient storage conditions. highest score of flavour was noted (8.82) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of flavour was noted (8.51) with the treatment T_0 Control. After 45 day storage, highest score of flavour was noted (8.28) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of flavour was noted (5.85) with the treatment T_0 Control. This findings correlates the findings of Rathoreet al. [14], Shakti et al.[19]and Khushbuet al.[13].

Taste (sensory score) of papaya candy was observed to decrease continuously up to the endof research under ambient storage conditions. , highest score of taste was noted (8.48) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of taste was noted (6.20) with the treatment T0 Control. After 45 day storage, highest score of taste was noted (7.94) with the treatmentT_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of taste was noted (5.54) with the treatment T0 Control. Taste in any food commodity plays important role in deciding its market value. This might be due to degradation of volatile substance and flavor constituents. Similar results were reported by Ames [17] and Chavan [18] in Jackfruit products.

Overall acceptability (sensory score) of papaya candy was observed to increase continuously up to the end of research under ambient storage conditions. highest score of overall acceptability was noted (8.55) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by

treatment T_3 Sugar 70%+Ginger 1.0%, While least score of overall acceptability was noted (6.36) with the treatment T0 Control. After 45 day storage, highest score of overall acceptability was noted (8.01) with the treatment T_4 Sugar 70%+ Ginger 1.5% followed by treatment T_3 Sugar 70%+Ginger 1.0%, While least score of overall acceptability was noted (5.70) with the treatment T0 Control. This findings correlates the findings of Vikram and Singh [20] and Rekhaet al.[21].

Table 1: Effect of herbal flavour on TSS (^{0}Brix), p^H and Acidity % of papaya candy during storage

S. No.	Treatment	Total soluble solid (^{0}Brix)				pH				Acidity (%)			
		0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days
1	T_0	73.54	73.64	73.79	73.96	6.203	6.233	6.273	6.313	0.207	0.204	0.200	0.195
2	T_1	85.17	85.35	85.57	85.82	5.145	5.175	5.215	5.255	0.277	0.269	0.260	0.259
3	T_2	85.51	85.66	85.87	86.13	5.040	5.070	5.110	5.150	0.275	0.266	0.265	0.263
4	T_3	86.28	86.45	86.67	86.95	4.470	4.500	4.540	4.580	0.269	0.260	0.259	0.257
5	T_4	86.79	86.95	87.15	87.45	4.170	4.200	4.240	4.280	0.264	0.255	0.254	0.252
6	T_5	83.41	83.55	83.77	84.05	5.417	5.447	5.487	5.527	0.305	0.296	0.295	0.293
7	T_6	83.65	83.77	84.01	84.25	5.430	5.460	5.500	5.540	0.293	0.284	0.283	0.281
8	T_7	83.26	83.37	83.59	83.85	5.250	5.280	5.320	5.360	0.286	0.277	0.276	0.275
9	T_8	84.71	84.84	85.05	85.30	4.787	4.817	4.857	4.897	0.282	0.273	0.272	0.270
10	T_9	82.15	82.29	82.51	82.77	5.733	5.763	5.803	5.843	0.312	0.303	0.302	0.301
11	T_{10}	82.63	82.78	83.01	83.26	5.677	5.707	5.747	5.787	0.309	0.300	0.299	0.298
12	T_{11}	81.40	81.56	81.77	82.03	5.800	5.830	5.870	5.910	0.321	0.312	0.311	0.310
13	T_{12}	81.56	81.70	81.92	82.16	5.737	5.767	5.807	5.847	0.317	0.308	0.307	0.306
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
	SE (m)	**0.302**	**0.937**	**0.302**	**0.657**	**0.041**	**0.062**	**0.196**	**0.106**	**0.002**	**0.009**	**0.002**	**0.010**
	C.D. at 0.5%	**0.881**	**2.736**	**0.883**	**1.918**	**0.120**	**0.182**	**0.572**	**0.310**	**0.006**	**0.027**	**0.007**	**0.029**

Table 2: Effect of herbal flavour on Ascorbic acid (mg/100g) Reducing sugar % And Non-reducing sugar % of papaya candy during storage

S. No.	Treatment	Ascorbic acid (mg/100g)				Reducing sugar (%)				Non- reducing sugar (%)			
		0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days
1	T_0	13.82	13.60	13.38	13.16	10.15	11.31	12.48	13.64	6.19	6.52	6.85	7.18
2	T_1	17.75	17.55	17.35	17.15	11.53	12.75	13.97	15.19	5.09	5.37	5.65	5.93
3	T_2	18.10	17.90	17.70	17.50	12.47	13.72	14.97	16.22	4.65	4.88	5.11	5.34
4	T_3	18.71	18.51	18.31	18.11	13.22	14.44	15.66	16.88	4.38	4.63	4.88	5.13
5	T_4	19.05	18.85	18.65	18.45	14.31	15.64	16.97	18.30	4.26	4.48	4.70	4.92
6	T_5	14.78	14.58	14.38	14.18	11.63	12.84	14.05	15.26	5.33	5.54	5.75	5.96
7	T_6	15.26	15.06	14.86	14.66	11.77	12.88	13.99	15.10	5.24	5.49	5.74	5.99
8	T_7	16.39	16.19	15.99	15.79	11.95	13.17	14.39	15.61	5.14	5.37	5.60	5.83
9	T_8	17.12	16.92	16.72	16.52	12.10	13.22	14.34	15.46	5.13	5.34	5.55	5.76
10	T_9	14.27	14.07	13.87	13.67	11.33	12.44	13.55	14.66	5.38	5.63	5.88	6.13
11	T_{10}	14.59	14.39	14.19	13.99	11.48	12.68	13.88	15.08	5.29	5.51	5.73	5.95
12	T_{11}	14.07	13.87	13.67	13.47	11.08	12.30	13.52	14.74	5.82	6.03	6.24	6.45
13	T_{12}	14.33	14.13	13.93	13.73	11.20	12.41	13.62	14.83	5.72	5.94	6.16	6.38
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
	SE (m)	**0.071**	**0.075**	**0.070**	**0.367**	**0.267**	**0.332**	**0.223**	**0.266**	**0.167**	**0.171**	**0.16**	**0.244**
	C.D. at 0.5%	**0.207**	**0.218**	**0.203**	**1.071**	**0.780**	**0.969**	**0.652**	**0.776**	**0.486**	**0.499**	**0.488**	**0.712**

Table 3: Effect of herbal flavour on Ascorbic acid (mg/100g) Reducing sugar % And Non-reducing sugar % of Mango candy during storage

S. No.	Treatment	Total sugar %				Colour				Texture			
		0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days
1	T_0	16.340	17.835	19.330	20.825	6.58	6.36	6.14	5.92	6.14	5.92	5.70	5.48
2	T_1	16.620	18.120	19.620	21.120	8.47	8.29	8.11	7.93	7.93	7.75	7.57	7.39
3	T_2	17.120	18.600	20.080	21.560	8.62	8.44	8.26	8.08	7.97	7.79	7.61	7.43
4	T_3	17.600	19.070	20.540	22.010	8.65	8.47	8.29	8.11	8.06	7.88	7.70	7.52
5	T_4	18.567	20.117	21.667	23.217	8.73	8.55	8.37	8.19	8.18	8.00	7.82	7.64
6	T_5	16.957	18.377	19.797	21.217	7.93	7.75	7.57	7.39	7.49	7.31	7.13	6.95
7	T_6	17.003	18.363	19.723	21.083	8.14	7.96	7.78	7.60	7.59	7.41	7.23	7.05
8	T_7	17.090	18.540	19.990	21.440	8.25	8.07	7.89	7.71	7.63	7.45	7.27	7.09
9	T_8	17.237	18.567	19.897	21.227	8.34	8.16	7.98	7.80	7.70	7.52	7.34	7.16
10	T_9	16.710	18.070	19.430	20.790	7.73	7.55	7.37	7.19	7.27	7.09	6.91	6.73
11	T_{10}	16.773	18.193	19.613	21.033	7.78	7.60	7.42	7.24	7.36	7.18	7.00	6.82
12	T_{11}	16.903	18.333	19.763	21.193	7.62	7.44	7.26	7.08	7.24	7.06	6.88	6.70
13	T_{12}	16.923	18.353	19.783	21.213	7.62	7.44	7.26	7.08	7.46	7.28	7.10	6.92
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
	SE (m)	**0.256**	**0.309**	**0.247**	**0.269**	**0.050**	**0.052**	**0.066**	**0.051**	**0.052**	**0.047**	**0.066**	**0.044**
	C.D. at 0.5%	**0.746**	**0.901**	**0.720**	**0.786**	**0.415**	**0.152**	**0.191**	**0.148**	**0.152**	**0.138**	**0.192**	**0.129**

Table 4: Effect of herbal flavour on score of flavour, teste and overall acceptability and benefit cost ratio of papaya candy during storage.

S. No.	Treatment	Flavour				Taste				overall acceptability				
		0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days	0 Day	15 Days	30 Days	45 Days	B:C Ratio
1	T_0	6.51	6.29	6.07	5.85	6.20	5.98	5.76	5.54	6.36	6.14	5.92	5.70	1.09
2	T_1	8.62	8.44	8.26	8.08	7.83	7.65	7.47	7.29	8.21	8.03	7.85	7.67	1.79
3	T_2	8.68	8.50	8.32	8.14	8.21	8.03	7.85	7.67	8.37	8.19	8.01	7.83	1.77
4	T_3	8.77	8.59	8.41	8.23	8.33	8.15	7.97	7.79	8.45	8.27	8.09	7.91	1.81
5	T_4	8.82	8.64	8.46	8.28	8.48	8.30	8.12	7.94	8.55	8.37	8.19	8.01	1.79
6	T_5	8.08	7.90	7.72	7.54	7.31	7.13	6.95	6.77	7.70	7.52	7.34	7.16	1.81
7	T_6	8.25	8.07	7.89	7.71	7.44	7.26	7.08	6.90	7.86	7.68	7.50	7.32	1.80
8	T_7	8.37	8.19	8.01	7.83	7.55	7.37	7.19	7.01	7.95	7.77	7.59	7.41	1.81
9	T_8	8.40	8.22	8.04	7.86	7.09	6.91	6.73	6.55	7.88	7.70	7.52	7.34	1.80
10	T_9	7.79	7.61	7.43	7.25	7.17	6.99	6.81	6.63	7.49	7.31	7.13	6.95	1.82
11	T_{10}	8.03	7.85	7.67	7.49	7.38	7.20	7.02	6.84	7.64	7.46	7.28	7.10	1.81
12	T_{11}	7.55	7.37	7.19	7.01	7.35	7.17	6.99	6.81	7.44	7.26	7.08	6.90	1.79
13	T_{12}	7.44	7.26	7.08	6.90	6.71	6.53	6.35	6.17	7.31	7.13	6.95	6.77	1.77
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	
	SE (m)	**0.036**	**0.037**	**0.040**	**0.046**	**0.065**	**0.066**	**0.08**	**0.086**	**0.026**	**0.026**	**0.022**	**0.034**	
	C.D. at 0.5%	**0.106**	**0.109**	**0.116**	**0.135**	**0.191**	**0.192**	**0.258**	**0.252**	**0.077**	**0.076**	**0.064**	**0.099**	

4. CONCLUSION

Based on present investigation, it is concluded that T_4 [Ginger syrup (1.5%)] was best in terms of best recipe with value addition for preparation of papaya candy. The same treatment T_4 [Ginger syrup (1.5%)] was found best in terms of quality changes in papaya candy during storage. The maximum B:C ratio was observed in T_9 [Rose syrup (1.0%)].

REFERENCES

1. AOAC. Official method of Analysis, (17 th ed.). Washington DC, USA, 2002.
2. S. Bhattarai, and R. Kusma, “Preparation and Quality Evaluation of Sugar and Honey Based Beetroot Candies”, Sustainability in Food and Agriculture, Vol. 3, No. 1, Pp. 15-18, 2022. http://doi.org/10.26480/sfna.01.2022.15.18.
3. T.I. Borokini, “Ethnomedical significance, mineral composition and phytochemicals constituents of Carica Papaya in Oyo state”, International Journal of Current Research, Vol. 4, No. 3, Pp. 43-48, 2012. http://www.journalcra.com
4. V. Chaudhary, V. Kumar, J. Singh, and R. Kumar, “Effect of Hot Air Oven Drying on the Moisture Kinetics and Drying Rate of Osmo-Dried Papaya (Carica papaya L.) Slices”, International Journal of Current Microbiology and Applied Sciences, Vol. 8, No. 2, Pp. 1945-1951, 2019. https://doi.org/10.20546/ijcmas.2019.802.226
5. CIHAR Standard. 2017, 11 07. Carbohydrate and sweetness of honey. Retrieved 06 26, 2022, from https://cdn.agclassroom.org/media/uploads/2017/11/07/Carbohydrates_and_the_Sweetness_of_Honey.pdf.
6. A.M. Durrani, P. Srivastava, and S. Verma, “Development and quality evaluation of selected honey based carrot candy”, Journal of Food Science and Technology, Vol. 48, No. 4, Pp. 502-505, 2009. http://hdl.handle.net/10603/57546
7. FAO-Food and Agriculture Organization of the United Nations FAOSTAT http://www.fao.org/faostat/es/#data/QC/visua lize. Accessed 22 Oct 2018, 2016.
8. Ahmad Tariq.Effect of different levels of sugar and citric acid on the physico-chemical properties of Apple jam, Thesis, M.Sc., Horticulture, AAIDU.2004;18.
9. Manivassagan S, Rana GS, KumarS, Joon MS.Qualitative changes in karonda (Carissa carandusLinn.) candy during storage at room temperature. Haryana J. Hort. Sci. 2006;35(1&2):19-21.

10. MallP, Tondon DK.Development of guava-aonla blended beverage. Acta Hort.2007;(735):555-560.

11. Braimwell MG, Badric N.Processing and quality evaluation of banana cheese, J. Food. Sci. & Tech. (Indian)2002;39:94-95.

12. Siddiqui AR.Effect of different levels of sugar and citric acid on the physico-chemicla properties of pear jam. Thesis, M.Sc. horticulture Fruit Prododuction and PHT AAIDU.2004;34-35.

13. Khushbu, Vijay Bahadur, Prasad VM, Mishra Saket,Paul V. Study on Preparation and Characterization of Value Added Herbal Beverage of Anonla (EmblicaofficinalesGaertn.) cv. NA-6.Int.J.Curr.Microbiol.App.Sci. 2017;6(9):2373-2379.
14. RathoreHA, Sammi TMS, Soomro AH.Effect of storage on physico-chemical composition and sensory properties of mango. Pk. J. Nutrition.2007;6:2,143-148.29.

15. Daisy, Gehlot R. Physical and bio-chemical changes in fresh aonla fruits and preserve of cvs. Banarasi and Chakaiya. Haryana Journal of Horticulture Sciences. 2006;35(1):57-9.

16. Jain SK, Verma RC, Mathur AN, Murdia LK. Studies on osmotic dehydration of papaya cubes. Journal of interacademicia. 2004;8(2):221-9.

17. Ames JM. Browning. Encyclopedia of Food Science and Nutrition (2nd). Elsevier; 2003.

18. Chavan UD, Prabhukhanolkar AE, Panwar, V.D. Preparation of osmotic Dehydration ripe banana slices. Journal of Food Sciences and Technology. 2010; 47(4):380-6.

19. Shakti Chandra Mondal, Md. Mostafa Kamal, MustafIshak Ali Mumin, Md.Mojaffor Hosain, Md. Rahmat Ali. Effect of Sucrose on the Physicochemical Properties, Organoleptic Qualities and Shelf-Life Stability of Aonla (Emblicaofficinalis) Candy. IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT). 2017;85-94.
20. VikramBalaji,Singh PurnimaSikarwar. Studies on Preparation of Value Added Herbal Kinnow –Aonla Beverages (RTS and Squash) during Storage. Int. J. Pure App. Biosci. 2018;6(1):758-765.

21. RekhaKailey, KajalDhawan, Prasad Rasane, Jyoti Singh, SawinderKaur, BhanuPratap Singh, NavneetKaur, DamanpreetKaur. Utilization of Foeniculumvulgarein herbal candy preparation and analysing its effect on the physico-chemical and sensory properties. Current Science. 2019;116:12,25.