



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 2257-2262
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www.thepharmajournal.com
Received: 04-09-2022
Accepted: 10-10-2022

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Standardization of recipe for rose gulkand by using natural source of sweeteners

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Abstract

A detailed investigation on Standardization of recipe for rose gulkand by using natural source of sweeteners was carried out during 2021-22 at the Floricultural Research Station, Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, Hyderabad-30. The experiment was laid out in Completely Randomized Design with three replication and thirteen treatments. They were evaluated for the physico-chemical parameters and sensory values at period of 45 days and 90 days of storage. It was observed that there were significant differences recorded in rose gulkand due to effect of different source of natural sweeteners. The study revealed that T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) was found to be best with desirable TSS (80.83 0B), total sugars (61.22%), ascorbic acid (11.90 mg 100g-1), anthocyanin content (339.54 mg 100g-1), antioxidant activity (16.10% of inhibition). Similarly, in respect with sensory values of colour, flavour, taste, texture, overall acceptability, treatment T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) was at par with T13 - Rose petals + Table Sugar (1:1.0 w/w).

Keywords: Rose, Gulkand, Natural source of sweeteners

Introduction

Edible flowers have been traditionally used in various foods and beverages. Besides their usage in culinary arts for flavour and garnish, they are well known as nutraceuticals because of having phytochemicals and biological properties. Flowers are among the loveliest objects on this earth and among them rose is the queen. Among the rose value added products 'Gulkand' is one of the important products. It is a sweet preserve of rose petals. 'Gulkand' (Golghand or Gulqand) is a two-ingredient dosage form, containing one type of edible petal mixed with sugar according to the traditional Persian medicine. Besides their usage in culinary arts for flavour and garnish, the presence of phytochemicals and biological properties got them to be known as nutraceuticals (Sardari *et al.*, 2018) [7]. Gulkand can make excellent flower processed products due to its high flavour and nutritional value and can reduce postharvest losses. Gulkand is one of the most appetizing ayurvedic preparations. Rose petal gulkand is rich in medicinal and nutritive properties with high calories. However, use of higher quantities of refined sugar causes many health problems and cannot be consumed by all section of people even though gulkand is rich in medicinal and nutritive properties. In order to increase the consumability of rose gulkand to all age groups with low sugars, research on alternate natural source of sugars is required without compromising the physico chemical and sensory attributes. In view of above facts keeping in health consciousness, the present work is formulated to standardize the recipe for rose gulkand by using alternative sources of natural sugars with low sugar content.

Materials and Methods

An investigation on "Standardization of recipe for rose gulkand by using natural source of sweeteners" was carried out during 2021-22 at the Floricultural Research Station, Sri Konda Laxman Telangana State Horticultural University, Rajendranagar, Hyderabad-30. The experiment was laid out in Completely Randomized Design with three replication and thirteen treatments *viz*., T1 - Rose Petals + Coconut sugar (1:0.5 w/w), T2 - Rose Petals + Coconut sugar (1:1.0 w/w), T3 - Rose Petals + Coconut sugar (1:1.5 w/w), T4 - Rose Petals + Palm Jaggery (1:0.5 w/w), T5 - Rose Petals + Palm Jaggery (1:1.0 w/w), T6 - Rose Petals + Palm Jaggery (1:1.5 w/w), T7 - Rose Petals + Honey (1:0.5 w/w), T8 - Rose Petals + Honey (1:1.0 w/w), T9 - Rose Petals + Honey (1:1.5 w/w), T10 - Rose Petals + Dates (1:0.5 w/w), T11 - Rose Petals + Dates (1:1.0 w/w), T12 - Rose Petals + Dates (1:1.5 w/w) and T13 - Rose Petals + Table sugar (1:1.0 w/w). Rose flowers were procured from research station.

Ingredients like coconut sugar, palm jaggery, honey, and dry date fruits were purchased from local supermarket. Fresh rose flowers were taken for preparation of gulkand, flowers were washed and dried. In a glass jar, the weighed amount of rose petals and various quantities of different natural sources of sugars were layered in alternate layers as per treatments. After filling of the jar, open mouth of jar was covered with muslin cloth and labelled as per treatments. Then the labelled jars were kept in hot air oven at 350 – 400C until all the sugars are melted and well mixed with the rose petals for impregnation process of sugars and other natural sugar substitute into rose petals.

Results and Discussion

Physico-chemical parameters

The data regarding the effect of different source of natural sweeteners in rose gulkand at 45 and 90 days of storage and the result of experiment were presented in Table 1 to 5.

Total soluble solids (°Brix)

Data presented in Table 1 shows at 45 days of storage, maximum total soluble solid 79.50 0Brix was with T6 - Rose Petals + Palm Jaggery (1: 1.5 w/w) and was statistically at par with T9 - Rose Petals + Honey (1:1.5 w/w) (77.23 0Brix). In contrast, minimum total soluble solid (4.93 0Brix) was observed in T10 - Rose Petals + Dates (1:0.5 w/w). Similarly, at 90 days of storage maximum total soluble solid (80.83 0Brix) was recorded with T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) which was followed by T9 - Rose Petals + Honey (1:1.5 w/w) (78.17 0Brix). The total soluble solid increased significantly with advancement of storage period. The increase in TSS content corresponds with the increase of hydrolysis of insoluble polysaccharide into soluble sugars in gulkand. Similar findings are also obtained by Sindumathi and Amutha (2014) ^[9] in coconut based jam, Rahman *et al.* (2018) ^[4] in guava jam.

Table 1: Effect of natural sugar sweeteners on TSS (0Brix) of rose gulkand at 45th and 90th days of storage

Treatments	TSS (0Brix)		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	47.70	48.23	47.97
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	73.07	73.93	73.50
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	71.93	72.53	72.23
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	58.87	59.57	59.22
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	65.87	66.30	66.08
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	79.50	80.83	80.17
T7- Rose Petals + Honey (1: 0.5 w/w)	42.97	43.33	43.15
T8- Rose Petals + Honey (1: 1.0 w/w)	76.03	76.60	76.32
T9- Rose Petals + Honey (1: 1.5 w/w)	77.23	78.17	77.70
T10- Rose Petals + Dates (1: 0.5 w/w)	4.93	5.23	5.08
T11- Rose Petals + Dates (1: 1.0 w/w)	6.30	6.63	6.47
T12- Rose Petals + Dates (1: 1.5 w/w)	8.03	8.70	8.37
T13- Rose petals + Table Sugar (1:1.0 w/w)	75.73	76.83	76.28
SEm ±	0.36	0.28	
CD at 5%	1.04	0.82	

Total sugar (%)

The data from Table 2 revealed that maximum total sugar content (60.63%) was registered with T13 - Rose petals + Table Sugar (1:1.0 w/w) and followed by T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) (55.57%). However, minimum total sugar content (11.47

%) was recorded with T10 - Rose Petals + Dates (1:0.5 w/w) during 45 days of storage. Similarly at 90 days of storage, maximum total sugar (61.85%) was recorded with T13 - Rose petals + Table Sugar (1:1.0 w/w) which was statistically at par with T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) (61.22%).

The data from Table 2 interprets that there is increase in level of total sugar percent with advancement of storage duration and with increased level of sugar sweeteners concentration. The increment of total sugar percent is attributed to the breakdown of insoluble polysaccharides into simple sugars by hydrolysis of polysaccharide during storage. There was high polysaccharide content in both sugars and palm jaggery. Our results are in agreement with Prachi *et al.* (2020) ^[3] in gulkand, Sarfarazi (2021) ^[8] in gulkand, Rajkumar *et al.* (2022) ^[6] in rose petal jam.

Table 2: Effect of natural sugar sweeteners on total sugars (%) of rose gulkand at 45th and 90th days of storage

Treatments	Total sugars (%)		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	48.39	50.09	49.24
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	51.72	56.08	53.90
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	53.82	58.26	56.04
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	46.91	48.80	47.86
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	51.95	56.33	54.14
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	55.57	61.22	58.40
T7- Rose Petals + Honey (1: 0.5 w/w)	45.80	46.88	46.34
T8- Rose Petals + Honey (1: 1.0 w/w)	47.63	50.02	48.83
T9- Rose Petals + Honey (1: 1.5 w/w)	51.78	55.27	53.52
T10- Rose Petals + Dates (1: 0.5 w/w)	11.47	11.69	11.58

T11- Rose Petals + Dates (1: 1.0 w/w)	13.69	13.84	13.77
T12- Rose Petals + Dates (1: 1.5 w/w)	15.70	15.83	15.77
T13- Rose petals + Table Sugar (1:1.0 w/w)	60.63	61.85	61.24
SEm ±	0.62	0.49	
CD at 5%	1.81	1.43	

Ascorbic Acid (mg 100g-1)

An analysis of Table 3 revealed the degradation of ascorbic acid content was with advancement of storage and with increase of sugar concentration of different natural sweeteners. The desirable level of ascorbic acid was with T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) (13.78–11.90 mg 100g-1) which was statistically at par with check T13 - Rose petals + Table Sugar (1:1.0 w/w) (14.89 – 13.65 mg 100g-1)

at 45 and 90 days of storage.

The degradation of ascorbic acid with advancement of storage is caused by oxidation of ascorbic acid in presence of light, heat, oxygen, enzymes (Prachi *et al.*, 2020) [3]. The ascorbic acid content of present study might be attribute by natural sugars, honey has 1 to 50 mol L-1. The decline in ascorbic acid content was also observed by Sarfarazi (2021) [8] in gulkand, Rajkumar *et al.* (2022) [6] in rose petal jam.

Table 3: Effect of natural sugar sweeteners on ascorbic acid (mg 100g-1) of rose gulkand at 45th and 90th days of storage

Treatments	Ascorbic ACID (mg 100g-1)		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	14.47	13.53	14.00
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	13.77	12.60	13.18
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	12.83	11.90	12.37
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	15.87	14.00	14.93
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	14.48	12.60	13.54
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	13.78	11.90	12.84
T7- Rose Petals + Honey (1: 0.5 w/w)	15.63	13.77	14.70
T8- Rose Petals + Honey (1: 1.0 w/w)	14.70	13.07	13.88
T9- Rose Petals + Honey (1: 1.5 w/w)	12.83	11.67	12.25
T10- Rose Petals + Dates (1: 0.5 w/w)	11.67	10.03	10.85
T11- Rose Petals + Dates (1: 1.0 w/w)	10.27	9.33	9.80
T12- Rose Petals + Dates (1: 1.5 w/w)	8.87	7.70	8.28
T13- Rose petals + Table Sugar (1:1.0 w/w)	14.93	13.65	14.29
SEm ±	0.51	1.34	
CD at 5%	1.50	3.90	

Anthocyanin (mg 100g-1)

It is clear that from Table 4 anthocyanin content is inversely proportional to sugar concentration i.e decrease of anthocyanin content with increase of sugar concentration. Similarly, there was gradual decrease of anthocyanin with advancement of storage period. The desirable anthocyanin content was recorded with T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) (345.11 to 339.54 mg 100g-1) which was statistically at par with T13 - Rose petals + Table Sugar (1:1.0

w/w) (352.06 to 344.76 mg100g-1).

The decrease of anthocyanin with increment of storage period and sugar concentration might be due to condensation reaction which degrades both ascorbic acid and anthocyanin, when both comes to interaction with each other. Present findings are in corresponding to Aggrawal and Kaur (2017) [1] in various rose products at ambient storage, Rajkumar *et al.* (2022) [6] in rose petal jam, Sarfarazi (2021) [8] in gulkand with sugar and sugar candy at different levels.

Table 4: Effect of natural sugar sweeteners on anthocyanin (mg 100g-1) of rose gulkand at 45th and 90th days of storage

Treatments	Anthocyanin (mg 100g-1)		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	424.43	420.26	422.34
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	374.33	365.98	370.16
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	333.97	332.59	333.28
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	435.56	427.21	431.39
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	385.46	374.33	379.90
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	345.11	339.54	342.33
T7- Rose Petals + Honey (1: 0.5 w/w)	416.08	406.34	411.21
T8- Rose Petals + Honey (1: 1.0 w/w)	378.50	370.16	374.33
T9- Rose Petals + Honey (1: 1.5 w/w)	343.71	332.59	338.15
T10- Rose Petals + Dates (1: 0.5 w/w)	189.25	173.95	181.60
T11- Rose Petals + Dates (1: 1.0 w/w)	164.20	148.90	156.55
T12- Rose Petals + Dates (1: 1.5 w/w)	153.07	130.81	141.94
T13- Rose petals + Table Sugar (1:1.0 w/w)	352.06	336.76	344.41
SEm ±	1.64	1.54	
CD at 5%	4.76	4.49	

Antioxidant Activity (% of inhibition)

The data of Table 5 revealed the desirable antioxidant activity

of rose gulkand was recorded in T6 - Rose Petals + Palm jaggery (1:1.5 w/w) (17.98% to 16.10% of inhibition) which

was statistically at par with T13 - Rose petals + Table Sugar (1:1.0 w/w) (18.95% to 17.80% of inhibition). An analysis of Table 5 divulged that there was decreasing pattern of antioxidant with increment of storage period and also with increase in concentration of natural sweeteners. The decrease in the antioxidant activity may be linked to decrease in the content of phytonutrients such as total phenolics and ascorbic

acid. Similar loss of antioxidant activity was observed by Kanwal *et al.* (2017) [2] in guava, this might be due to development of antioxidant millard products all through jam preparation. Aggrawal and Kaur (2017) [1] in different rose products recorded the loss in mean antioxidant capacity for 3.20%.

Table 5: Effect of natural sugar sweeteners on antioxidant activity (% of inhibition) of rose gulkand at 45th and 90th days of storage

Treatments	Antioxidant activity (% of inhibition)		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	22.26	21.18	21.72
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	16.87	12.50	14.69
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	13.41	11.37	12.39
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	23.02	20.35	21.69
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	19.95	17.90	18.93
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	17.98	16.10	17.04
T7- Rose Petals + Honey (1: 0.5 w/w)	25.32	23.54	24.43
T8- Rose Petals + Honey (1: 1.0 w/w)	24.63	22.00	23.32
T9- Rose Petals + Honey (1: 1.5 w/w)	21.58	19.03	20.30
T10- Rose Petals + Dates (1: 0.5 w/w)	25.11	20.01	22.56
T11- Rose Petals + Dates (1: 1.0 w/w)	18.33	17.82	18.08
T12- Rose Petals + Dates (1: 1.5 w/w)	16.77	14.22	15.50
T13- Rose petals + Table Sugar (1:1.0 w/w)	18.95	17.80	18.38
SEm ±	0.23	0.68	
CD at 5%	0.67	1.97	

Sensory values

The data recorded effect of different natural sources of sweeteners on sensory values of rose gulkand at 45 and 90 days of storage is presented in Table 6 to 10

Colour

The data of Table 6 divulged there was a significant decline in colour of rose gulkand with advance of storage period. The highest score was with T9 - Rose Petals + Honey (1:1.5 w/w)

(7.73 to 7.64) and followed by T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) (7.55 to 7.45) at end of storage period due to bright colour of honey. The colour reduction of rose gulkand with increase of storage might be due to oxidation and enzymatic browning which results in discolouration of product. Present findings are similar with Rajkumar *et al.* (2022) [6] in rose petal jam, Prachi Tamrakar *et al.* (2020) [3] in gulkand, Ullah *et al.* (2018) [10] in carrot and apple blended jam.

Table 6: Effect of natural sugar sweeteners on colour of rose gulkand at 45th and 90th days of storage

Treatments	Colour		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	3.82	3.27	3.55
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	6.91	6.09	6.50
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	4.09	3.55	3.82
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	3.45	3.27	3.36
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	4.82	4.27	4.55
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	7.55	7.45	7.50
T7- Rose Petals + Honey (1: 0.5 w/w)	4.55	4.09	4.32
T8- Rose Petals + Honey (1: 1.0 w/w)	6.55	6.36	6.45
T9- Rose Petals + Honey (1: 1.5 w/w)	7.73	7.64	7.68
T10- Rose Petals + Dates (1: 0.5 w/w)	1.73	0.00	0.86
T11- Rose Petals + Dates (1: 1.0 w/w)	2.09	0.00	1.05
T12- Rose Petals + Dates (1: 1.5 w/w)	2.27	0.00	1.14
T13- Rose petals + Table Sugar (1:1.0 w/w)	7.55	7.36	7.45
SEm ±	0.23	0.39	
CD at 5%	0.65	1.13	

Flavour

The apparent data of table 7 revealed that flavour of rose gulkand decreased significantly with increase in storage period. The highest score (8.27 to 7.73) was with T6 - Rose Petals + Palm Jaggery (1:1.5 w/w) and followed by T13 - Rose petals + Table Sugar (1:1.0 w/w) (8.09 to 7.64).

According to Sarfarazi (2021) [8] in gulkand with sugar and sugar candy at different levels, the reduction of flavour with longer storage period was attributed by loss of highly volatile aromatic compound which was very sensitive to high storage temperature as well as enzymatic degradation of phenols and oxidative changes of sugars during storage.

Table 7: Effect of natural sugar sweeteners on flavour of rose gulkand at 45th and 90th days of storage

Treatments	Flavour		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	4.36	4.27	4.32
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	7.45	7.09	7.27
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	6.64	5.36	6.00
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	3.82	3.45	3.64
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	5.36	4.91	5.14
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	8.27	7.73	8.00
T7- Rose Petals + Honey (1: 0.5 w/w)	4.45	4.09	4.27
T8- Rose Petals + Honey (1: 1.0 w/w)	6.36	5.82	6.09
T9- Rose Petals + Honey (1: 1.5 w/w)	7.82	7.09	7.45
T10- Rose Petals + Dates (1: 0.5 w/w)	2.09	0.00	1.05
T11- Rose Petals + Dates (1: 1.0 w/w)	2.73	0.00	1.36
T12- Rose Petals + Dates (1: 1.5 w/w)	3.27	0.00	1.64
T13- Rose petals + Table Sugar (1:1.0 w/w)	8.09	7.64	7.86
SEm ±	0.48	0.36	
CD at 5%	1.39	1.05	

Texture

The data of Table 8 showed that texture of rose gulkand had diminishing trend with advancement of storage period. T13 - Rose petals + Table Sugar (1:1.0 w/w) has highest score (8.45 to 8.09) which was followed by T6 - Rose Petals + Palm Jaggery (1: 1.5 w/w) (7.55 to 7.27).

The decline trend of texture might be due to the effect of biochemical and atmospheric moisture changes during storage. Our results were in correspondence with findings of Rajkumar *et al.* (2018) ^[5] in rose petal jam, Aggarwal and Kaur (2017) ^[1] in rose extract in different valuable products and by products, Sarfarazi (2021) ^[8] in gulkand.

Table 8: Effect of natural sugar sweeteners on texture of rose gulkand at 45th and 90th days of storage

Treatments	Texture 45 th Day	90 th Day	Mean
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	5.55	5.18	5.36
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	7.09	6.91	7.00
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	4.18	3.91	4.05
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	5.45	5.18	5.32
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	7.27	6.55	6.91
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	7.55	7.27	7.41
T7- Rose Petals + Honey (1: 0.5 w/w)	6.27	5.73	6.00
T8- Rose Petals + Honey (1: 1.0 w/w)	7.36	6.82	7.09
T9- Rose Petals + Honey (1: 1.5 w/w)	7.45	7.09	7.27
T10- Rose Petals + Dates (1: 0.5 w/w)	1.64	0.00	0.82

Taste

The data on Table 9 showed that there was a decreasing trend on taste of rose gulkand with longer storage period. T13 - Rose petals + Table Sugar (1:1.0 w/w) scored highest (8.18 to 7.91) and followed by T6 - Rose Petals + Palm Jaggery (1: 1.5 w/w) is on same level (8.09 to 7.73).

The decrease of taste of rose gulkand might be due to adverse effect of fluctuations in acids, decrease in pH, sugar/acid ratio. Our current results are in conformity with the findings of Aggarwal and Kaur (2017) ^[1] in rose extract in different valuable products and by products, Sarfarazi (2021) ^[8] in gulkand.

Table 9: Effect of natural sugar sweeteners on taste of rose gulkand at 45th and 90th days of storage

Treatments	Taste 45 th Day	90 th Day	Mean
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	4.09	3.73	3.91
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	6.82	6.09	6.45
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	5.45	5.18	5.32
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	5.91	5.27	5.59
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	7.36	6.91	7.14
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	8.09	7.73	7.91
T7- Rose Petals + Honey (1: 0.5 w/w)	6.36	6.09	6.23
T8- Rose Petals + Honey (1: 1.0 w/w)	7.09	6.73	6.91
T9- Rose Petals + Honey (1: 1.5 w/w)	7.82	7.27	7.55
T10- Rose Petals + Dates (1: 0.5 w/w)	1.73	0.00	0.86
T11- Rose Petals + Dates (1: 1.0 w/w)	2.64	0.00	1.32
T12- Rose Petals + Dates (1: 1.5 w/w)	3.18	0.00	1.59
T13- Rose petals + Table Sugar (1:1.0 w/w)	8.18	7.91	8.05
SEm ±	0.39	0.63	
CD at 5%	1.12	1.83	

Overall Acceptability

Data of table 10 revealed that the overall acceptability of rose gulkand decreased with advancement of storage period. The highest score (8.36 to 8.18) was with T13 - Rose petals + Table Sugar (1:1.0 w/w) which was at par with T6 - Rose Petals + Palm Jaggery (1: 1.5 w/w) (8.18 to 7.91).

The degradation in overall acceptability with increment of storage was due to the decline of colour, flavour, texture and taste with increasing storage period. Present findings are in similarity with Sarfarazi (2021)^[8] in gulkand, Rajkumar *et al.* (2018)^[5] in rose petal jam.

Table 10: Effect of natural sugar sweeteners on overall acceptability of rose gulkand at 45th and 90th days of storage

Treatments	Overall acceptability		Mean
	45 th Day	90 th Day	
T1- Rose Petals + Coconut Sugar (1: 0.5 w/w)	5.27	5.09	5.18
T2- Rose Petals + Coconut Sugar (1: 1.0 w/w)	7.18	7.09	7.14
T3- Rose Petals + Coconut Sugar (1: 1.5 w/w)	5.45	5.09	5.27
T4- Rose Petals + Palm Jaggery (1: 0.5 w/w)	5.55	5.27	5.41
T5- Rose Petals + Palm Jaggery (1: 1.0 w/w)	7.09	6.82	6.95
T6- Rose Petals + Palm Jaggery (1: 1.5 w/w)	8.18	7.91	8.05
T7- Rose Petals + Honey (1: 0.5 w/w)	5.18	4.91	5.05
T8- Rose Petals + Honey (1: 1.0 w/w)	7.09	6.82	6.95
T9- Rose Petals + Honey (1: 1.5 w/w)	7.91	7.64	7.77
T10- Rose Petals + Dates (1: 0.5 w/w)	1.73	0.00	0.86
T11- Rose Petals + Dates (1: 1.0 w/w)	2.27	0.00	1.14
T12- Rose Petals + Dates (1: 1.5 w/w)	3.18	0.00	1.59
T13- Rose petals + Table Sugar (1:1.0 w/w)	8.36	8.18	8.27
SEm ±	0.75	0.44	
CD at 5%	2.18	1.27	

Conclusion

From above results the present investigation on “Standardization of Recipe for Rose Gulkand by using Natural Source of Sweeteners” can be concluded that palm jaggery (1:1.5 w/w) can be used as best alternative to table sugar (1:1.0 w/w) in preparation of rose gulkand as low calorie substitute to cane sugar.

Future scope

From the investigation it is evident we can development of new combination of different natural source of sweeteners to improve the physico chemical and storage qualities. And also use new varieties or different species of rose can be suggested for utilized in production of gulkand.

Acknowledgement

The authors are grateful to Sri Konda Laxman Telangana State Horticultural University for sharing their valuable resources and providing me timely help.

Conflict of Interest

None

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