International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(12): 1330-1336
www.biochemjournal.com
Received: 05-09-2025
Accepted: 09-10-2025

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Standardization of a recipe for the preparation of rose petal jam (GULKHAND)

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i12Sp.6710

Abstract
The present experiment "Standardization of a recipe for the preparation of Rose Petal Jam (Gulkhand)" was carried out during August 2023 to December 2023 in Post Harvest Laboratory of Department of Horticulture, SHUATS, Prayagraj. The experiment was laid out in a Completely Randomized Design with 12 treatments and 3 replications. The treatment consisted of Sugar, Jaggery, Honey and Date palm with 75%, 100% and 125% each per kg Rose petals. It was observed that the quality observations and sensory evaluation were affected by various treatments. Based on the results and findings of the present experiment, it can be concluded that different treatments influenced the quality of Rose petal jam throughout the storage period. The results indicated that the treatment T_3- rose petal + sugar (1:1.25Kg) was found the most suitable than all different treatments with respect to total sugar, total soluble solids, pH, and acidity, and in terms of sensory qualities i.e. color, Flavour, taste, texture, and overall acceptability. The treatment T_1 in terms of ascorbic acid, in terms of benefit cost ratio, the treatment T_1 was recorded as the best during the storage period of 60 days among all the parameters.

Keywords: Gulkhand, sensory quality, treatment, benefit cost ratio

Introduction
The Rose plant belongs to the family of Rosaceae and genus Rosa, it contains diploid C.N. (2n) =14 which includes 200 sp. and more than 18000 cultivars. (*Ginova et al.2013*) [1]. Presently in India total area under floriculture about 309.26 thousand hectares with a production of loose flowers amounting to 1652.99 Thousand MT and cut flowers up to 593.41 thousand MT during 2016- In India rose is grown in an area of 30.87million hectares with an annual production 212.67 thousand MT. Their cultivation is concentrated at Aligarh, Kannauj, Gazipur, Ballia, and Jaunpur in Uttar Pradesh. In Maharashtra, Rajasthan, Madhya Pradesh, Karnataka and Andhra Pradesh, Gulkand is greatly in demand. UP is one of the best in 'gulkand' production in the country, with Kannauj being a major hub. About 75 percent of this produce is exported to West-Asian countries in the form of petals, ascertaining the importance of rose for it's by products. Among the various varieties, damask rose (Rosa damascena Mill.) is the most important rose species used to produce rose oil, water, gulkand, concrete and absolute which are valuable and important base materials for the perfume and cosmetic industry (*Ayci et al., 2005*) [2]. Rosa damascena is known as Damask rose. The summer Damask rose was hybrid between R. phoenicia ×R. gallica, while the autumn Damask, R. × bifera came from R. gallica × R. moschata or R. canina. It is an old vigorous shrub with exquisite fragrance, bears clusters of pink to red, double petalled flowers. Gulkand is a sweet preserve made by mixing a blend of rose petals and sugar in equal ratio. It is one of the most delicious ayurvedic preparations which has been used since ancient times for good strength. Gulkand is mainly prepared from sp. like R. chinensis, R. gallica, R. pomifera, R. centifolia and R. bourboniana. Among the diverse varieties, damask rose (Rosa damascena Mill.) is the main rose species utilized to make rose oil, rose water, gulkand, concrete and absolute which are valuable and important raw materials for the perfume and cosmetic industry. Rose is a potential source of nutraceutical compounds with high gastronomic importance *(Athrinandan et al 2022)* [3].

Consumption of Gulkand provides a list of the profits on an ordinary basis according to the National Institute of Ayurvedic Medicine. It acts as a tonic which decreases stress and strengthens the heart and central nervous system of human beings and decreases redness and swelling of the eyes. It treats ulcers in the mouth and makes teeth and gums powerful. It is a good rejuvenator that corrects skin problems like pimples and blemishes. It repairs sperm abnormalities in males, such as less number or weak sperm. Protects from sunstroke and prevents bleeding of the nose during the summer season. Moreover, this is a gentle laxative, it reinforces the body's 7 Dhatus (fundamental elements or tissues such as plasma, blood, muscles, fat, sperm, bone, and bone marrow), as par suggested by *Rudrawar and Singar (2017)* [4].

The only disadvantage of gulkand is that diabetics should avoid it. It has a lot of sugar in it, which might cause your blood sugar to rise *(Sao and Sharma, 2021)* [5].

Materials and Methods

The present experiment "Standardization of a recipe for the preparation of Rose petals Jam (Gulkhand)" was carried out during August 2023 to December 2023 in the Post Harvest Laboratory of Department of Horticulture, SHUATS, Prayagraj (U.P.) during the academic year 2023-2024. The Rose petal Jam (Gulkhand) was laid out in a Completely Randomized Design with 12 treatments and 3 replications, The sample was stored for a period of 60 days under ambient temperature. The treatments were T_1 Rose: Sugar (1:0.75 Kg), T_2 Rose; Sugar (1:1 Kg), T_3 Rose: Sugar (1:1.25 Kg), T_4 Rose: Honey (1:0.75 Kg), T_5 Rose: Honey (1:1 Kg), T_6 Rose: Honey (1:1.25 Kg), T_7 Rose: Jaggery (1:0.75 Kg), T_8 Rose: Jaggery (1:1 Kg), T_9 Rose: Jaggery (1:1.25 Kg), T_{10} Rose: Date palm (1:0.75 Kg), T_{11} Rose: Date palm (1:1 Kg), T_{12} Rose: Date palm (1:1.25 Kg).

Procedure for preparation of Rose petal Jam (Gulkhand)

The Rose petals to be processed were washed gently under tap water to remove dust, dirt and other undesired materials adhering to the petals, make sure they are dry and clean. Weigh and Add the Rose petals and sugar or honey or jaggery or date palm powder as per treatment combination Arrange a layer of rose petals, top it with a layer of granulated sugar or honey or jaggery or date palm powder, keep alternating till the jar is full, close the lid tightly. Keep it in sunlight daily for impregnation of sugar, honey, jaggery, date palm powder into petals. Every alternate day, mix the ingredients together with a wooden spoon. Jam like consistency is for checking (endpoint) of rose petal Jam. The Rose petal Jam was stored in sterilized & airtight containers at ambient temperature. This was then subsequently used for periodical evaluation at 0-, 20-, 40- and 60-days interval for a period.

Sensory analysis of Rose petal Jam (Gulkhand)

For statistical analysis samples were evaluated for TSS, Acidity, pH, Total sugar, Ascorbic acid and sensory evaluation for colour and appearance, flavour and taste, texture and overall acceptability was performed by a panel of 9 members. The samples were presented to 9 members. The members were asked to rate the different composition presented to them on a 9-point hedonic scale with the ratings of: 9 = Like extremely; 8 = Like very much; 7 = Like moderately; 6 = Like slightly; 5 = Neither like nor dislike; 4 = Dislike slightly; 3 = Dislike moderately; 2 = Dislike very much; and 1 = Dislike extremely. The result was analyzed by statistical software (statistics).

Results and Discussion

Physico-chemical properties of Rose petal Jam (Gulkhand)

The nutritional properties of Rose petal Jam was determined by evaluating its physico-chemical parameters viz. Total Soluble Solids, Acidity, pH, Total Sugars and Ascorbic acid.

Total Soluble Solids (0Brix)

The maximum TSS (Total soluble solids) (70.41, 70.99, 72.02 and 73.68) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 whereas the minimum TSS (Total soluble solids) (1.02, 2.15, 4.93 and 5.15) was observed at initial, 20, 40 and 60 days respectively in the treatment T_{10}. The total soluble solids of rose petal Jam increased significantly with advancement of storage period. A slightly increase in TSS during storage might be due to conversion of polysaccharides into soluble sugars in gulkhand. Similar finding was also reported by Chanbisana and Banik (2007), Sindumathi and Amutha (2014) [19] in coconut-based jam, Rahman *et al.,* (2018) [20] in guava jam. Rajkumar *et al.,* (2018) [21] in rose petal jam (gulkhand).

Acidity (%)

The maximum acidity (%) (0.41, 0.41, 0.45 and 0.46) was observed at initial, 20, 40 and 60 days respectively in the treatment T_7 where the minimum acidity (0.10, 0.12, 0.13 and 0.15) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3. The acidity (%) of rose petal Jam shows the degradation of pectin substances into soluble solids might have contributed towards increase the level of acidity in the during storage period of Aonla jam. Similar findings were also obtained by Chanbisana and Banik (2007), Rajkumar *et al.,* (2018) [21] in rose petal jam (gulkhand).

Total pH

The maximum Total pH (5.14, 5.19, 5.16 and 5.12) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum pH (4.78, 4.69, 4.55 and 4.49) was observed at initial, 20, 40 and 60 days respectively in the treatment T_{10}.The pH during storage may be due to changes in chemical properties which are affected by storage conditions. This finding agreed with the finding of Rayguru *et al.,* (2008) and Vikram and Prasad (2014) [22], also reported similar trend in apple jam, Rajkumar *et al.,* (2018) [21] in gulkhand.

Total Sugar (%)

The maximum total sugar (%) (61.30, 62.32, 63.21 and 63.34) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum Total sugar (%) (12.01, 12.20, 12.45 and 12.55) was observed at initial, 20, 40 and 60 days respectively in treatment T_{10} the increment of total sugar percent is attributed to the breakdown of insoluble polysaccharides into simple sugar by hydrolysis of polysaccharide during storage. Our results are similar with Prachi *et al.,* (2020) in gulkhand, Sarfarazi (2021) [23] in gulkhand and Rajkumar *et al.,* (2022) [8] in rose petal jam.

Ascorbic Acid

The maximum ascorbic acid (20.35, 16.50, 15.10 and 13.34) was observed at initial, 20, 40 and 60 days respectively in the treatment T_1 where the minimum Ascorbic acid (10.20,

9.25, 8.05 and 7.20) was observed at initial, 20, 40 and 60 days in the treatment T_{12} respectively. In rose petal Jam the pattern of decreasing of ascorbic acid (mg/100g) during storage might be due to increase in temperature level which was affect the ascorbic acid due to its thermolabile nature which was destroyed with temperature during storage period. Moreover, it may probably due to the process of oxidation of ascorbic acid into dehydroascorbic acid by enzyme ascorbinase. the decreasing trend of the ascorbic acid over storage period was given by Patel *et al.* (2015) [24] in Pineapple blended with banana jam. The decline in ascorbic acid content was also observed by Sarfarazi (2021) [23] in gulkhand, Rajkumar *et al.*, (2022) [8] in rose petal jam.

Organoleptic properties of rose petal Jam (Gulkhand)

The sensory acceptability of rose petal Jam (Gulkhand) was evaluated by analyzing its organoleptic properties viz. colour and appearence, flavour, taste, texture and overall acceptability.

Colour and Appearance

The maximum colour and appearance score (8.56, 7.52, 7.23 and 7.15) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum Colour and Appearance score (2.64, 2.00, 1.88 and 1.42) was observed at initial, 20, 40 and 60 days in the treatment T_{10} respectively. In rose petal jam the deterioration of colour due to enzymatic and non-enzymatic reactions on pigment during storage of products impair the quality of the products. Similar findings were similar with Rajkumar *et al.*, (2022) [8], in gulkhand and Ullah (2018) in carrot and apple blended jam.

Flavour

The maximum flavour score (8.68, 8.65, 8.48 and 8.45) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum flavour score (2.65, 2.52, 2.48 and 1.84) was observed at initial, 20, 40 and 60 days in the treatment T_{10} respectively. In gulkhand 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 a very sensitive to high storage temperature as well as enzymatic degradation of phenols and oxidative changes of sugar during storage. These results were similar to the study by Patel *et al.*, (2015) [24] and Rajkumar *et al.*, (2018).

Taste

The maximum taste score (8.92, 8.88, 8.55 and 8.43) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum taste score (2.64, 2.40, 2.30 and 2.08) was observed at initial, 20, 40 and 60 days in the treatment T_{10} respectively. The decrease of taste of rose gulkhand 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 Agrawal and Kaur (2017), in rose extract in different valuable products and byproducts, Sarfarazi (2021) [23] and Rajkumar *et al.*, (2018) [21] in gulkhand.

Texture

The maximum texture score (9.38, 9.32, 9.22 and 9.17) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum texture score (2.50, 2.38, 2.16 and 2.08) was observed at initial, 20, 40 and 60 days in the treatment T_{10} respectively. The decline trend of texture in rose petal Jam might be due to the effect of biochemical and atmosphere moisture changes during storage. Our results were in correspondence with the finding of Rajkumar *et al*., (2018) in rose petal jam. Agrawal and Kaur (2017) in different valuable products and byproducts, Sarfarazi (2021) [23] in Gulkhand.

Overall acceptability

The maximum overall acceptability score (8.77, 8.54, 8.42 and 8.35) was observed at initial, 20, 40 and 60 days respectively in the treatment T_3 where the minimum overall acceptability score (2.30, 2.18, 2.08 and 2.01) was observed at initial, 20, 40 and 60 days in the treatment T_{10} respectively. Overall acceptability scores of rose petal Jam were decreased in all the treatments during storage due to decline in colour, consistency and flavour scores. Similar results were reported by Sarfarazi (2021) [23] in gulkhand and Rajkumar *et al.*, (2018) [21] in rose petal jam.

Economics

In terms of economics, the maximum benefit cost ratio (1.30) was recorded in the treatment T_1 Rose petals + sugar (1:0.75 Kg) with the Gross return, Net Return and Total cost being (₹ 1000), (₹ 565) and (₹ 435) respectively and minimum benefit cost ratio (0.07) was recorded in the treatment T_{12} Rose Petals
+ Date (1:1.25 Kg) with their Gross return, Net return and Total cost being (₹ 1500), (₹ 95) and (₹ 1405) respectively.

Table 1: Effect of various treatment combinations on T.S.S (°B) of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment		Storage p		T.S.S (° Brix) eriod (Days)	
notion	Treatment combination	1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	68.12	69.32	71.00	71.00
T_2	Rose Petals + Sugar (1:1 Kg)	69.28	70.34	71.55	72.67
T_3	Rose Petals + Sugar (1:1.25 Kg)	70.41	70.99	72.02	73.68
T_4	Rose Petals + Honey (1:0.75 Kg)	45.31	46.67	47.22	49.98
T_5	Rose Petals + Honey (1:1 Kg)	46.27	48.62	49.86	51.22
T_6	Rose Petals + Honey (1:1.25 Kg)	47.16	50.12	51.56	52.56
T_7	Rose Petals + Jaggery (1:0.75 Kg)	52.88	53.52	54.67	56.53
T_8	Rose Petals + Jaggery (1:1 Kg)	53.45	54.27	56.25	57.72
T_9	Rose Petals + Jaggery (1:1.25 Kg)	53.80	55.11	57.32	57.86
T_{10}	Rose Petals + Date (1:0.75 Kg)	1.02	2.15	4.93	5.15
T_{11}	Rose Petals + Date (1:1 Kg)	1.32	3.15	6.30	6.45
T_{12}	Rose Petals + Date (1:1.25 Kg)	2.01	4.03	8.00	8.04
	C.V.	0.525	0.392	0.265	0.117
	F' Test	S	S	S	S
	S.E.(d)	0.183	0.141	0.100	0.044
	C.D. at 5 %	0.37	0.291	0.205	0.091

Table 2: Effect of various treatment combinations on Acidity (%) of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Total acidity (%)			
		Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	0.12	0.13	0.15	0.17
T_2	Rose Petals + Sugar (1:1 Kg)	0.11	0.12	0.15	0.16
T_3	Rose Petals + Sugar (1:1.25 Kg)	0.10	0.12	0.13	0.15
T_4	Rose Petals + Honey (1:0.75 Kg)	0.22	0.23	0.25	0.28
T_5	Rose Petals + Honey (1:1 Kg)	0.21	0.20	0.24	0.25
T_6	Rose Petals + Honey (1:1.25 Kg)	0.18	0.19	0.20	0.23
T_7	Rose Petals + Jaggery (1:0.75Kg)	0.41	0.41	0.45	0.46
T_8	Rose Petals + Jaggery (1:1 Kg)	0.40	0.40	0.43	0.45
T_9	Rose Petals + Jaggery (1:1.25 Kg)	0.36	0.39	0.43	0.44
T_{10}	Rose Petals + Date (1:0.75 Kg)	0.38	0.33	0.23	0.17
T_{11}	Rose Petals + Date (1:1 Kg)	0.39	0.35	0.26	0.18
T_{12}	Rose Petals + Date (1:1.25 Kg)	0.41	0.37	0.29	0.20
C.V.		12.89	13.81	18.90	19.88
F' Test		S	S	S	S
S.E.(d)		0.060	0.030	0.041	0.042
C.D.5%		0.029	0.063	0.085	0.088

Table 3: Effect of various treatment combinations on total pH of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Total pH			
		Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	5.11	5.09	5.02	4.93
T_2	Rose Petals + Sugar (1:1 Kg)	5.23	5.14	5.08	5.08
T_3	Rose Petals + Sugar (1:1.25 Kg)	5.14	5.19	5.16	5.12
T_4	Rose Petals + Honey (1:0.75 Kg)	5.03	4.92	4.82	4.53
T_5	Rose Petals + Honey (1:1 Kg)	5.12	5.06	5.05	4.53
T_6	Rose Petals + Honey (1:1.25 Kg)	5.18	5.15	5.13	4.52
T_7	Rose Petals + Jaggery (1:0.75 Kg)	4.89	4.74	4.63	4.52
T_8	Rose Petals + Jaggery (1:1 Kg)	5.12	5.09	5.06	4.64
T_9	Rose Petals + Jaggery (1:1.25Kg)	5.14	5.24	5.15	4.81
T_{10}	Rose Petals + Date (1:0.75 Kg)	4.78	4.69	4.55	4.49
T_{11}	Rose Petals + Date (1:1 Kg)	5.10	5.06	5.04	4.65
T_{12}	Rose Petals + Date (1:1.25 Kg)	5.16	5.10	5.06	5.01
	C.V.	0.630	0.673	0.603	0.739
	F' Test	S	S	S	S
	S.E.(d)	0.026	0.028	0.024	0.029
	C.D.5%	0.054	0.057	0.051	0.059

Table 4: Effect of various treatment combinations on Total sugar (%) of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Total sugar			
		Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	60.83	61.32	61.89	62.45
T_2	Rose Petals + Sugar (1:1 Kg)	60.90	61.56	62.32	63.00
T_3	Rose Petals + Sugar (1:1.25 Kg)	61.30	62.32	63.21	63.34
T_4	Rose Petals + Honey (1:0.75 Kg)	47.46	48.65	48.80	48.96
T_5	Rose Petals + Honey (1:1 Kg)	48.65	49.03	49.48	50.54
T_6	Rose Petals + Honey (1:1.25 Kg)	49.32	49.67	50.30	50.2
T_7	Rose Petals + Jaggery (1:0.75 Kg)	50.43	51.54	52.34	53.45
T_8	Rose Petals + Jaggery (1:1 Kg)	51.40	52.44	52.67	53.56
T_9	Rose Petals + Jaggery (1:1.25 Kg)	51.28	52.53	53.56	53.66
T_{10}	Rose Petals + Date (1:0.75 Kg)	12.01	12.20	12.45	12.55
T_{11}	Rose Petals + Date (1:1 Kg)	13.05	13.30	13.65	13.80
T_{12}	Rose Petals + Date (1:1.25 Kg)	15.10	15.40	15.60	15.70
C.V.		0.257	0.069	0.180	0.184
F' Test		S	S	S	S
S.E.(d)		0.091	0.026	0.066	0.069
C.D.5%		0.188	0.073	0.136	0.140

Table 5: Effect of various treatment combinations on ascorbic acid of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Ascorbic acid (mg/100g) Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	20.35	16.50	15.10	13.34
T_2	Rose Petals + Sugar (1:1 Kg)	18.40	15.16	12.63	11.50
T_3	Rose Petals + Sugar (1:1.25 Kg)	17.60	15.20	12.63	11.14
T_4	Rose Petals + Honey (1:0.75 Kg)	16.50	14.00	12.93	12.48
T_5	Rose Petals + Honey (1:1 Kg)	15.50	13.60	12.60	12.26
T_6	Rose Petals + Honey (1:1.25 Kg)	13.77	13.40	12.48	12.26
T_7	Rose Petals + Jaggery (1:0.75 Kg)	16.40	15.80	12.81	11.77
T_8	Rose Petals + Jaggery (1:1 Kg)	15.50	14.61	12.29	11.21
T_9	Rose Petals + Jaggery (1:1.25Kg)	14.60	13.50	12.23	11.12
T_{10}	Rose Petals + Date (1:0.75 Kg)	12.87	11.60	10.60	9.80
T_{11}	Rose Petals + Date (1:1 Kg)	12.60	11.30	10.20	9.30
T_{12}	Rose Petals + Date (1:1.25 Kg)	10.20	9.25	8.05	7.20
C.V.		0.172	0.220	0.256	0.285
F' Test		S	S	S	S
S.E.(d)		0.022	0.024	0.025	0.026
C.D.5%		0.045	0.051	0.052	0.053

Table 6: Effect of various treatment combinations on colour and appearance of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination		Colour and Appearance Storage period (Days)		
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	8.02	7.23	7.01	6.89
T_2	Rose Petals + Sugar (1:1 Kg)	8.35	7.43	7.16	7.12
T_3	Rose Petals + Sugar (1:1.25 Kg)	8.56	7.52	7.23	7.15
T_4	Rose Petals + Honey (1:0.75 Kg)	5.39	5.16	5.12	4.92
T_5	Rose Petals + Honey (1:1 Kg)	5.65	5.18	5.15	5.04
T_6	Rose Petals + Honey (1:1.25 Kg)	5.70	5.22	5.22	5.09
T_7	Rose Petals + Jaggery (1:0.75 Kg)	4.76	4.67	4.03	4.01
T_8	Rose Petals + Jaggery (1:1 Kg)	4.85	4.72	4.34	4.11
T_9	Rose Petals + Jaggery (1:1.25 Kg)	4.84	4.79	4.66	4.37
T_{10}	Rose Petals + Date (1:0.75 Kg)	2.64	2.00	1.88	1.42
T_{11}	Rose Petals + Date (1:1 Kg)	2.84	2.20	2.08	1.98
T_{12}	Rose Petals + Date (1:1.25 Kg)	2.99	2.35	2.10	2.00
	C.V.	0.644	0.633	0.643	0.627
	F' Test	S	S	S	S
	S.E.(d)	0.028	0.025	0.024	0.023
	C.D.5%	0.059	0.052	0.051	0.048

Table 7: Effect of various treatment combinations on Flavour of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Flavour Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	8.78	8.46	8.25	8.19
T_2	Rose Petals + Sugar (1:1 Kg)	8.52	8.64	8.45	8.44
T_3	Rose Petals + Sugar (1:1.25 Kg)	8.68	8.65	8.48	8.45
T_4	Rose Petals + Honey (1:0.75 Kg)	4.56	4.42	4.40	4.39
T_5	Rose Petals + Honey (1:1 Kg)	4.62	4.57	4.51	4.43
T_6	Rose Petals + Honey (1:1.25 Kg)	4.76	4.68	4.61	4.48
T_7	Rose Petals + Jaggery (1:0.75 Kg)	4.50	4.45	4.34	4.34
T_8	Rose Petals + Jaggery (1:1 Kg)	4.72	4.64	4.52	4.50
T_9	Rose Petals + Jaggery (1:1.25 Kg)	5.00	4.83	4.61	4.59
T_{10}	Rose Petals + Date (1:0.75 Kg)	2.65	2.52	2.48	1.84
T_{11}	Rose Petals + Date (1:1 Kg)	2.98	2.88	2.70	2.10
T_{12}	Rose Petals + Date (1:1.25 Kg)	3.60	3.40	3.20	3.00
C.V.		0.536	0.563	0.561	0.559
F' Test		S	S	S	S
S.E.(d)		0.023	0.024	0.023	0.022
C.D.5%		0.048	0.049	0.048	0.046

Table 8: Effect of various treatment combinations on Taste of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Taste			
		Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	8.86	8.53	8.44	8.40
T_2	Rose Petals + Sugar (1:1 Kg)	8.93	8.73	8.54	8.40
T_3	Rose Petals + Sugar (1:1.25 Kg)	8.92	8.88	8.55	8.43
T_4	Rose Petals + Honey (1:0.75 Kg)	4.21	4.19	4.16	4.15
T_5	Rose Petals + Honey (1:1 Kg)	4.28	4.20	4.19	4.16
T_6	Rose Petals + Honey (1:1.25 Kg)	4.32	4.21	4.21	4.26
T_7	Rose Petals + Jaggery (1:0.75 Kg)	4.57	4.37	4.15	3.94
T_8	Rose Petals + Jaggery (1:1 Kg)	4.62	4.41	4.13	4.11
T_9	Rose Petals + Jaggery (1:1.25 Kg)	4.71	4.41	4.23	3.97
T_{10}	Rose Petals + Date (1:0.75 Kg)	2.64	2.40	2.30	2.08
T_{11}	Rose Petals + Date (1:1 Kg)	2.95	2.80	2.60	2.10
T_{12}	Rose Petals + Date (1:1.25 Kg)	3.60	3.30	3.15	3.05
C.V.		0.525	0.544	0.579	0.576
F' Test		S	S	S	S
S.E.(d)		0.022	0.022	0.023	0.022
C.D.5%		0.046	0.046	0.048	0.046

Table 9: Effect of various treatment combinations on texture score of Rose Petal Jam (Gulkhand) during storage in ambient conditions.

Treatment notion	Treatment combination	Texture score			
		Storage period (Days)			
		1 Days	20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	8.78	8.59	8.43	8.43
T_2	Rose Petals + Sugar (1:1 Kg)	9.23	9.12	9.01	8.47
T_3	Rose Petals + Sugar (1:1.25 Kg)	9.38	9.32	9.22	9.17
T_4	Rose Petals + Honey (1:0.75 Kg)	6.12	6.04	5.53	5.99
T_5	Rose Petals + Honey (1:1 Kg)	6.61	6.33	6.14	6.04
T_6	Rose Petals + Honey (1:1.25 Kg)	6.76	6.62	6.57	6.34
T_7	Rose Petals + Jaggery (1:0.75 Kg)	5.33	5.18	5.06	5.03
T_8	Rose Petals + Jaggery (1:1 Kg)	5.54	5.42	5.34	5.21
T_9	Rose Petals + Jaggery (1:1.25 Kg)	5.61	5.56	5.48	5.22
T_{10}	Rose Petals + Date (1:0.75 Kg)	2.50	2.38	2.16	2.08
T_{11}	Rose Petals + Date (1:1 Kg)	2.75	2.65	2.55	2.35
T_{12}	Rose Petals + Date (1:1.25 Kg)	3.60	3.25	3.10	3.02
C.V.		0.455	0.473	0.560	0.460
F' Test		S	S	S	S
S.E.(d)		0.022	0.022	0.026	0.021
C.D.5%		0.046	0.046	0.054	0.044

Table 10: Effect of various treatment combinations on overall acceptability of Rose petal Jam (Gulkhand) during storage in ambient conditions.

Treatment	Treatment combination		Overall Acceptability Storage period (Days)		
notion	1 Days		20 Days	40 Days	60 Days
T_1	Rose Petals + Sugar (1:0.75 Kg)	8.65	8.52	8.49	8.41
T_2	Rose Petals + Sugar (1:1 Kg)	8.62	8.68	8.59	8.54
T_3	Rose Petals + Sugar (1:1.25 Kg)	8.77	8.54	8.42	8.35
T_4	Rose Petals + Honey (1:0.75 Kg)	4.65	4.58	4.51	4.41
T_5	Rose Petals + Honey (1:1 Kg)	4.74	4.61	4.49	4.40
T_6	Rose Petals + Honey (1:1.25 Kg)	5.14	5.06	4.47	4.45
T_7	Rose Petals + Jaggery (1:0.75 Kg)	4.26	4.15	4.11	3.79
T_8	Rose Petals + Jaggery (1:1 Kg)	4.43	4.31	4.27	4.23
T_9	Rose Petals + Jaggery (1:1.25Kg)	4.68	4.43	4.39	4.27
T_{10}	Rose Petals + Date (1:0.75 Kg)	2.30	2.18	2.08	2.01
T_{11}	Rose Petals + Date (1:1 Kg)	2.68	2.42	2.25	2.15
T_{12}	Rose Petals + Date (1:1.25 Kg)	3.50	3.30	3.10	3.01
C.V.		0.526	0.584	0.591	0.573
F' Test		S	S	S	S
S.E.(d)		0.022	0.024	0.024	0.023
C.D.5%		0.046	0.050	0.049	0.047

Conclusion

Based on the results and findings, it can be concluded that the treatment T_3 rose petal + sugar (1:1.25Kg) was recorded as the best in terms of Total soluble solid, T_7 [Rose petals + jaggery (1:0.75) Kg] in terms of total acidity, T_3 [Rose petals + sugar (1:1.25) Kg] in terms of pH, T_1 [Rose petals + Sugar (1:0.75) Kg] in terms of Ascorbic acid, T_3 [Rose petals + sugar (1:1.25) Kg] in terms of Total sugar. In terms of organoleptic parameters, the treatment T_3 [Rose petals + sugar (1:1.25) Kg] was recorded as the best during the storage period of 60 days. In terms of benefit-cost ratio, the treatment T_1 [Rose petals
+ sugar (1:0.75) Kg] was recorded the highest among all the parameters, and minimum was recorded in treatment T_{12} [Rose petals + Date palm (1:1.25kg)].

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