

1 | **Study on sensory evaluation and chemical changes occurred in Mahua**
2 | **(*Madhuca longifolia*) flower burfi during the storage**

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3 | **ABSTRACT**

4 | ~~In the present study,~~ The cow milk was standardized to 4% fat. The Burfi was
5 | prepared by addition of crushed dried Mahua flowers in the proportion of 100:0 (T₁), 90:10
6 | (T₂), 85:15 (T₃), 80:20 (T₄) and 75:25 (T₅) with 30 per cent sugar was added. The objectives
7 | of the present investigations were to study the chemical and sensory changes during storage
8 | of the selected treatment i.e. T₄ (80% ~~khoa-khoa~~ 20% crushed dried (Mahua flower) at room
9 | temperature and refrigerated temperature at the interval of 0, 5, 10, 15, 20, 25 days. The
10 | study aimed to investigate the quality of the burfi during storage. The data obtained was
11 | statistically analyzed by FRBD. Sensory evaluation studies were conducted by a panel of
12 | judges and it was found that the burfi prepared by using 20 parts of crushed dried Mahua
13 | flowers and 80 parts of khoa was having the highest overall acceptability scores. The overall
14 | acceptability scores of selected treatment were ~~decreased from~~ decreased from 5th days
15 | onwards. But burfi was acceptable up to 15 days and 25 days onwards at room temperature
16 | and refrigerated temperature, respectively. The results regarding the chemical analysis
17 | revealed that the fat, protein, lactose, ash, titratable acidity and total solids content of burfi
18 | was increased after 0th day to 25th day in both room and refrigerated condition.
19 | ~~While~~ Although, moisture and solids not fat content reported decrease in trend in both room
20 | and refrigerated temperature. The rate of changes was found more in room temperature
21 | ~~conditions.~~

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22 | ~~Keywords~~ conditions.

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23 | Keywords : Milk; Khoa; Burfi; Mahua flower; Chemical properties; Fat; Protein; Total
24 | solids; Acidity; Ash

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26 | **1. Introduction:**

27 | Milk is known as nature's most complete food and dairy products are considered the
28 | most nutritious foods. On the other hand, the traditional view of the role of milk has been
29 | greatly expanded in recent years. Milk contains biologically active compounds besides its
30 | major proteins, casein and whey ~~proteins, that~~ proteins that have important physiological and
31 | biochemical functions with significant impact on human metabolism, nutrition and health
32 | (Park and Haenlein, 2013).

33 | Burfi is one of the most popular khoa based sweet in India. Once confined to
34 | household production, burfi is gaining an international market in recent
35 | years owing to its delicious taste, flavour and texture. The Mahua tree is
36 | considered as medicinal tree and very useful for curing diseases like piles,
37 | skin diseases, headache, ulcer, constipation and many more. Mahua flowers
38 | are high in Vitamin C, which is responsible for their antioxidant properties.
39 | Carotene, a precursor to Vitamin A, is found in Mahua flowers. Flowers are
40 | also high in minerals such as calcium and phosphorus. Mahua flowers also
41 | contain a little number of proteins and lipids (Dwivedi *et al.*, 2022).

42 | **2. Material and methods :**

43 | Experimental trials were conducted using fresh, clean cow milk obtained from the Dairy
44 | Farm at College of Agriculture Nagpur. Good quality of dried Mahua flowers obtained from
45 | nearby local market and clean and crystalline sugar were used for the preparation of
46 | Mahua burfi.

47 | **Treatment Details :**

- 48 | • T₁ - 100% khoa burfi
- 49 | • T₂ - 90% khoa + 10% crushed dried Mahua flowers
- 50 | • T₃ - 85% khoa + 15% crushed dried Mahua flowers
- 51 | • T₄ - 80% khoa + 20% crushed dried Mahua flowers
- 52 | • T₅ - 75% khoa + 25% crushed dried Mahua flowers

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54 In all treatments sugar was added at the rate 30% by wt. of khoa.

55 **Treatments for keeping quality studies**

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56 **Conditions**

57 Factor A : Temperature (a) Room temperature

58 (b) Refrigeration temperature

59 Factor B : Time in days (0, 5, 10, 15, 20, 25 days)

60 Number of Treatments : 12 (As stated above in combination with factor A & B)

61 Number of Replication : 5

62 Design of experiment : Factorial Randomized Block Design (FRBD)

63 **Preparation of Burfi**

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64 Receiving of fresh cow milk



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66 Standardization (4% fat)



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68 Filtration



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70 Continuous heating and stirring (80°C)



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72 Viscous product with pasty consistency



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74 Gentle heating till pat formation



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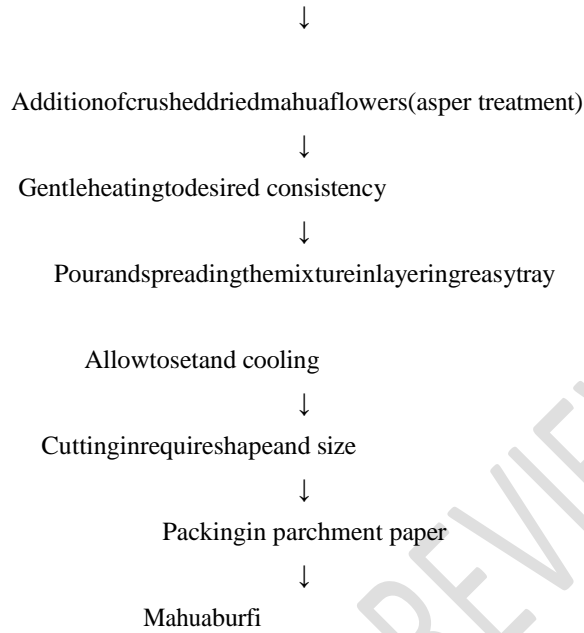
76 Khoa



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78 Addition of sugar 30%

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3. Result and Discussion

Table 1-1: Changes in sensory evaluation of selected treatment of burfi (T₄) prepared with crushed dried Mahua flower during storage.

Where, A1, A1: Room Temperature; A2, A2: Refrigerated Temperature

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Parameters	Sensory Score	
Treatment Period (Days)	A1	A2
0	8.3	8.3
5	7.5	7.9
10	6.8	7.3
15	6.4	7.00
20	Nil	6.5
25	Nil	5.5
Result	Sig	sig

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99 | The mean score of overall acceptability of zero day storage of Mahua burfi was same
100 | i.e. 8.3 at room temperature and refrigerated temperature. Score of overall acceptability was
101 | decreased after 0th day to 25th day of storage in both room temperature as well as refrigerated
102 | temperature. On 25th day of storage mean overall acceptability score of burfi were decreased
103 | from 8.3 to 0 and 8.3 to 5.5 at room temperature and refrigerated temperature, respectively.
104 | Further, it was revealed from Table that, overall acceptability score value was decreased
105 | significantly due to effect of temperature, storage interval and their interaction. Overall
106 | acceptability score was decreased very fast for the burfi stored at room temperature as
107 | compare to burfi stored at refrigerated temperature.

108 | The temperature. The present results were found that, the overall acceptability of burfi
109 | stored at room temperature were acceptable only 15 days, while at refrigerated temperature
110 | was acceptable up to 25 days.

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111 | This trend of result was in agreement with the trend of result noted by Shrivastava *et al.* (2018)
112 | who observed that the overall acceptability of rava burfi decreased at faster rate
113 | during storage period at room temperature as compared to refrigerated temperature. The
114 | overall acceptability score on 0 day storage at room temperature and refrigerated temperature
115 | were seen as 8.48. And the score on 9th day storage at room temperature and 35th day
116 | storage at refrigerated temperature were significantly decreased as 6.20 and 7.02 respectively.

117 | **Table 2. Chemical changes in selected treatment of burfi (T₄) prepared with crushed**
118 | **dried Mahua flowers during storage**

Parameters	Moisture		Fat		Protein		Ash		Total Solid		SNF		Titra Ac	
	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2		
Treatment	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2	A1	A2
Period (Days)														
0	15.63	15.63	12.96	12.96	14.15	14.15	2.58	2.58	84.37	84.37	71.01	71.01	0.33	0.33
5	15.46	15.60	13.75	13.42	14.52	14.42	2.90	2.81	84.69	84.34	70.90	70.94	0.35	0.34
10	14.87	15.56	14.52	13.63	14.75	14.63	3.21	2.95	85.13	84.46	70.60	70.80	0.40	0.38
15	14.67	15.46	14.92	13.78	14.92	14.77	3.41	3.28	85.32	84.53	70.42	70.75	0.43	0.41
20	14.51	15.35	15.70	14.20	15.68	15.39	3.50	3.39	85.48	84.65	69.61	69.78	0.52	0.44
25	13.72	14.62	15.75	14.57	15.75	15.80	3.75	3.55	86.27	85.37	69.25	69.45	0.57	0.45
Result	sig	sig	sig	sig	sig	sig	sig	sig	sig	sig	sig	sig	sig	sig

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Where, ~~A1~~, A1: Room Temperature; ~~A2~~, A2: Refrigerated Temperature

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~~Moisture~~ Moisture ~~Temperature~~ Moisture

From the table 2, it revealed that, ~~The~~the moisture percentage has been decreased after 0th day to 25th day of storage at both room temperature as well as refrigerated temperature. On 25th day of storage mean moisture percentage of burfi was decreased from 15.63 to 13.72 and 15.63 to 14.62 at both room temperature and refrigerated temperature, respectively. According to the BIS (IS: 5550), the moisture content of burfi should not exceed 15%. Based on the table, the burfi stored at room temperature on the 10th, 15th, 20th and 25th day and 25th day at refrigerated temperature all meet this standard. ~~This results are in agreement with the results noted by Ingle (2010) who analyzed~~ analyzed the moisture ~~percent~~ present of burfi prepared with different pulps and revealed that the total moisture content reduced by 5.68 per cent on refrigerated temperature and 7.39 per cent on ambient temperature. Shrivastava *et*

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132 | *al.*(2018) observed the moisture content of [ravaraveburfi](#) decreased rapidly at room
133 | temperature as compared to refrigerated temperature.

134 | **Fat**

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135 | The fat percentage has been increased after 0th day to 25th day of storage at both room
136 | temperature as well as refrigerated temperature. On 25th day of storage mean fat percentage
137 | of burfi increased from 12.96 to 15.75 and 12.96 to 14.57 at room temperature and
138 | refrigerated temperature, respectively. This might be due to the losses in moisture content of
139 | burfi during storage. The Bureau of Indian Standards (IS: 5550) has set a limit of atleast 10
140 | per cent for the fat content of burfi. Based on the table, the burfi stored at room temperature
141 | and refrigerated temperature both meet ~~this standards~~[this standard](#). Present results are in
142 | agreement with the results reported by Ingle (2010) who observed that the fat per cent was
143 | significantly increased from 18.06 to 19.66 in T₁, while 20.14 in T₂ treatment during 13 days
144 | of storage period which is slightly more by 2.08 per cent on ambient temperature. Shrivastava *et al.*
145 | *al.* (2018), observed that as the storage period progresses, the sample showed an increase in
146 | the fat content of ravaburfi for both the storage temperatures studied.

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147 | **Protein**

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148 | The protein per cent was increased after 0th day to 25th day of storage at room temperature as
149 | well as refrigerated temperature. On 25th day of storage mean protein percentage of burfi
150 | increased from 14.15 to 15.75 and 14.15 to 15.80 at room temperature and refrigerated
151 | temperature, respectively. under room temperature rate of protein content increased in burfi
152 | was higher as compare to storage under refrigerated condition, this might be due to fast
153 | evaporation of moisture from burfi and increasing trend in total solids. The present results are
154 | supported by the results noted by Patil *et al.* (2015) which determine the chemical
155 | composition of burfi during interval of storage and observed that protein content was
156 | increased from 14.90 to 16.30 percent in market burfi. Shrivastava *et al.* (2018) observed that
157 | there was a progressive increase in protein content of ravaburfi with increase in storage
158 | period at 30 ± 2°C and 7 ± 2°C which was found to be significant.

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159 | **Ash**

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160 | The ash percentage has been increased after 0th day to 25th day of storage at both room
161 | temperature as well as refrigerated temperature. On 25th day of storage mean protein

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162 percentage of burfi were increased from 2.58 to 3.75 and 2.58 to 3.55 per cent at room
163 temperature and refrigerated temperature, respectively. Ash content was increased highly at
164 room temperature as compared to refrigerated temperature. The values of ash content in
165 present investigation are similar with other researchers like Prasad *et al.* (2017) reported that
166 the ash content was increasing from 2.95 to 3.09 per cent in burfi during storage. Shrivastava *et al.* (2018) observed that there was increase in ash content of ravaburfi with increase in
167 storage period at $30 \pm 2^\circ\text{C}$ and $7 \pm 2^\circ\text{C}$ which was found to be **significant**.

169 **Total** ~~significant~~. **Total Solids**

170 ———The total solids percentage has been increased after 0th day to 25th day of storage at
171 room temperature as well as refrigerated temperature. On 25th day of storage mean total solid
172 percentage of burfi increased from 84.37 to 86.27 and 84.37 to 85.37 at room temperature
173 and refrigerated temperature, respectively. Ingle (2010) reported that initial percentage of
174 total solids in burfi was 80.14, which increased during storage subsequently and significantly
175 to 85.82 per cent i.e. by 5.68 percent in T₁ and up to 87.53 per cent i.e. by 7.39 percent in T₂
176 treatment i.e. on refrigerated and ambient temperature. The total solids increased in both the
177 treatments may be due to the proportionate reduction in moisture at different storage
178 temperature levels. Shete *et al.* (2012) reported that total solids content in burfi was increased
179 from 74.13 to 82.90%, Chavhan (2013) and Satav *et al.* (2014) also found same treatment
180 results. These results are in agreement with present results found in experimental trial.

181 **Solids** ~~Not~~ **Fat**

182 The solid not fat percentage has been slightly decreased after 0th day to 25th day of
183 storage at room temperature as well as refrigerated temperature. On 25th day of storage mean
184 solids not fat percentage of burfi decreased from 71.01 to 69.25 and 71.01 to 69.45 at room
185 temperature and refrigerated temperature, respectively. The decrease in solids not fat content
186 of burfi storage of room temperature was found more under room temperature as compare to
187 refrigerated temperature. This might be due to high rate of evaporation of moisture from burfi
188 under room temperature. Shrivastava *et al.* (2018) reported that the solids not fat content was
189 decreased in burfi prepared from cow milk khoa by using rava. The ~~snf~~SNF per cent on 0
190 day storage at room temperature and refrigerated temperature were same. ~~And~~ ~~T~~the ~~SNF~~snf
191 per cent on 9th day storage at room temperature and 35th day storage at refrigerated
192 temperature were seen decreasing.

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193 Titratable acidity

194 The titratable acidity percentage has been increased after 0th day to 25th day of storage at room
195 temperature as well as refrigerated temperature. On 25th day of storage mean titratable
196 acidity percentage of burfi were increased from 0.33 to 0.57 and 0.33 to 0.45 at room
197 temperature and refrigerated temperature, respectively. According to the BIS (IS: 5550), the
198 acidity content of burfi should not exceed 0.45 per cent. The burfi stored at room temperature
199 and refrigerated temperature both meet these standards till 15 and 25 days respectively. The
200 values of titratable acidity and trend of present investigation are agreed with the findings of
201 Ingle (2010) ~~who reported~~ who reported that there was increase of acidity from 0.52 to 0.72
202 and 0.52 to 0.80 per cent in T₁ and T₂ treatment, respectively. Shrivastava (2018) that the
203 ~~titratable~~ titratable acidity of ravaburfi increased at faster rate during storage period at room
204 temperature as compared to refrigerated temperature. The titratable acidity per cent on 0 day
205 storage at room temperature and refrigerated temperature were seen as 0.264 per cent. And
206 the titratable acidity per ~~cent~~ cent on 9th day storage at room temperature and 35th day
207 storage at refrigerated temperature were significantly seen as 0.294 and 0.293
208 percent respectively.

209 Conclusion respectively.

210 4. Conclusion

211 — Overall acceptability scores were decreased from 5th days onwards. But burfi was
212 acceptable upto 15 days and 25 days at room temperature and refrigerated temperature,
213 respectively. Fat, protein, total sugar, ash, total solids, titratable acidity content of burfi
214 prepared with 80% cow milk khoa and 20% crushed dried Mahua flower was increased from
215 5th day to 25th day in both room and refrigerated temperature. While, moisture and SNF was
216 decreased in both room temperature and refrigerated temperature. The rate of changes was
217 found more in room temperature storage.

218 Thus storage. Thus, from present investigation, it was concluded that burfi can be stored and
219 utilized upto 15 days at room temperature and upto 25 days and onwards under refrigerated
220 temperature.

221 5. References

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UNDER PEER REVIEW