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Impact of oat powder on the physico-chemical properties of burfi: A comprehensive analysis

Sachin Shilar, Shankar Narwade and Pavan Dudhate

Abstract

The research study was conducted on “Studies on preparation of *burfi* using oat powder”. Research work was carried out in the Post graduate laboratory in Department of Animal Husbandry and Dairy Science, College of Agriculture, VNMKV, Parbhani during the year 2022-23. *Burfi* was prepared from buffalo milk (standardized with 6 percent fat and 9 percent SNF) with constant level of sugar (30 percent by weight of *khoa*) and with different levels of oat powder (2.5, 5, 7.5 and 10 percent by weight of *khoa*). On an average oat powder *burfi* of treatments T₁, T₂, T₃, T₄ and T₅ contained moisture was 16.00, 15.60, 15.00, 14.45 and 13.40 percent, respectively, the fat was 19.90, 18.54, 17.66, 16.94 and 15.98 percent, the protein was 15.61, 16.65, 17.05, 17.55 and 17.96 percent, the ash was 2.42, 2.49, 2.56, 2.62 and 2.69 percent, total solids 84.00, 84.40, 85.00, 85.55 and 86.35 percent and the carbohydrate was 46.05, 46.70, 47.72, 48.43 and 49.95 percent, the titratable acidity was 0.554, 0.535, 0.509, 0.496 and 0.483 percent, the pH was 6.37, 6.57, 6.60, 6.71 and 6.81 respectively. Use of oat powder @ 5 percent of *khoa* in *burfi* preparation was more acceptable and desirable.

Keywords: Burfi, physicochemical properties, buffalo milk, oat

Introduction

The world's largest producer of milk is India. It has production of more than 230.58 million tonnes of milk annually during 2022-23 and per capita availability is 444 gm/day. The production increased by 3.83 percent during 2022-23 over the estimate of 2021-22. In India, 5-6 percent of total collected milk is converted into western type of product and nearly half of that milk i.e., 50-55 percent is utilized for manufacture of traditional dairy products. Nearly 45.7 percent used as fluid milk by people. The dairy product *khoa*, which has been heat-desiccated, is primarily utilized as a basis for a huge variety of confections. It is the main constitute for preparing indigenous sweets like *burfi*, *peda*, *kalakand*, etc. About 6,00,000 metric tonnes of *khoa* is prepared annually which utilize 7% of total production of milk in India (Aggarwal *et al.*, 2018) ^[1].

Khoa is classified into three types as: 1. Pindi, 2. Dhaph, 3. Danedar. *viz.*, Pindi type of *khoa* used for *burfi* and *peda* making. *Khoa* is used as a basic ingredient or intermediary product in the production of several well-known milk confections. Traditional dairy products in India include *khoa* and sweets made with *khoa*, such as *peda*, *burfi*, milk cake, *kalakand*, *gulabjamun*, etc. are famous in market having high commercial significance because of their taste, nutritional value and popularity throughout the country. The majority of the food consumed by humans comes from cereals. They are the least expensive food source of energy and make up a sizable portion of the human diet in terms of both calories and protein, especially in developing nations. Rice, wheat, maize, sorghum, millet, barley, oats, and rye are the main cereal crops. The majority of Indians get 70-80% of their daily energy consumption from these grains, which constitute the primary source of energy in the Indian diet. Whole grains are rich source of fiber, trace minerals, and other nutrients. While insoluble fiber guards against diabetes, colon cancer, and diverticulosis, soluble fiber can lower blood cholesterol. In addition, cereals are a good source of potassium, iron, folic acid, pantothenic acid, and vitamin B. Additionally, cereals are a significant source of trace metals like zinc, copper, selenium, and manganese. Antioxidant enzymes are made up of these trace elements. Vitamin E and necessary linoleic acid are present in cereal embryos.

Certain cereals, including oatmeal, are high in soluble fiber (B-glucan) and low in salt. Eating whole grain cereals on a regular basis can lower risk of certain cancer and coronary heart disease by as much as 30%.

Oat (*Avena sativa*) is a healthy, whole grain ingredient. They supply fiber, protein, carbohydrate, vitamins, minerals and antioxidants and other important nutrients. Betaglucans, a type of soluble fibre found in oat (Keenan *et al.* 2002) [2].

Oats (*Avena sativa*) are highly valued for their nutritional value, high dietary fiber level, and phytochemical content. Oat consuming have a number of health advantages, including anti-cancer and hypocholesterolaemic effects. Oats are now thought to be a good addition to a celiac patient's diet. Oat-based food products, such as breads, biscuits, cookies, probiotic drinks, morning cereals, flakes, and baby food, are becoming more and more popular due to their high nutritional content.

Low-glycemic whole grain cereals, such as oats and high dietary fibre diets are associated with reduced risk of development of type 2-diabetes and heart disease.

Materials and Methods

The research study conducted on "Studies on preparation of *burfi* using oat powder" at the Department of Animal Husbandry and Dairy Science, College of Agriculture,

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

The whole, fresh, clean, buffalo milk was obtained from the Department of Animal Husbandry and Dairy Science, College of Agriculture, Parbhani. Oat powder and sugar obtained from the local market of Parbhani. Different equipment *viz.*, kunti, stainless-steel strainer, karahi, mixer, grinder were available in the department.

Methods

Treatments combinations

For the preparation oat powder *burfi*, the following treatment combinations were taken for study:

T₁ = (control) 100 Parts of *khoa* + 0 parts of oat powder.

T₂ = 97.5 Parts of *khoa* + 2.5 parts of oat powder.

T₃ = 95 Parts of *khoa* + 5 parts of oat powder.

T₄ = 92.5 Parts of *khoa* + 7.5 parts of oat powder.

T₅ = 90 Parts of *khoa* + 10 parts of oat powder.

In above all preparations, sugar was added @ 30 percent of *khoa* w/w basis.

Flow chart for preparation of oat powder *burfi*

Preparation of oat powder *burfi* by using following method suggested by Sharma *et al.* (2017) [10] with slight modification

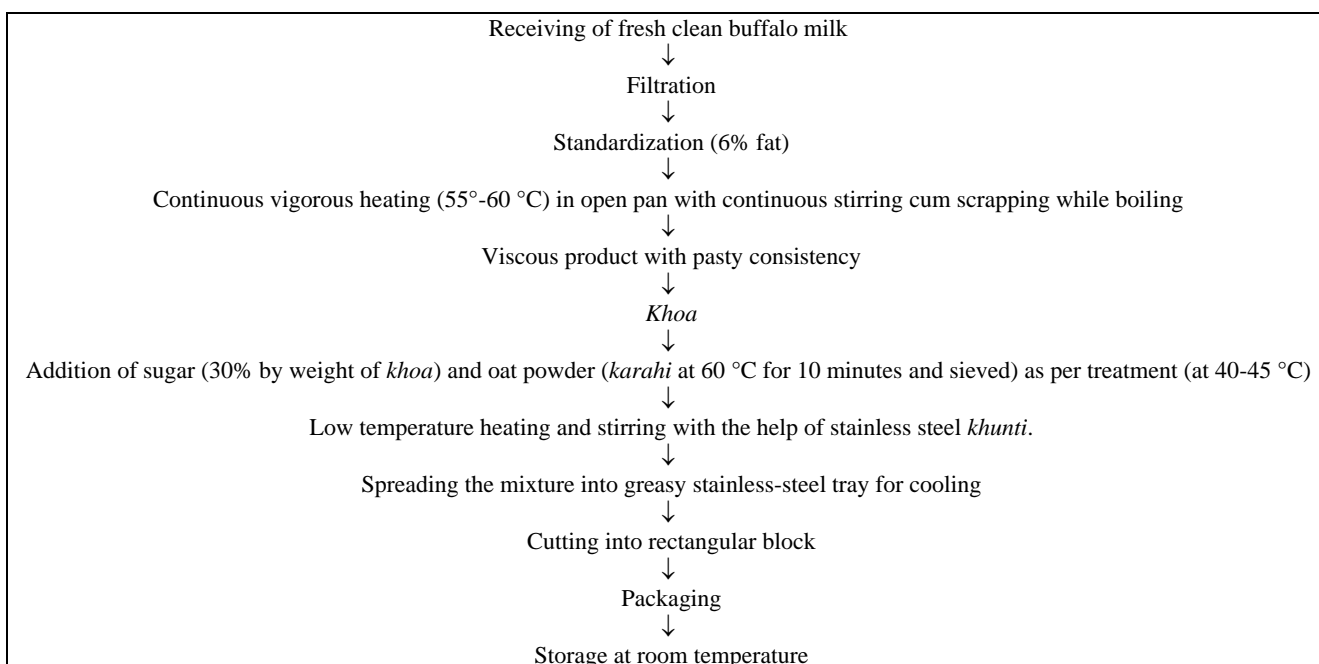
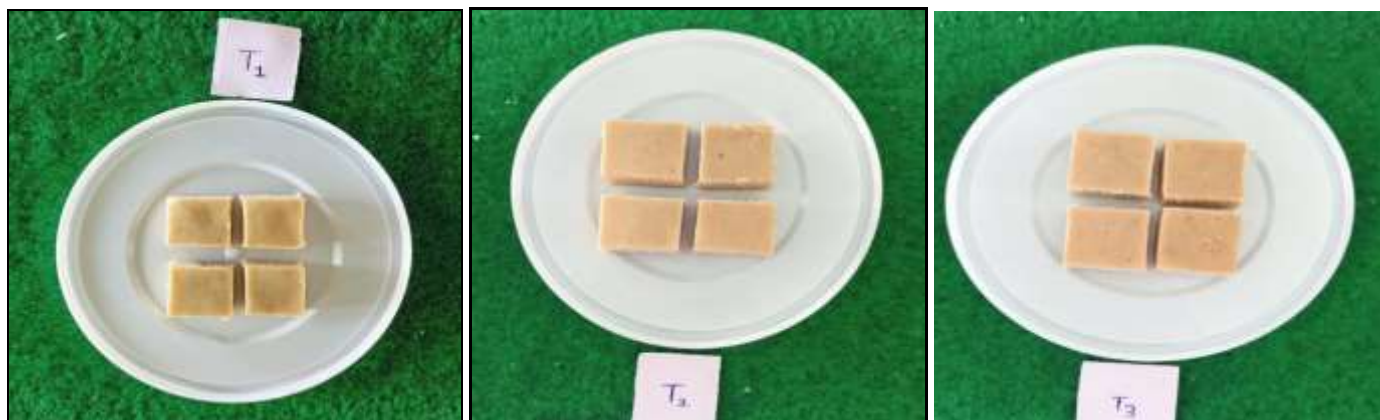


Fig 1: Preparation of *burfi* using oat powder



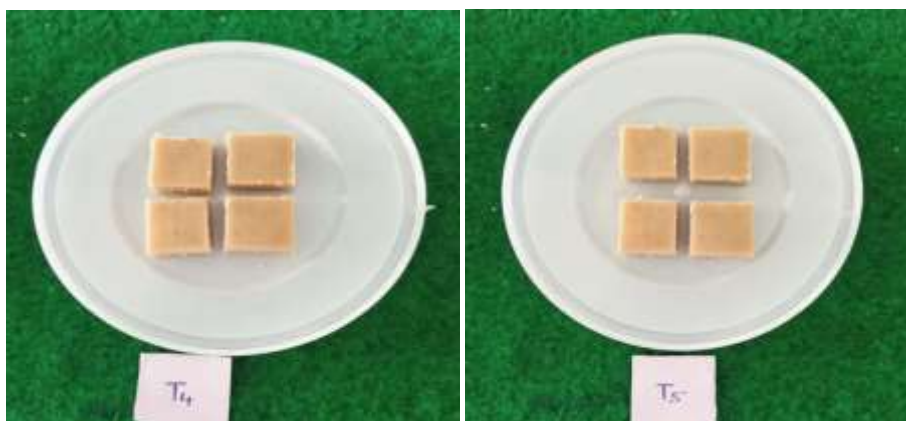


Fig 2: Burfi prepared by using oat powder

Result and Discussion

Chemical composition of burfi using oat powder

The oat powder burfi made under different treatments were subjected to analysis viz. moisture, fat, protein, ash, total sugar, total solid, titratable acidity and pH.

Moisture content of burfi using oat powder

Moisture content in oat powder burfi varied due to incorporation of different levels of oat powder and presented in table no.1

Table 1: Moisture content of burfi influenced by oat powder

Treatments/ Replications	Moisture content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	16.30	15.30	16.10	16.30	16.00 ^a
T ₂	16.10	14.90	15.50	15.90	15.60 ^{ab}
T ₃	15.50	14.50	14.70	15.30	15.00 ^{bc}
T ₄	14.70	14.30	14.50	14.30	14.45 ^c
T ₅	13.50	13.10	13.30	13.70	13.40 ^d
S.E. ± 0.204532, C.D. at 5% 0.616526					
Values with superscripts are significantly different at (p<0.05)					

Data presented in table 1 shows that mean moisture content in T₁, T₂, T₃, T₄ and T₅ were 16.00, 15.60, 15.00, 14.45 and

13.40 percent, respectively. Basically, in all the treatments shows the significant variation for moisture content in oat powder burfi. As the oat powder levels increased in burfi the moisture content in burfi was decreased. This might be due to the oat powder oat powder which soak the moisture content in burfi. The highest moisture content observed for treatment T₁ (16.00) whereas, lowest moisture obtained for T₅ (13.40).

Kapare (2017) [12] reported that moisture content of burfi incorporated with finger millet was decreased with increased levels of finger millet powder. However, treatments T₀, T₁, T₂, T₃ and T₄ contains moisture content 16.84, 16.62, 16.35, 16.09 and 15.87 percent respectively.

Patil (2021) [9] observed that moisture content of burfi incorporated with black gram flour was decreasing with increasing levels of black gram powder. The highest moisture content (15.90) was observed in controlled burfi (T₁), whereas lowest (13.90) was in burfi with 10 percent level of black gram flour. This might be due to gritty texture in black gram powder.

Fat content of burfi using oat powder

Fat content in oat powder burfi varies due to addition of different levels of oat powder and data depicted in table no. 2

Table 2: Fat content of burfi as influenced by oat powder

Treatments/ Replications	Fat content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	20.43	19.77	19.47	19.96	19.90 ^a
T ₂	19.65	17.09	18.64	18.81	18.54 ^b
T ₃	18.15	16.79	18.05	17.65	17.66 ^{bc}
T ₄	17.93	15.74	17.57	16.54	16.94 ^{cd}
T ₅	15.79	15.57	16.78	15.81	15.98 ^d
S.E. ± 0.385191, C.D. at 5% 1.161091					
Values with superscripts are significantly different at (p<0.05)					

From the above table 2 it was reported that the average fat content in oat powder burfi was 19.90, 18.54, 17.66, 16.94 and 15.98 percent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. It was also reported that highest fat content was in T₁ (19.90) and lowest fat content in T₅ (15.98). fat content of burfi was significantly influenced by the incorporation of oat powder in burfi. As the oat powder levels increases the fat content of burfi decreased significantly.

Kamble et al., (2019) [5] studied pineapple pulp burfi where fat content ranged from 15.81 to 21.95 percent in decreasing manner.

Kapare (2017) [12] who studied fat content in finger millet burfi 21.07, 20.48, 19.90, 19.31 and 18.72 percent in

respective order.

These results were closely relevant to researcher Patil (2021) [9] who studied black gram flour burfi that fat content of burfi for treatment T₁, T₂, T₃, T₄ and T₅ were 20.88, 19.52, 18.63, 17.93 and 16.95 percent, respectively. Fat content in T₁ plain control burfi was highest as 20.88 percent whereas lowest was found in treatment T₅ as 16.95 percent. This might be due to less amount of fat content in black gram flour.

Protein content of burfi using oat powder

Protein content in oat powder burfi different due to addition of different levels of oat powder and data depicted in table no. 3.

Table 3: Protein content of *burfi* as influenced by oat powder

Treatments/ Replications	Protein content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	15.76	14.84	15.91	15.94	15.61 ^e
T ₂	16.54	16.65	16.74	16.67	16.65 ^d
T ₃	16.97	17.09	17.14	17.00	17.05 ^c
T ₄	17.49	17.54	17.66	17.51	17.55 ^b
T ₅	17.91	17.99	18.03	17.91	17.96 ^a
S.E. ± 0.121221, C.D. at 5% 0.3654					
Values with superscripts are significantly different at ($p < 0.05$)					

From the table no 3 it was reported that the average protein content in oat powder *burfi* was 15.61, 16.65, 17.05, 17.55 and 17.96 percent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. It was also reported that highest protein content was in T₅ (17.96) and lowest protein content in T₁ (15.61). The protein content of *burfi* was significantly influenced by the addition of different levels of oat powder in *burfi*. As the oat powder levels increases the protein content of *burfi* increases significantly.

These findings were close agreement with reports of Mete *et al.*, (2017) [6], Pal *et al.*, (2018) [7], found similar result from alphonso mango *burfi*, khajoor *burfi* and bottle guard *burfi*

respectively.

Patil (2021) [9] recorded that the protein content of black gram flour *burfi* was highest in the treatment T₅ (16.94) followed by the treatments T₁ (14.60), T₂ (15.63), T₃ (16.03) and T₄ (16.54). The protein content of black gram *burfi* was observed increasing as increasing levels of black gram powder.

Ash content of *burfi* using oat powder

Ash content in oat powder *burfi* varies due to incorporation of different levels of oat powder and data depicted in table no. 4 and graphically represented in fig. 1.

Table 4: Ash content of *burfi* influenced by oat powder

Treatments/ Replications	Ash content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	2.40	2.44	2.42	2.45	2.42 ^c
T ₂	2.46	2.49	2.50	2.53	2.49 ^c
T ₃	2.51	2.57	2.58	2.61	2.56 ^b
T ₄	2.55	2.62	2.65	2.67	2.62 ^b
T ₅	2.59	2.71	2.74	2.75	2.69 ^a
S.E. ± 0.023735, C.D. at 5% 0.071544					
Values with superscripts are significantly different at ($p < 0.05$)					

From the table 4, it was observed that for treatments T₁, T₂, T₃, T₄ and T₅ the ash content of the product 2.42, 2.49, 2.56, 2.62 and 2.69 percent respectively. As the oat powder levels increases the ash content level of product was also increased. This might be due to high content of minerals and high number of total solids in *burfi*.

Kapare (2017) [12] studied on preparation of *burfi* incorporated with finger millet powder reported that the average values for ash content of *burfi* in range of 2.43 to 2.63 percent.

Patil (2021) [9] also observed that the ash content of black gram *burfi* increasing with increasing levels of black gram powder. Maximum ash content was found in T₅ (2.72) and minimum in T₁ (2.45).

Carbohydrate content of *burfi* using oat powder

Carbohydrate content in oat powder *burfi* varies due to addition of different levels of oat powder and data depicted in table no. 5.

Table 5: Carbohydrate content of *burfi* as influenced by oat powder

Treatments/ Replications	Carbohydrate content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	45.11	47.65	46.10	45.35	46.05 ^c
T ₂	45.25	48.87	46.62	46.09	46.70 ^c
T ₃	46.87	49.05	47.53	47.44	47.72 ^{bc}
T ₄	47.33	49.80	47.62	48.98	48.43 ^{ab}
T ₅	50.21	50.63	49.15	49.83	49.95 ^a
S.E. ± 0.56216, C.D. at 5% 1.694531					
Values with superscripts are significantly different at ($p < 0.05$)					

The data shown in below table no. 5 indicate that carbohydrate content was increases from treatment T₁, T₂, T₃, T₄ and T₅ as 46.05, 46.70, 47.72, 48.43 and 49.95 percent respectively. The highest carbohydrate was observed in treatment T₅ (49.95%) whereas lowest in treatment T₁ (46.05%). This difference may occur due to presence of carbohydrate in oat powder. The carbohydrate content of oat powder *burfi* was observed increasing as the increasing levels of oat powder.

Kapare (2017) [12] reported that the carbohydrate content of finger millet *burfi* for different T₀, T₁, T₂, T₃ and T₄ treatments found as 44.66, 45.65, 46.64, 47.64, and 48.62 respectively. The highest carbohydrate content was in treatment T₄ i.e., 48.62.

Similar results were found with Pawar (2011) reported that dried date *burfi* contains carbohydrate in treatment T₀, T₁, T₂ and T₃ as 47, 49, 51 and 53 percent respectively.

Patil (2021) [9] recorded that carbohydrate content of black

gram flour *burfi* was highest in treatment T₅ (50.09) followed by treatment T₁ (46.17%), T₂ (46.83%), T₃ (47.85%), T₄ (48.54). The carbohydrate content of black gram powder *burfi* was observed increasing as the increasing levels of black gram powder.

Total solids content of *burfi* using oat powder

Total solids content of oat powder *burfi* varies due to incorporation of different levels of oat powder and data depicted in table no.6.

Table 6: Total solids content of *burfi* as influenced by oat powder

Treatments/ Replications	Total solid content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	83.70	84.70	83.90	83.70	84.00 ^d
T ₂	83.90	85.10	84.50	84.10	84.40 ^{cd}
T ₃	84.50	85.50	85.30	84.70	85.00 ^{bc}
T ₄	85.30	85.70	85.50	85.70	85.55 ^b
T ₅	86.50	85.90	86.70	86.30	86.35 ^a
S.E. ± 0.210555, C.D. at 5% 0.634681 Values with superscripts are significantly different at (p<0.05)					

The result presented in the table no. 6 it shows that the average total solids content of product was found to be 84.00, 84.40, 85.00, 85.55 and 86.35 percent for treatments T₁, T₂, T₃, T₄ and T₅ respectively.

The highest total solids content observed for the treatment T₅ (86.35) and the lowest was observed for treatment T₁ (84.00). All treatments were significantly varying from each other. And it also indicates that as the addition of oat powder levels increases the total solids content of product increases with decrease in moisture content. This might be due to high total solid content of oat powder.

Kapare (2017) [12] observed that the total solids content for finger millet *burfi* was in the increasing range of 83.16 to 84.13.

Similar results were found with the researcher Patil (2021) [9] who prepared black gram *burfi* observed that total solids contents for treatments T₁, T₂, T₃, T₄ and T₅ were 84.10, 84.50, 85.10, 85.65 and 86.70 percent respectively.

pH of *burfi* using oat powder

pH of oat powder *burfi* varies due to the addition of different levels of oat powder added and data depicted in table no. 7.

Table 7: pH of *burfi* as influenced by oat powder

Treatments/ Replications	pH content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	6.39	6.37	6.38	6.35	6.37 ^c
T ₂	6.61	6.69	6.49	6.50	6.57 ^b
T ₃	6.65	6.63	6.55	6.60	6.60 ^b
T ₄	6.79	6.77	6.64	6.67	6.71 ^a
T ₅	6.91	6.88	6.72	6.74	6.81 ^a
S.E. ± 0.03605, C.D. at 5% 0.108666 Values with superscripts are significantly different at (p<0.05)					

Result presented in table no.7, it was reported that the average pH content of the product was found to be 6.37, 6.57, 6.60, 6.71 and 6.81 for the treatments T₁, T₂, T₃, T₄ and T₅ respectively. The maximum pH content was recorded for treatment T₅ (6.81) and minimum for T₁ (6.37). All the treatments were different from each other. It was also represented that as the addition of oat powder levels increases the pH content of product increases with decreases in titratable acidity.

Patil (2021) [9] observed that the pH content of black gram

burfi was highest in the treatment T₅ (6.88) followed by treatments T₁ (6.44), T₂ (6.62), T₃ (6.68) and T₄ (6.79). The pH content of black gram *burfi* was observed increased as increasing level of black gram powder.

Titratable acidity of *burfi* using oat powder

Titratable acidity of oat powder *burfi* varies due to incorporation of different levels of oat powder and data depicted in table no. 8.

Table 8: Titratable acidity of *burfi* influenced by oat powder

Treatments/ Replications	Titratable acidity content (percent)				Mean Score (percent)
	R I	R II	R III	R IV	
T ₁	0.558	0.552	0.546	0.541	0.549 ^a
T ₂	0.542	0.539	0.531	0.529	0.535 ^{ab}
T ₃	0.532	0.514	0.498	0.495	0.509 ^{bc}
T ₄	0.522	0.502	0.481	0.482	0.496 ^c
T ₅	0.508	0.482	0.473	0.472	0.483 ^c
S.E. ± 0.007215, C.D. at 5% 0.02175 Values with superscripts are significantly different at (p<0.05)					

As the oat powder levels increases in *burfi*, the acidity content in *burfi* was decreases continuously. Highest tritrate acidity observed in treatment T₁ (0.55) whereas lowest observed in T₅

(0.48). Decrease in acidity content observed due to increasing levels of oat powder in preparation of *burfi*.

These results were similar with Patil (2021) [9], black gram

burfi contains 0.539, 0.525, 0.502, 0.487 and 0.474 percent acidity whereas Jadhav (2015) [4] besan *burfi* contains 0.734,

0.682, 0.617, 0.575 and 0.492 percent acidity respectively.

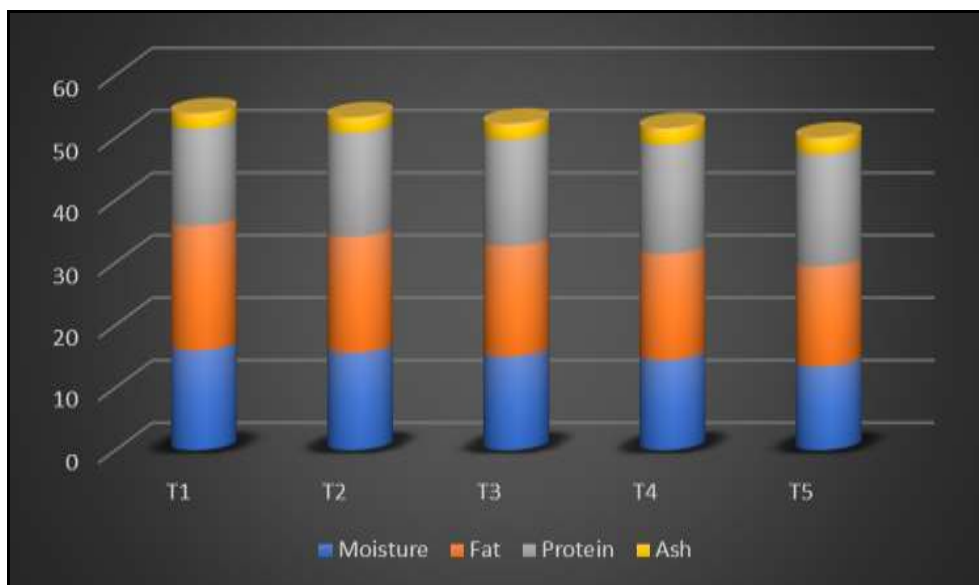


Fig 3: Physico-chemical properties of Burfi using with oat powder

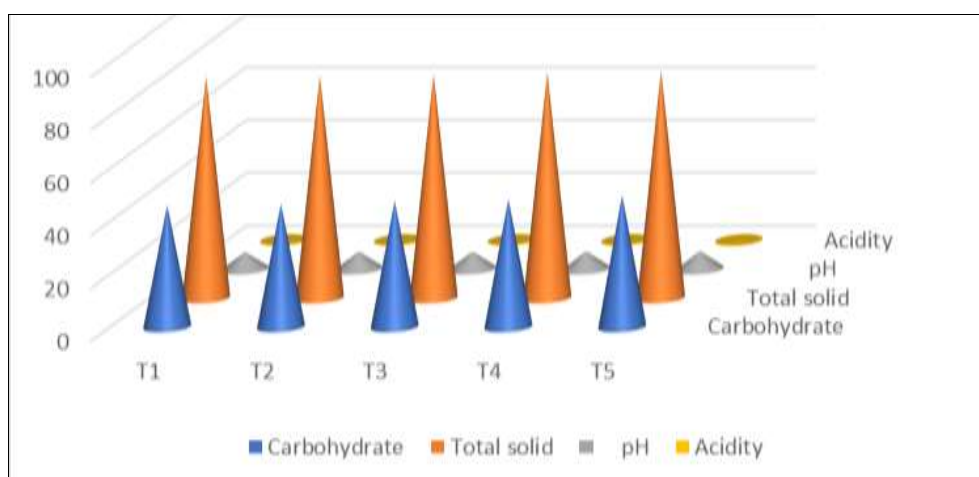


Fig 4: Physico-chemical properties of Burfi using with oat powder

Conclusion

From the results of current investigations, it is concluded that:
1) Oat powder could be successfully used in preparations of dairy products like *burfi*.

- 1) Use of oat powder @ 5 percent of *khoa* in preparation *burfi* was more acceptable and desirable.
- 2) On the basis of sensory evaluation, *burfi* prepared from the 95 percent *khoa* and 5 percent oat powder (T₃) was recorded highly acceptable over other treatment in respect of colour and appearance, body and texture, flavour and overall acceptability.
- 3) While in chemical composition score, control T₁ was acceptable and liked very much as compared to other treatments, T₃ with 5 percent oat powder and 95 percent *khoa* gained acceptable score with likely very much. Hence, it is concluded that the 5 percent oat powder *burfi* is more nutritious and cheaper for consumers.

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