

Comparison of the antioxidant Potential of Natural Antioxidants in Ghee

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Abstract

Pomegranate peel powder and grape seed powder are good natural antioxidants. Experiments were conducted by adding these powder in ghee as antioxidants to replace BHA which is a potent carcinogen. Sample with different concentrations of pomegranate peel powder and grape seed powder viz., 0.5 per cent, 1 per cent, 1.5 per cent and 2 per cent. Control and 0.02 per cent BHA sample were also prepared. Sensory evaluation was done to optimise the best concentration of and optimised concentration to 1.5 per cent. Chemical analysis was done for 21 days at an interval of 3 days. It was observed that there was a steady increase in PV value in all treatments however it was less in case of pomegranate peel powder (0.968) which indicated that its high potentiality as antioxidant. Thiobarbituric Acid value was found to be 0.047 in grape seed powder treatment on 21st day which was the lowest among the group and remarkable. It was observed that grape seed powder sample's value had comparatively less Carbonyl values (0.516) indicating low oxidative rancidity. From the above experiment, it was concluded that grape seed powder could be used as an antioxidant additive for ghee and suitable replacement for BHA.

Keywords: Ghee, Grape Seed Powder, Natural Antioxidants, Pomegranate Peel Powder.

1. Introduction

Ghee is an anhydrous milk fat which is a complex lipid of mixed glycerides together with a small amount of free fatty acids, phospholipids. It also contains sterols and their esters, fat-soluble vitamins (A, D, E and K), carotenoids, carbonyl compounds. Ghee occupies a prominent place in the Indian diet, hydrocarbons, charred casein, moisture and traces of trace elements like copper and iron. Oxidative rancidity is the major pathway by which ghee undergoes deterioration. This is referred to as autoxidation because the rate of oxidation increases as the reaction proceeds under usual processing and storage conditions.

Pomegranate peels are known for its antioxidant potential and are composed of an interior network of membranes. Comprising almost 26–30% of total fruit weight and are characterized by substantial amounts of phenolic compounds, including flavonoids and hydrolysable tannins

In India, only legally approved as an antioxidant in ghee is Butylated Hydroxyl Anisole. Though natural antioxidants have the better potentiality to prevent rancidity in ghee, but no commercial trial has not been tried to date to evaluate the natural antioxidant in ghee. In another aspect during large scale production aftertaste and flavor of natural antioxidant have not been tried till date. So, commercial application or market of functional

ghee using natural product still out of reach for the dairy industry. The objective of this study is to the modeling of antioxidant potential of natural antioxidants using different chemical analysis. It is done by preparation of ghee samples, Optimization of the percentage of natural antioxidants and analysis of antioxidant potential using different tests.

2. Material and methods

Chemicals and reagents All the chemicals used during the investigation were AR grade and procured from standard suppliers (HI MEDIA® and SIGMA-ALDRICH).

2.1 Raw materials

Fresh, good quality and well ripened pomegranate fruits were procured from the local fruit market. Freshly prepared milk cream was obtained from the experimental dairy plant of the institute, SRS, ICAR-NDRI, Bengaluru. The synthetic antioxidant Butylated hydroxyl anisole (BHA) was obtained from HI MEDIA®, Mumbai, India.

2.2 Preparation of samples

Cream was separated from milk using cream separator and the obtained cream of about 40-60% fat content was refrigerated at 10-12 °C. Cream was churned in mixer

grinder using ice water as well as ice cubes to obtain butter of 80 % fat content. Measured quantity of pomegranate peel powder and grape seed powder were added to butter by separating total butter to 6 parts as control, BHA, 0.5 %, 1 %, 1.5 %, 2 % according to percentage weight basis. Butter was heated in the vessel and temperature was noted time to time. It was constantly heated up to 105 °C and slowly heated with frequent stirring until 119 °C and thus ghee was obtained.

2.3 Sensory evaluation

Sensory evaluation of ghee samples were evaluated for colour and flavour using nine point hedonic scale. Sensory panel members were requested to score the samples from 1 to 9 (1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely). It was done to optimise the best concentration of pomegranate peel powder for further analysis.

3. Results and Discussion

3.1 Sensory analysis

Sensory analysis were conducted as per standard procedure and the evaluation was done by a panel of 7 trained judges.

Table 1 Sensory evaluation of pomegranate peel powder

	1	2	3	4	5	6
Colour & Appearance	8	8.21	8.21	8	8	7.28
Body & Texture	7.9	7.97	7.92	7.5	8.14	8.21
Flavour	8.14	8.14	8.14	8.32	8.14	8.07
Overall Acceptability	7.9	7.9	7.78	7.71	7.5	7.42

1= 0.5 % pomegranate peel powder sample

2= 1 % pomegranate peel powder sample

3= 1.5 % pomegranate peel powder sample

4= 2 % pomegranate peel powder sample

5= Control sample

6= 0.02 % BHA sample

Table 2 Sensory evaluation of grape seed powder

	1	2	3	4	5	6
Colour & Appearance	8	8	7.85	7.85	8	7.28
Body & Texture	8.071	7.85	7.714	7.64	8.14	8.21
Flavour	8.2	8.071	8.28	8.28	8.14	8.07
Overall Acceptability	8.079	7.92	8.07	7.5	7.5	7.42

1= 0.5 % grape seed powder sample

2= 1 % grape seed powder sample

3= 1.5 % grape seed powder sample

4= 2 % grape seed powder sample

5= Control sample

6= 0.02 % BHA sample

3.2 Peroxide value

Best sample was selected based on average score of sensory analysis and optimization of pomegranate concentration was determined. The analysis was done with 2 replication and it was coded as follows

1. C: control sample Re1
2. C0: control sample Re2
3. B: BHA sample Re1
4. B0: BHA sample Re2
5. P: pomegranate peel powder sample Re1
6. P0: pomegranate peel powder sample Re2
7. G: grape seed powder sample Re1
8. G0: grape seed powder sample Re2

Results of the analysis PV which was done for 21 days and the readings are shown in a chart below. There was a steady increase in PV value for all types of samples and all readings were high compared to the initial end point readings of peroxide value.

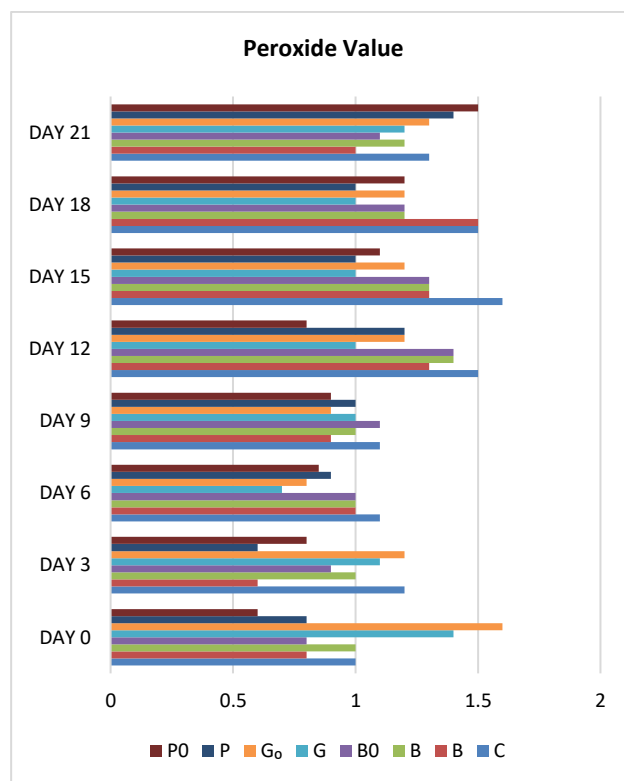


Fig.1 Result of PV analysis

3.3 TBA value

TBA Analysis was done for 21 days and the results of the readings are tabulated below. Readings were taken as Optical Density at 532 nm using spectrophotometer. Lowest value among the result was showed by control

sample on the day of starting of experiment (0th day) and highest value was also by control sample on last day of experiment. There was a gradual increase in the value of TBA for each sample and its replication also for control sample but vice versa in case of BHA and pomegranate in a replication

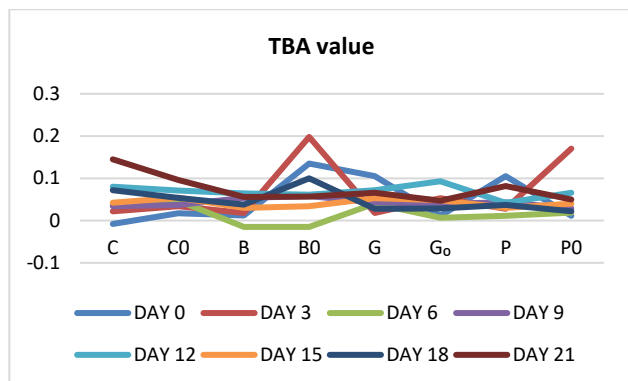


Fig 2 Result of TBA analysis

3.4 Carbonyl Value

Results of the analysis CV which was done for 21 days and the readings are shown in a chart below. There was constant pattern of CV values for control sample where as BHA sample show slight decrease in value from 0.692 to 0.41. In the case of pomegranate CV value was constantly increasing and at 21st day it shows a highest peak among all as 0.954

Table 3 Carbonyl value of samples

CV	C	B	G	P
DAY 0	0.602	0.692	0.444	0.504
DAY 3	0.502	0.645	0.407	0.482
DAY 6	0.525	0.688	0.585	0.502
DAY 9	0.368	0.699	0.544	0.465
DAY 12	0.673	0.518	0.518	0.673
DAY 15	0.398	0.443	0.494	0.552
DAY 18	0.606	0.606	0.785	0.402
DAY 21	0.434	0.41	0.352	0.954

Conclusions

Ghee, anhydrous milk fat (clarified butterfat or butter oil), is usually prepared from cow milk or buffalo milk. Ghee has got typical pleasing and appetizing aroma. It contributes colour and flavor richness to foods. Oxidative deterioration degrades color, flavor, aroma and nutritive value of ghee affecting suitability for consumption and reducing shelf-life of the product.

Modelling of antioxidants potential of the natural antioxidants is an important study. Ghee was prepared from butter and added different concentration of pomegranate peel powder and grape seed powder. Sensory evaluation was done. Highest score was obtained from 1.5 % pomegranate peel powder and grape seed powder added ghee sample and the concentration was optimized.

Peroxide value, TBA value and carbonyl value were found out in order to measure the antioxidant potential of sample. Analysed Peroxide value (Progress of lipid oxidation), Thiobarbituric Acid value (the measure of lipid oxidation) and Carbonyl values (measure of oxidative rancidity) for 21 days at an interval of 3 days for the treatments pomegranate peel powder (1.5 per cent), 0.02 per cent BHA and control. It was observed that there was a steady increase in PV value in all treatments however it was less in case of pomegranate peel powder (0.968) which indicated that its high potentiality as antioxidant. Thiobarbituric Acid value was found to be 0.047 in grape seed powder treatment on 21st day which was the lowest among the group and remarkable. It was observed that grape seed powder sample's value had comparatively less Carbonyl values (0.516) indicating low oxidative rancidity. From the above experiment, it was concluded that grape seed powder could be used as an antioxidant additive for ghee and suitable replacement for BHA.

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