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Total Antioxidant Capacity and Total Phenolic Content of Traditionally Preparedyogurt Fortified with Some Dry Fruits and Fresh Fruits

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ABSTRACT

Introduction: There is a burgeoning consumer inclination towards healthy eating, natural, organic and convenience food products. As consumer is usually looking for the products which can offer more health benefits, therefore supplementation of yogurt with natural source of antioxidants could play a role in reducing the risk of many chronic diseases.

Aim/Objective: The present study was undertaken with the aim of developing functional food product "Naturally flavored yogurts" - supplemented with the natural sources of antioxidants to add value to the yogurt that has most powerful antioxidant activity.

Methods: Three naturally flavored varieties of antioxidant-rich yogurts were developed. Sample-1 was supplemented with strawberries, almonds, prunes and rose petals. Sample-2 was developed with saffron and pistachio along with dried figs and raisins. Sample-3 was prepared with fresh fruits like plums, kiwi and pomegranate. After sensory evaluation, the three samples thus prepared, were then screened for their Total antioxidant capacity and total phenolic content.

Results: The results of the study revealed that – sample-3 showed highest phenolic and antioxidant activity.

Conclusion: It can thus be concluded that - sample-3 can be considered as good source of antioxidant among all the three developed variants. All the three developed variants however may impart various health benefits when consumed.

Key Words: Functional food, Yogurt, Total antioxidant capacity, Total phenolic content, Dry fruits, Fresh fruits

INTRODUCTION

Health and Nutrition continues to be a key area of interest among consumers. Regular balanced diet directly affects the healthiness and wellbeing. The past decade has witnessed intense interest in "nutraceuticals" (or "functional foods") in which phytochemical constituents can have long-term health promoting or medicinal qualities.[1,2]

Eating a healthy diet has become most important especially during the COVID-19 pandemic. We are what we eat and our eating habits highly influence our body's ability to prevent, fight and recover from various diseases. Since past two years of COVID-19 pandemic, there has been an increased awareness of the role of food in improving health and wellbeing and thereby used as a means to prevent, delay and overcome many lifestyle disorders. (WHO, Health Campaign' 2021)[3]

The consumer is now looking for food products which can offer immunity along with other health benefits. The amalgamation of nutritionally rich ingredients into basic products may affect the nutraceutical, nutritional and functional properties of the fortified foods. Hence, in the currently emerging modern communities, functional foods, is becoming an important branch of the food industry. [4]

Antioxidants constitute an important group among commonly used additives. Antioxidants play a major role in the prevention of human diseases and disorders, function as free radical scavengers, complexes of pro-oxidant metals, reducing agent and quenchers of singlet oxygen formation. Along with the maintenance of redox homeostasis, natural antioxidants also show other properties such as antibacterial, antiviral, anti-inflammatory, anti-cancer etc. The safety of synthetic food antioxidants is a major issue which limits their use.

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Alternatively, natural antioxidants allow food manufacturers to produce stable products with 'clean' labels of all-natural ingredients.[4]

The antioxidants in fruits, vegetables, tea and red wine are the main factors for the observed efficacy of various foods in management of chronic diseases including heart disease and some cancers. The free radical scavenging activity of antioxidants in foods has been extensively investigated and reported in the literature by Miller and Rigelhof.[5,6]

Dairy products are one of the most fascinating foods with regard to their nutritional benefits and potential antioxidant activity. Milk contains a wide variety of antioxidant molecules such as milk caseins and whey proteins.[7,8] So also, milk contains diverse antioxidant molecule traces i.e. low molecular weight thiols,[9,10] ascorbate,[11] tocopherol, retinol and carotenoids.[12,13]

Low-fat yogurts can be looked upon as one of the most promising sources of protein, calcium, vitamins, and probiotics, which can enhance the gut microflora. Probiotics may boost the immune system. They may also offer protection for bones and teeth and may help preventing digestive and intestinal problems. Supplementation of yogurt with natural sources of antioxidants could play a role in reducing the risk of many acute and chronic diseases.[14]

MATERIALS & METHODS

All the fruits and dry fruits used in the study was viz. strawberry, pomegranate, kiwi, plums, almonds, dried apricots, pistachio, saffron, dried figs and raisins were collected from the supermarket (Mumbai). Roses were also collected from the local market, petals were separated and washed thoroughly, shade dried and used.

Preparation of yoghurt

Production of yogurt was carried out by following a traditional process on cow's milk, using starter culture and incubation at RT. The finished yogurt samples were stored at 4°C± 0.5°C and used for the analysis.

Preparation of sample:

Sample 1: contained 70gms Yoghurt with 13.0gm of strawberry pulp (prepared from the fresh strawberry fruits), 9.0gms of almonds, 7.0 gms dried apricot, and 1.0gms of rose petals

Sample 2: contained 70gms Yoghurt with 12.0gm plums, 10.0 gms dried figs, 10.0gms Pistachio, 9.0gms raisins and 1.0gms of saffron

Sample 3: contained 70.0gms Yoghurt with 12.0gms of chopped plums, 10.0gms pomegranate & 8.0 gms of chopped kiwi

Preparation of sample extract for analysis:

1gm of the sample was weighed and crushed using mortar and pestle. This mixture was then dissolved in water and volume was made up to 100ml and used for all the assays.

In-vitro antioxidation analysis:

The assays for total antioxidant capacity (by the method of Prieto et al.(1999)) [16] and total phenolic content (by Folin-Ciocalteau reagent method (McDonald et al., 2001) [17] using gallic acid standard) were performed using known and standardized methods.[18]

RESULTS

Total antioxidant capacity

The total antioxidant capacity was calculated by measuring the capacity of extract to reduce molybdenum and calculated in terms of mg % of gallic acid and the values are reported in table 1. The antioxidant activity seen to be highest in sample 3, while sample 1 and sample 2 showed same antioxidant activity. (Table 1)

Total phenolic content:

The phenolic content of samples evaluated by measuring the amount of phenols present in terms of mg % of gallic acidand the values are reported in table 2. Phenolic content (in mg%) was found to be very high in sample 3. Phenolic activity of sample 3 was found to be almost double of sample 1 and sample 2. (Table 2)

DISCUSSION

Zainoldin et al. (2009)[19] showed that fruit enriched yoghurt has a good source of antioxidant. In the said study the antioxidant activity of plain yogurt (19.16%) was enriched by the presence of white and red dragon fruit (24.97- 45.74%). In accordance with their results, in our present study we have enriched yogurt with fruits and dry fruits and have found that yogurt enriched with plum, kiwi and pomegranate showed highest antioxidant capacity.

Dilek et al.[20] demonstrated that grape seed extract can be successfully used for the fortification of traditional yogurt.

Other similar studies describing enhanced antioxidant activity of yogurts by the addition of natural fruit extracts include yogurts fortified with callus by Karaaslan et al., 2011, [21] with grape seed extract by Chouchouli et al., 2013 [22] and with wild blackberry extract by Martins et al., 2014. [23]

CONCLUSION

Hence, it can be concluded that the yogurt can be enriched and fortified with fruits and dry fruits to increase the antioxidant content of yogurt. This research has important application in commercial yogurt production techniques.

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Table 1: Total Antioxidant activity (TAA) expressed as mg of Gallic acid equivalents (GAE)/g of the Yogurt sample.

Sr. No.	Yogurt sample	Total Antioxidant activity (TAA) expressed as mg of Gallic acid equivalents (GAE)/g of the Yogurt sample.
1	Sample 1	244.4 + 0.81
2	Sample 2	244.4 + 0.59
3	Sample 3	480.2 + 0.74

*All values are expressed as mean ± SD for three determinations

Table 2: Total Phenolic content (TPC) expressed as mg of Gallic acid equivalents (GAE)/g of the Yogurt sample.

Sr. No.	Yogurt sample	Total Phenolic Content (TPC) expressed as mg of Gallic acid equivalents (GAE)/g of the Yogurt sample.
1	Sample 1	312.5 + 0.52
2	Sample 2	273.5 + 0.76
3	Sample 3	617.5 + 0.83

*All values are expressed as mean ± SD for three determinations