

Effect of Honey and Carbonation on Sensory Attributes of Ready-To-Serve Carbonated Functional Greek Yoghurt Whey Beverage

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Abstract—This research investigates the creation of a novel ready-to-serve (RTS) carbonated Greek yoghurt whey beverage enriched with honey as a functional ingredient. Carbonation process infuse carbon dioxide into liquids, is explored for its sensory impact and potential health benefits. The study aims to optimize the level of honey (15%, 25% and 35%) for sensory appeal and nutritional enhancement in the carbonated Greek yoghurt whey beverage, addressing consumer demand for innovative and health-conscious beverage options.

Index Terms—Honey, Greek yoghurt whey, Carbonation

I. INTRODUCTION

The market experiences an increase in aseptically processed and packaged ready-to-serve beverages, which enhance nutrition by using fruit juices to sweeten carbonated water. The growing demand for soft drinks has a significant potential in developing naturally nutrient-rich fruit juice beverages. Our country produces various soft drink varieties, including sweetened carbonated (aerated) beverages, still beverages containing fruit juice or pulp and soda water (Yadav *et al.*, 2013). Nutraceuticals is a combination of nutrition and pharmaceutical, where nutrition means the process by which organisms obtain and utilize nutrients from food for sustenance and growth (Sachdeva *et al.*, 2020). Whey holds significant promise as a foundational ingredient for creating functional and nutraceutical beverages due to its inherent nutritional and functional properties. Among the various innovative microbiological processes for utilizing whey, the production of fermented whey beverages such as soft drinks, beer-like products, whey wine and low-alcoholic beverages appears to be the most cost effective and feasible method for transforming unused milk nutrients into value-added products. Utilizing whey from Greek

yoghurt production reduces waste and creates valuable products, fostering sustainability across multiple sectors. Whey comprises approximately 80-90% of the volume of milk used in the production of channa, paneer, cheese, and casein, based on its typical composition. Whey contains 93% water and roughly 50% of the total solids found in milk, with lactose being the primary component (Kumar *et al.*, 2015). Greek yoghurt sets itself apart from regular yoghurt due to its denser, richer texture and higher protein content, resulting in a more pronounced flavor and taste, leading to increased market demand. Its protein-rich nature makes it a valuable ingredient in smoothies, protein bars, and baked goods. It also serves in the production of fermented foods, as animal feed, or even as a fertilizer, owing to its nutrient composition (Uduwerella *et al.*, 2017). Honey is a syrup primarily contains fructose (38.5 %) and glucose (31.3 %), maltose (7.2 %) and sucrose (1.3 %) and various oligosaccharides up to 10.9 %. It has several well-known antimicrobial properties. It consists of carbohydrates, primarily sugars like fructose and glucose. Honey boasts a diverse array of components like proteins, lipids, amino acids, minerals, vitamins, phenolic compounds, and organic acids. Honey has been valued for its antiaging properties, immune-boosting effects, antibacterial properties, and its efficacy in treating conditions like bronchial congestion, sore throat, coughs, and colds (Valverde *et al.*, 2022). carbonation creates a fizzy sensation upon consumption which alters the sensory perception for consumers. Carbonation refers to the process of infusing a liquid with carbon dioxide (CO₂) gas, achieved by pressurizing and cooling the liquid. This method is used to dissolve CO₂ gas into water, creating fizzy beverages. CO₂ is a harmless and odorless gas which can exist in solid, liquid, or gas form and is

soluble in liquids. The dissolved gas not only gives the beverage its unique flavor and effervescence but also serves as a deterrent against bacteria (Abu-Reidah., 2020).

II. MATERIALS AND METHODS

The research study on RTS carbonated nutraceutical functional yoghurt whey beverage was conducted at the Post

Graduate Laboratory of Dairy Technology Department situated in Dairy Science College, Regional Campus of Karnataka Veterinary, Animal and Fisheries Sciences University, Bengaluru. For the research, milk was utilized from Students Experimental Dairy Plant

(SEDP) of Dairy Science College, Hebbal, Bengaluru. *Streptococcus thermophilus* and *Lactobacillus delbrueckii ssp. Bulgaricus* were included in the mixed culture used to make the yoghurt, which was procured from Delvo DSL pvt Ltd. *Lactobacillus acidophilus* probiotic culture was obtained from Department of Dairy Microbiology, of Dairy Science College, Hebbal, Bengaluru. Plastic cups made of polypropylene (PP) were used to pack the carbonated functional Greek yoghurt whey beverage. The optimization process for creating the Ready To-Serve carbonated functional Greek yoghurt whey beverage involved Honey and carbonation are illustrated in Figure 1.

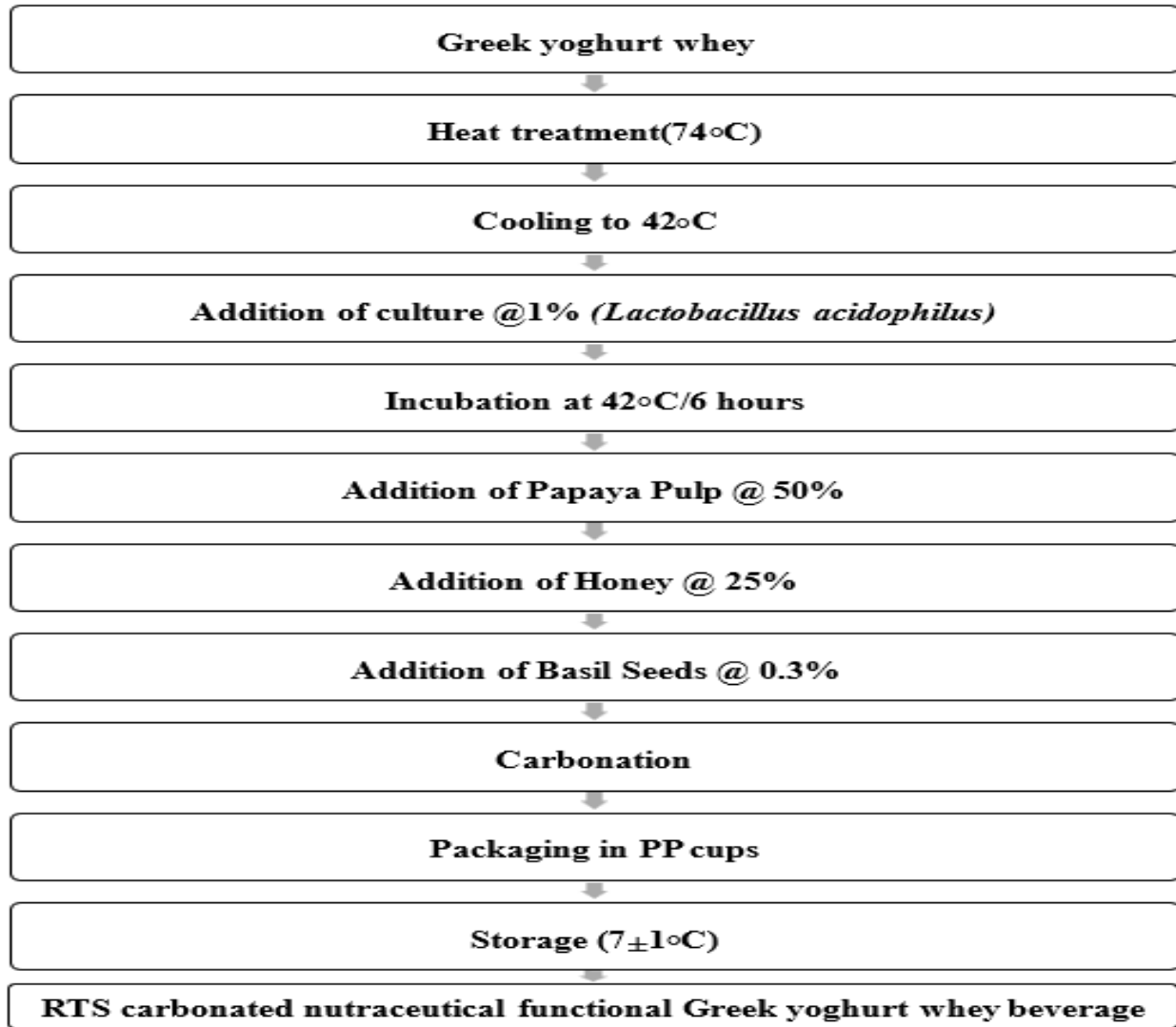


Figure 1: Flow chart of RTS carbonated nutraceutical functional Greek yoghurt whey beverage

Sensory Evaluation

A 9-point hedonic scale was used by the selected panel of trained judges to evaluate the generated study sample's sensory qualities, including colour and appearance, body and texture, flavour, and overall acceptability. The highest-scoring output will be further used for statistical analysis Peryam and Pilgrim, (1957).

Statistical Analysis

Statistical Analysis will be conducted for obtained data using R Software (R. version 4.2.2) and other suitable statistical software to determine the significance and non-significance of the trials and the treatments.

III. RESULT AND DISCUSSION

Effect of different levels of honey on sensory attributes of Greek yoghurt whey beverage

The results pertaining to the effect of addition of honey to Greek yoghurt whey beverage on colour and appearance, body and texture, flavour, sweetness and overall acceptability are presented in Table 1.

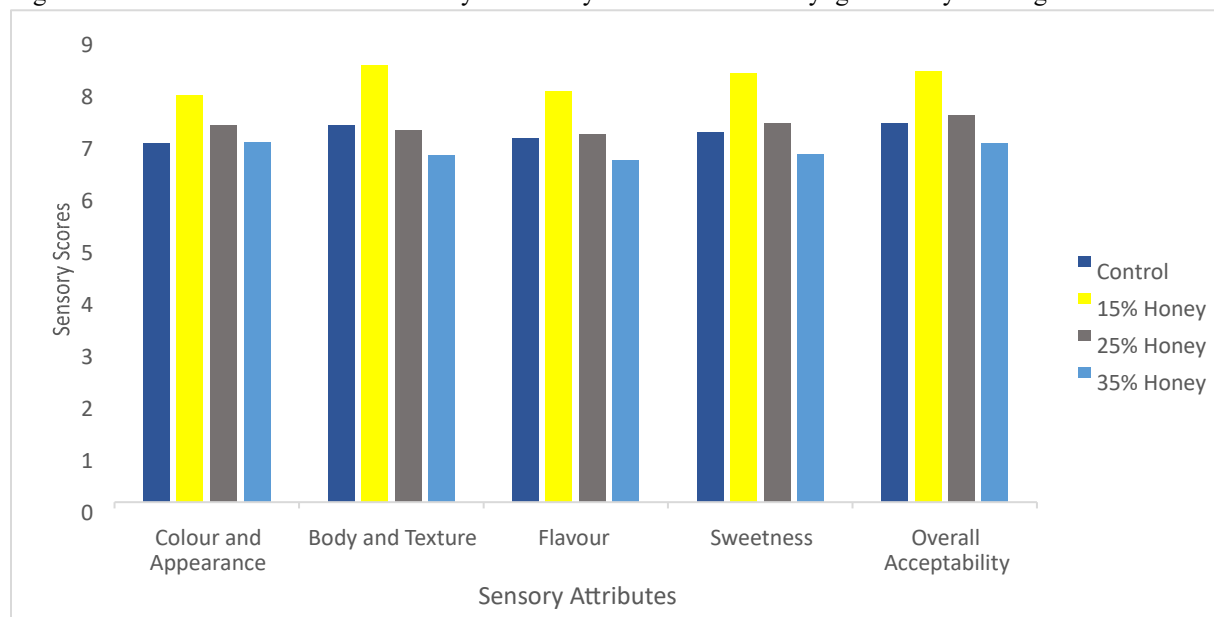
The mean sensory scores for colour and appearance for control sample was 6.91 as against 7.83, 7.25 and 6.93 for Greek yoghurt whey beverages added with honey at 15, 25 and 35 per cent respectively. The highest sensory score with respect to colour and appearance

was secured by whey beverage containing 15 per cent level of honey. The observed sensory score for body and texture of control sample was 7.25. The experimental samples recorded 8.41, 7.16 and 6.68 out of 9.00 for honey blended Greek yoghurt whey beverage. The sensory scores with respect to flavour for control sample was 7.00 and it was 7.91, 7.08 and 6.58 out of 9.00 for Greek yoghurt whey beverage. The control sample's mean sensory scores for sweetness were 7.12, whereas the Greek yoghurt whey combined with 15, 25 or 35 per cent levels of honey received scores of 8.25, 7.29, and 6.70 respectively. The sensory scores awarded for overall acceptability of control Greek yoghurt whey beverage was 7.29 as against 8.28, 7.45 and 6.91. The Greek yoghurt whey beverage with 15 per cent honey secured highest average sensory scores compared to 25 and 35 per cent honey addition. The result findings of our research is similar to Nath *et al.*, (2015) who optimized the blend of honey, aloe vera pulp, and soya milk to achieve the highest sensory ratings and appeal. The ideal ratio for honey, aloe vera pulp, soya milk, and water was 2.5:1.0:2.5:4.0. The chosen mix contained equal parts honey and soya milk with 10 % aloe vera pulp. The average ranks for key sensory aspects such as appearance, colour, flavour, taste, consistency, and overall acceptability were 67.6, 69.0, 69.2, 72.9, 75.0, and 69.5, respectively.

Table 1: Effect of different levels of honey on sensory attributes of Greek yoghurt whey beverage.

Level of honey (%)	Colour and appearance	Body and texture	Flavour	Sweetness	Overall acceptability
Control	6.91 ^a	7.25 ^b	7.00 ^b	7.12 ^b	7.29 ^{ab}
15	7.83 ^a	8.41 ^a	7.91 ^a	8.25 ^a	8.28 ^a
25	7.25 ^a	7.16 ^b	7.08 ^b	7.29 ^b	7.45 ^{ab}
35	6.93 ^a	6.68 ^b	6.58 ^b	6.70 ^b	6.91 ^b
CD (P<0.05)	0.90	0.76	0.62	0.67	0.80

Figure 2. Effect of different levels of honey on sensory attributes of Greek yoghurt whey beverage.



Effect of carbonation on sensory attributes of functional Greek yoghurt whey beverage

The results pertaining to the effect of carbonation on different Greek yoghurt whey beverage on colour and appearance, body and texture, flavour, sweetness and overall acceptability are presented in Table 2. Ingestion of CO₂ did not had any remarkable effect on colour and appearance of Greek yoghurt whey beverage.

The mean sensory scores for colour and appearance for control sample was 7.00 as against 7.41, and 8.75 for Greek yoghurt whey beverages with different treatments respectively. The highest sensory score with respect to colour and appearance was secured by Greek yoghurt whey beverage containing 8.75 of carbonation. The observed sensory score for body and texture of control sample was 7.66. The experimental samples recorded 7.50 and 8.76 out of 9.00 for mixed functional ingredients blended Greek yoghurt whey

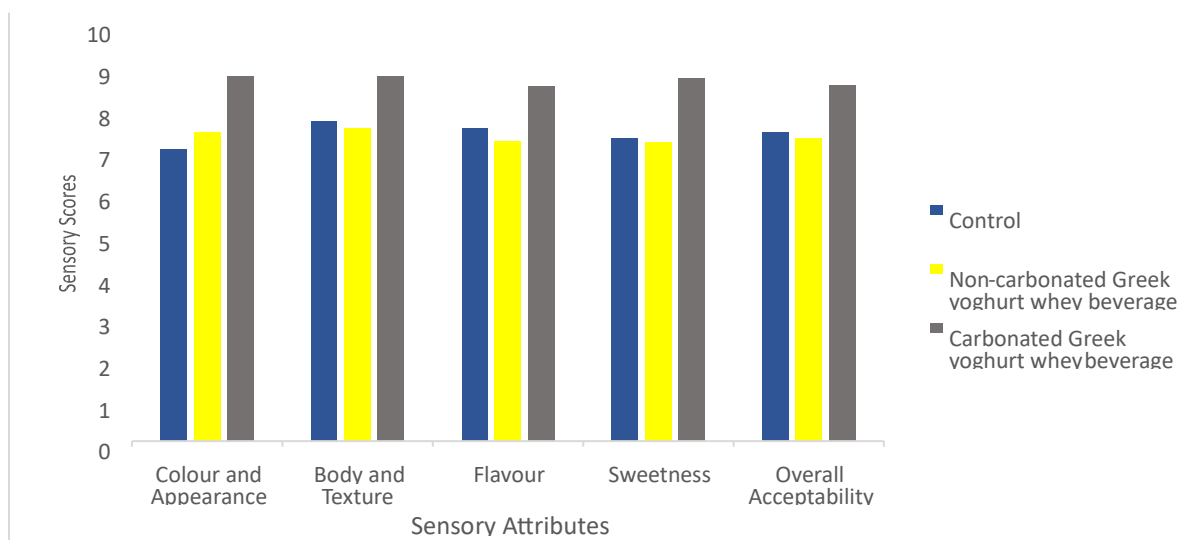
beverage respectively. The sensory scores with respect to flavour for control sample was 7.50 and it was 7.18 and 8.50 out of 9.00 for Greek yoghurt whey beverage. Greek yoghurt whey beverage mixed with functional ingredients and carbonation secured highest flavour scores compared to control and non-carbonated sample. The average sensory rating for sweetness in the control sample was 7.25 and it was 7.16 and 8.70 for functional Greek yoghurt whey beverage. The sensory scores awarded for overall acceptability of control Greek yoghurt whey beverage was 7.40 as against 7.25 and 8.53. The research result is justified by the findings of Shareef (2013) who developed a lactose-fermented paneer whey beverage by blending orange, mango, and pineapple juices at various levels, followed by carbonation for 3 minutes. It was reported that carbonation enhanced the taste, flavour, and overall acceptability of the product.

Table 2. Effect of carbonation on sensory attributes of functional Greek yoghurt whey beverage.

Samples	Colour and appearance	Body and texture	Flavour	Sweetness	Overall acceptability
Control	7.00 ^a	7.66 ^a	7.50 ^b	7.25 ^a	7.40 ^b
Non-carbonated Greek yoghurt whey beverage	7.41 ^a	7.50 ^a	7.18 ^b	7.16 ^a	7.25 ^b
	8.75 ^a	8.76 ^a	8.50 ^a	8.70 ^a	8.53 ^a

Carbonated Greek yoghurt whey beverage					
CD (P<0.05)	0.63	0.82	0.704	0.83	0.706

Figure 3. Effect of carbonation on sensory attributes of functional Greek yoghurt whey beverage.



IV. CONCLUSION

The current research study explores the development of a ready-to-serve (RTS) carbonated nutraceutical beverage made from yogurt whey by incorporating varying amounts of honey as a functional ingredient during the carbonation process. The final optimized level of honey was 15%. The carbonated Greek yoghurt whey beverage achieved the highest score in sensory evaluation compared to control and non-carbonated Greek yoghurt whey beverage.

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