**Organoleptic Quality and Production Cost Assessment of Muskmelon, Honey and Inulin-Based Greek Yoghurt**

**ABSTRACT**

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| --- |
| The present study was undertaken to evaluate the sensory quality and cost of production of Greek yoghurt enriched with Muskmelon (*Cucumis melo*) pulp, honey, and inulin, targeting the development of a functional and consumer-acceptable fermented dairy product. The experiment was conducted using a Completely Randomized Design (CRD) with five treatments and five replications each. The study was carried out at the Division of Dairy Science, Dr. Sharadchandra Pawar College of Agriculture, Baramati. During the academic year 2023 to 2025. Greek yoghurt was prepared by incorporating muskmelon pulp at levels of 0, 5, 10, 15, and 20 percent along with 12 percent honey and 0.8 percent inulin into standardized cow milk. The yoghurt was fermented using a mixed culture of Streptococcus thermophilus and Lactobacillus delbrueckii subsp. bulgaricus, followed by straining to obtain Greek yoghurt. Sensory evaluation was carried out by panel of 5 semi-trained judges using a 9-point hedonic scale for parameters like colour and appearance, flavour, body and texture, taste and overall acceptability. Cost of production was calculated for each treatment based on ingredient cost and processing inputs. Among the five treatments, the Greek yoghurt sample containing 15 percent muskmelon pulp (T3) exhibited the highest sensory scores for all attributes, with an overall acceptability score of 7.77. Higher pulp concentrations negatively impacted texture and flavour. The cost analysis showed T3 to be the most economical formulation due to optimal ingredient usage and high acceptability. Greek yoghurt formulated with 15 percent muskmelon pulp, 12 percent honey and 0.8 percent inulin was found to deliver the best balance of sensory quality and cost efficiency. |

***Keywords****: Greek Yoghurt, Muskmelon pulp, Honey, Inulin.*

1. **INTRODUCTION**

Fermented milk products have played an essential role in the human diet for centuries due to their improved digestibility, enhanced nutritional value and extended shelf life. Among these, Greek yoghurt stands out as a protein-rich, thick fermented dairy product obtained by straining whey from regular yoghurt. It offers superior texture and higher nutritional density, making it a favoured choice among health-conscious consumers (Tamime and Robinson, 2007; Wouters, 2012). Fortification with natural ingredients such as fruit pulp, prebiotics, and natural sweeteners has further expanded its market potential by enhancing both sensory appeal and functionality (Sundaram and Kumaran, 2015; Khurana and Kanawjia, 2007).

Muskmelon (*Cucumis melo*) is a sweet, juicy fruit known for its medicinal and nutritional value. Rich in vitamins A and C, potassium and antioxidants, it has shown anti-inflammatory, antioxidant and anticancer properties (Parle and Singh, 2011; Fatima *et al.,* 2023). Despite its abundance and popularity, muskmelon is rarely utilized in value-added dairy products like yoghurt. Prior studies suggest that blending muskmelon pulp with dairy products such as lassi or yoghurt improves sensory scores and consumer acceptance (Anarthe, 2020; Singh *et al.,* 2018), making it an ideal choice for product innovation in the functional dairy segment.

Honey, a traditional natural sweetener, contains antimicrobial and antioxidant compounds and supports probiotic activity. Its incorporation in fermented milk products improves flavour and aids the growth of lactic acid bacteria without inhibiting microbial fermentation (Tamime and Robinson, 2007; J. Food Science, 2001).

Inulin, a non-digestible carbohydrate extracted mainly from chicory roots, acts as a prebiotic fibre that promotes gut health, improves calcium absorption and enhances the texture of dairy products (Gibson *et al.,* 2004; Karimi *et al.,* 2015). These functional ingredients not only improve nutritional properties but also support better consumer health outcomes.

Given the growing demand for functional and affordable dairy foods, this study aims to develop a Greek yoghurt enhanced with muskmelon pulp, honey and inulin. The study focuses specifically on evaluating sensory attributes such as colour and appearance, flavour, body and texture, taste and overall acceptability, along with determining the cost of production to assess its market feasibility (Washimbe *et al.,* 2020; Anarthe, 2020). This approach not only supports consumer health but also promotes efficient utilization of seasonal fruits and natural sweeteners in functional dairy product development.

**2. MATERIAL AND METHODS**

The present investigation was carried out during the academic year 2023–2025 at the Department of Animal Husbandry and Dairy Science, Dr. Sharadchandra Pawar College of Agriculture, Baramati, Maharashtra. The study was conducted in the dairy processing unit. The bacterial culture was procured from NCDC, NDRI Karnal and all other required ingredients were purchased from local market Baramati.

**Preparation of Muskmelon Pulp**

The Muskmelon pulp was prepared as per protocol developed by (Washimbe D. V. *et al.,* 2020)

Muskmelon fruit

Washing

Peeling

Cutting into pieces

Removing of seeds

Blending or Grinding

Pulp

Flowchart 1: Preparation of Muskmelon Pulp



**Plate No. 1** Muskmelon Fruits Muskmelon Pulp

**Preparation of Muskmelon Pulp Incorporated Greek Yoghurt**

The Greek Yoghurt was prepared by using standardized procedure along with slight modifications given by Hariharan V. *et al.,* (2023).

Cow Milk

Filtration and Standardization

Pasteurization 85 for 30 min

Homogenization at 2 stages

Cooling at 40

Inoculation of starter culture (1% of milk)

Addition of Inulin (0.8% of milk)

Mixing

Incubation at 42 for 5-6 hrs

Cooling at 5

Allowing to be hang in a clean white muslin cloth (For 1-2 hrs)

Desorption of whey from solid mass

Addition of Muskmelon Pulp and Honey (12%) at the desired level as per treatment combinations

Muskmelon incorporated Greek Yoghurt

Packing and Storage at 4 ±1°C

Flowchart 2: Preparation of Muskmelon Pulp Incorporated Greek Yoghurt

**Treatment Combinations**

The research trial was conducted with the fallowing different combinations

T0: Plain Greek Yoghurt + Inulin 0.8 % (Control)

T1: Greek Yoghurt + Honey (12 %) + Inulin (0.8 %) + Muskmelon Pulp (5 %)

T2: Greek Yoghurt + Honey (12 %) + Inulin (0.8 %) +Muskmelon Pulp (10 %)

T3: Greek Yoghurt + Honey (12 %) + Inulin (0.8 %) +Muskmelon Pulp (15 %)

T4: Greek Yoghurt + Honey (12 %) + Inulin (0.8 %) +Muskmelon Pulp (20 %)



**Plate No. 2** Experimental treatment combinations

**Cost of Production**

The cost of producing Muskmelon Greek Yoghurt with honey and inulin was calculated by taking into account the cost of processing of finished product as well as the current market prices for the ingredients.

**3. RESULTS AND DISCUSSION**

**3.1 Results**

**A] Sensory evaluation of Greek yoghurt incorporated with Muskmelon pulp**

The five samples of Muskmelon pulp, honey and inulin incorporated Greek yoghurt were subjected for sensory attributes like as colour and appearance, flavour, body and texture, taste and overall acceptability. By the panel of five semi trained judges using a 9-point hedonic scale.

**1) Colour and Appearance**

**Table 1: Effect of different levels of Muskmelon pulp on Colour and appearance score of Greek yoghurt**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Replications** | | | | | **Mean** |
| **R I** | **R II** | **R III** | **R IV** | **R V** |
| **T0** | 7.10 | 7.60 | 7.00 | 7.05 | 7.30 | 7.21c |
| **T1** | 7.05 | 7.10 | 7.80 | 7.40 | 7.60 | 7.39c |
| **T2** | 7.50 | 8.00 | 7.90 | 7.55 | 7.70 | 7.73ab |
| **T3** | 7.62 | 8.17 | 7.92 | 8.25 | 7.69 | 7.93a |
| **T4** | 7.30 | 7.65 | 7.50 | 7.60 | 7.55 | 7.52bc |
| **SE** 0.11 **CD at 5%** 0.33 | | | | | | |

The colour and appearance score of Greek yoghurt clearly indicate that highest value was observed for treatment T3 and T2 was found statistically at par with it. There was no significant difference between T0, T1 and T4. From the above results it was concluded that the Greek yoghurt blended by using 15 parts of Muskmelon pulp was liked very much by the panel of 5 semi trained judges.

This pattern matches the conclusions made by Anarthe N. K. (2020) in Muskmelon pulp lassi, having colour and appearance score ranged from 6.75 to 8.88. Mukhekar *et al*., (2018) studied that the colour and appearance score of yoghurt ranged from 7.22 to 8.60. Padale A. S. (2024) reported the effect of Custard apple pulp on colour and appearance score of Greek yoghurt ranged between 7.37 to 7.82.

**2) Flavour**

**Table 2: Effect of different levels of Muskmelon pulp on Flavour score of Greek yoghurt**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Replications** | | | | | **Mean** |
| **R I** | **R II** | **R III** | **R IV** | **R V** |
| **T0** | 7.05 | 7.20 | 6.95 | 6.90 | 7.15 | 7.05d |
| **T1** | 7.10 | 7.25 | 7.40 | 7.45 | 7.30 | 7.30c |
| **T2** | 7.25 | 7.55 | 7.45 | 7.40 | 7.80 | 7.49b |
| **T3** | 7.50 | 7.65 | 7.70 | 7.75 | 7.85 | 7.69a |
| **T4** | 7.20 | 7.40 | 7.35 | 7.3 | 7.45 | 7.34bc |
| **SE** 0.06 **CD at 5%** 0.18 | | | | | | |

For the attribute flavour, highest value was observed for T3 and none of the treatments were at par with it. Treatment T2, T4 and T1 were found statistically non-significant with each other. While T0 was found statistically significant.

The reports found in the analysis for flavour are same with the findings of Gawade *et al.,* (2018) reported that flavour score of the lemongrass distillate was ranged between 7.20 to 8.90. Nath M. *et al.,* (2020) prepared yoghurt with different fruits, almonds and dark chocolates had secured sensory score for the attribute flavour was ranged between 6.60 to 8.93.

**3) Body and Texture**

**Table 3: Effect of different levels of Muskmelon pulp on Body and texture score of Greek yoghurt**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Replications** | | | | | **Mean** |
| **R I** | **R II** | **R III** | **R IV** | **R V** |
| **T0** | 7.05 | 7.30 | 7.20 | 7.25 | 7.35 | 7.23c |
| **T1** | 7.15 | 7.25 | 7.45 | 7.35 | 7.65 | 7.37bc |
| **T2** | 7.35 | 7.45 | 7.65 | 7.45 | 7.75 | 7.53ab |
| **T3** | 7.60 | 7.80 | 7.70 | 7.65 | 7.90 | 7.73a |
| **T4** | 7.30 | 7.40 | 7.70 | 7.35 | 7.10 | 7.37bc |
| **SE** 0.07 **CD at 5%** 0.22 | | | | | | |

For the attribute body and texture, highest value was observed for T3 and T2 was found statistically at par with it. Also T0, T1 and T4 were found statistically at par with each other.

The outcomes obtained were similar with Padale A. S. (2024) studied the effect of custard apple pulp on body and texture of Greek yoghurt ranged between 7.30 to 7.62. Nath M. *et al.,* (2020) prepared yoghurt with different fruits, almonds and dark chocolates had secured sensory score for the attribute body and texture was ranged between 6.60 to 8.77.

**4) Taste**

**Table 4: Effect of different levels of Muskmelon pulp on Taste of Greek yoghurt**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Replications** | | | | | **Mean** |
| **R I** | **R II** | **R III** | **R IV** | **R V** |
| **T0** | 6.95 | 7.20 | 7.10 | 7.30 | 7.20 | 7.15d |
| **T1** | 7.10 | 7.30 | 7.30 | 7.20 | 7.25 | 7.23cd |
| **T2** | 7.35 | 7.75 | 7.60 | 7.40 | 7.50 | 7.52b |
| **T3** | 7.60 | 7.80 | 7.90 | 7.70 | 7.55 | 7.71a |
| **T4** | 7.30 | 7.45 | 7.65 | 7.25 | 7.35 | 7.40bc |
| **SE** 0.06 **CD at 5%** 0.18 | | | | | | |

It was observed that treatment T3 were significantly superior over the rest of all treatments T0, T1, T2 and T4 in respect to taste. There was no significant difference between treatment T2 and T4 also in T0 and T1 but there was significant difference between T0 and T2.

The results were observed by Gawade *et al.,* (2018) stated that the effect of lemongrass distillate on taste score of yoghurt ranged between 7.20 to 8.90. Padale A. S. (2024) reported the taste scores of custard apple incorporated Greek yoghurt were ranged from 7.20 to 7.57.

**5) Overall Acceptability**

**Table 5: Effect of different levels of Muskmelon pulp on Overall acceptability of Greek yoghurt**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Treatments** | **Parameters** | | | | **Mean** |
| **Colour and appearance** | **Flavour** | **Body and texture** | **Taste** |
| **T0** | 7.21 | 7.05 | 7.23 | 7.15 | 7.16d |
| **T1** | 7.39 | 7.30 | 7.37 | 7.23 | 7.32c |
| **T2** | 7.73 | 7.49 | 7.53 | 7.52 | 7.57b |
| **T3** | 7.93 | 7.69 | 7.73 | 7.71 | 7.77a |
| **T4** | 7.52 | 7.34 | 7.37 | 7.40 | 7.41c |
| **SE** 0.05 **CD at 5%** 0.14 | | | | | |

From the data it was concluded that the treatment T3 was significantly superior over the rest of all treatments T0, T1, T2 and T4 in respect to overall acceptability. There was no significant difference between T1 and T4 but there was significant difference between T0 and T2.

The results in this agreement were similar to the observation of Mukhekar A. S. (2018) reported that the overall acceptability score of yoghurt incorporated with Aloe Vera were ranged in between 7.37 to 8.31. Padale A. S. (2024) reported the overall acceptability scores of custard apple incorporated Greek yoghurt were ranged from 7.25 to 7.62.

**B] Cost of production of Greek yoghurt incorporated with Muskmelon pulp**

All the required ingredients for preparation of Muskmelon pulp incorporated Greek yoghurt were rated as per the market price of 2024-2025. The manufacturing cost of Muskmelon pulp incorporated Greek yoghurt was presented in Table 6.

From the Table 6 it can be said that, the cost of production of Greek yoghurt for treatments T0, T1, T2, T3 and T4  were Rs. 126, 185.5, 187, 188.5 and 190, respectively

**Table 6: Cost of production of Greek yoghurt incorporated with Muskmelon pulp**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Particulars** | **Quantity (Unit)** | **Rate (Rs.)** | **Treatments** | | | | | |
| **T0 (Amt. Rs)** | **T1(Amt. Rs)** | **T2(Amt. Rs)** | | **T3(Amt. Rs)** | **T4(Amt. Rs)** |
| **A. Raw Material** | | | | | | | | | |
| 1. | Cow milk | 1000 ml | 32 / lit | 32.00 | 32.00 | 32.00 | | 32.00 | 32.00 |
| 2. | Honey | 120 gm | 480/kg | - | 58.00 | 58.00 | | 58.00 | 58.00 |
| 3. | Muskmelon Pulp | Variable | 30/kg | - | 50 gm (1.50 Rs.) | 100 gm (3.00 Rs.) | | 150 gm (4.50 Rs.) | 200 gm (6.00 Rs.) |
| 4. | Inulin | 8 gm | 2000/kg | 16.00 | 16.00 | 16.00 | | 16.00 | 16.00 |
| 5. | Culture | 10 gm | 5000/kg | 50.00 | 50.00 | 50.00 | | 50.00 | 50.00 |
| **B. Processing** | | | | | | | | | |
| 6. | Processing Charges (Electricity+Labour +Gas+Miscellaneous) | Fixed | - | 24.00 | 24.00 | | 24.00 | 24.00 | 24.00 |
| 7. | Packaging | Fixed | - | 4.00 | 4.00 | | 4.00 | 4.00 | 4.00 |
| 8. | Total Production Cost |  |  | **126** | **185.5** | | **187** | **188.5** | **190** |

**Fig.1: Cost of production of Greek yoghurt incorporated with Muskmelon pulp**

**3.2 Discussion**

The present study demonstrated that Greek yoghurt enriched with 15 percent muskmelon pulp (T3), 12 percent honey, and 0.8 percent inulin attained the highest sensory scores across all evaluated attributes. This confirms the potential of muskmelon as a functional additive that enhances both the flavor and aesthetic appeal of yoghurt. The findings are consistent with those of Anarthe (2020), who reported similar improvements in sensory parameters when muskmelon pulp was incorporated into buffalo milk lassi.

Similarly, Singh *et al.,* (2018) observed improved consumer acceptability in fruity yoghurts using muskmelon, which supports the suitability of this fruit for value addition in fermented dairy products.

The improved sensory scores in the T3 formulation can be attributed to the optimal balance between fruit pulp, sweetener and prebiotic fibre.

As observed by Padale A. S. (2024), the addition of custard apple pulp also enhanced the overall sensory appeal of Greek yoghurt, which aligns with the current results.

Importantly, the study also highlighted the cost-efficiency of the T3 formulation. Although higher muskmelon concentrations increased the cost slightly, the T3 sample offered the best balance between consumer preference and production cost.

**4. CONCLUSION**

In terms of sensory evaluation, yoghurt with 15 percent Muskmelon pulp scored the highest across key attributes such as colour and appearance (7.93), flavour (7.69), body and texture (7.73), taste (7.71) and overall acceptability (7.77). This treatment provided a visually appealing product with a pleasant balance of sweetness, acidity and a smooth, gel-like texture all of which was appreciated by the judges. While the cost of production increased slightly with higher levels of Muskmelon pulp from Rs. 126 for the control sample (T0) to Rs. 190 for treatment (T4) samples, the optimal formulation (T3) was still considered economically viable at Rs. 188.5. Hence, the 15 percent Muskmelon pulp formulation (T3) was identified as the ideal combination for developing Muskmelon pulp and honey incorporated Greek yoghurt.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of manuscripts.

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