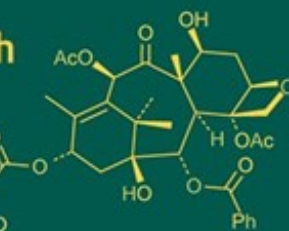
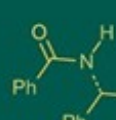


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
Indexing: Embase
IJABR 2026; SP-10(9): 2402-2404
www.biochemjournal.com
Received: 24-06-2026
Accepted: 13-08-2026
Published: 26-09-2026

The names and affiliations of all authors are provided below, following the references.

Study on optimisation of level of grape (*Vitis vinifera*) juice for preparation of paneer whey beverage

Prajwal Y Ugalkar¹, DT Undratwad², VG Atkare³, Bhavana R Wankhade⁴, SR Munnarwar⁵, RK Shewale⁶, Vaishali K Mukade⁷, SN Barmade⁸, Gargee B Kasturkar⁹

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sad.10187>

ABSTRACT

The present investigation was carried out during 2025-26 at the Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur. The study aimed to develop a palatable and nutritious whey based beverage by incorporating grape juice at five different levels, viz., 0% (T_1), 4% (T_2), 8% (T_3), 12% (T_4) and 16% (T_5), with sugar maintained at 10% in all treatments. The prepared beverages were evaluated for sensory attributes, physicochemical properties and production cost. The findings indicated that increasing the proportion of grape juice resulted in a decrease in fat and ash content, while protein, total solids, acidity and total sugar increased progressively. Among the treatments, T_3 containing 8% grape juice exhibited the highest sensory acceptability, recording an overall acceptability score of 8.43 out of 9, along with a desirable nutritional composition. Based on the overall sensory performance, nutritional characteristics and economic considerations, the beverage containing 8% grape juice and 10% sugar was identified as the most suitable treatment.

Keywords: Paneer whey, Grape juice, Sensory evaluation, The results in accordance with the investigation of, Significantly highest score, Overall acceptability

Introduction

India has the largest dairy industry in the world and contributes nearly 25% of global milk production. In 2023-24, India produced about 239.3 million metric tonnes of milk, which increased to nearly 247 million tonnes in 2025. The dairy sector contributes around 3.5% to the national economy and forms about 65% of the livestock sector's total output. India's per capita milk availability reached around 485 grams per day in 2024-25, showing continuous growth in milk consumption. (DAHD, 2025)

Paneer whey can be defined as the yellow-green watery part of milk (serum) that remains after the coagulation of milk during paneer (Indian cottage cheese) production. It accounts for about 85-90% of the volume of milk and retains approximately 55% of the original milk nutrients. The average composition of paneer whey dry matter is about 70% lactose (depending on the acidity of the whey), 14% proteins, 9% minerals, 4% fats and 3% lactic acid (Elizabeta, 2021) [1].

Paneer whey contained 6.06% TS, which was about 50% of the milk solids, 0.13% fat, 0.38% protein, 5.08% lactose and 0.62% ash. The pH and acidity of paneer whey were 5.43 and 0.24% lactic acid, respectively. The results obtained in the present investigation are in agreement with (S Raghavendra *et al.*, 2017) [2].

The fruit of the grape is one of the most palatably edible foods, having many established nutritional and medicinal properties for consumers. The grape is a good source of water (82%), carbohydrates (12-18%), proteins (0.5-0.6%) and fat (0.3-0.4%). Additionally, the grape contains significant amounts of potassium (0.1-0.2%), vitamin C (0.01-0.02%) and vitamin A (0.001-0.0015%). Grape also has a small amount of calcium (0.01-0.02%) and phosphorus (0.08-0.01%). A grape berry is primarily composed of three major structural components the outer skin, the fleshy pulp and the seeds, each contributing to its overall nutritional and physicochemical characteristics. Nutritional analysis per serving of grapes gives 78 calories of energy, 0.3 g of protein, 19 g of carbohydrate, 0.23 g of fat (3% calories from fat), 0.18 mg of sodium, 155 mg of potassium, 0.4 g of fiber, 20 nanogram of calcium, 30 nanogram of phosphorus and 1 mg of vitamin C (Yadav *et al.*, 2009) [3].

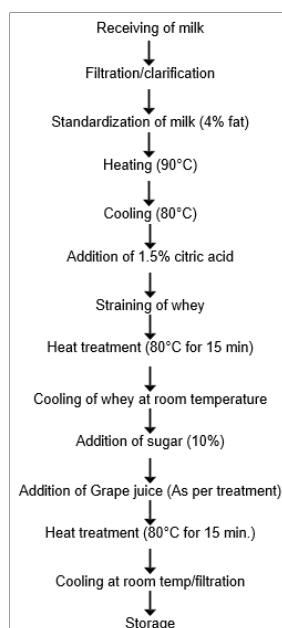
Corresponding Author:

Prajwal Y Ugalkar

PG Scholar, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

Material and Methods

Flow-diagram for manufacture of paneer whey beverage



Treatment details used for the study

The whey beverage is prepared by formulating different levels of grape juice and whey as control T₁ (100:0)%, T₂ (96:04)%, T₃ (92:08)%, T₄ (88:12)% and T₅ (84:16)% with the addition of 10% sugar in all treatments. The finished product level were finalised by sensory evaluation by using 9 point Hedonic Scale given by (Nelson and Trout) and analysed for physicochemical properties of the product.

Statistical analysis

The data obtained during different phases of this study were analysed using CRD (Completely Randomized Design) with five treatments and four replications.

Sensory evaluation

Sensory evaluation for all the parameter (flavour, body and texture, colour and appearance and overall acceptability) carried out by the trained panel of judge by using 9 point hedonic scale as suggested by Nelson and Trout (1964).

Result and Discussion

The present study and investigation were analysed for the sensory evaluation focused on flavour, body and texture, colour and appearance, as well as overall acceptability as per the method suggested by Nelson and Trout (1964).

Table 1. Sensory score for paneer whey beverage with grape (*Vitis vinifera*) juice (Score out of 9)

Treatments	Flavour	Body and texture	Colour and appearance	Overall acceptability
T ₁ (0%)	7.81	7.78	7.90	7.74
T ₂ (4%)	8.14	8.12	8.19	7.95
T ₃ (8%)	8.44	8.54	8.33	8.43
T ₄ (12%)	7.50	7.60	7.74	7.54
T ₅ (16%)	7.36	7.40	7.50	7.30
SE(m) ±	0.0300	0.0227	0.0305	0.0335
C.D. 5%	0.0887	0.0820	0.0902	0.0993
Results	Sig	Sig	Sig	Sig

Flavour

It is observed from Table that, the score for flavour was 7.81, 8.14, 8.44, 7.50 and 7.36 for beverage samples prepared with grape juice in the proportions of 100:0 (T₁), 96:4 (T₂), 92:8 (T₃), 88:12 (T₄) and 84:16 (T₅) paneer whey to grape juice, respectively. The flavour of the beverage was significantly affected by the addition of grape juice. The significantly highest score (8.44 out of 9) was obtained by the beverage prepared with 8 per cent grape juice. The flavour score of beverage in treatment T₃ (8.44) was superior over the rest of the treatments.

The results in accordance with the investigation of Sharma *et al.*, (2020) [4] observed that the flavour scores of the chhana whey beverage were 7.4, 7.7, 8.2, 8.3 and 7.9 for treatments without ginger powder (T₀) and with 0.1% (T₁), 0.2% (T₂), 0.3% (T₃) and 0.4% (T₄) ginger powder, respectively. The flavour of the chhana whey beverage was significantly influenced ($P < 0.05$) by the incorporation of ginger powder. The flavour score increased progressively with the addition of ginger powder up to 0.3%, where the highest score (8.3) was recorded. However, a further increase in ginger powder to 0.4% resulted in a decline in flavour score (7.9).

Tidake *et al.*, (2023) [5] stated that the mean flavour scores of T₁, T₂, T₃ and T₄ were 8.18, 8.21, 8.11 and 7.91, respectively. T₂ recorded the highest flavour score (8.21), while T₄ showed the lowest (7.91). The results indicate that increasing bottle gourd extract beyond 30% gradually reduced the flavour acceptability of the whey beverage.

Body and texture

It is observed from Table that, the score for body and texture was 7.78, 8.12, 8.54, 7.60 and 7.40 for beverage samples prepared with grape juice in the proportions of 100:0 (T₁), 96:4 (T₂), 92:8 (T₃), 88:12 (T₄) and 84:16 (T₅) paneer

whey to grape juice, respectively. The body and texture of the beverage was significantly affected by the addition of grape juice. The significantly highest score (8.54 out of 9) was obtained by the beverage prepared with 8 per cent grape juice. The body and texture score of beverage in treatment T₃ (8.54) was superior over the rest of the treatments.

The results in accordance with the investigation of Khodake *et al.*, (2017) [6] observed that, the body and texture scores of the whey based custard pulp beverage were 6.75, 7.00, 8.50, 7.50 and 7.75 for T₁ to T₅, respectively. The treatments significantly affected ($P < 0.05$) the body and texture of the beverage. The score improved with increasing treatment level and reached the maximum value of 8.50 in T₃. Further increase in the treatment level caused a reduction in the score, although a slight improvement was observed in T₅.

Yelne *et al.*, (2025) [7] reported that the body and texture scores were 6.3, 7.0, 8.5 and 6.5 for T₁, T₂, T₃ and T₄, respectively. T₃ (92:8 paneer whey:tomato juice) recorded the highest score (8.5), indicating better body and texture, while T₁ showed the lowest score (6.3). The results suggest that 8% tomato juice improved the body and texture of the beverage.

Colour and appearance

It is observed from Table that, the score for colour and appearance were 7.90, 8.19, 8.33, 7.74 and 7.50 for beverage samples prepared in the proportions of 100:0 (T₁), 96:4 (T₂), 92:8 (T₃), 88:12 (T₄) and 84:16 (T₅) paneer whey to grape juice. The colour and appearance of the beverage was significantly affected due to the addition of grape juice. The significantly highest score (8.33 out of 9) was obtained by the beverage prepared with 8 parts of grape juice. The colour and appearance score of beverage in treatment T₃ (8.33) was superior over the rest of the treatments.

The results in accordance with the investigation of Sharma *et al.*, (2020) [4] reported that the experimental treatments were without ginger powder (T₀), addition of 0.1% (T₁), 0.2% (T₂), 0.3% (T₃), 0.4% (T₄) ginger powder and the average colour and appearance scores were 7.5, 7.8, 8.0, 8.0 and 7.4. The colour and appearance of chhana whey beverage significantly differed ($P < 0.05$) due to addition of ginger powder in the chhana whey. As the level of addition of ginger powder in the CWB increased the colour and appearance increased. Then colour and appearance started decline. The colour of whey beverage gradually become darker (creamish yellow) as level increased.

Tidake *et al.*, (2023) [5] stated that the mean scores for colour and appearance of the control (T₁) and paneer whey beverages with bottle gourd extract (T₂, T₃ and T₄) were 8.04, 8.08, 8.01 and 7.90, respectively. T₂ recorded the highest score (8.08), while T₄ had the lowest (7.90). The scores decreased with increasing levels of bottle gourd extract, indicating that higher incorporation levels slightly reduced the visual appeal of the beverage.

Overall acceptability

It is observed from Table that, the overall acceptability scores of paneer whey beverage prepared with different levels of grape juice ranged from 7.30 to 8.43 out of 9. The mean overall acceptability scores were 7.74, 7.95, 8.43, 7.54 and 7.30 for T₁ (0%), T₂ (4%), T₃ (8%), T₄ (12%) and T₅ (16%) grape juice, respectively. The overall acceptability of the beverage was significantly influenced by the addition of grape juice. The highest overall acceptability score (8.43 out of 9) was recorded for the beverage containing 8% grape juice (T₃), indicating that this level provided the most acceptable product among all the treatments.

The results in accordance with the investigation of Sharma *et al.*, (2020) [4] reported that the overall acceptability scores of the chhana whey beverage were 7.4, 7.8, 8.2, 8.4 and 7.5 for treatments without ginger powder (T₀) and with 0.1% (T₁), 0.2% (T₂), 0.3% (T₃) and 0.4% (T₄) ginger powder, respectively. The overall acceptability of the chhana whey beverage was significantly influenced ($P < 0.05$) by the incorporation of ginger powder. The overall acceptability increased with increasing levels of ginger powder up to 0.3%, at which the highest score (8.4) was obtained. However, further addition of ginger powder to 0.4% resulted in a decline in overall acceptability (7.5).

Tidake *et al.*, (2023) [5] stated that the overall acceptability scores of T₁, T₂, T₃ and T₄ were 8.14, 8.29, 8.09 and 7.91, respectively. Treatment T₂ (30% bottle gourd extract) recorded the highest acceptability (8.29), slightly higher than the control. However, acceptability decreased with increasing levels of bottle gourd extract, with T₄ (50%) receiving the lowest score (7.91).

Conclusion

Paneer whey can be effectively utilized for the preparation of a value added beverage by incorporating grape juice at different levels of 0, 4, 8, 12 and 16 per cent and with 10 per cent sugar maintained in all formulations. Among all

the treatments, the beverage containing 8 per cent grape juice (T₃) with a paneer whey to grape juice ratio of 92:8 showed the best sensory performance. It obtained the highest scores for flavour, body and texture, colour and appearance, as well as overall acceptability. T₃ recorded an overall acceptability score of 8.43 out of 9, indicating that the 8 per cent level of grape juice provided the most desirable balance of sensory characteristics for preparation of whey beverage with grape juice.

References

1. Elizabeta M. Composition and nutritional value of whey in dairy Processing. *Journal of Dairy Science and Technology*. 2021;15(2):123-130.
2. Raghavendra S, Veena N, Surendra Nath B, Amaladhas PH. Utilization of concentrated paneer whey in the preparation of dahi. *Indian J Dairy Sci*. 2017;70(6):720-725.
3. Yadav M, Jain S, Bhardwaj A, Nagpal R, Puniya M, Tomar R, Singh V, Parkash O, Prasad GBKS, Marotta F, Yadav H. Biological and medicinal properties of grapes and their bioactive constituents: An update. *Journal of Medicinal Food*. 2009;12(3):473-484.
4. Sharma N, Chavan KD, Jaybhay VB. Development of ginger (*Zingiber officinalis* L.) flavoured chhana whey beverage. *The Pharma Innovation Journal*. 2020;9(9):36-41.
5. Tidake HR, Shinde AT, Khatare AN, Kurumkar RB, Dukare DK. Effect of addition of bottle gourd (*Lagenaria siceraria*) extract in paneer whey on sensory parameters of paneer whey beverage. *The Pharma Innovation Journal*. 2023;12(12):2108-2112.
6. Khodke D, Bidwe KU, Shelke RR, Kahate PA. Preparation of whey based custard apple (*Annona squamosa* L.) pulp beverage. *Research Journal of Animal Husbandry and Dairy Science*. 2017;8(2):94-98.
7. Yelne AV, Atkare VG, Undratwad DT. Formulation and sensory quality evaluation of tomato juice enriched paneer whey beverage. *International Journal of Agriculture and Food Science*. 2025;7(7):558-560.
8. Department of Animal Husbandry and Dairying. Basic animal husbandry statistics 2025. Ministry of Fisheries, Animal Husbandry and Dairying, Government of India; 2025.

How to cite this article: Ugalkar PY, Undratwad D, Atkare V, Wankhade BR, Munnarwar S, Shewale R, et al. Study on optimisation of level of grape (*Vitis vinifera*) juice for preparation of paneer whey beverage. *International Journal of Advanced Biochemistry Research*. 2026;SP-10(9):2402-2404. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sad.10187>

Authors

Prajwal Y Ugalkar

PG Scholar, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

DT Undratwad

Assistant Professor & I/C Professor and Head of Section, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

VG Atkare

Professor and Associate Dean, Animal Husbandry and Dairy Science Section, College of Agriculture, Mul, Maharashtra, India

Bhavana R Wankhade

Assistant Professor, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

SR Munnarwar

Assistant Professor, Animal Husbandry and Dairy Science Section, College of Agriculture, Mul, Maharashtra, India

RK Shewale

PG Scholar, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

Vaishali K Mukade

PG Scholar, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

SN Barmade

PG Scholar, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India

Gargee B Kasturkar

PG Scholar, Animal Husbandry and Dairy Science Section, College of Agriculture, Nagpur, Maharashtra, India