ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating (2026): 4.97
IJAFS 2026; 8(8): 119-122
www.agriculturaljournals.com
Received: 14-05-2026
Accepted: 18-06-2026

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Antioxidant activity and mineral profile of Panchagavya

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DOI: https://www.doi.org/10.33545/2664844X.2026.v8.i8b.1765

Abstract
A study was conducted to evaluate the antioxidant activity and mineral profile of panchagavya prepared from Bargur cattle dairy products namely dung, urine, milk, curd and ghee. The aim of this study was to prepare panchagavya using two different methods, namely the Natarajan (2003) method (P1) and the traditional method (P2), and to assess their antioxidant activity and mineral profile. The DPPH scavenging activity at 10 µg and 50 µg concentrations did not show any significant difference between the P1 and P2 samples, whereas at 30 µg concentration, a significantly ($p < 0.05$) higher antioxidant activity was observed in panchagavya sample P1 (1.85 ± 0.04) when compared to panchagavya sample P2 (1.65 ± 0.04). The calcium, magnesium, sodium and manganese contents were significantly ($p < 0.01$) higher in P1 (610.17 ± 8.57, 341.33 ± 11.90, 317.33 ± 16.88 and 7.10 ± 0.13), than P2 (415.17 ± 8.49, 279.33 ± 3.75, 269.00 ± 18.99 and 6.20 ± 0.17), similarly iron content was significantly higher in ($p < 0.05$) P1 (79.00 ± 3.30) than P2 (62.17 ± 3.61), whereas zinc and copper contents did not show any significant variation between P1 and P2. In conclusion, the panchagavya prepared from Natarajan (2003) method (P1) showed comparatively superior antioxidant and nutritional properties than panchagavya (P2) prepared from traditional method, hence panchagavya (P1) can be used as a feed supplement in animal production.

Keywords: Panchagavya, milk, curd, ghee, dung, urine, iron

1. Introduction
Panchgavya is an organic formulation, which in Sanskrit means the blend of five disparate products viz., milk, curd, ghee, urine and dung obtained from Desi cow (all these products are individually called as Gavya and jointly named as Panchagavya) (Aditi and Sharma, 2021) [1].

Nutrients present in panchagavya was analyzed by Solaiappan, (2003) [14] and who reported that panchagavya is a living elixir of many microorganisms, bacteria, fungi, protein, carbohydrate, fat, amino acids, vitamins, enzymes, known and unknown growth promoting factors, micronutrients, trace elements, antioxidants and immunity enhancing factors.

Similarly, importance of nutritional aspects of panchagavya suggested by Dhama *et al.* (2014) [4] who reported that panchagavya is positively an encouraging solution for various ailments/diseases of humans and animals with immense biomedical applications along with other beneficial usages. Its usage would further expand through scientific validation and research supports, clinical trials, commercialization and popularity in the society and the public.

Athavale *et al.* (2012) [2] recorded that at 100, 150 and 200 µg concentration, the DPPH scavenging activity of panchagavya samples were 9.25, 11.63 and 14.42. Panchagavya showed concentration dependent antioxidant activity in the range of 20- 100 µg and the increase in activity is attributed to the presence of phenolic compounds and other antioxidants in the Panchagavya, which pair with DPPH free radicals, resulting in higher inhibition percentages.

Panchagavya is a unique preparation having both water based (colloidal milk without fat portion, urine, curd and dung) and fat based (ghee, milk with fat particles) products. It is likely to provide both polar and non-polar natural antioxidants. The results of the free radicals scavenging activity of panchagavya revealed that it act as an excellent antioxidant (Sivaji *et al*., 2022) [13].

Sethuraman *et al.* (2024) [12] reported that DPPH (2,2-diphenyl-1-picrylhydrazyl) and FRAP (ferric-reducing antioxidant power) assays revealed better antioxidant activity of panchagavya.

Natarajan (2002) [8] reported that the panchagavya contained (mg/liter) calcium 350 to 650, zinc 3 to 6 and copper 0.4 to 1.0 respectively.

The approximate mineral content (mg/ liter) of panchagavya was calcium 152 to 256, magnesium 48 to 92, sodium 90, iron 9.17 to 53, manganese, 0.28 to 5.05, zinc 0.26 to 6.35 and copper 2.18 to 14.95 respectively (Chakraborty and Sarkar, 2019) [3].

Kumar (2025) [5] reported that the panchagavya contained (mg/liter) magnesium 250 - 400 and sodium 200 to 350, respectively.

In this study, Natarajan (2003) [9] method (additional ingredients along with five ingredients from cows) and Traditional method (five ingredients from cows alone) were used to prepare panchagavya. Hence, this study was conducted to analyse and compare the panchagavya prepared from Bargur cattle dairy products for its antioxidant activity and mineral profile in order to identify superior one having better antioxidant and nutritional qualities.

2. Materials and Methods:

2.1 Preparation of Panchagavya

2.1.1 Natarajan, 2003 method

Panchagavya sample P1 was prepared using Natarajan (2003) [9] method, and in this method 5 kgs of fresh Bargur cow dung was mixed with 0.5 kg of Bargur cow ghee in a mud container on first day and it was kept for three days at room temperature and it was thoroughly mixed daily. On fourth day the other ingredients namely Bargur cow urine 3 litres, Bargur cow milk 2 litres, Bargur cow curd 2 litres, sugarcane juice 3 litres, tender coconut water 3 litres, ripened banana (12 Nos.) and toddy 2 litres were added. If toddy is not available, 100 gms of yeast powder and 100 gms of jaggery may be mixed with 2 litres of warm water. After 30 minutes, this solution will be added to panchagavya. The mixture was mixed properly and covered with nylon net to prevent entry of flies. The container was then placed under shade and mixed thoroughly twice daily for 15 days. The Panchagavya stock solution was ready after the 18th day.

2.1.2 Traditional method

Panchagavya sample P2 was prepared using traditional method (only five ingredients obtained from indigenous cattle were used) 5 kgs of fresh Bargur cow dung was mixed with 0.5 kgs of Bargur cow ghee in the mud pot on first day and kept for three days at room temperature and thoroughly mixed twice daily. On fourth day the other ingredients namely Bargur cow urine 3 litres, Bargur cow milk 2 litres, Bargur cow curd 2 litres and water 8 liters were added. The mixture was mixed properly and covered with nylon net to prevent entry of flies. The container was then placed under shade and mixed thoroughly twice daily for 15 days. The Panchagavya stock solution was ready after the 18th day.

2.2 Assessment of antioxidant activity of Panchagavya

Antioxidant activity of Panchagavya samples were analyzed at National Institute of Food Technology Entrepreneurship and Management, Thanjavur by following the method prescribed by Montoro *et al*. (2020) [7].

2.3 Minerals content (Sodium, Calcium, Magnesium, Iron, Manganese, Copper and Zinc)

The mineral content of panchagavya samples were analyzed at Department of Environmental Science, Tamil Nadu Agricultural University, Coimbatore by using the method prescribed by the FCO, (1985) [16].

2.4. Statistical Analysis

The values obtained were statistically analyzed by using paired T test and interpreted.

3. Result

3.1 Antioxidant activity (DPPH) of Panchagavya

The mean (± SE) scavenging DPPH antioxidant activity of the P1 and P2 panchagavya samples is presented in Table 1.

The antioxidant activity of the standard **(**ascorbic acid**)** increased with concentration, recording values of 49.49 ± 0.06, 90.66 ± 0.44 and 94.38 ± 0.23 per cent at 10, 30 and 50 µg**,** respectively.

At 10 µg concentration, the scavenging DPPH antioxidant activity (per cent) of P1 and P2 samples was 1.10 ± 0.04 and 1.17 ± 0.04, respectively, and no significant difference was observed between them. At 30 µg concentration, the values recorded for P1 and P2 were 1.85 ± 0.04 and 1.65 ± 0.04**,** respectively, and the difference between the samples was significant ($p < 0.05$)**.** At 50 µg concentration, the scavenging activity of P1 and P2 samples was 1.87 ± 0.02 and 1.89 ± 0.01, respectively, and no significant difference was observed between the two samples.

Overall, the DPPH free radical scavenging antioxidant activity of both P1 and P2 samples showed variation with changes in concentration, indicating that the antioxidant activity of panchagavya is concentration-dependent**.**

Table 1: Antioxidant activity (DPPH) of Panchagavya

Name of the Panchagavya	10 µg concentration (per cent)^{NS}	30 µg concentration (per cent)*	50 µg concentration (per cent)^{NS}
Standard (Ascorbic acid)	49.49 ± 0.06	90.66 ± 0.44	94.38 ± 0.23
Panchagavya (P1)	1.10 ± 0.04	1.85 ± 0.04	1.87 ± 0.02
Panchagavya (P2)	1.17 ± 0.04	1.65 ± 0.04	1.89 ± 0.01

** - ($p < 0.01$), * - ($p < 0.05$), NS - Not Significant

3.2 Mineral content of Panchagavya

The mean (± SE) mineral content (mg/l) of the P1 and P2 *Panchagavya* samples is presented in Table 2.

The calcium, magnesium, sodium, iron, manganese, zinc and copper contents (mg/l) of P1 panchagavya were 610.17 ± 8.57, 341.33 ± 11.90, 317.33 ± 16.88, 79.00 ± 3.30, 7.10 ± 0.13, 5.50 ± 0.46 and 0.70 ± 0.09, respectively.

The corresponding values for P2 Panchagavya were 415.17 ± 8.49, 279.33 ± 3.75, 269.00 ± 18.99, 62.17 ± 3.61, 6.20 ± 0.17, 4.20 ± 0.26 and 0.60 ± 0.09, respectively.

Statistical analysis revealed that calcium, magnesium, sodium and manganese contents differ significantly ($p < 0.01$) between the two samples, and iron content differed significantly ($p < 0.05$) between the two samples, whereas zinc and copper contents did not show any significant variation.

Table 2: Mineral (mg/l) content of Panchagavya

Treatment	Calcium**	Magnesium**	Sodium**	Iron*	Manganese**	Zinc NS	Copper NS
P1	610.17 ± 8.57	341.33 ± 11.90	317.33 ± 16.88	79.00 ± 3.30	7.10 ± 0.13	5.50 ± 0.46	0.70 ± 0.09
P2	415.17 ± 8.49	279.33 ± 3.75	269.00 ± 18.99	62.17 ± 3.61	6.20 ± 0.17	4.20 ± 0.26	0.60 ± 0.09

** - ($p < 0.01$), * - ($p < 0.05$), NS - Not Significant

4. Discussion

4.1 Antioxidant activity (DPPH) of Panchagavya

The mean (± SE) DPPH free radical scavenging antioxidant activity of the P1 and P2 panchagavya samples is presented in Table 1.

The DPPH scavenging activity at 10 and 50 µg concentrations did not show any significant difference between the P1 and P2 samples, whereas at 30 µg concentration, a significantly ($p < 0.05$) higher antioxidant activity was observed in panchagavya sample P1 when compared to panchagavya sample P2. This higher antioxidant values in P1 is may be due to additional ingredients used for its preparation than P2.

The DPPH free radical scavenging antioxidant activity of both P1 and P2 samples varied with concentration, indicating that the antioxidant potential of panchagavya is concentration-dependent. Overall, the results suggest that the panchagavya samples possess appreciable antioxidant activity.

The findings are in agreement with those reported by Athavale *et al*. (2012) [2] who observed DPPH scavenging activities of 9.25, 11.63 and 14.42 per cent at 100, 150 and 200 µg concentrations, respectively, and attributed the increase in activity to the presence of phenolic compounds and other natural antioxidants in panchagavya. Similarly, Sivaji *et al*. (2022) [13] reported that panchagavya is a unique formulation comprising both water-based components (colloidal milk without fat portion, urine, curd and dung) and fat-based components (ghee and milk containing fat particles). This combination is likely to supply both polar and non-polar natural antioxidants, thereby contributing to its overall antioxidant potential. Further, these findings are in agreement with the findings of Sethuraman *et al.* (2024) [12] who reported that DPPH (2,2-diphenyl-1-picrylhydrazyl) and FRAP (ferric-reducing antioxidant power) assays revealed better antioxidant activity of panchagavya.

4.2 Mineral content of Panchagavya

The mineral content (mg/l) of the panchagavya samples P1 and P2 is presented in Table 2. Statistical analysis revealed that calcium, magnesium, sodium and manganese differed significantly ($p < 0.01$) between the two samples, and iron content showed significant differences ($p < 0.05$) between the two samples, whereas zinc and copper contents did not show any significant variation. The mineral content exhibited a comparatively higher cumulative increase in the P1 sample than in the P2 panchagavya. These findings are in accordance with the reports of Natarajan (2002) [8], who documented calcium levels of 350-650 mg/l, zinc 3-6 mg/l and copper 0.4-1.0 mg/l; Kumar *et al*. (2025) [5], who reported magnesium levels of 250-400 mg/l and sodium levels of 200-350 mg/l; and Chakraborty and Sarkar (2019) [3], who observed iron levels of 40-80 mg/l and manganese levels of 5-10 mg/l in panchagavya preparations.

The comparatively higher mineral content observed in the P1 sample may be attributed to the inclusion of sugarcane juice, tender coconut water, banana and toddy. These ingredients are naturally rich in minerals and could have contributed to the improved mineral composition of the formulation. Similar findings on the mineral richness of these ingredients were reported by Rethinam and Krishnakumar (2022) [11] for tender coconut water, Souza *et al*. (2019) [15] for sugarcane juice, Oyeyinka and Afolayan (2019) [10] for banana and Mahilrajana and Thurisingam (2022) [6] for toddy.

5. Summary and Conclusion:

The present study concludes that analysis and comparison of antioxidant activity and mineral profile of two different panchagavya samples (P1 and P2) showed significant difference between them. Panchagavya prepared from Natarajan (2003) [9] method (P1) showed significantly higher antioxidant activity (%), similarly P1 showed significantly higher values (mg/liter) of calcium, magnesium, sodium, iron and manganese contents when compared to panchagavya prepared from traditional method (P2). Hence, the panchagavya prepared from Natarajan (2003) [9] method (P1) showed comparatively superior antioxidant activity and mineral properties than traditionally prepared pnchagavya (P2). In conclusion the panchagavya prepared from Natarajan (2003) [9] method (P1) can be effectively used as feed supplement in animal production.

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