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Composition and physico-chemical properties of *Panchagavya*

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Abstract

A study was conducted to evaluate the composition and physico-chemical properties of panchagavya prepared from Bargur cattle dairy products namely dung, urine, milk, curd and ghee. The study aimed to prepare panchagavya using two different methods, namely the Natarajan (2003) method (P1) and the traditional method (P2), and to assess their composition and physico-chemical properties. The proximate composition analysis revealed no significant differences in moisture (%) and crude fat (%) content between panchagavya samples P1 (89.00 ± 0.26 and 2.77 ± 0.07) and P2 (88.67 ± 0.33 and 2.60 ± 0.08) was observed. Crude fibre (%) content was significantly higher ($P < 0.05$) in P2 (1.40 ± 0.15) than P1 (0.71 ± 0.08); however, crude ash (%) content was significantly ($P < 0.05$) higher in P1 (3.00 ± 0.19) than P2 (2.40 ± 0.06). Crude protein (%) and energy (Kcal/Kg) content (4034.17 ± 33.15) were significantly higher ($P < 0.01$) in P1 (2.78 ± 0.03 and 4034.17 ± 33.15) when compared to P2 (2.33 ± 0.02 and 3743.33 ± 44.10). The physico-chemical analysis revealed that the pH of P2 (4.72 ± 0.05) was significantly higher ($P < 0.01$) than P1 (3.64 ± 0.05). No significant difference was observed in electrical conductivity (ds/m) and nitrogen (%) values between P1 (13.50 ± 0.65 and 0.30 ± 0.06) and P2 (12.50 ± 0.65 and 0.23 ± 0.04). Organic carbon (%) content was significantly higher ($P < 0.01$) in P1 (3.62 ± 0.19) than P2 (2.43 ± 0.24). Phosphorus (%) content was significantly higher ($P < 0.01$) in P1 (0.05 ± 0.01) than P2 (0.03 ± 0.01), similarly potassium (%) content was significantly higher ($P < 0.01$) in P1 (0.36 ± 0.01) than P2 (0.29 ± 0.02). In conclusion, the panchagavya prepared from Natarajan (2003) method (P1) is comparatively superior nutritional properties than panchagavya (P2) prepared from traditional method, hence panchagavya (P1) can be used in agriculture and animal production.

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

1. Introduction

Panchagavya 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 Solaippan, (2003) ^[21] 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) ^[7] 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.

Selvaraj *et al.* (2007) ^[18] reported the moisture, protein, total ash and gross energy values of panchagavya were approximately 86.1 per cent, 229 ppm (0.143 per cent), 2.5–3.0 per cent and 400–700 kcal/kg respectively.

Radha and Rao (2014) ^[16], Mathivanan *et al.* (2006) ^[11], Uthirapandi *et al.* (2018) ^[24] and Punitha *et al.* (2010) ^[15] who reported the pH of panchagavya were 3.7, 4.52, 4.3 and 5.32 respectively.

Electrical Conductivity values of panchagavya was analyzed by Sivapragasam *et al.* (2014) ^[20] who reported an EC value of 10.22 dS/m in panchagavya and Chakraborty and Sarkar (2019) ^[4] reported electrical conductivity (EC) values of panchagavya ranging from 6.15 to 11.02 dS/m. Udhayakumar, R. (2015) ^[23] reported the organic carbon (OC) content of Panchagavya were 0.57 to 17.45%.

Chandrakala *et al.* (2007) ^[5] reported that the total nitrogen content of panchagavya was 0.03 per cent. Sharma *et al.* (2024) ^[19] who reported that the phosphorus content of panchagavya was 0.385. Similarly, the potassium content was analyzed by Mol *et al.* (2024) ^[12] and Choudhary (2021) ^[6] who reported that the potassium content of panchagavya were 1.35% and 0.84% respectively.

Hence, in this study Natarajan (2003) ^[13] 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 composition and physico-chemical characteristics in order to identify superior one having better 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) ^[13] 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 Composition of Panchagavya / Proximate composition of Panchagavya (crude protein, crude fat, ash and moisture)

The proximate composition includes moisture, crude protein, crude fat and total ash per cent which were analyzed by following the standard procedure of AOAC (1995) ^[2] and the results were expressed on dry matter basis. The crude protein content was determined by the Kjeldahl method and the crude fat content was determined by the Soxhlet method. The total ash content was determined by ashing the samples overnight at 550 °C. Moisture is estimated by drying the sample overnight at 105 °C.

2.3 Analysis of Panchagavya for physico-chemical characteristics

The pH, Electrical Conductivity (ds/m), Organic carbon (%), Nitrogen (%), Phosphorous (%) and Potassium (%) content of Panchagavya samples were analyzed at Department of Environmental Science, Tamil Nadu Agricultural University, Coimbatore by using the method prescribed by FCO (1985) ^[3].

2.4. Statistical Analysis

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

3. Results

3.1 Composition of Panchagavya

The mean ($\pm$ SE) moisture per cent of the P1 sample was 89.00 ± 0.26 , whereas the value for the P2 was 88.67 ± 0.33 (Table 1). Statistical analysis indicated no significant difference in moisture content between P1 and P2. The mean ($\pm$ SE) crude protein per cent of the P1 and P2 were 2.78 ± 0.03 and 2.33 ± 0.02 respectively (Table 1). Significant difference ($P < 0.01$) was observed in crude protein content between the two panchagavya samples.

The mean ($\pm$ SE) crude fibre per cent of the P1 and P2 samples were 0.71 ± 0.08 and 1.40 ± 0.15 respectively (Table 1). Statistical analysis revealed significant difference ($P < 0.05$) in crude fibre content between the two panchagavya samples. The mean ($\pm$ SE) crude fat per cent of the P1 and P2 samples were 2.77 ± 0.07 and 2.60 ± 0.08 (Table 1) respectively. Statistical analysis indicated no significant difference in crude fat content between the two panchagavya samples. The mean ($\pm$ SE) crude ash per cent of P1 and P2 were 3.00 ± 0.19 and 2.40 ± 0.06 (Table 1) respectively. Statistical analysis revealed a significant difference ($P < 0.05$) in crude ash content of P1 and P2. The mean ($\pm$ SE) gross energy content (Kcal/Kg) of the P1 and P2 samples were 4034.17 ± 33.15 and 3743.33 ± 44.10 respectively. Significant difference ($P < 0.01$) was observed in gross energy content between P1 and P2.

Table 1: Composition of Panchagavya (Mean $\pm$ SE)

Name of the sample	Moisture (%)	Crude protein (%)	Crude fibre (%)	Crude fat (%)	Crude ash (%)	Gross Energy (Kcal/Kg)
Panchagavya Sample (P1)	89.00 ± 0.26^{NS}	$2.78 \pm 0.03^{**}$	0.71 ± 0.08	2.77 ± 0.07^{NS}	$3.00 \pm 0.19^*$	$4034.17 \pm 33.15^{**}$
Panchagavya Sample (P2)	88.67 ± 0.33	2.33 ± 0.02	$1.40 \pm 0.15^*$	2.60 ± 0.08	2.40 ± 0.06	3743.33 ± 44.10

** - ($P < 0.01$) * - ($P < 0.05$) NS - Not Significant

3.2. Physico-chemical properties of Panchagavya

The mean ($\pm$ SE) pH of panchagavya samples were presented in Table 2. The pH of panchagavya samples P1 and P2 were 3.64 ± 0.05 and 4.72 ± 0.05 respectively. A significant

difference ($P < 0.01$) was observed in the pH values between P1 and P2. The mean ($\pm$ SE) electrical conductivity (EC) of the panchagavya samples P1 and P2 were 13.50 ± 0.65 and 12.50 ± 0.65 dS/m respectively (Table 2). No significant

difference was observed in the electrical conductivity between samples. The mean ($\pm$ SE) organic carbon content (per cent) P1 was 3.62 ± 0.19 , whereas P2 showed a value of 2.43 ± 0.24 (Table 2). Statistical analysis indicated that the organic carbon content differed significantly ($P < 0.01$) between P1 and P2. The mean ($\pm$ SE) nitrogen content (per cent) of the P1 was 0.30 ± 0.06 , whereas it was 0.23 ± 0.04 for the P2 (Table 2). No significant difference was observed between the nitrogen content of P1 and P2. The mean ($\pm$ SE) phosphorus

content (per cent) of the panchagavya P1 samples was 0.05 ± 0.01 , whereas the P2 showed a mean value of 0.03 ± 0.01 (Table 2). There was a significant difference ($P < 0.01$) in phosphorous content between samples. The mean ($\pm$ SE) potassium content (per cent) of the P1 was 0.36 ± 0.01 , whereas the value for the P2 was 0.29 ± 0.02 (Table 2). Statistical analysis indicated a significant difference ($P < 0.05$) in the potassium contents between the two panchagavya samples.

Table 2: Physico-chemical properties of Panchagavya (Mean $\pm$ SE)

Name of the sample	pH	Electrical Conductivity (ds/m)	Organic carbon (%)	Nitrogen (%)	Phosphorous (%)	Potassium (%)
Panchagavya Sample (P1)	$3.64 \pm 0.05^{**}$	13.50 ± 0.65^{NS}	$3.62 \pm 0.19^{**}$	0.30 ± 0.06^{NS}	$0.05 \pm 0.01^{**}$	$0.36 \pm 0.01^*$
Panchagavya Sample (P2)	4.72 ± 0.05	12.50 ± 0.65	2.43 ± 0.24	0.23 ± 0.04	0.03 ± 0.01	0.29 ± 0.02

** - ($P < 0.01$) * - ($P < 0.05$) NS - Not Significant

4. Discussion

4.1 Composition of Panchagavya

The moisture content of the panchagavya samples P1 and P2 did not differ significantly (Table 1). The results indicated that the incorporation of additional ingredients such as sugarcane juice, tender coconut water, ripened banana and toddy in P1 did not exert any noticeable influence on the overall moisture content when compared with the traditionally prepared panchagavya (P2). However, the moisture content observed in both P1 and P2 in the present study was higher than the values reported by Selvaraj *et al.* (2007) [18], Kumar *et al.* (2006) [9] and Lakshmi and Sreeni (2022) [10] who documented a moisture content of 86.1%, 86.41% and 86.1 to 87.5% in panchagavya respectively, and this may be due to variations in the moisture level of the raw materials used as well as differences in environmental conditions during the preparation of panchagavya.

The crude protein content of the panchagavya samples P1 was significantly ($P < 0.01$) higher than P2. The present findings were in close agreement with the findings of Kumar *et al.* (2006) [9] who reported the crude protein content of panchagavya was 3.72 per cent. The present crude protein values differ from the findings of Mol *et al.* (2024) [12] who reported a crude protein range of 7.00 to 16.63 per cent, and these variations in crude protein content may be attributed to differences in the protein content of the ingredients used. The crude fibre content of the panchagavya samples P2 was significantly ($P < 0.05$) higher than P1 (Table 1). This may be due to lesser amount of fermentation in traditional method which leads to higher crude fibre content in P2, whereas additional ingredients used in P1 increase the amount of fermentation and simultaneously reduce the crude fibre content in P1. The present crude fibre values were in close agreement with the findings of Kumar *et al.* (2006) [9] who reported a crude fibre content of 0.95 per cent in panchagavya.

The crude fat content of P1 and P2 did not vary significantly (Table 2). This suggests that the additional ingredients used in P1 did not show any influence on crude fat content. The present crude fat values agree with the findings of Kumar *et al.* (2006) [9] who reported an ether extract content of 2.35 per cent, and Lakshmi and Sreeni (2022) [10] who documented a fat content of 3.09 per cent in panchagavya. The crude ash content of panchagavya P1 was significantly ($P < 0.05$) higher when compared to P2 and were presented in Table 2. This suggests that the additional ingredients used in P1 show significant influence on crude ash content. The results obtained in the present study are in agreement with the findings of Selvaraj *et al.* (2007) [18] who reported an ash

content ranging from 2.5 to 3.0 per cent in panchagavya. However, the crude ash values were higher than those reported by Kumar *et al.* (2006) [9] and Lakshmi and Sreeni (2022) [10] who reported an ash contents 2.10 per cent and 0.89 per cent respectively. These variations may be attributed to differences in the composition of ingredients and the methods adopted during the preparation process.

The gross energy content of panchagavya P1 was significantly ($P < 0.01$) higher when compared to Panchagavya P2 (Table 2) and this may be due to additional ingredients added in the P1 preparation when compared to P2 preparation. The present gross energy values were higher than the findings of Selvaraj *et al.*, (2007) [18] and Sreenivasa *et al.* (2011) [22] who reported gross energy value of panchagavya is around 400–700 kcal/kg (as-fed basis) and 600–900 kcal kg⁻¹ on fresh basis respectively. Higher values of energy content of this study may be due to significant influence of source of ingredients used for panchagavya preparation.

4.2. Physico-chemical properties of Panchagavya

The analysis of the results pertaining to the pH of the panchagavya samples (P1 and P2) revealed a significant difference between the treatments (Table 2). A comparatively higher pH was observed in P2, whereas P1 exhibited a lower pH value. The lower pH recorded in the P1 sample is comparable with the findings of Radha and Rao (2014) [16] and Uthirapandi *et al.* (2018) [24] who reported a pH of 3.7 (after 19 days) and 4.3 respectively. The relatively higher pH observed in P2 (4.72) can be compared with the findings of Punitha *et al.* (2010) [15], who reported that the pH decreased from 5.32 to 4.52 during 10 to 30 days of fermentation of panchagavya. Likewise, Priya *et al.* (2016) [14] observed pH values of 5.10, 4.43, 3.97 and 3.73 at 15, 30, 45 and 60 days of fermentation, respectively. In the present study lower pH in P1 compared to P2 might be due to addition of extra ingredients, enhanced microbial fermentation and organic acid production.

The electrical conductivity of the panchagavya samples P1 and P2 did not show any significant difference (Table 2). Additional ingredients used in P1 did not influence the EC value. The results are comparable with the findings of Chakraborty and Sarkar (2019) [4], who reported EC values ranging from 6.15 to 11.02 dS/m. Similarly, Sivapragasam *et al.* (2014) [20] reported an EC value of 10.22 dS/m in panchagavya, which is also in close agreement with the values recorded in the present investigation. The organic carbon content (%) of the panchagavya samples P1 was significantly ($P < 0.01$) higher when compared to P2 (Table 2). The relatively higher organic carbon content observed in P1 may

be attributed to the additional ingredients which are rich sources of fermentable organic matter. The organic carbon values obtained in the present study are in agreement with the findings of Udhayakumar (2015) ^[23], who reported that the organic carbon content of panchagavya ranged from 0.57 to 17.45 per cent. This variation may be due to difference in ingredients used for preparation of panchagavya.

The nitrogen content (per cent) of the panchagavya samples P1 and P2 did not differ significantly (Table 2). The nitrogen content was higher than the values reported by Dhasarathan *et al.* (2018) ^[8], Chandrakala *et al.* (2007) ^[5] and Reddy *et al.* (2021) ^[17] who documented the nitrogen content in panchagavya sample were 0.024%, 0.03% and 0.10% respectively, This may be due to differences in raw materials, preparation methods, fermentation period and environmental conditions during the preparation of panchagavya. The phosphorus content of P1 was significantly higher ($P < 0.01$) than P2 (Table 2). The additional ingredients used in P1 had a significant influence on the phosphorus content compared with the P21. The present phosphorus content of P1 and P2 were higher than the value reported by Dhasarathan *et al.* (2018) ^[8], who documented a phosphorus content of 0.018% in panchagavya, in contrast, values were lower than one reported by Sharma *et al.* (2024) ^[19] who documented a phosphorus content in panchagavya ranged from 0.08 to 0.385%. The potassium content of the panchagavya samples P1 was significantly higher ($P < 0.05$) than P2 (Table 2). Additional ingredients used in P1 markedly influence the potassium content compared with the P2. The values obtained in the study are in agreement with findings of Mol *et al.* (2024) ^[12] who reported potassium levels ranging from 0.345 to 1.35% in panchagavya. The variations in potassium content among samples may be attributed to potassium content of raw materials used especially banana which is rich in potassium, fermentation period and environmental conditions during the preparation of panchagavya.

5. Summary and Conclusion

The present study concludes that analysis and comparison of composition and physico-chemical properties of two different panchagavya samples (P1 and P2) showed significant difference between them. Panchagavya prepared from Natarajan (2003) ^[13] method (P1) showed significantly higher values of crude protein, crude ash and gross energy, similarly P1 showed significantly higher values of organic carbon, phosphorous and potassium when compared to panchagavya prepared from traditional method (P2). Hence, the panchagavya prepared from Natarajan (2003) ^[13] method (P1) showed comparatively superior nutritional characteristics than traditionally prepared panchagavya (P2). In conclusion, the panchagavya prepared from Natarajan (2003) ^[13] method (P1) can be effectively used as fertilizer in agriculture and also effectively used as feed supplement in animal production.

Conflict of Interest

Not available

Financial Support

Not available

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