



Urine Characterization of Indigenous and Exotic Cows in Rainy, Winter and Summer Season

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An investigation was conducted to characterize the urine of indigenous and exotic cow breeds for various chemical and bio-chemical properties. The study was undertaken in College of Agriculture, Pune, Maharashtra. There were eleven indigenous cow breeds (*Gir, Sahiwal, Red Sindhi, Red Kandhari, Khillar, Konkan Kapila, Tharparkar, Gaolao, Rath, Deoni and Dangi*) and two exotic breeds (*Cross breeds and Phule Triveni*) under study. Fresh urine samples during rainy, winter and summer season in 2022-23 were collected and analyzed. The average pH and electrical conductivity was lower by 5.91 and 29.32% in urine of indigenous breeds compared to exotic breeds. The nitrogen in urine varied from 0.37 to 0.46 %. It was higher by 10.86 % in indigenous breeds over exotic breeds. Potassium of urine varied from 0.30 to 0.76% which was higher by 69.24% indigenous breeds over exotic cow breeds. The magnesium content in urine of indigenous cow breeds was lower (7.01 %) over exotic breeds. The sodium in cow urine varied from 1045 to 1503 mg/kg in both breeds. The iron was higher (44.30 %) in urine of indigenous over exotic cow breeds. The manganese, copper and zinc in cow urine ranged from 4.80 to 19.20 mg/kg, 1.53 to 2.42 mg/kg and 2.25 to 3.06 mg/kg, respectively. The average urease activity varied from 16.28 to 19.02 %.

Key Words: Biochemical properties, Chemical properties, Exotic cow, Indigenous cow, Season, Urine.

INTRODUCTION

Cow rising is one of the traditions in Indian culture. From this cow, various products are derived viz. milk, ghee, curd, urine dung etc. which are frequently employed in a variety of Ayurvedic compositions. The beneficial effects of cow urine and dung are numerous. They both contribute to the production of insecticides, fungicides, and pesticides. Out of these two, one important product with several applications is 'cow urine'. There are several advantages to cow urine, especially in the field of agriculture. It is notable for its numerous applications, ease of usage, and eco-friendliness. In India, the practice of using cow urine has long been recognized. It has been said that cow pee has countless medicinal benefits and can heal both plants and human so favorite of terminal illnesses.

The urine of cows has long been thought to be a highly helpful bio pesticide and fertilizer in agricultural operations. Its abundance of macro- and micro-nutrients, bactericidal, and preventive qualities help to cleanse the air and increase soil fertility. It is regarded as an option for plant nutrition, metabolic stimulation, and pest and disease management since it is thought to give nutrients to plants at a cheap cost. (Ambigalakshmi *et al*, 2023). Among different organic sources, cow urine is good source of nitrogen, besides, it contains sulphur, phosphate, potassium, sodium, manganese, carbolic acid, iron, silicon, chlorine, salt, enzyme and hormones. It strengthens the fact that cow's urine is not a toxic effluent as 95% of its content being water, 2.5% urea and the remaining 2.5% a mixture of minerals, salts, hormones and enzymes. (Vala and Desai, 2021). Considering the importance of cow

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Table 1. Urine pH and electrical conductivity of indigenous and exotic cows during rainy, winter and summer season.

Sr. No.	Breed	pH				Electrical conductivity (dSm ⁻¹)			
		Rainy	Winter	Summer	Average	Rainy	Winter	Summer	Average
1	Gir	7.86	8.20	8.42	8.16	22.36	29.54	26.38	26.09
2	Sahiwal	7.43	7.24	7.88	7.52	19.50	20.40	25.85	21.92
3	Red Sindhi	8.56	8.67	8.85	8.69	20.56	27.80	26.70	25.02
4	Red Kandhari	7.68	7.80	8.20	7.89	24.36	28.70	33.60	28.89
5	Khillar	7.61	7.55	7.75	7.64	22.58	25.80	26.60	24.99
6	Konkankapila	7.58	7.85	8.07	7.83	28.36	30.50	34.25	31.04
7	Tharparkar	7.95	8.43	8.75	8.38	23.60	22.40	25.55	23.85
8	Gaolao	7.96	8.74	8.50	8.40	20.60	22.50	24.65	22.58
9	Rathi	7.95	8.05	8.22	8.07	24.30	28.40	27.30	26.67
10	Deoni	8.20	8.68	9.15	8.68	20.36	21.50	24.20	22.02
11	Dangi	7.20	7.53	7.90	7.54	28.90	33.40	28.45	30.25
	Average	7.82	8.07	8.34	-	23.23	26.45	27.59	-
12	Cross Breed	8.69	8.70	9.00	8.80	34.30	33.50	41.25	36.35
13	PhuleTriveni	7.84	8.40	8.85	8.36	35.60	33.80	40.20	36.53
	Average	8.27	8.55	8.93	-	34.95	33.65	40.73	-
	SE (m) $\pm$	0.26	0.36	0.16	-	0.56	0.82	1.92	-
	CD (5%)	0.76	1.04	0.49	-	1.64	2.41	5.61	-

urine especially urine of indigenous cows, the present investigation was planned to evaluate chemical and bio-chemical properties of cow urine.

MATERIALS AND METHODS

The investigation was conducted to characterize the indigenous and exotic cow urine for various chemical and biological properties at Division of Soil Science and Animal Husbandry and Dairy Science, College of Agriculture, Pune (MS) during rainy, winter and summer season of 2022-23. For this purpose, thirteen cow breeds including eleven indigenous (*Gir, Sahiwal, Red Sindhi, Red Kandhari, Khillar, Konkan Kapila, Tharparkar, Gaolao, Rathi, Deoni* and *Dangi*) and two exotic (*Cross breeds* and *Phule Triveni*) breeds were selected.

Fresh cow urine of these breeds was collected from Division of Animal Husbandry and Dairy Science, College of Agriculture, Pune early in the morning from herd of healthy Indigenous

and exotic cows. After wiping faecal matter from the vulva, the cows were stimulated to urinate by stroking the side of the vulva and mid-stream urine was collected from each breed of animal in clean containers. After that it was transferred into well sterile labeled bottles and used for analysis. Urine was collected from same age group of lactating cows and with same feed

RESULTS AND DISCUSSION

The data on pH of cow urine revealed that average pH ranged from 7.20 to 9.15. The pH of indigenous cow ranged from 7.82 to 8.34 while for exotic cows it was 8.27 to 8.93. The significantly higher pH (8.80) was observed for the cross breed. The increasing trend of pH was observed from rainy to summer season. The average electrical conductivity EC of indigenous cows was 23.23 to 27.59 dSm⁻¹ while in exotic cows it was 34.95 to 40.73 dSm⁻¹. Lower EC was observed in Sahiwal breed (19.50 dSm⁻¹) while higher was in exotic breed of Phule Triveni (35.60 dSm⁻¹). The

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Table 2. Nitrogen and phosphorus in urine of indigenous and exotic cows during rainy, winter and summer season.

Sr. No.	Breed	Nitrogen (%)				Phosphorus (%)			
		Rainy	Winter	Summer	Average	Rainy	Winter	Summer	Average
1	Gir	0.52	0.59	0.62	0.58	0.050	0.038	0.037	0.042
2	Sahiwal	0.48	0.53	0.51	0.51	0.035	0.025	0.023	0.028
3	Red Sindhi	0.45	0.52	0.54	0.50	0.043	0.031	0.033	0.036
4	Red Kandhari	0.39	0.44	0.51	0.45	0.029	0.019	0.023	0.023
5	Khillar	0.35	0.41	0.44	0.40	0.026	0.021	0.022	0.023
6	Konkankapila	0.33	0.37	0.35	0.35	0.083	0.068	0.068	0.073
7	Tharparkar	0.44	0.49	0.48	0.47	0.022	0.014	0.022	0.019
8	Gaolao	0.38	0.42	0.48	0.43	0.026	0.021	0.020	0.022
9	Rathi	0.27	0.34	0.41	0.34	0.116	0.089	0.071	0.092
10	Deoni	0.33	0.37	0.39	0.36	0.038	0.025	0.033	0.032
11	Dangi	0.24	0.28	0.30	0.27	0.034	0.028	0.023	0.028
	Average	0.38	0.43	0.46	-	0.046	0.034	0.034	-
12	Cross Breed	0.34	0.35	0.33	0.34	0.025	0.020	0.018	0.021
13	PhuleTriveni	0.39	0.45	0.43	0.42	0.065	0.052	0.048	0.055
	Average	0.37	0.40	0.38	-	0.045	0.036	0.033	-
	SE (m) $\pm$	0.02	0.023	0.14	-	0.004	0.009	0.006	-
	CD (5%)	0.06	0.067	0.41	-	0.013	0.026	0.019	-

increased electrical conductivity of the cow urine in the summer season may be due to higher accumulation of salts in cow urine due to higher body evaporation. Khushboo *et al* (2021) observed that EC level in the cow urine was significantly lower in winter season than in the summer season. Sakhare *et al* (2022) observed that higher electrical conductivity (20 dS m⁻¹) in cattle urine. The findings in close confirmation to this were also reported by Veerasha *et al* (2013) and Jadhav *et al* (2020).

The nitrogen of indigenous breeds varied from 0.38 to 0.46 % while in exotic breeds, it ranged from 0.37 to 0.40 %. The nitrogen in the cow urine was affected due to season and also breed wise. It was higher in the Gir breed during summer season. This was higher than exotic breeds across the seasons. Variation in the nitrogen content of cow urine may be due to the protein in the diet and rate of metabolism in different breeds varies as per climatic conditions.

Jadhav *et al* (2020) reported that nitrogen content in cow urine ranged from 0.55 to 0.83 %. Sakhare *et al* (2022) observed that nitrogen content of cattle urine was 0.50% during application of urine in soil. Sharma *et al* (2020) observed that urea nitrogen and total nitrogen varies from 23-28 ml/kg/day and 40-45 ml/kg/day.

The phosphorus in the cow urine ranged from 0.014 to 0.116 %. Across the season, higher P (0.092 %) was observed in the urine of Rathi breed compared to others. This was recorded higher during rainy season in both indigenous and exotic breeds. Cow urine source of macro micro and has disinfectant properties to purify the atmosphere and improve soil fertility. Cow urine therefore could be an effective tool to address multi nutrient deficiency in most of the soils (Pathak and Ram 2013). The potassium in cow urine varied from 0.14 to 1.33 %. Significantly higher potassium (0.91%) was observed in Gir cow which was at par with Sahiwal (0.82%) and Deoni (0.80 %).

Table 3. Potassium and sodium in urine of indigenous and exotic cows during rainy, winter and summer season.

Sr. No.	Breed	Potassium (%)				Sodium (mg/kg)			
		Rainy	Winter	Summer	Average	Rainy	Winter	Summer	Average
1	Gir	0.91	1.15	1.33	1.13	1750	1240	1740	1577
2	Sahiwal	0.82	1.05	0.84	0.90	1422	1647	1795	1621
3	Red Sindhi	0.44	0.55	0.86	0.62	1415	1536	1848	1600
4	Red Kandhari	0.36	0.48	0.45	0.43	1004	1142	1234	1127
5	Khillar	0.58	0.78	0.40	0.59	806	1000	1100	969
6	Konkankapila	0.34	0.42	0.24	0.33	398	405	521	441
7	Tharparkar	0.55	0.77	0.38	0.57	724	856	850	810
8	Gaolao	0.56	0.72	0.44	0.57	1134	1402	1521	1352
9	Rathi	0.46	0.57	0.38	0.47	1700	1954	1968	1874
10	Deoni	0.80	1.02	0.45	0.76	435	504	614	518
11	Dangi	0.61	0.79	0.51	0.64	703	769	805	759
	Average	0.58	0.76	0.57	-	1045	1132	1272	-
12	Cross Breed	0.14	0.20	0.20	0.18	1205	1341	1570	1372
13	PhuleTriveni	0.58	0.74	0.39	0.57	1319	1245	1435	1333
	Average	0.36	0.47	0.30	-	1262	1293	1503	-
	SE (m) $\pm$	0.04	0.035	0.06	-	84.83	39.54	56.01	-
	CD (5%)	0.12	0.101	0.172	-	247.13	115.20	163.14	-

Table 4. Per cent high or low content in chemical properties and nutrients of indigenous cows over exotic cow urine.

Sr No	Parameter	Low/High (%)
1	pH	-5.91
2	EC	-29.32
3	Nitrogen	10.86
4	Phosphorus	0.25
5	Potassium	69.24
6	Calcium	49.98
7	Magnesium	-7.01
8	Sodium	14.93
9	Iron	44.30
10	Manganese	15.73
11	Copper	1.27
12	Zinc	25.22

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Table 5. Calcium and magnesium in urine of indigenous and exotic cows during rainy, winter and summer season.

Sr. No.	Breed	Calcium (mg/kg)				Magnesium (mg/kg)			
		Rainy	Winter	Summer	Average	Rainy	Winter	Summer	Average
1	Gir	521	407	240	389	220	140	154	171
2	Sahiwal	594	400	150	381	320	310	235	288
3	Red Sindhi	550	486	504	513	110	205	311	209
4	Red Kandhari	430	321	341	364	206	Traces	115	161
5	Khillar	220	204	110	178	306	115	143	188
6	Konkan kapila	304	333	Traces	319	Traces	416	317	367
7	Tharparkar	360	200	Traces	280	102	207	234	181
8	Gaolao	198	257	364	273	106	Traces	Traces	106
9	Rathi	403	300	Traces	352	211	105	314	210
10	Deoni	399	Traces	Traces	399	217	136	115	156
11	Dangi	200	364	300	288	Traces	123	152	138
	Average	379	327	287	-	200	195	209	-
12	Cross Breed	111	310	170	194	123	245	287	218
13	Phule Triveni	204	308	110	205	113	304	227	215
	Average	157	309	140	-	118	275	257	-
	SE (m) $\pm$	3.12	2.68	1.82		4.52	3.59	2.71	
	CD (5%)	10.59	6.94	3.51		12.91	10.20	6.05	

Ramani *et al* (2012) reported potassium 7.55 g/L and sodium 1.06 g/L in milch cow urine. Across the season, average sodium was observed from 441 mg/kg (*Konkan Kapila*) to 1874 mg/kg (Rathi). Higher sodium (1272 mg/kg) was recorded in the summer season over other seasons. These findings are in close confirmatory to the finding reported by Saunders (1982), Ramani *et al* (2012), Gulhane *et al* (2017) and Sharma and Kumar (2020).

From the overall study of urine characterization of indigenous and exotic cow revealed that the pH, electrical conductivity and magnesium were lower by 5.91, 2932 and 7.01 per cent, respectively. While nitrogen, phosphorus, potassium, calcium, sodium, iron, manganese,

copper and zinc were higher by 10.86, 0.25, 69.24, 49.98, 14.93, 44.30, 15.73, 1.27 and 25.22 percent compared to exotic breeds of cow. Therefore, the use of indigenous cow urine in agriculture is having prime importance.

The data revealed that the calcium in the cow urine varied from traces to 594 mg/kg. High calcium was reported in the urine of Red Sindhi breed over other. Average calcium varied from traces to 513 mg/kg. Across the seasons, higher calcium was observed in rainy season (379 mg/kg). Parihar *et al* (2004) reported that higher level of calcium in non-descript cows urine compared to crossbreed cow. The magnesium in various cow breeds ranged from 106 to 367 mg/kg.

Table 6. Iron and Manganese in urine of indigenous and exotic cows during rainy, winter and summer season.

Sr. No.	Breed	Iron (mg/kg)				Manganese (mg/kg)			
		Rainy	Winter	Summer	Average	Rainy	Winter	Summer	Average
1	Gir	30.00	29.71	43.65	34.45	10.30	12.30	19.20	13.93
2	Sahiwal	17.67	16.66	31.45	21.93	9.50	10.00	15.30	11.60
3	Red Sindhi	24.33	23.77	20.44	22.85	11.04	12.40	11.07	11.50
4	Red Kandhari	10.00	9.21	12.58	10.60	8.70	8.00	9.10	8.60
5	Khillar	8.00	7.78	7.55	7.78	7.80	9.51	14.30	10.54
6	Konkan kapila	34.67	33.34	44.10	37.37	10.55	13.02	17.30	13.62
7	Tharparkar	24.00	23.39	26.06	24.48	7.80	8.00	10.40	8.73
8	Gaolao	25.00	24.60	20.44	23.35	10.09	14.33	13.20	12.54
9	Rathi	24.00	23.86	26.30	24.72	5.90	7.00	11.37	8.09
10	Deoni	9.67	9.21	9.30	9.39	6.50	7.49	8.94	7.64
11	Dangi	10.67	11.28	13.16	11.70	4.80	5.61	10.06	6.82
	Average	19.82	19.35	23.18	-	8.45	9.79	12.75	-
12	Cross Breed	12.67	12.21	14.30	13.06	7.70	9.21	10.70	9.20
13	Phule Triveni	16.67	15.87	14.70	15.75	8.50	8.00	9.44	8.65
	Average	14.67	14.04	14.50	-	8.10	8.61	10.07	-
	SE (m) $\pm$	1.42	1.55	1.77	-	0.42	0.71	0.66	-
	CD (5%)	4.08	4.53	5.17	-	1.25	2.09	1.95	-

The study on the iron of cow urine indicated variation from 7.55 to 44.10 mg/kg. Average iron in the urine of indigenous cows was 19.82 mg/kg while in urine of exotic cows was 14.67mg/kg. In Konkan kapila, iron was higher in all the three seasons under study compared to other breeds. The range of manganese varied from 4.80 to 19.20 mg/kg. The results are in close confirmatory to Ramani *et al* (2012) and Sakhare *et al* (2022).

The copper content across the seasons, varied from 1.44 to 2.40 mg/kg. Among all the breeds, Dangi urine recorded higher copper (3.17 mg/kg) over other breeds. During all the three seasons, higher copper was observed in summer season and higher in exotic breeds. The average

zinc in cow urine ranged from 2.00 to 4.05 mg/kg. The average zinc in indigenous and exotic breeds was 2.96 and 2.37 mg/kg. Parihar *et al* (2004) also reported higher levels of zinc, magnesium, potassium and calcium in non-descript cow urine compared to crossbred cows.

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Table 7. Copper and zinc in urine of indigenous and exotic cows during rainy, winter and summer season.

Sr. No.	Breed	Copper (mg/kg)				Zinc (mg/kg)			
		Rainy	Winter	Summer	Average	Rainy	Winter	Summer	Average
1	Gir	1.74	1.40	1.54	1.56	3.56	3.75	4.05	3.79
2	Sahiwal	1.33	1.20	2.00	1.51	2.57	3.20	3.44	3.07
3	Red Sindhi	2.01	2.08	2.11	2.07	2.70	2.90	3.05	2.88
4	Red Kandhari	1.90	1.83	1.94	1.89	2.43	2.80	2.56	2.60
5	Khillar	1.46	1.60	2.00	1.69	2.57	2.70	2.48	2.58
6	Konkan kapila	1.60	1.90	2.46	1.99	2.70	2.90	3.04	2.88
7	Tharparkar	1.70	2.00	3.50	2.40	2.37	2.10	2.55	2.34
8	Gaolao	1.07	1.27	2.00	1.44	2.43	2.77	2.94	2.71
9	Rathi	1.23	1.80	2.44	1.82	2.60	2.73	2.00	2.44
10	Deoni	1.29	1.60	2.00	1.63	2.67	3.70	3.60	3.32
11	Dangi	3.10	3.40	3.00	3.17	3.25	4.05	4.00	3.77
	Average	1.68	1.83	2.27	-	2.71	3.05	3.06	-
12	Cross Breed	1.33	1.50	2.00	1.61	2.53	2.40	2.44	2.46
13	Phule Triveni	1.73	2.00	2.84	2.19	2.33	2.10	2.30	2.24
	Average	1.53	1.75	2.42	-	2.43	2.25	2.37	-
	SE (m) $\pm$	0.10	0.09	0.16	-	0.22	0.13	0.20	-
	CD (5%)	0.27	0.23	0.46	-	0.65	0.39	0.58	-

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