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Effect of foliar spray of cow breeds urine on growth and yield of wheat (*Triticum aestivum* L.)

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Abstract

The present investigation entitled “Effect of foliar spray of cow breeds urine on growth and yield of wheat (*Triticum aestivum* L.)” was conducted during Rabi 2024-25 at the Agronomy Research Farm, College of Agriculture, Pune. The experiment aimed to assess the comparative efficacy of foliar application of cow urine from different breeds on growth, yield, quality, and nutrient dynamics in wheat. The research findings showed that the maximum mean grain (42.50 q ha^{-1}) and straw (54.26 q ha^{-1}) yield of wheat were obtained by using spray of Tharparkar cow breed urine at 20% concentration. These yields were at par with spray of Rathu cow breed urine at 20% concentration and significantly superior over other treatments. The total nutrient uptake by the wheat crop showed significant differences. The highest total uptake of nitrogen ($104.39 \text{ kg ha}^{-1}$), phosphorus (32.18 kg ha^{-1}) and potassium (75.68 kg ha^{-1}) was recorded under the Tharparkar urine treatments and interestingly, the higher nutrient uptake of nitrogen (105.7 kg ha^{-1}), phosphorus (32.18 kg ha^{-1}) and potassium (73.94 kg ha^{-1}) was recorded under the 20% CUS treatment, followed closely by Rathu urine treatments. The lowest uptake (86.91 , 26.55 , and 63.73 kg ha^{-1} of N, P, and K, respectively) was observed under crossbred urine with water spray.

Keywords: Cow urine, Tharparkar, Rathu, 20%, 15%, nutrient content, CUS

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops grown worldwide and plays a vital role in ensuring food security. In India, it is the second most extensively cultivated and consumed staple food after rice, contributing significantly to the diet of approximately 65% of the population (Mishra *et al.*, 2005) [5]. Its importance is particularly evident in Northern India, especially in the fertile Gangetic plains, where wheat serves as a primary source of dietary energy and caloric intake (Joshi *et al.*, 2007) [3].

In Indian culture, the tradition of revering and nurturing cows often referred to as cow rising-holds significant importance. From cows, a variety of valuable products are derived, including milk, ghee, curd, urine and dung. These by-products are commonly used in Ayurvedic formulations and natural remedies. Among these, cow urine stands out due to its diverse applications and notable benefits, particularly in the fields of agriculture and medicine. Cow urine, along with dung, plays a key role in the preparation of eco-friendly insecticides, fungicides and pesticides. Its use is appreciated for being both effective and environmentally sustainable.

Cow urine, a significant component of traditional Indian agricultural practices, is well known for its bio-fertilizing, bio-pesticidal, and plant growth-promoting properties. It contains essential plant nutrients such as nitrogen, phosphorus, potassium, along with micronutrients, enzymes, amino acids, and naturally occurring growth hormones, which contribute to its effectiveness as a sustainable alternative to synthetic agrochemicals (Dhama *et al.*, 2005). Its application has shown to improve soil fertility, stimulate plant metabolism, and enhance crop growth and yield without causing environmental harm (Patel *et al.*, 2015) [9].

The composition and efficacy of cow urine can vary considerably among different cattle breeds due to differences in genetic makeup, digestive physiology, diet, and associated microbial ecosystems. Indigenous breeds such as Tharparkar, Rathu, and Dangi are often believed to

produce more potent urine containing higher concentrations of medicinal and bioactive compounds when compared to exotic breeds like Holstein Friesian and Jersey (Chauhan and Singh 2001; Pathak & Ram, 2010) ^[1, 8]. These perceived differences are frequently cited in traditional knowledge systems; however, scientific evidence supporting these claims remains limited and largely anecdotal. There is a pressing need for systematic, breed-specific studies to validate and quantify the biochemical and agronomic efficacy of cow urine in crop production.

Materials and Methods

The present field experiment entitled “Effect of foliar spray of cow breeds urine on growth and yield of wheat (*Triticum aestivum* L.)” was carried out at Division of Agronomy, College of Agriculture Pune, during *rabi* season of 2024-25. The experiment was laid out in Split Plot Design with sixteen treatments and three replications with gross and net plot sizes 3.00 m x 2.40 m and 2.40 m x 1.60 m respectively. The wheat crop was sown at row spacing of 20cm. The study was designed to evaluate the effects of cow urine derived from four different breeds (Tharparkar, Rath, Dangi, and Crossbred) and four foliar spray concentrations (10%, 15%, 20% and water spray) on growth, yield, yield attributes, soil properties, and economics of wheat.

Prior to sowing, farmyard manure (FYM) was applied as per standard agronomic recommendations. The required doses of nitrogen (N), phosphorus (P), and potassium (K) fertilizers were applied based on the recommended package of practices for wheat cultivation. Observations related to growth parameters were recorded at 15-day intervals throughout the crop growth period, while yield and yield-attributing traits were recorded at the time of harvest. Additionally, nutrient uptake (NPK) by the crop and residual soil fertility status were analyzed after harvest. It gives rough index of Straw yield. The data and observations recorded in the experiment were statistically analysed in split plot design and stated significance at 5%. (Panse and Sukhatme, 1985) ^[6].

Results and Discussion

Influence of Cow breeds urine on grain and straw yield

The mean grain yield of wheat was (42.50 q ha⁻¹). The mean grain yield of wheat differed significantly due to various treatments under study. The data summarized in Table 1.

Effect of cow breeds

The grain yield of wheat was influenced significantly due to urine of different cow breeds. The grain yield of wheat was significantly found superior with urine of tharparkar (B₁), which was at par with urine of rathi (B₂) and significantly superior over rest of breeds. The cross breed (B₄) urine recorded significantly lower grain yield.

The straw yield of wheat was influenced significantly due to urine of different cow breeds. The straw yield was significantly superior with urine of tharparkar (B₁) (56.50 kg ha⁻¹) which was at par with urine spray of rathi breed (B₂) (55.37 kg ha⁻¹) and significantly superior over urine of rest breeds. The urine spray of cross breed (B₄) (51.42 kg ha⁻¹) recorded significantly lower straw yield.

Effect of foliar spray

The grain yield of wheat was significantly higher at 20% CUS (F₃) which was at par with 15% (F₂) and significantly superior over rest of urine concentrations. The water spray (F₄) recorded

significantly lower grain yield.

The straw yield of wheat was significantly higher at 20% CUS (F₃) (55.92 kg ha⁻¹) which was at par with 15% (F₂) (55.62 kg ha⁻¹) and significantly superior over rest of urine concentrations. The water spray (F₄) (53.00 kg ha⁻¹) recorded significantly lower straw yield.

Interaction Effect

The highest grain yield (45.00 q ha⁻¹) was observed with treatment receiving 20% CUS with Tharparkar cow urine, which was at par with 20% CUS with Rath (44.72 q ha⁻¹) and crossbreed urine (44.32 q ha⁻¹) and also it was at par with 15% CUS with tharparkar (44.00 q ha⁻¹), dangi (43.27 q ha⁻¹) and cross breed (44.26 q ha⁻¹) and it was at par with 10% CUS with rathi (44.00 q ha⁻¹) suggesting that these combinations were statistically similar. These results indicate that 20% CUS concentration was the most effective foliar dose across all cow breeds urine.

These results are in agreement with findings by Pathak *et al.* (2014) ^[7], who reported that foliar application of cow urine enhanced nutrient uptake and increased yield in cereals. Kumar *et al.* (2020) ^[4], who found that indigenous cow breeds like Tharparkar had higher urea, nitrogen, and growth-promoting compounds in urine compared to crossbreeds.

The highest straw yield (58.00 q ha⁻¹) was recorded under the application of 20% CUS foliar spray with Tharparkar cow urine, which was at par with Rath + 20% CUS (57.01 q ha⁻¹), Dangi + 20% (56.00) and Tharparkar + 15% CUS (57.00 q ha⁻¹), Rath + 15% (56.80) and Tharparkar + 10% (56.00) indicating that these treatments are statistically similar in performance. This highlights the superior efficacy of Tharparkar and Rath urine at higher concentrations of CUS in improving biomass production. Similar result was reported by Kumar *et al.* (2020) ^[4].

N, P and K uptake by grain and straw

The data regarding N, P and K uptake (per cent) in grain and straw of wheat influenced by different treatments are presented in Table 2.

Effect of cow breeds

The total uptake of nitrogen, phosphorus, and potassium was highest under the Tharparkar (104.39 kg ha⁻¹), which was statistically at par with Rath (103.15 kg ha⁻¹). Dangi also showed moderately higher uptake and was at par with Rath in case of phosphorus and potassium. The lowest nutrient uptake was recorded in crossbreed cow urine (86.91 kg ha⁻¹), which was statistically inferior to all other treatments.

The superior performance of indigenous cow urine (especially Tharparkar and Rath) may be attributed to higher microbial load, better nitrogenous compounds, and enzymatic activity which enhance nutrient mineralization and availability in the soil.

Effect of foliar spray

Among the foliar spray treatments, 20% CUS (105.7 kg ha⁻¹) recorded the highest uptake of N, P, and K, which was statistically at par with 15% CUS (102 kg ha⁻¹). Both 15% and 20% CUS were significantly superior to 10% CUS and water spray. The lowest values were recorded in the water spray (90.29 kg ha⁻¹) treatment.

The increased nutrient uptake with higher CUS concentrations can be explained by improved enzymatic activity, enhanced photosynthesis, and better nutrient absorption.

Interaction Effect

The interaction between cow breeds and foliar spray was found to be non-significant for total nitrogen, phosphorus, and potassium uptake, indicating that the combined effects did not vary significantly beyond the individual effects.

Table 1: Mean grain and straw yields of wheat as influenced by different treatments

Tr. No.	Grain yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)
A) Cow Breeds urine		
B ₁ - Urine of Tharparkar	43.50	56.50
B ₂ - Urine of Rath	43.18	55.37
B ₃ - Urine of Dangi	41.82	53.75
B ₄ - Urine of Cross breed	41.52	51.42
S.E.(m)+	0.19	0.37
C.D. at 5%	0.68	1.29
B) Foliar Spray concentrations (%)		
F ₁ - 10% CUS	41.08	52.50
F ₂ - 15% CUS	43.63	55.62
F ₃ - 20% CUS	44.62	55.92
F ₄ - Water Spray	40.68	53.00
S.E.(m)+	0.32	0.46
C.D. at 5%	0.94	1.36
C) Interaction (Cow breeds urine x Foliar Spray concentrations)		
SE(m) ±	0.64	0.93
CD at 5%	1.89	2.73
General mean	42.50	54.26

Table 2: Grain yield (q ha⁻¹) as influenced by interaction of cow breeds and foliar spray

Cow Breeds Foliar spray	Grain yield (q ha ⁻¹)				Mean
	Urine of Tharparkar	Urine of Rath	Urine of Dangi	Urine of cross breed	
10% CUS	43.00	44.00	41.00	36.33	41.08
15% CUS	44.00	43.00	43.27	44.26	43.63
20% CUS	45.00	44.72	43.00	44.32	44.62
Water spray	42.00	41.00	40.00	39.70	40.68
Mean	43.50	43.18	41.82	41.52	42.50
Cow Breeds urine x Foliar spray					
SE(m) ±	0.64				
CD at 5%	1.89				

Table 3: Straw yield (q ha⁻¹) as influenced by interaction of cow breeds and foliar spray

Cow Breeds Foliar spray	Straw yield (q ha ⁻¹)				Mean
	Urine of Tharparkar	Urine of Rath	Urine of Dangi	Urine of cross breed	
10% CUS	56.00	51.67	51.00	51.33	52.50
15% CUS	57.00	56.80	55.00	53.67	55.62
20% CUS	58.00	57.01	56.00	52.67	55.92
Water spray	55.00	54.00	53.00	50.00	53.00
Mean	56.50	55.37	53.75	51.42	54.26
Cow Breeds x Foliar spray					
SE(m) ±	0.93				
CD at 5%	2.73				

Table 4: Total N, P and k uptake (Kg ha⁻¹) by Wheat crop as influenced by different treatments

Treatment	Nutrient uptake by grain (kg ha ⁻¹)			Nutrient uptake by straw (kg ha ⁻¹)			Total nutrient uptake by crop (kg ha ⁻¹)		
	N	P	K	N	P	K	N	P	K
A) Cow Breeds urine									
B ₁ - Urine of Tharparkar	80.47	19.57	23.92	25.23	12.61	51.76	104.39	32.18	75.68
B ₂ - Urine of Rath	78.20	18.70	22.95	24.22	11.90	50.15	103.15	30.6	73.10
B ₃ - Urine of Dangi	75.94	17.84	21.99	23.24	11.20	48.55	99.18	29.04	70.54
B ₄ - Urine of Cross breed	69.05	15.93	19.72	20.86	10.62	44.01	86.91	26.55	63.73
SE(m) ±	0.73	0.50	0.41	0.43	0.40	0.73	0.83	0.78	1.1
CD at 5%	2.20	1.50	1.25	1.30	1.20	2.21	2.50	2.36	3.30
B) Foliar Spray concentrations (%)									
F ₁ - 10% CUS	75.53	17.43	21.58	23.65	10.79	48.55	99.18	28.22	70.13
F ₂ - 15% CUS	78.20	18.70	22.52	23.80	11.47	49.01	102	30.17	72.09
F ₃ - 20% CUS	80.47	19.57	23.92	25.23	12.61	50.02	105.7	32.18	73.94
F ₄ - Water Spray	68.67	15.55	19.34	21.62	10.62	44.76	90.29	26.17	64.1
SE(m) ±	1.01	0.42	0.8	0.74	0.83	0.35	1.3	0.78	0.64
CD at 5%	3.03	1.23	1.8	2.23	2.50	1.02	3.9	2.34	1.92
C) Interaction (Cow breeds urine x Foliar Spray concentrations%)									
SE(m) ±	1.15	0.75	0.57	0.98	0.94	0.87	1.34	1.04	1.53
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
General mean	75.81	17.91	21.99	23.48	11.47	48.35	98.85	29.38	70.41

*NS= non-significant

Conclusion

The foliar application of Tharparkar cow breed urine at 15% and 20% concentrations recorded higher value of growth and yield attributing character like grain yield and straw yield of wheat. However, it is followed by Rath urine at 15% and 20% respectively. The nutrient uptake by plants was significantly influenced by the foliar application of Tharparkar cow breed urine at 15% and 20% in wheat and the highest uptake of NPK was found. However, it is followed by Rath urine at 15% and 20% respectively.

Furthermore, it can be stated from an economic perspective that the foliar application by Tharparkar urine at 15% and 20% in wheat notably achieved the best net returns and benefit-cost

ratio, followed by the foliar application by Rath urine at 15% and 20% in wheat.

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