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Impact of foliar application of cow urine from different breeds 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 (45.03 q ha^{-1}) and straw (62.30 q ha^{-1}) yield of wheat were obtained by using spray of urine of Gir at 20% concentration. These yields were at par with spray of urine of Sahiwal 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 ($109.87 \text{ kg ha}^{-1}$), phosphorus (27.47 kg ha^{-1}) and potassium (88.34 kg ha^{-1}) was recorded under the urine of Gir treatments and interestingly, the higher nutrient uptake of nitrogen ($112.62 \text{ kg ha}^{-1}$), phosphorus (27.95 kg ha^{-1}) and potassium (91.21 kg ha^{-1}) was recorded under the 20% CUS treatment, followed closely by urine of Sahiwal treatments. The lowest uptake (92.88 , 24.08 and 76.87 kg ha^{-1} of N, P and K respectively) was observed under water spray.

Keywords: Cow urine, Gir, Sahiwal, 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) ^[14]. 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) ^[8].

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. 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) ^[17].

Cow urine is made up of 95% water, 2.5% urea, and 2.5% minerals, salts, hormones and enzymes. Cow urine contains useful nutrients like nitrogen (1%), potassium (1.9%) and small

amounts of phosphorus (Tamhane *et al.*, 1965). It also has important nutrients like iron, calcium, carbonic acid, ammonia, manganese, sulphur, phosphates, uric acid, amino acids, enzymes, cytokinin and lactose (Bhadauria, 2002). It also has elements such as sodium, magnesium, copper, iodine, silver, urea, oxalic acid, lead, hippuric acid, creatinine, enzymes, steroids, propylene oxide, ethylene oxide, glycosides, glucose, citric acid, alkaloids, acetate and substances that support plant growth (Agrawal, 2002) ^[1].

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 20 cm. The study was designed to evaluate the effects of cow urine derived from four different breeds (Gir, Sahiwal, Red Sindhi and Crossbreed) 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) ^[15].

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

Grain yield was significantly affected by different cow breeds. The highest grain yield was recorded in urine of Gir (42.86 q ha⁻¹) which was at par with urine of Sahiwal (42.15 q ha⁻¹) and significantly superior over the urine of Red Sindhi (41.39 q ha⁻¹) and urine of Cross breed (40.57 q ha⁻¹). The grain yield was recorded in urine of Cross breed (40.57 q ha⁻¹).

The superior performance of Gir and Sahiwal urine can be attributed to their higher biological activity, containing growth-promoting hormones, nitrogenous compounds and essential micronutrients. These components enhance physiological processes such as nutrient uptake, photosynthetic rate and reproductive efficiency, resulting in higher yield. Similar breed-based yield differences have been reported by Choudhary and Ghosh (2019) ^[4] and Punia *et al.* (2018), who observed better grain yields in wheat when treated with cow urine from indigenous breeds as compared to Cross breed cows.

Effect of foliar spray

The effect of foliar spray concentrations on grain yield was also found to be significant. The higher grain yield was recorded with 20% CUS (43.51 q ha⁻¹) which was statistically at par with 15% CUS (42.87 q ha⁻¹) and significantly superior over the 10% CUS (41.53 q ha⁻¹) and water spray (39.06 q ha⁻¹). The lowest grain yield was recorded in water spray (39.06 q ha⁻¹).

The increase in yield with higher concentrations of cow urine solution can be attributed to improved enzymatic activity, better nutrient assimilation and greater chlorophyll content which supports more efficient grain filling. These findings are consistent with the studies of Tiwari *et al.* (2020) and Jatav *et al.* (2020), who reported that foliar application of cow urine at 15-20% concentrations led to significant improvements in growth, yield components and final grain yield in wheat and other cereals.

Interaction Effect

The interaction effect between cow breeds and foliar spray treatments on grain yield was found to be significant.

The highest yield was recorded under the combination of urine of Gir + 20% CUS (45.03 q ha⁻¹), followed by combination of urine of Gir + 15% CUS (44.12 q ha⁻¹), combination of urine of Sahiwal +20% CUS (44.00 q ha⁻¹) and combination of urine of Sahiwal +15% CUS (43.77 q ha⁻¹). The lowest yield was found in combination of urine of Sahiwal + water spray (38.71 q ha⁻¹).

The synergistic effect of using urine from high-performing indigenous breeds (like Gir) in combination with optimal foliar spray concentrations (20%), which promotes efficient source-sink translocation and grain filling. These results align with findings by Sharma *et al.* (2020) and Bharadwaj *et al.* (2015), who noted that the combined effect of organic foliar applications and breed-specific bioactivity played a crucial role in enhancing yield performance.

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 significant differences were observed among cow breeds with respect to NPK uptake by grain, straw and total crop.

Nitrogen Uptake: The maximum total nitrogen uptake by crop (grain + straw) was recorded with urine of Gir (109.87 kg ha⁻¹), followed by urine of Sahiwal (107.47 kg ha⁻¹) and urine of Red Sindhi (103.81 kg ha⁻¹). The lowest uptake was observed in urine of Cross breed (100.51 kg ha⁻¹). **Phosphorus Uptake:** Similarly, urine of Gir recorded the highest phosphorus uptake (27.47 kg ha⁻¹) significantly superior over urine of Red Sindhi (26.15 kg ha⁻¹) and urine of Cross breed (25.50 kg ha⁻¹). **Potassium Uptake:** Potassium uptake was also highest under urine of Gir (88.34 kg ha⁻¹), followed closely by urine of Sahiwal (88.13 kg ha⁻¹). Urine of Gir and urine of Sahiwal at par with each other.

These findings suggest that the urine of indigenous breeds like Gir and Sahiwal contains a higher concentration of nutrients and growth-promoting substances, which enhance nutrient uptake by wheat crops. This aligns with the findings of Pathak and Ram (2013) ^[16] and Sharma *et al.* (2020), who emphasized the superior quality of urine from indigenous breeds in promoting nutrient availability and plant metabolism.

Effect of foliar spray

The application of different concentrations of cow urine spray had a significant influence on NPK uptake by the wheat crop. The highest total nitrogen uptake ($112.62 \text{ kg ha}^{-1}$) was recorded under 20% CUS which was significantly superior to all other treatments. Phosphorus and potassium uptake also followed the same trend, with 27.95 kg ha^{-1} and 91.21 kg ha^{-1} respectively under 20% CUS. The lowest uptake across all three nutrients was noted in the water spray with total NPK uptake of 92.88, 24.08 and 76.87 kg ha^{-1} , respectively.

This clearly indicates that increasing the concentration of cow urine foliar spray up to 20% enhances the nutrient uptake, possibly due to the better absorption of micronutrients and stimulants present in cow urine. Similar results were reported by Meena *et al.* (2019) ^[11] and Yadav *et al.* (2021), where higher concentrations of cow urine significantly increased nutrient assimilation in crops.

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		
B1- Urine of Gir	42.86	58.06
B2 - Urine of Sahiwal	42.15	56.98
B3 - Urine of Red Sindhi	41.39	56.41
B4 - Urine of Cross breed	40.57	54.99
S.E.(m)+	0.20	0.46
C.D. at 5%	0.72	1.62
B) Foliar Spray concentrations (%)		
F1 - 10% CUS	41.53	57.62
F2 - 15% CUS	42.87	58.73
F3 - 20% CUS	43.51	59.79
F4- Water Spray	39.06	50.29
S.E.(m)+	0.22	0.36
C.D. at 5%	0.67	1.07
SE(m) $\pm$	0.45	0.73
CD at 5%	1.34	2.14
General mean	41.74	56.61

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

Cow Breeds	Grain yield (q ha^{-1})				Mean
Foliar spray	Urine of Gir	Urine of Sahiwal	Urine of Red Sindhi	Urine of cross breed	
10% CUS	43.00	42.13	41.00	40.00	41.53
15% CUS	44.12	43.77	42.53	41.07	42.87
20% CUS	45.03	44.00	43.00	42.00	43.51
Water spray	39.28	38.71	39.05	39.19	39.06
Mean	42.86	42.15	41.39	40.57	41.74
Cow Breeds urine x Foliar spray					
SE(m) $\pm$			0.45		
CD at 5%			1.34		

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

Cow Breeds	Straw yield (q ha^{-1})				Mean
Foliar spray	Urine of Gir	Urine of Sahiwal	Urine of Red Sindhi	Urine of Cross breed	
10% CUS	60.91	58.00	57.00	54.57	57.62
15% CUS	60.00	59.53	58.40	57.00	58.73
20% CUS	62.30	60.27	59.24	57.36	59.79
Water spray	49.04	50.12	50.99	51.04	50.29
Mean	58.06	56.98	56.41	54.99	56.61
Cow Breeds x Foliar spray					
S.E.(m) $\pm$			0.73		
C.D. at 5%			2.14		

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									
B1- Urine of Gir	81.15	17.02	21.83	28.72	10.45	66.51	109.87	27.47	88.34
B2 - Urine of Sahiwal	79.63	16.81	21.60	27.84	10.26	66.53	107.47	27.07	88.13
B3 - Urine of Red Sindhi	76.96	16.13	21.04	26.85	10.02	64.69	103.81	26.15	85.73
B4 -Urine of Cross breed	75.06	15.68	20.44	25.45	9.82	62.94	100.51	25.50	83.38
S.E.(m) $\pm$	0.50	0.14	0.08	0.32	0.10	0.51	0.72	0.14	0.07
C.D. at 5%	1.73	0.50	0.30	1.11	0.36	1.78	2.50	0.47	0.26
B) Foliar Spray concentrations (%)									
F1 - 10% CUS	77.75	16.45	21.10	28.34	10.24	65.83	106.09	26.69	86.93
F2 - 15% CUS	80.80	16.88	22.05	29.28	10.57	67.54	110.08	27.45	89.59
F3 - 20% CUS	82.23	17.19	22.45	30.39	10.76	68.76	112.62	27.95	91.21
F4- Water Spray	72.03	15.11	19.33	20.85	8.97	57.54	92.88	24.08	76.87
SE(m) $\pm$	0.53	0.14	0.18	0.42	0.09	0.51	0.80	0.16	0.55
CD at 5%	1.54	0.41	0.54	1.23	0.28	1.51	2.60	0.56	1.75

C) Interaction (Cow breeds urine x Foliar Spray concentrations%)									
SE(m) ±	1.06	0.28	0.37	0.84	0.19	1.03	1.52	0.30	0.62
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
General mean	78.20	16.41	21.23	27.22	10.14	64.92	105.41	26.54	86.31

*NS= non-significant

Conclusion

The foliar application of urine of Gir 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 urine of Sahiwal at 15% and 20% respectively. The nutrient uptake by plants was significantly influenced by the foliar application of urine of Gir at 15% and 20% in wheat and the highest uptake of NPK was found. However, it is followed by urine of Sahiwal at 15% and 20% respectively. Therefore, it can be stated from an economic perspective that the foliar application by urine of Gir at 15% and 20% in wheat notably achieved the best net returns and benefit-cost ratio, followed by the foliar application by urine of Sahiwal at 15% and 20% in wheat.

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