The Pharma Innovation Journal 2023; 12(9): 2093-2095

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(9): 2093-2095

www.thepharmajournal.com
Received: 24-07-2023
Accepted: 29-08-2023

Hiralkumari A Chaudhari
M.Sc (Agri.), Department of Soil Science and Agricultural Chemistry, B.A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

RD Shinde
Assistant Professor, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Anand Agricultural University, Jabugam, Gujarat, India

Saloni R Solanki
M.Sc (Agri.), Department of Soil Science and Agricultural Chemistry, B.A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

AP Patel
Assistant Professor, Department of Agronomy, B.A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

Corresponding Author:
Hiralkumari A Chaudhari
M.Sc (Agri.), Department of Soil Science and Agricultural Chemistry, B.A. College of Agriculture, Anand Agricultural University, Anand, Gujarat, India

Effect of foliar application of nitrogen on nutrient content in wheat and soil properties

Hiralkumari A Chaudhari, RD Shinde, Saloni R Solanki and AP Patel

Abstract
A field experiment was conducted at Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) during *rabi* season of the year 2022-23 to evaluate the effect of foliar application of different sources of nitrogen *viz*., cow urine, urea and Nano nitrogen on nutrient content in wheat and soil properties after harvest of wheat. The field experiment was laid out in Randomized Block Design with three replications. Results of the experiment revealed that the treatment receiving an application of 50% RDN in soil along with foliar spray of 4 ml/l Nano nitrogen was found effective for increasing nitrogen content in wheat after harvest of wheat and application of 100% RDN in soil found to be beneficial for improving soil properties.

Keywords: Cow urine, nano nitrogen, nutrient content, soil properties, urea

Introduction
Wheat (*Triticum aestivum* L.) is the India's second most popular grain after rice. It is the most widely cultivated major food crop in the world. After China, India is the world's second-largest producer of wheat. India produces nearly 12% of the world's total wheat. In India, wheat occupies 31.12 million hectares area with the production of 109.58 million tones and productivity of 3521 kg/ha. While it is grown in 1.01 million hectares area with production of 3.25 million tones and productivity of 3205 kg/ha in Gujarat. (Anonymous, 2021) [1]. Use of synthetic fertilizers had sustained the productivity level for quite some time. However, indiscriminate use of chemical fertilizers resulted in a serious decline in the health of the soil in important wheat-growing regions. Thus, adoption of integrated nutrient management can increase the crop productivity without compromising soil fertility (Mishra *et al*., 2017) [6]. Effective fertilization is essential from an economic and environmental standpoint. It results into increasing crop yields with minimizing environmental nutrient losses. It is appropriate to note that sensible management practices, judicious choices, and balanced fertilizer application are main factors that contribute to effective nutrient utilization. A successful fertilization technique that raises nutrient availability is foliar fertilization, or supplying nutrients through leaves. It has been discovered that applying fertilizers, especially urea, through the soil to plants has been found to be less effective than applying it to the plant's foliage in addition to the soil (Mosluh *et al*., 1978) [7]. Additionally, foliar feeding ensures that crops have sufficient access to nutrients for a greater yield (Arif *et al*., 2006) [2]. To meet increasing demand of food, it is necessary to increase the efficiency of inputs. Cow urine is a rich source of nutrients (particularly nitrogen and potassium), but usually washed out as waste material. Being organic in nature, it can be used in crop production without any adverse effect on environment or human health (Rajanna *et al*., 2012 and Singh *et al*., 2012) [9, 10]. Nano-fertilizer is a new concept of nutrient management in crop production and it is in its belonging stage there is a great thrust area in agriculture for sustainable crop improvement with major importance of nano-nitrogen. Nano-fertilizers are in fact important because they are environmentally friendly and critical to promote sustainable agricultural development. Nano-fertilizer having higher surface area and auspicious picking for improving the quality and quantity of plants and seeds grown for consumption, for minimizing production cost as well as eco-friendly to sustainable food production. Nanoparticles' behaviour, mobility and their smart delivery system has a strong bearing on the growth and yield of crops (Mani and Mondal, 2016) [5]. But, such information on wheat is still lacking. There is need to increase the crop production without affecting crop and environmental quality, improve the nutrient use efficiency and find out alternative to high analysis fertilizers. Therefore, considering the present scenario, this experiment is planned.

Materials and Methods

A field experiment was carried out at Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) on wheat crop 'GW-451' during *rabi* season of the year 2022-23. The soil of the experimental field was loamy sand in texture, alkaline in reaction, low in organic carbon with medium nitrogen and phosphorus and high potassium availability. The experiment comprising fourteen treatments *viz*., T_1-100% RDN, T_2-100% RDN *fb* foliar spray of water, T_3-50% RDN *fb* foliar spray of 2% cow urine, T_4-75% RDN *fb* foliar spray of 2% cow urine, T_5-50% RDN *fb* foliar spray of 4% cow urine, T_6-75% RDN *fb* foliar spray of 4% cow urine, T_7-50% RDN *fb* foliar spray of 2% urea, T_8-75% RDN *fb* foliar spray of 2% urea, T_9-50% RDN *fb* foliar spray of 4% urea, T_{10}-75% RDN *fb* foliar spray of 4% urea, T_{11}-50% RDN *fb* foliar spray of 2 ml/l Nano nitrogen, T_{12}-75% RDN *fb* foliar spray of 2 ml/l Nano nitrogen, T_{13}-50% RDN *fb* foliar spray of 4 ml/l Nano nitrogen and T_{14}-75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen. These treatments were evaluated in Randomized Block Design with three replications. The foliar application was made with two sprays at 30 and 50 DAS of wheat. The recommended dose of nitrogen (120 kg/ha) and phosphorus (60 kg/ha) was applied in soil through urea and DAP. The observations on nutrient content at different stages were recorded and soil properties were analyzed after harvest of wheat.

Results and Discussion

Nutrient content in wheat

The nitrogen content in wheat at all the stages was influenced significantly due to various levels of cow urine, urea and Nano nitrogen except N content in wheat before 1st spray. Significantly higher N content in wheat after 1st spray (1.25%) was found with the treatment of soil application of 75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen (T_{14}) and was found to be at par with treatments T_8, T_9, T_{10}, T_{12} and T_{13}. The treatment T_{14} recorded significantly higher N content in wheat before 2nd spray (1.15%) than other treatments but was found on same bar with treatments T_8, T_{10}, T_{12} and T_{13}. Different levels of cow urine, urea and Nano nitrogen failed to produce significant effect on P and K contents in grain and straw at harvest of wheat. However, the nitrogen content in grain (1.98%) at harvest of wheat was registered significantly higher with the treatment T_{14} (75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen) and was remained at par with the treatments T_1, T_2, T_6, T_8, T_{10}, T_{12} and T_{13}. Significantly maximum N content in wheat straw (0.537 %) at harvest was noticed under treatment T_{14} (75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen) and was found to be at par with treatments T_8, T_{10} and T_{12}. The increase in N content is probably due to reducing particle size of Nano nitrogen, which increased the number of particles per unit area and specific surface area of a fertilizer. This increased the opportunities for fertilizer interaction led to greater penetration and nutrient uptake, resulting in the higher nitrogen content in wheat grain and straw. Similar results were also found by Astaneh *et al*. (2021) [3] and Patidar *et al*. (2022) [8].

Chemical properties of soil

The different levels of cow urine, urea and Nano nitrogen failed to produce significant effect on pH, EC, organic carbon, available phosphorus and available potassium in soil after harvest of wheat. But the treatment receiving an soil application of Recommended Dose of Nitrogen (RDN) significantly influenced the availability of nitrogen in soil. Among the different treatments, the treatment receiving 100% RDN (T_1) in soil through urea recorded significantly maximum nitrogen availability (159 kg/ha) and was remained at par with the treatments T_2, T_4, T_6, T_8, T_{10}, T_{12} and T_{14}. The increment of N availability in soil might be due to higher level of nitrogen application through 100% RDN and efficient use of applied nitrogen as it was subjected to least losses such as leaching, volatilization and ammonia fixation. These finding are close agreement with those findings obtained by Singh *et al*. (2018) [11] and Choudhary *et al*. (2022) [4].

Table 1: Effect of different treatments on N content in wheat

Treatments No.	Treatments	N content in wheat (%)		
		Before 1st spray	After 1st spray	Before 2nd spray
T_1	100% RDN	0.609	0.99	0.91
T_2	100% RDN *fb* foliar spray of water	0.605	0.99	0.92
T_3	50% RDN *fb* foliar spray of 2% cow urine	0.562	0.97	0.87
T_4	75% RDN *fb* foliar spray of 2% cow urine	0.579	1.06	1.00
T_5	50% RDN *fb* foliar spray of 4% cow urine	0.573	1.03	0.97
T_6	75% RDN *fb* foliar spray of 4% cow urine	0.582	1.10	1.00
T_7	50% RDN *fb* foliar spray of 2% urea	0.564	1.11	1.02
T_8	75% RDN *fb* foliar spray of 2% urea	0.584	1.18	1.10
T_9	50% RDN *fb* foliar spray of 4% urea	0.568	1.16	1.04
T_{10}	75% RDN *fb* foliar spray of 4% urea	0.590	1.22	1.14
T_{11}	50% RDN *fb* foliar spray of 2 ml/l Nano nitrogen	0.564	1.13	1.03
T_{12}	75% RDN *fb* foliar spray of 2 ml/l Nano nitrogen	0.579	1.21	1.13
T_{13}	50% RDN *fb* foliar spray of 4 ml/l Nano nitrogen	0.570	1.17	1.10
T_{14}	75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen	0.583	1.25	1.15
S.Em.±		0.011	0.012	0.03
C.D. at 5%		NS	NS	0.09
C.V. (%)		3.90	3.62	4.71

Table 2: Effect of different treatments on N, P and K content in wheat at harvest of wheat

Treatments No.	Treatments	N content (%)		P content (%)		K content (%)	
		Grain	Straw	Grain	Straw	Grain	Straw
T_1	100% RDN	1.86	0.494	0.451	0.181	0.477	1.530
T_2	100% RDN *fb* foliar spray of water	1.87	0.492	0.452	0.181	0.477	1.529
T_3	50% RDN *fb* foliar spray of 2% cow urine	1.76	0.431	0.442	0.174	0.471	1.531
T_4	75% RDN *fb* foliar spray of 2% cow urine	1.82	0.464	0.450	0.180	0.479	1.540
T_5	50% RDN *fb* foliar spray of 4% cow urine	1.78	0.449	0.450	0.179	0.477	1.540
T_6	75% RDN *fb* foliar spray of 4% cow urine	1.87	0.498	0.453	0.183	0.481	1.552
T_7	50% RDN *fb* foliar spray of 2% urea	1.78	0.454	0.443	0.170	0.471	1.530
T_8	75% RDN *fb* foliar spray of 2% urea	1.87	0.512	0.447	0.173	0.476	1.537
T_9	50% RDN *fb* foliar spray of 4% urea	1.83	0.476	0.445	0.172	0.475	1.542
T_{10}	75% RDN *fb* foliar spray of 4% urea	1.94	0.525	0.447	0.176	0.479	1.549
T_{11}	50% RDN *fb* foliar spray of 2 ml/l Nano nitrogen	1.81	0.460	0.442	0.172	0.473	1.530
T_{12}	75% RDN *fb* foliar spray of 2 ml/l Nano nitrogen	1.90	0.516	0.445	0.174	0.477	1.535
T_{13}	50% RDN *fb* foliar spray of 4 ml/l Nano nitrogen	1.85	0.488	0.444	0.172	0.475	1.541
T_{14}	75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen	1.98	0.537	0.447	0.178	0.481	1.549
	S.Em.±	0.04	0.013	0.011	0.005	0.012	0.034
	C.D. at 5%	0.13	0.038	NS	NS	NS	NS
	C.V. (%)	4.13	4.68	4.30	4.61	4.44	3.82

Table 3: Effect of different treatments on chemical properties of soil

Tr. No.	Treatments	EC (dS/m)	pH	OC (%)	Available N (kg/ha)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)
T_1	100% RDN	8.05	0.115	0.38	159	55.03	267
T_2	100% RDN *fb* foliar spray of water	8.04	0.115	0.37	156	55.12	266
T_3	50% RDN *fb* foliar spray of 2% cow urine	7.94	0.104	0.34	140	52.91	255
T_4	75% RDN *fb* foliar spray of 2% cow urine	7.97	0.111	0.37	148	53.52	264
T_5	50% RDN *fb* foliar spray of 4% cow urine	7.94	0.107	0.34	141	53.56	258
T_6	75% RDN *fb* foliar spray of 4% cow urine	7.99	0.110	0.36	152	54.17	262
T_7	50% RDN *fb* foliar spray of 2% urea	7.94	0.107	0.34	143	53.38	256
T_8	75% RDN *fb* foliar spray of 2% urea	7.99	0.109	0.36	151	54.97	261
T_9	50% RDN *fb* foliar spray of 4% urea	7.96	0.108	0.35	142	54.43	257
T_{10}	75% RDN *fb* foliar spray of 4% urea	8.02	0.113	0.37	151	55.09	263
T_{11}	50% RDN *fb* foliar spray of 2 ml/l Nano nitrogen	7.95	0.107	0.35	140	53.17	255
T_{12}	75% RDN *fb* foliar spray of 2 ml/l Nano nitrogen	8.00	0.113	0.37	149	53.70	260
T_{13}	50% RDN *fb* foliar spray of 4 ml/l Nano nitrogen	7.94	0.107	0.34	143	53.94	256
T_{14}	75% RDN *fb* foliar spray of 4 ml/l Nano nitrogen	8.02	0.112	0.36	152	54.55	263
S.Em.±		0.15	0.003	0.01	3.91	1.28	6.91
C.D. at 5%		NS	NS	NS	11	NS	NS
C.V. (%)		3.30	4.02	4.73	4.59	4.09	4.60

References

1. Anonymous. Directorate of Economics and Statistics, Ministry of Agriculture and Farmer Welfare, Government of India, 2021. Retrieved from https://eands.dacnet.nic.in/Accessed on 18th June, 2022.
2. Arif M, Chohan MA, Ali S, Gul R, Khan S. Response of wheat to foliar application of nutrients. Journal of Agricultural and Biological Science. 2006;1(4):30-34.
3. Astaneh N, Bazrafshan F, Zare M, Amiri B, Bahrani A. Nano-fertilizer prevents environmental pollution and improves physiological traits of wheat grown under drought stress conditions. Scientia Agropecuaria. 2021;12(1):41-47.
4. Choudhary S, Bohra JS, Jat M, Dadrwal BK, Singh VP. Effect of fertility, zinc and cow urine levels on yield and soil parameters of wheat and their residual effect on succeeding fodder maize under dairy based integrated farming system of Varanasi tract. The Pharma Innovation Journal. 2022;11(5):1150-1158.
5. Mani PK, Mondal S. Agri-nanotechniques for plant availability of nutrients. Plant Nanotechnology; c2016. p. 263-303.
6. Mishra KN, Patra AK, Garnayak LM, Mohanty AK, Swain SK. Long-erm effects of integrated nutrient management on productivity and soil properties of rice (*Oryza sativa*)-rice cropping system in coastal Odisha. Indian Journal of Agronomy. 2017;62(3):239-246.
7. Mosluh KI, Seth J, Rashid AK. Efficacy of urea spray for wheat crop under irrigated conditions in Iraq. Plant and Soil. 1978;49(1):175-178.
8. Patidar R, Choudhary J, Choudhary R, Tomar M, Kannoj, Choudhary R. Effect of nano urea on nutrient content and economics of wheat (*Triticum aestivum* L.) under restricted irrigation condition. Frontiers in Crop Improvement. 2022;10(2):1055-1058.
9. Rajanna GA, Murali K, Gopakkali P, Nayak P, Sudakara TM, Lakshmipathy RN. Effect of different sources and time of application of organic manures on residual fertility and nutrient balance in aerobic rice (*Oryza sativa* L.). Crop Research. 2012;43(1-3):5-9.
10. Singh L, Singh P, Kotru R, Hasan B, Chand L, Lone BA. Cow urine spray and integrated nutrient management of rice on productivity and energyuse under temperate valley conditions. Indian Journal of Agricultural Sciences. 2012;82(7):583-588.
11. Singh SN, Maurya KK, Singh GP. Effect of cow urine (gomutra) as a source of nitrogen on growth, yield and nitrogen uptake in rice (*Oryza sativa* L.). International Journal of Microbiology Research. 2018;10(3):1035-1037.