Biological Forum – An International Journal 14(4a): 455-461(2022)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Investigating the Impact of Nitrogen Sources on Nutrient Content and their Uptake in Rice Grain and Straw

Amit Kumar[1], S.K. Singh[2], Rohtas Kumar[3], Sandip Kumar Gautam[4] and Mohit Sharma[1]*
[1]Ph.D. Research Scholar, Department of Soil Science,
Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana), India.
[2]District Extension Specialist (Soils), Department of Soil Science,
Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana), India.
[3]Assistant Scientist, Department of Soil Science,
Chaudhary Charan Singh Haryana Agricultural University, Hisar (Haryana), India.
[4]Ph.D. Research Scholar, Department of Soil Science, CSJMU Kanpur, (Uttar Pradesh), India.

(Corresponding author: Amit Kumar)*
(Received 18 September 2022, Accepted 16 November, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The appropriate application of manures and fertilizers as a nitrogen source can greatly impact the nutrient content and absorption by plants, which in turn affects crop yield. Rice is an exhaustive crop which removes a large amount of nutrients from the soil. So, to study the soil fertility status it is important to study nutrient removal from the soil. Keeping this in mind, a field experiment was conducted at Chaudhary Charan Singh Haryana Agricultural University, Krishi Vigyan Kendra farm, Fatehabad (Haryana) during Kharif 2020 to study the effect of different nitrogen sources on N, P, K, and S content and their uptake by rice grain and straw. The experiment was laid out with fourteen treatments, *viz.*, T_1 (Control), T_2 (100% RDN through urea), T_3 (75% RDN + 25% N through FYM), T_4 (50% RDN + 50% N through FYM), T_5 (25% RDN + 75% N through FYM), T_6 (100% N through FYM), T_7 (75% RDN + 25% N through Vermicompost), T_8 (50% RDN + 50% N through Vermicompost), T_9 (25% RDN + 75% N through Vermicompost), T_{10} (100% N through Vermicompost), T_{11} (75% RDN + 25% N through Poultry manure), T_{12} (50% RDN + 50% N through Poultry manure), T_{13} (25% RDN + 75% N through Poultry manure), and T_{14} (100% N through Poultry manure). In grain and straw, the N content varied from 1.17 to 1.30 % and 0.43 to 0.57 %, respectively. The treatments T_2, T_3, T_7 and T_{11} recorded the highest N content in grain (0.51 %) and straw (0.26 %). In grain, the highest P content (0.51 %) was observed in T_2, T_3, T_7 and T_{11} and the lowest (0.38 %) in T_1 treatment. Phosphorus content in straw varied from (0.26 %) in T_2, T_3, T_7 and T_{11} to (0.19 %) in T_1 treatment. In grain, the highest K content (0.52 %) was observed in T_2, T_3, T_7 and T_{11} and the lowest (0.39 %) was observed in T_1. In straw, K content ranged from 1.56 % in T_1 to 1.80 % in T_2, T_3, T_7 and T_{11} treatment. In grain and straw, the highest (0.20 %) S content was observed in treatment T_2, T_3, T_7 and T_{11}. Apart from this, treatment T_2 also recorded the highest uptake of N, P, K, and S in grain and straw. So, this study helped in understanding the amount of nutrients removed from the soil by rice crop.

Keywords: Nitrogen sources, RDN, FYM, Vermicompost, poultry manure, nutrient content, uptake.

INTRODUCTION

In India and Haryana, rice is grown on an area of 43.66 million hectares and 1.44 million hectares, respectively, during the year 2019-2020. This resulted in a production of 118.87 million tonnes and 4.8 million tonnes of rice in India and Haryana, respectively. The average productivity of rice in India was 2.74 tonnes per hectare and 3.33 tonnes per hectare in Haryana (Anonymous, 2021).

Generally, farmers use higher fertilizer doses than they required to increase the yield but the efficiency of applied fertilizers is relatively low in the rice cropping system because of rapid loss of plant nutrients, especially N, through gaseous volatilization, surface runoff, and leaching (Zhu and Chen 2002). Due to the increase in the cost of chemical fertilizer, short supply, availability and sustainability issues, there is need to reduce the nutritional dependency only on chemical fertilizers. Therefore, to fulfil the requirement of crops through organic manures like farmyard manure, vermicompost, poultry manure, etc. could be option for sustaining soil fertility and crop productivity along with restoration of overall soil quality as it brings about equilibrium between degenerative and restorative activities in the soil environment. On an average, well-rotted FYM contains 0.5% N, 0.2% P_2O_5 and 0.5% K_2O. Vermicompost is also a nutrient-rich organic fertilizer and works as a soil conditioner. Generally, poultry manure contains more amount of plant nutrients than the FYM and vermicompost. Many scientists (Tiwari *et al.*, 2017; Bhatt *et al.*, 2019) reported that replacement of 50% of nutrients required through the organic sources is the best combination for the growth and yield of rice. Therefore, the integrated use of manures and fertilizers can help sustain soil quality and crop productivity. Devari and Sharma (2010) found that the application of FYM significantly increased the quantity of N, P, K, removal by rice grain over control. Vermicompost proved its superiority over FYM in respect of P, Zn, Fe, Mn, and Cu removal by rice grain. Chaudhary *et al.* (2011) reported that the treatments with the application of 75% RDN + 25% N through vermicompost and 75% RDN + 25% through FYM gave a significantly higher uptake of N, P and K than inorganic alone. Kumar *et al.* (2014) reported that conjunctive use of organic and inorganic sources significantly increased the uptake of total N, P and K by hybrid rice. Lakshmi *et al.* (2015) observed the highest uptake of N, P and K (109, 32 and 120 kg ha^{-1}) by rice whereas (32.1, 4.2 and 12.0 kg ha^{-1}) by the green gram in case of treatment 75% RDFN + vegetable vermicompost. This treatment also gave the highest uptake of Zn and Cu by the rice crop. Gill and Aulakh (2018) found that the application of FYM followed by 50% of the recommended dose of N gave the maximum uptake of NPK in grains and straw of basmati rice. Amanullah (2020) demonstrated that N concentrations in rice grains and straw was high when mineral N was applied in the form of urea or in combination with animal manure (U + PM), while lower N concentration was noted where N was not applied or where N was applied in the form of organic N. So, the present study aimed at investigating the impact of different organic manure and chemical fertilizer as nitrogen sources on nutrient content and uptake by rice grain and straw.

MATERIALS AND METHODS

A field study was conducted at the Chaudhary Charan Singh Haryana Agricultural University's Krishi Vigyan Kendra farm in Fatehabad, Haryana during the Kharif season of 2020.The experiment was laid down in a Randomized Block Design (RBD) with fourteen treatments, *viz.* T_1 (Control), T_2 (100% RDN through urea)) + 50% RDN through FYM), T_3 (75% RDN + 25% N through FYM), T_4 (50% RDN + 50% N through FYM), T_5 (25% RDN + 75% N through FYM), T_6 (100% N through FYM), T_7 (75% RDN + 25% N through Vermicompost), T_8 (50% RDN + 50% N through Vermicompost), T_9 (25% RDN + 75% N through Vermicompost), T_{10} (100% N through Vermicompost), T_{11} (75% RDN + 25% N through Poultry manure), T_{12} (50% RDN + 50% N through Poultry manure), T_{13} (25% RDN + 75% N through Poultry manure) and T_{14} (100% N through Poultry manure). The treatments comprised four sources of nitrogen *viz*., urea, FYM, vermicompost and poultry manure. Fertilizers used as the source of N, P and K were urea, single super phosphate and muriate of potash, respectively for the fulfilment of crop requirements. Nitrogen was applied in three doses, with 1/3rd applied at planting and the rest applied 21 and 42 days after transplanting. Phosphorous and potash were applied at the time of field preparation. The organic sources (FYM, vermicompost, and poultry manure) were applied one week before planting and incorporated into the soil according to the treatment requirements. The seeds used were of the PB-1509 variety and were transplanted into the field when they were 25 days old, with one or two seedlings per hill and a spacing of 20 × 15 cm. Recommended cultural practices were followed during the experiment and irrigation was applied as needed. The crop was harvested when the plant's spikelets turned yellow and the grain moisture content was around 15%. The crop was harvested by hand and then threshed manually after sun drying. At harvest of crop, grain and straw samples from each plot were collected, dried in air and finally in an oven at 60 ± 2°C for 2 hours. Samples were ground in grinder machine and stored in polyethylene bags for the analysis of nitrogen, phosphorus, potassium and sulphur. Grain and straw samples were digested separately in di-acid mixture of sulphuric acid and perchloric acid in 9:1 ratio, while for the analysis of the sulphur the plant and grain samples were digested in the di-acid mixture of nitric acid and perchloric acid in 4:1 ratio. The uptake of nitrogen (N), phosphorus (P), potassium (K) and sulphur (S) were computed from the data on N, P, K and S concentration and grain and straw yield.

RESULTS AND DISCUSSION

A. Effect of different nitrogen sources on N, P, K and S content and its uptake by rice grain and straw

(i) Nitrogen content and its uptake. It was revealed from the data (Table 3) that total N content of the grain ranged from 1.17 to 1.30 % in various treatments. There was significant increase in the total N content of grains in all the treatments as compared to the control. Highest total N content (1.30 %) in the grain was recorded in the treatment T_2, T_3, T_7 and T_{11} which was statistically at par with treatments T_4, T_8, T_{12}. Further, total N content in the straw ranged from 0.43 to 0.58 % in various treatments and it increased significantly in all the treatments over the control. In case of straw, highest total N content (0.58 %) was recorded in the treatment T_2, T_3, T_7 and T_{11} which was statistically at par with treatments T_4, T_8, T_{12} while lowest total N content (0.43 %) was recorded in the control. The favourable conditions for microbial as well as chemical activities due to addition of fertilizers application in combination with organic sources increased the mineralization of nutrients and ultimately the available nutrient pool of the soil led to higher content of nutrients in seed and straw, (Jakhar *et al*., 2021). The results are in confirmation with those obtained by Singh *et al.* (2001); Singh and Tiwari (2019).

It was observed from the data (Table 4) that nitrogen uptake in grain and straw increased significantly in all the treatments over the control. Highest N uptake (58.02 kg ha^{-1}) in grain was recorded in the treatment T_2 which was statistically at par with T_3, T_7 and T_{11} while lowest (31.01 kg ha^{-1}) was observed in the control. Further, highest N uptake (29.78 kg ha^{-1}) in straw was recorded in treatment T_2 which was statistically at par with T_3, T_4, T_7, T_8, T_{11} and T_{12} while lowest (14.02 kg ha^{-1}) was recorded in the control. Application of 100% RDN through urea alone showed significantly higher uptake of nitrogen in grain and straw as compared to the manures applied alone. Comparing the treatment receiving 100% N through manures, highest N uptake (41.12 and 20.34 kg ha^{-1}) in grain and straw, respectively was observed in treatment T_{14} followed by T_{10} (40.83 and 19.74 kg ha^{-1}) and T_6 (40.64 and 18.20 kg ha^{-1}). In the treatments receiving combined application of chemical fertilizer and manures, highest nitrogen uptake (56.54 and 28.74 kg ha^{-1}) in grain and straw, respectively was observed in treatment T_{11} which was statistically at par with T_3 and T_7 in case of grain and T_3, T_4, T_7, T_8 and T_{12} in case of straw and lowest N uptake (43.92 and 21.67 kg ha^{-1}) in grain and straw, respectively was observed in T_5. Increased uptake of N in plots receiving poultry manure as compared to vermicompost and FYM may be due to higher availability of nutrients by mineralization of nitrogen applied through poultry manure. These findings are in conformity with the findings of Fatehi *et al.* (1997); Sarwar *et al.* (2012); Sultana *et al.* (2015); Surve *et al.* (2019).

(ii) Phosphorus content and its uptake. It depicted from the data (Table 3) that there was significant increase in the total P content of grains in all the treatments as compared to control. Highest total P content (0.51 %) in the grain was recorded in the treatments T_2, T_3, T_7 and T_{11} which was statistically at par with the T_4, T_8 and T_{12}. Likewise, total P content in the straw also increased significantly in all the treatments over the control. Highest total P content (0.26 %) in straw was recorded in the treatment T_2, T_3, T_7 and T_{11} which was statistically at par with the T_8 and T_{12}. Lowest value of total P content *i.e*., 0.38 % in straw and 0.19 % in straw was recorded in the T_1 (control). The increase in P content in rice grain and straw with combined allocation of sources as compared to manures alone may be due to improvement of the soil environment which encouraged proliferation of roots resulting in more absorption of water and nutrients from larger area and depth. Moreover, organic manures after decomposition released nutrients which became available to plants and thus increased the P concentration, (Chesti *et al.,* 2015; Ajnar and Namdeo 2021). The results are in close confirmation with those reported by Singh *et al.* (2001); Singh and Tiwari (2019); Mishra *et al.* (2021).

The data pertaining to the P uptake by grain and straw (Table 4) revealed that uptake increased significantly over the control. Highest P uptake (22.78 kg ha^{-1}) in grain was recorded in the treatment T_2 which was statistically at par with T_3, T_7, T_{11} and T_{12} while significantly higher over the rest of the treatments and lowest (10.05 kg ha^{-1}) was observed in the control. Further, highest P uptake (13.42 kg ha^{-1}) in straw was recorded in treatment T_2 which was statistically at par with T_3, T_7, T_8, T_{11} and T_{12} while lowest (14.02 kg ha^{-1}) was recorded in the control. In the treatments receiving 100% N only through manures, highest phosphorus uptake (15.08 and 9.16 kg ha^{-1}) in grain and straw, respectively was observed in T_{14} followed by T_{10} (14.99 and 8.85 kg ha^{-1}) and T_6 (14.60 and 8.22 kg ha^{-1}) which were statistically at par with each other. In the treatments receiving N through combined application of manures and chemical fertilizer, highest phosphorus uptake (22.17 and 13.05 kg ha^{-1}) in grain and straw, respectively was recorded in T_{11} which was statistically at par with T_3, T_7, T_8 and T_{12} and lowest P uptake (16.85 and 9.34 kg ha^{-1}) in grain and straw, respectively was recorded in the treatment T_5. The nutrients in chemical fertilizer are in readily available form and their uptake is easy by plants when applied in soil. This might also be attributed to better availability of nutrients in the soil under these treatments, (Desai *et al.,* 2020). Increased uptake of P in plots receiving poultry manure as compared to vermicompost and FYM may be due to higher availability of nutrients by decomposition of the applied poultry manure. These findings are in conformity with the findings of Sarwar *et al.* (2012); Rai *et al.* (2015); Surve *et al.* (2019).

(iii) Potassium content and its uptake. It observed from the data (Table 3) that there was significant increase in the total K content of grains in all the treatments as compared to the control. Highest total K content (0.52 %) in the grain was recorded with the treatments T_2, T_3, T_7 and T_{11} which was statistically par with the T_4, T_8 and T_{12} while lowest K content (0.39 %) was observed in the T_1 (control). Further, total K content in straw ranged from 1.56 to 1.80 % among the various treatments. Total K content in the straw increased significantly in all the treatments over the control. Highest total K content (1.80 %) in straw was recorded in the treatment T_2, T_3, T_7 and T_{11} which was statistically at par with the T_4, T_8, and T_{12}. Lowest total K content (1.56 %) in straw was recorded in the T_1 (control). Increased K content with increased chemical fertilizer may be attributed that these sources provide better nutrients availability and forms which are readily available as compared to manures. The results in terms of the current investigation are in close collaboration with the findings of Singh *et al.* (2001); Singh and Tiwari (2019).

A perusal of the data (Table 4) revealed that potassium uptake by grain and straw increased significantly over the control. Highest K uptake (22.72 kg ha^{-1}) in grain was recorded in the treatment T_2 which was statistically at par with T_3, T_7 and T_{11} while significant over the other treatments while lowest K uptake (10.30 kg ha^{-1}) was observed in the T_1 (control). Further, highest K uptake (93.92 kg ha^{-1}) in straw was recorded in treatment T_2 which was significant over rest of the treatments while lowest K uptake (51.30 kg ha^{-1}) in straw was recorded in the T_1 (control). In the treatments where 100% N applied only through manures, highest K uptake (15.82 and 71.14 kg ha^{-1}) was observed in T_{14} in grain and straw, respectively followed by T_{10} (15.75 and 68.38 kg ha^{-1}) and T_6 (15.69 and 65.22 kg ha^{-1}). In the treatment receiving N through both sources *i.e.,* chemical fertilizer and manures, highest K uptake (22.80 and 90.87 kg ha^{-1}) in grain and straw, respectively was observed in treatment T_{11} which was found statistically at par with T_7 and T_3 in case of grain and with T_3, T_4, T_7, T_8 and T_{12} in case of straw and lowest (17.14 and 72.54 kg ha^{-1}) in grain and straw, respectively was observed in T_5. Higher availability of potassium in poultry manure increased its uptake in plots receiving poultry manure as compared to vermicompost and FYM. These findings are in conformity with the findings of Fatehi *et al.* (1997); Sarwar *et al.* (2012); Surve *et al.* (2019).

(iv) Sulphur content and its uptake. A perusal of the data in the Table 3 revealed that total S content in the grain and straw increased significantly over the control. Highest S content (0.20 %) in grain was found in the treatment T_2, $T_{3,}$ T_7 and T_{11} while lowest (0.15 %) was recorded in the control. Highest total S content (0.10 %) in straw was observed in the treatments T_2, $T_{3,}$ T_7 and T_{11} which was statistically at par with the treatments T_4, T_8 and T_{12} while significantly higher over rest of the treatments. Lowest S content (0.07%) in straw was observed in the control. Azim (1999) and Hoque (1999) reported that application of S from manure and fertilizers increased S content both in grain and straw. Similar results were also obtained by Sharma *et al.* (2009); Pandey *et al.* (2016); Singh and Tiwari (2019).

It was observed from the data (Table 4) that S uptake in rice grain and straw increased significantly as compared to the control. Highest S uptake (8.71 kg ha^{-1}) in grain was recorded in the treatment T_2 which was statistically at par with the treatments $T_{3,}$ T_7 and T_{11} while lowest S uptake (3.84 kg ha^{-1}) in grain was found in the control. Further, highest sulphur uptake (5.07 kg ha^{-1}) in straw was observed in the treatment T_2 which was statistically at par with T_7 and T_{11} and lowest (2.33 kg ha^{-1}) was observed in control. Comparing the treatments receiving N through manures alone, higher S uptake (5.99 and 3.23 kg ha^{-1}) in grain and straw, respectively was observed with treatment T_{14} which was statistically at par with T_{10} (5.91 and 3.07 kg ha^{-1}) and T_6 (5.87 and 2.89 kg ha^{-1}). The treatments receiving N through combined application of chemical fertilizer and manures, highest S uptake (8.39 and 5.01 kg ha^{-1}) in grain and straw, respectively was observed in treatment T_{11} which was statistically at par with T_3 and T_7 but remained significant over the other treatments while lowest S uptake (6.45 and 3.48 kg ha^{-1}) in grain and straw, respectively was observed in treatment T_5. Among manures, highest S uptake was observed in treatment received nitrogen through poultry manure as compared to vermicompost and FYM.

Table 1: Initial soil physico-chemical properties of experimental field.

Parameters	Contents
Soil composition Sand (%) Silt (%) Clay (%) Textural Class	30.30 30.60 39.10 Clay Loam
pH	8.00
Electrical conductivity (dS m^{-1})	0.74
Organic Carbon (%)	0.64
Available N (kg ha^{-1})	114.4
Available P (kg ha^{-1})	15.5
Available K (kg ha^{-1})	228.3
Available S (kg ha^{-1})	31.5
DTPA extractable Zn (mg kg^{-1})	1.84
DTPA extractable Fe (mg kg^{-1})	9.22
DTPA extractable Cu (mg kg^{-1})	1.27
DTPA extractable Mn (mg kg^{-1})	5.82

Table 2: Chemical properties of FYM, Vermicompost and Poultry Manure.

Parameters	FYM	Vermicompost	Poultry manure
pH	6.69	6.98	7.18
EC	0.52	0.58	0.64
OC (%)	14.80	27.40	22.90
N (%)	0.63	1.89	2.80
P (%)	0.35	0.62	0.89
K (%)	0.59	0.83	1.18
S (%)	0.13	0.17	0.15
DTPA extractable Fe (mg kg^{-1} soil)	8.77	13.60	8.12
DTPA extractable Zn (mg kg^{-1} soil)	12.32	15.46	10.84
DTPA extractable Mn (mg kg^{-1} soil)	16.59	20.27	14.36
DTPA extractable Cu (mg kg^{-1} soil)	4.24	5.42	3.68

Table 3: Effect of different nitrogen sources on N, P, K and S content by rice grain and straw.

Treatments	Nitrogen content (%)		Phosphorus content (%)		Potassium content (%)		Sulphur content (%)	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T_1: Control	1.17	0.43	0.38	0.19	0.39	1.56	0.15	0.07
T_2: 100% RDN (through urea)	1.30	0.57	0.51	0.26	0.52	1.80	0.20	0.10
T_3: 75% RDN + 25% N through FYM	1.30	0.57	0.51	0.26	0.52	1.80	0.20	0.10
T_4: 50% RDN + 50% N through FYM	1.28	0.55	0.49	0.24	0.51	1.79	0.19	0.09
T_5: 25% RDN + 75% N through FYM	1.25	0.53	0.48	0.23	0.49	1.78	0.18	0.08
T_6: 100% N through FYM	1.25	0.50	0.45	0.23	0.48	1.78	0.18	0.08
T_7: 75% RDN + 25% N through Vermicompost	1.30	0.57	0.51	0.26	0.52	1.80	0.20	0.10
T_8: 50% RDN + 50% N through Vermicompost	1.29	0.56	0.50	0.25	0.51	1.79	0.19	0.09
T_9: 25% RDN + 75% N through Vermicompost	1.26	0.54	0.48	0.24	0.49	1.78	0.19	0.08
T_{10}: 100% N through Vermicompost	1.25	0.51	0.46	0.23	0.48	1.78	0.18	0.08
T_{11}: 75% RDN + 25% N through Poultry manure	1.30	0.57	0.51	0.26	0.52	1.80	0.20	0.10
T_{12}: 50% RDN + 50% N through Poultry manure	1.28	0.56	0.50	0.25	0.51	1.79	0.19	0.09
T_{13}: 25% RDN + 75% N through Poultry manure	1.26	0.52	0.48	0.24	0.49	1.78	0.19	0.08
T_{14}: 100% N through Poultry Manure	1.25	0.51	0.46	0.23	0.48	1.78	0.18	0.08
SEm±	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00
CD (P= 0.05)	0.02	0.03	0.02	0.01	0.02	0.01	0.02	0.01

Table 4: Effect of different nitrogen sources on N, P, K and S uptake by rice grain and straw.

Treatments	Nitrogen uptake (kg ha^{-1})		Phosphorus uptake (kg ha^{-1})		Potassium uptake (kg ha^{-1})		Sulphur uptake (kg ha^{-1})	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
T_1: Control	31.01	14.02	10.05	6.11	10.27	51.30	3.84	2.33
T_2: 100% RDN (through urea)	58.02	29.78	22.78	13.42	23.07	93.92	8.71	5.07
T_3: 75% RDN + 25% N through FYM	55.03	28.39	21.59	12.80	21.90	90.00	8.32	4.68
T_4: 50% RDN + 50% N through FYM	50.15	26.10	19.23	11.22	20.01	84.21	7.37	4.35
T_5: 25% RDN + 75% N through FYM	43.92	21.67	16.85	9.34	17.14	72.54	6.45	3.48
T_6: 100% N through FYM	40.64	18.20	14.60	8.22	15.69	65.22	5.87	2.89
T_7: 75% RDN + 25% N through Vermicompost	55.47	28.69	21.64	13.23	22.15	90.86	8.35	4.83
T_8: 50% RDN + 50% N through Vermicompost	50.86	27.07	19.63	12.16	20.15	86.33	7.31	3.97
T_9: 25% RDN + 75% N through Vermicompost	45.22	23.42	17.16	10.20	17.52	76.45	6.69	3.42
T_{10}: 100% N through Vermicompost	40.83	19.74	14.99	8.85	15.75	68.38	5.91	3.07
T_{11}: 75% RDN + 25% N through Poultry manure	56.54	28.74	22.17	13.05	22.80	90.87	8.39	5.01
T_{12}: 50% RDN + 50% N through Poultry manure	52.18	27.80	20.35	12.49	20.73	88.98	7.86	4.56
T_{13}: 25% RDN + 75% N through Poultry manure	45.58	23.41	17.48	10.94	17.88	79.75	6.83	3.75
T_{14}: 100% N through Poultry Manure	41.12	20.34	15.08	9.16	15.82	71.14	5.99	3.26
SEm±	1.23	1.38	0.89	0.43	0.65	3.01	0.23	0.13
CD (P= 0.05)	3.59	4.02	2.59	1.26	1.89	8.80	0.69	0.37

Higher uptake of S could be justified as a result of mineralization of poultry manure that contributed to accumulation of more amount of S in soil and also through microbiological oxidation (Gogoi *et al.,* 2015) and resulted higher uptake by plant. Similar results observed by Naher and Paul (2017). These findings are in close conformity with the findings of Saha *et al.* (2007); Sharma *et al.* (2009); Pandey *et al.* (2016).

CONCLUSION

The results of the study indicate that the type of nitrogenous source used had a significant impact on the nutrient content of rice grain and straw. The nutrient content was higher in treatments where chemical fertilizers were used, indicating that these fertilizers provide plant nutrients in a readily available form for plants. In contrast, treatments using organic sources had lower nutrient content, suggesting that these sources may not be fully decomposed and therefore not as easily available to the plants. The nutrient content in grain and straw is also influenced by the overall nutrient status of the soil.

FUTURE SCOPE

Investigating the impact of nitrogen sources on nutrient content and uptake in rice grain and straw is a topic of ongoing research. As the global population continues to grow, the demand for food production will also increase, making it important to optimize crop yields and quality. One way to achieve this is by identifying the most effective sources of nitrogen for rice cultivation. The future scope of this topic may involve further research to better understand the long-term effects of different nitrogen sources on crop growth, nutrient uptake, and grain and straw quality. Additionally, research could also focus on identifying the most sustainable and cost-effective sources of nitrogen that promote optimal crop growth while minimizing environmental impact. Another area of study is the effects of different climates and soil conditions on the effectiveness of different nitrogen sources, as this can vary depending on the region. The study can be conducted on various genotype of rice and its response to Nitrogen source. Furthermore, research could also be extended to explore the impact of different nitrogen sources on nutrient uptake and grain/straw quality in other important cereal crops such as wheat and corn, as this could have implications for food security on a global scale.

Acknowledgement. The authors are thankful to CCS Haryana Agricultural University, Hisar for providing all the necessary facilities for the conduct of the research work.
Conflict of interest. None.

REFERENCES

Ajnar, P. and Namdeo, S. (2021). Effect of integrated nutrient management on Indian mustard yield attributes and yield. *Journal of Pharmacognosy and Phytochemistry*, *10*(2), 545-548.

Amanullah, Ullah, H., Elshikh M. S., Alwahibi M. S., Alkahtani, J., Muhammad, A., Khalid, S. and Imran (2020). Nitrogen contents in soil, grains, and straw of hybrid rice differ when applied with different organic nitrogen sources. *Agriculture*, *10*(9), 386.

Anonymous (2021). Area, production and productivity of rice in India and Haryana. http://www.indiastat.com.

Azim, S. M. A. (1999). Effect of sulphur, zinc and boron supplied from manure and fertilizers on BRRI 29. M.Sc. Thesis, Dept. Soil Sci., (Jan-June, 1999. Sem.), BAU, Mymensingh.

Bhatt, M., Singh, A. P., Singh, V., Kala, D. C. and Kumar, V. (2019). Long-term effect of organic and inorganic Fertilizers on soil physico-chemical properties of a silty clay loam soil under rice-wheat cropping system in *Tarai* region of Uttarakhand. *Journal of Pharmacognosy and Phytochemistry*, *8*(1), 2113-2118.

Chaudhary, S. K., Singh, J. P. and Jha, S. (2011). Effect of integrated nitrogen management on yield, quality nutrient uptake of rice (*Oryza sativa*) under different date of planting. *Indian Journal of Agronomy*, *56*(3), 228-231.

Chesti, M. H., Kohli, A., Mujtaba, A., Sofi, J. A., Qadri, T. N., Peer, Q. J. A., Dar, M. A. and Bisati, I. A. (2015). Effect of integrated application of inorganic and organic sources on soil properties, yield and nutrient uptake by rice (*Oryza sativa* L.) in intermediate zones of Jammu and Kashmir. *Journal of the Indian Society of Soil Science*, *63*(1), 88-92.

Desai, S. S., Chaudhary, M. G., Patel, R. S., Ganvit, K. R. and Rathva, R. D. (2020). Effect of integrated nutrient management on quality, content, uptake and available nutrient status in soil after harvest of cumin (*Cuminum cyminum* L.). *International Journal of Chemical Studies*, *8*(6), 2177-2180.

Devari, M. R. and Sharma, S. N. (2010). Effect of different combinations of organic materials and biofertilizers on productivity, grain quality and economics in organic farming of basmati rice (*Oryza sativa* L.). *Indian Journal of Agronomy*, *55*(4), 290-294.

Fatehi, G., Mcdonold, G.K. and Lance, R. C. M. (1997). Responsiveness of barley cultivar to nitrogen fertilizer. *Australian Journal of Experimental Agriculture*, *37*, 199-211.

Gill, P. K. and Aulakh, C. S. (2018). Effect of integrated nitrogen management on NPK uptake in basmati rice (*Oryza sativa* L.). *Journal of Applied and Natural Science*, *10*(1), 258-261.

Gogoi, B., Kalita, B., Deori, B. and Paul, S. K. (2015). Soil properties under rainfed rice (*Oryza sativa*) crop as affected by integrated supply of nutrients. *International Journal of Agriculture Innovations and Research*, *3*(6), 1720-1725.

Hoque, M. A. (1999). Response of BRRI dhan 29 to sulpher, zinc and boron supplied from manure and fertilizers, M.Sc. Thesis, Department of Soil Science (January-June, 1999, Sem.) BAU, Mymensingh.

Jakhar, M., Sharma, P. K., Mandeewal, R. L. and Choudhary, R. (2020). Effect of integrated nutrient management on growth attributes, nitrogen content, nitrogen uptake and quality of chickpea (*Cicer arietinum* L.). *International Journal of Chemical Studies*, *8*(6), 1125-1127.

Kumar, V., Singh, O., Thorat, T. N., Chourasiya, A., Porte, S. S. and Parihar, A. K. S. (2014). Effect of integrated nutrient management (INM) on yield and nutrient uptake of hybrid rice (*Oryza sativa* L.) in partially reclaimed sodic soil. *Journal of Soils and Crops*, *24*(2), 241-246.

Lakshmi, C. S. R., Rao, P. C., Sreelatha, T., Padmaja, G., Madhavi and Rao, P. V. (2015). Effect of integrated nutrient management on soil properties, yield and nutrient uptake in Rice-Green gram cropping system in an Inceptisol of Andhra Pradesh. *Journal of the Indian Society of Soil Science*, *63*(4), 400-405.

Mishra, S. P., Singh, S. S., Anshuman, K., Singh, K., Prakash, V. and Yadav, S. K. (2021). Effect of integrated nutrient management on soil property and nutrients uptake by rice (*Oryza sativa* L.). *International Journal of Chemical Studies*, *9*(2), 187-190.

Naher, M. S. and Paul, A. K. (2017). Effect of integrated nutrient management on nutrient uptake and sustainable grain yield in transplanted aman rice. *SAARC Journal of Agriculture*, *15*(1), 43-53.

Pandey, A. K., Kumar, V. and Prasad, J. (2016). Effect of continuous cropping and fertilization on sulphur fractions and their contribution to sulphur uptake under Rice-wheat system in Calciorthents. *Journal of the Indian Society of Soil Science*, *64*(2), 163-168.

Rai, K. N., Kumar, A., Rai, T. N. and Jaiswal, P. (2015). Effect of integrated nutrient management practices on yield and phosphorous availability of rice-wheat cropping system. *Trends in Biosciences*, *8*(13), 3457-3459.

Saha, P. K., Ishaque, M., Saleque, M. A., Miah, M. A. M., Panaullah, G. M. and Bhuiyan, N. I. (2007). Long-Term integrated nutrient management for rice-based cropping pattern: Effect on growth, yield, nutrient uptake, nutrient balance sheet and soil fertility. *Communications in Soil Science and Plant Analysis*, *38*(5-6), 579-610.

Sarwar, M., Jilani, G., Rafique, E., Akhtar, M. E. and Chaudhry, A. N. (2012). Impact of integrated nutrient management on yield and nutrient uptake by maize under rainfed conditions. *Pakistan Journal of Nutrition*, *11*, 27-33.

Sharma, A., Sharma, P., Brar, M. S. and Dhillon, N. S. (2009). Comparative response to sulphur application in raya (*Brassica juncea*) and wheat (*Triticum aestivum*) grown on light textured alluvial soils. *Journal of the Indian Society of Soil Science*, *57*(1), 62-65.

Singh, R., Singh, S. and Prasad, K. (2001). Effect of fertilizers, FYM and row spacing on transplanted rice. *Crop Research-Hisar*, *22*(2), 295-296.

Singh, V. B. and Tiwari, A. K. (2019). Effect of Integrated nutrient management (INM) on Physico-chemical properties of soil, available content and nutrient uptake by Okra (*Abelmoschus esculentus*). *International Journal of Current Microbiology and Applied Sciences*, *8*(3), 130-137.

Sultana, M. S., Paul, A. K., Rahman, M. H., Kaium, A., Shahriar, S. and Bari, A. S. M. F. (2015). Influence of integrated use of vermicompost, pressmud and urea on the growth and yield of Hybrid Dhan Hira 2. *Scholarly Journal of Agricultural Sciences*, *5*(3), 95-102.

Surve, U. S., Dhonde, A. S., Kumbhar, J. S. and Bhosale, P.U. (2019). Effect of integrated nutrient management on productivity, nutrient uptake, soil properties and economics of soybean-wheat cropping system in Western Maharashtra. *International Journal of Chemical Studies*, *7*(2), 497-500.

Tiwari, A., Naga, A., Singh, N. B. and Kumar, A. (2017). Effect of interated nutrient management (INM) on soil properties, yield and economics of rice (*Oryza sativa* L.). *Research in Environment and Life Sciences*, *10*(7), 640-644.

Zhu, Z. L. and Chen, D. L. (2002). Nitrogen fertilizer use in China–Contributions to food production, impacts on the environment and best management strategies. *Nutrient Cycling in Agroecosystems*, *63*(2), 117-127.

How to cite this article: Amit Kumar, S.K. Singh, Rohtas Kumar, Sandip Kumar Gautam and Mohit Sharma (2022). Investigating the Impact of Nitrogen Sources on Nutrient Content and their Uptake in Rice Grain and Straw. *Biological Forum – An International Journal, 14*(4a): 455-461.