



Effect of Tillage Practices and Fertilization Levels on Nutrient Uptake and Content in Grain and Straw of Wheat under Rice-Wheat Cropping System

Rohit Yadav ^{a*}, R. A. Yadav ^a, M. Z. Siddiqui ^a,
Sanjeev Kumar ^a, Mohit Yadav ^a, Sanjay Babu ^b,
Yogesh Kumar ^c and Ravindra Sachan ^d

^a Department of Agronomy, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.)-208002, India.

^b Department of Seed Science and Technology, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.)-208002, India.

^c Department of Soil Conservation and Water Management, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.)-208002, India.

^d Department of Soil Science and Agricultural Chemistry, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.)-208002, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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*Corresponding author: E-mail: rohittdv97@gmail.com;

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ABSTRACT

The present investigation was conducted at Agronomy Research Farm, CSAUAT, during *rabi* 2021-22 and 2022-23. The experiment was laid out into Split plot design with three replicates. The parameters were observed plant *viz.* nitrogen content in grain and straw (%), nitrogen uptake in grain and straw (kg ha^{-1}), phosphorus content in grain and straw (%), phosphorus uptake in grain and straw (kg ha^{-1}), potassium content in grain and straw (%), nitrogen uptake in grain and straw (kg ha^{-1}). Basis on the pooled data the results of study revealed that in case of tillage practices maximum nitrogen content in grain and straw (1.80 and 0.53%), Nitrogen uptake in grain and straw (93.34 and 36.26 kg ha^{-1}). Phosphorus content in grain and straw (0.31 and 0.20%) Phosphorus uptake in grain and straw (16.23 and 13.80 kg ha^{-1}), Potassium content in grain and straw (0.42 and 1.38%), Potassium uptake in grain and straw (22.15 and 93.88 kg ha^{-1}) respectively was reported in conventional tillage whereas in case of various fertility levels maximum nitrogen content in grain and straw (1.83 and 0.59%), Nitrogen uptake in grain and straw (100.31 and 35.06 kg ha^{-1}). Phosphorus content in grain and straw (0.35 and 0.25%) Phosphorus uptake in grain and straw (18.16 and 16.63 kg ha^{-1}) respectively, Potassium content in grain and straw (0.45 and 1.41%), Potassium uptake in grain and straw (24.97 and 101.03 kg ha^{-1}) respectively with the application of 125% RDF+ tebunconzole.

Keywords: Tillage practices; fertilization levels; rice; wheat; growth stages; cropping system; India.

1. INTRODUCTION

“Wheat (*Triticum aestivum* L.) contributes substantially to the national food security by providing more than 50% of the calories to the people who mainly depend on it. Its grains contain starch 60-68%, protein 8-15%, fat 1.5-2.0%, cellulose 2.0-2.5%, and minerals 1.5-2.0%” [1]. “Wheat is broadly cultivated across the world and China is the first producer of this cereal followed by India. Like wheat, rice is also a cereal and it largely grows across the world and China is the first producer followed by India” [2-4]. “Rice is one of the major contributors to the food grain production contributing approximately 43 per cent of the total food grain production in India” [5]. “Rice grains contain 80% carbohydrates, 7-8% protein, 3% fat, and 3% fiber. India, being blessed and enriched with a diverse agro- ecological condition, ensuring food and nutritional security to a majority of the Indian population through production and steady supply particularly in the recent past, is the second largest producer of wheat worldwide. In India, wheat is grown on 33.64 million hectares area with 107.59 million tons production and 3206.30 kg ha^{-1} productivity during 2019-20. The global demand of wheat will increase to about 900 million tons of wheat by the year 2050. It has been estimated that India will need at least 140 million tonnes of wheat by 2050 as against present estimated production of 109.24 million tonnes. The world area under wheat crop accounts 216.18 million ha producing 763.6 million metric tonnes with an average of 3530 kg

ha^{-1} . In India, it covers 29.32 million ha producing 103.6 million metric tonnes, one third of the total food grain production, with an average productivity of 3530 kg ha^{-1} . The current world population of 7.7 billion is expected to reach 9.7 billion by 2050. India is the second most populous country (1.3 billion) after China (1.41 billion) and expected to surpass China by touching a peak of 1.7 billion by 2050” [6]. “Rice is one of the major contributors to the food grain production contributing approximately 43per cent of the total food grain production in India” [5]. “In India rice is cultivated in an area of 44.38 million hectares with a production of 104.31 million tons. The country has to produce about 130 million tons of rice by 2025 to meet the food requirement of the growing population. Over 2 billion people in Asia alone derive 80% of their energy needs from, rice which contains 80% carbohydrates, 7-8% protein, 3% fat and 3% fiber. Generally, conventional tillage aims at reversing and stirring a deep layer of soil; incorporating and destroying plant debris; exposing soil pests to sunshine for control; lump breaking and ground leveling. Conventional tillage involves many mechanical operations starting with deep ploughing, deep discing, ripping, shallow tyne workings, and fine seedbed preparation after the harvest of different grain crops, in both winter and summer production seasons. Thereafter, a fallow period is given to enable moisture capture before the planting of the next crop. This approach results in a bare soil surface exposed to wind and water erosion and high compaction after heavy rains which then needs to be loosened again to assist

in weed control and to promote moisture absorption from subsequent rainfalls. Reduced tillage is designated as full-width tillage that disturbs the entire soil surface, leaving 15% to 30% of residue cover after planting. Other conservation tillage practices in the inland pacific north-west include minimum tillage, delayed minimum tillage, under cutter fallow, chisel, discs, and sweep tillage systems. The under cutter method of fallow management uses wide V blade sweeps that slice beneath the soil surface and simultaneously deliver nitrogen during primary spring tillage followed by one or two non-inversion rod weeding operations during the summer to control weeds" [7]. "Both minimum tillage and delayed minimum tillage use under cutter V-sweep as a primary tillage. Herbicides may be used to control weeds following primary tillage, but secondary tillage such as rod weeding is used more commonly. Delayed minimum tillage is similar to minimum tillage except primary spring tillage with under cutter V-sweep is delayed until at least mid-May" [8].

Reduced tillage practices cannot be approached with "one size fits all." Reduced tillage options that you can choose will depend on conditions such as type of crop rotation, soil type, water availability for cover cropping, finance to purchase new soil management tools, and your goals for reducing tillage. It is advisable to discuss first with your cooperative.

"Plant naturally takes time for growth and development and use of plant growth promoters provides nutrients for the soil microorganism, thus increasing the activities of microbes in soil, which in turn helps to convert unavailable plant nutrients into available form for faster plant growth promotion. Natural plant growth promoters (Phyto hormones) are involved in urging and stimulating root and shoot growth whereas organic plant growth promoters (PGPS) including soil fertility and productivity of crop also help in faster growth plant growth promotion and avoids grain disease. With improved chemistry plant growth promoters have multisite modes of action without being in contact only on leaf surface and are absorbed by the leaves and other plant parts and move within in treated plant" [9].

2. MATERIALS AND METHODS

2.1 Description of Study Site

The experiment was conducted during *rabi* season of 2021-22 and 2022-23 at student's

Instructional farm, C.S.A. University of Agriculture and Technology, Kanpur Nagar (U.P.). The field was well leveled and irrigated by tube well. The farm is situated at main campus of the university, in the west northern part of Kanpur city under sub-tropical zone in ^vth agroclimatic zone (central plain zone).

2.2 Edaphic Condition

The soil was moist, well drained with uniform plane topography. The soil of the experimental field was alluvial in origin, sandy loam in texture and slightly alkaline in reaction having pH 7.68 and 7.69 (1:2.5 soil: water suspension method given by Jackson, [10]), electrical conductivity 0.243 and 0.244 dSm⁻¹ (1:2.5 soil: water suspension method given by Jackson, [10]), Organic carbon in soil is 3.9 and 3.8 g ka⁻¹ (Walkley and Black's rapid titration method given by Walkley and Black, [11]), with available nitrogen 165.41 and 167.78 kg ha⁻¹ (Alkaline permanganate method given by Subbiah and Asija, [12]), available phosphorus as sodium bicarbonate-extractable P was 8.12 and 8.15 kg ha⁻¹ (Olsen's calorimetrically method, Olsen et al., [13]) available potassium was 187.15 and 189.47 kg ha⁻¹ (Flame photometer method given by Hanwey and Heidel, [14]).

2.3 Field Experiment

The experiment was laid out into Split plot design with 3 replications. Two levels of tillage Conventional tillage (two ploughing followed by sowing), reduced tillage (one ploughing followed by sowing). These practices tillage were each randomly allotted to main plot with ten 10 fertilization levels F₁ - (Absolute Control), F₂ - (RDF- 150:60:40 NPK kg/ha), F₃ - (75% RDF- 112.5:15:30 NPK kg/ha + 10 t FYM/ha), F₄- (125% RDF- 187.5:75:50 NPK kg/ha) F₅ - (RDF- 150: 60: 40 NPK kg/ha + two spray of chloromequate chloride- lihocine 0.2% at first node (45 Days) and flag leaf stage (80 DAS), F₆ - (RDF- 150: 60: 40 NPK kg/ha + Two Spray of tebusconazole- Folicur 430 SC @ 0.1% at first node and flag leaf stage (80 DAS), F₇ - (75% RDF 112.5:45:30 NPK kg/ha + 10t FYM/ha + two Spray of chloromequate chloride - lihocine 0.2% at first node (45 DAS) and flag leaf stage (80 DAS), F₈ - (75% RDF 112.5:45:30 NPK kg/ha + 10 t FYM/ha + two Spray to tebusconazole- folicur 430SC @0.1% at first node and flag leaf stage (80 DAS), F₉ - (125% RDF- 187.5:75:50 NPK kg/ha + two spray of chloromequate chloride- lihocine 0.2% at first node (45 DAS) and flag leaf

stage (80 DAS), F₁₀ – (125% RDF- 187.5:75:50 NPK kg/ha + two spray of tebuconazole Folicur 430 SC @ 0.1% - folicur 430 SC @ 0.1% at first node and flag Leaf (80 DAS). There fertilization levels were randomly allocated to sub plots. Standard culture practices recommended for wheat was followed uniformly in all experimental plots.

2.4 Harvesting

The wheat crop was harvested when grains were fully matured and straw turned yellow. The border lines and plants were removed first to eliminate border effect. The crop from net plot was cut close to the ground and kept in respective plots for sun drying. Threshing was done plot wise. Wheat grain and straw yield was recorded by weighing as per the treatment.

2.5 N, P & K Content and Uptake in Grain and Straw of Wheat

Grain uptake (kg ha⁻¹) = Grain yield (q ha⁻¹) × Nutrient content (%) in grain

Straw uptake (kg ha⁻¹) = Straw yield (q ha⁻¹) × Nutrient content (%) in straw

2.6 Statistical Analysis

The growth parameters and yields were recorded and analyzed as per Gomez and Gomez [15] the tested at 5% level of significance to interpret the significant differences.

3. RESULTS AND DISCUSSION

3.1 Nitrogen Content in Grain and Straw (%)

The data of nitrogen content in grain was not significantly affected but in straw was significantly influenced by tillage practices and fertilization levels. The grain have higher amount of nitrogen content than straw. The maximum nitrogen content in grain was recorded in the conventional tillage practice (1.80 and 1.76%) followed by the reduced tillage (1.77 and 1.75%) and maximum nitrogen content in straw was recorded in conventional tillage (0.53 and 0.50%) followed by reduce tillage (0.51 and 0.48%) during 2021-22 and 2022- 23 year of study. Among fertilization levels, The highest nitrogen content in grain (1.83 and 1.80%) and straw (0.59 and 0.56%) were recorded in 125% RDF + tebuconazole and it was with 125% RDF + chloromequate chloride (1.82 and 1.79%)

and (0.57 and 0.54%) in grain and straw respectively. The minimum nitrogen content in grain (1.73 and 1.69%) and straw (0.47 and 0.45%) were recorded in the control and interaction in nitrogen content in grain and straw between tillage practices and fertilization levels during both year of experimentation. Similar findings were also reported by Verma et al. [16] and Kacharoo and Razdan [17].

3.2 Nitrogen Uptake in Grain and Straw (kg ha⁻¹)

The data of nitrogen uptake in grain was not significantly affected but in straw was significantly influenced by tillage practices and fertility levels. The grain have highest amount of nitrogen uptake than straw. The maximum nitrogen uptake in grain was recorded in the conventional tillage practice (93.34 and 89.44 kg ha⁻¹) followed by the reduced tillage (88.69 and 85.56 kg ha⁻¹) and maximum nitrogen uptake in straw was recorded in conventional tillage (36.26 and 33.90 kg ha⁻¹) followed by reduce tillage (34.51 and 32.13 kg ha⁻¹) during 2021-22 and 2022-23 year of study. Among fertilization levels, The highest nitrogen uptake in grain (100.31 and 97.38 kg ha⁻¹) and straw (35.06 and 38.67 kg ha⁻¹) were recorded in 125% RDF + tebuconazole and it was at par with 125% RDF + chloromequate chloride (98.89 and 95.57 kg ha⁻¹) and (40.36 and 37.88 kg ha⁻¹) in grain and straw respectively. The minimum nitrogen uptake in grain (78.40 and 75.01 kg ha⁻¹) and straw (29.77 and 29.61 kg ha⁻¹) were recorded in the control. There were no significant interaction in nitrogen uptake in grain and straw between tillage practices and fertilization levels during both year of experimentation. Similar findings were also reported by Gholami et al. [18] and Shri et al., [19].

3.3 Phosphorus Content in Grain and Straw (%)

The data of phosphorus content in grain was not significantly affected but in straw was significantly influenced by tillage practices and fertilization levels. The grain have higher amount of nitrogen content than straw. The maximum phosphorus content in grain was recorded in the conventional tillage practice (0.31 and 0.27%) followed by the reduce tillage (0.28 and 0.24%) and maximum phosphorus content in straw was recorded in conventional tillage (0.20 and 0.19%) followed by reduced tillage (0.18 and 0.17%) during 2021-22 and 2022-23

year of study. Among fertilization levels, The highest phosphorus content in grain (0.35 and 0.31%) and straw (0.25 and 0.23%) were recorded in 125% RDF+ tebunconzole and it was with 125% RDF + chloromequate chloride (0.33 and 0.30%) and (0.23 and 0.22%) in grain and straw. The minimum phosphorus content in grain (0.22 and 0.19%) and straw (0.12 and 0.12) were recorded in the control followed by RDF (0.26 and 0.23%) and (0.16 and 0.15%) in grain and straw. There were no significant interaction in phosphorus content in grain and straw between tillage practices and fertilization levels during both year of experimentation. Similar findings were also reported by Bakhshandeh et al. (2018) and Seth and Singh [20].

3.4 Phosphorus Uptake in Grain and Straw (kg ha⁻¹)

The data of nitrogen uptake in grain was not significantly affected but in straw was significantly influenced by tillage practices and fertilization levels. The grain have higher amount of phosphorus uptake than straw. The maximum phosphorus uptake in grain was recorded in the conventional tillage practice (16.23 and 14.05 kg ha⁻¹) followed by the reduced tillage (14.24 and 12.23 kg ha⁻¹) and maximum phosphorus uptake in straw was recorded in conventional tillage (13.80 and 12.87 kg ha⁻¹) followed by reduce tillage (12.47 and 11.56 kg ha⁻¹) during 2021-22 and 2022-23 year of study. Among fertilization levels, The highest phosphorus uptake in grain (18.16 and 15.99 kg ha⁻¹) and straw (16.63 and 15.29 kg ha⁻¹) were recorded in 125% RDF + tebunconzole and it was with 125% RDF + chloromequate chloride (17.38 and 14.97 kg ha⁻¹) and (15.36 and 14.38 kg ha⁻¹) in grain and straw. The minimum phosphorus uptake in grain (10.21 and 8.40 kg ha⁻¹) and straw (7.52 and 7.36 kg ha⁻¹) were recorded in the control. There were no significant interaction in phosphorus uptake in grain and straw between tillage practices and fertilization levels during both year of experimentation. Similar findings were also reported by Gupta et al. [21] and Saini et al. [22].

3.5 Potassium Content in Grain and Straw (%)

The data of potassium content in grain was not significantly affected but in straw was significantly influenced by tillage practices and fertilization levels. The grain have higher amount

of potassium content than straw. The maximum potassium content in grain was recorded in the conventional tillage practice (0.42 and 0.41%) followed by the reduce tillage (0.41 and 0.40%) and maximum potassium content in straw was recorded in conventional tillage (1.38 and 1.36%) followed by reduced tillage (1.36 and 1.35%) during 2021-22 and 2022-23 year of study. Among fertilization levels, The highest potassium content in grain (0.45 and 0.45%) and straw (1.41 and 1.39%) were recorded in 125% RDF + tebunconzole and it was with 125% RDF + chloromequate chloride (0.44 and 0.44%) and (1.40 and 1.39%) in grain and straw. The minimum potassium content in grain (0.37 and 0.36%) and straw (1.31 and 1.30%) were recorded in the control followed by RDF (0.39 and 0.38%) and (1.35 and 1.33%) in grain and straw. There were no significant interaction in potassium content in grain and straw between tillage practices and fertilization levels during both year of experimentation and pooled. Similar findings were also reported by Gupta et al. [23], Kumar et al. [24] and Singh et al. [25].

3.6 Potassium Uptake in Grain and Straw (kg ha⁻¹)

The data of potassium uptake in grain was not significantly affected but in straw was significantly influenced by tillage practices and fertilization levels. The grain have higher amount of potassium uptake than straw. The maximum potassium uptake in grain was recorded in the conventional tillage practice (22.15 and 21.09 kg ha⁻¹) followed by the reduced tillage (20.84 and 19.56 kg ha⁻¹) and maximum potassium uptake in straw was recorded in conventional tillage (93.88 and 91.03 kg ha⁻¹) followed by reduce tillage (91.52 and 88.73 kg ha⁻¹) during 2021-22 and 2022-23 year of study. Among fertilization levels, The highest potassium uptake in grain (24.97 and 23.74 kg ha⁻¹) and straw (101.03 and 98.12 kg ha⁻¹) were recorded in 125% RDF + tebunconzole and it was with 125% RDF + chloromequate chloride (24.11 and 22.90 kg ha⁻¹) and (99.11 and 96.58 kg ha⁻¹) in grain and straw. The minimum potassium uptake in grain (16.99 and 15.93 kg ha⁻¹) and straw (82.41 and 80.07 kg ha⁻¹) were recorded in the control. There were no significant interaction in potassium uptake in grain and straw between tillage practices and fertilization levels during both year of experimentation and pooled. Similar findings were also reported by Singh et al. [26], Yadav et al. [27] and Puniya et al. [28].

Table 1. Effect of tillage practices and fertilization levels on nitrogen content and uptake in grain and straw of wheat

Treatment	Nitrogen content (%)						Nitrogen uptake (kg ha ⁻¹)					
	Grain			Straw			Grain			Straw		
Tillage practices	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Conventional tillage	1.803	1.76	1.78	0.53	0.50	0.52	93.34	89.44	91.59	36.26	33.90	35.08
Reduced tillage	1.774	1.75	1.76	0.51	0.48	0.50	88.69	85.56	87.12	34.51	32.13	33.32
S.E(m)±	0.007	0.001	0.012	0.002	0.002	0.002	0.133	0.556	0.203	0.159	0.197	0.092
C.D. (5%)	NS	NS	NS	0.016	0.005	0.016	0.872	3.646	1.327	1.042	1.293	0.605
Fertilization Levels												
F ₁	1.73	1.69	1.71	0.47	0.45	0.46	78.40	75.01	76.70	29.77	29.61	28.69
F ₂	1.75	1.72	1.74	0.50	0.47	0.48	83.56	80.28	81.92	32.01	29.78	30.89
F ₃	1.76	1.73	1.75	0.51	0.48	0.49	85.82	82.51	84.17	33.07	30.81	31.94
F ₄	1.77	1.74	1.76	0.52	0.49	0.50	88.01	84.65	86.33	34.25	31.96	33.11
F ₅	1.78	1.75	1.77	0.53	0.50	0.51	90.28	86.88	88.58	35.51	32.85	34.18
F ₆	1.79	1.76	1.78	0.54	0.51	0.52	92.33	89.12	90.73	36.75	34.38	35.56
F ₇	1.80	1.77	1.79	0.55	0.52	0.53	95.13	91.87	93.50	37.98	35.57	36.78
F ₈	1.81	1.78	1.80	0.56	0.53	0.54	97.01	93.71	95.36	39.09	36.65	37.87
F ₉	1.82	1.79	1.81	0.57	0.54	0.55	98.89	95.57	97.23	40.36	37.88	39.12
F ₁₀	1.83	1.80	1.82	0.59	0.56	0.57	100.31	97.38	99.05	35.06	38.67	40.86
S.E(m)±	0.017	0.017	0.023	0.006	0.007	0.005	1.154	0.971	0.979	0.388	0.346	0.319
C.D. (5%)	NS	NS	NS	0.017	0.019	0.014	3.322	2.795	2.818	1.118	0.995	0.329

Table 2. Effect of tillage practices and fertilization levels on phosphorus content and uptake in grain and straw of wheat

Treatment	Phosphorus content (%)						Phosphorus uptake (kg ha ⁻¹)					
	Grain			Straw			Grain			Straw		
Tillage practices	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Conventional tillage	0.31	0.27	0.293	0.20	0.19	0.19	16.23	14.05	15.14	13.80	12.87	13.34
Reduce tillage	0.28	0.24	0.266	0.18	0.17	0.18	14.24	12.23	13.24	12.47	11.56	12.02
S.E(m)±	0.003	0.001	0.001	0.001	0.001	0.001	0.068	0.030	0.038	0.067	0.012	0.065
C.D. (5%)	0.019	0.008	0.004	0.007	0.009	0.004	0.444	0.200	0.246	0.440	0.081	0.424
Fertilization Levels												
F ₁	0.22	0.19	0.20	0.12	0.12	0.12	10.21	8.40	9.31	7.52	7.36	7.44
F ₂	0.26	0.23	0.24	0.16	0.15	0.15	12.63	10.71	11.67	10.244	9.40	9.82
F ₃	0.27	0.24	0.25	0.17	0.16	0.16	13.38	11.42	12.40	11.02	10.16	10.59
F ₄	0.28	0.25	0.26	0.17	0.17	0.17	14.14	12.13	13.14	11.86	10.97	11.42
F ₅	0.29	0.26	0.27	0.19	0.18	0.18	14.93	12.88	13.90	12.73	11.82	12.28
F ₆	0.30	0.27	0.28	0.20	0.19	0.19	15.70	13.64	14.67	13.61	12.68	13.14
F ₇	0.31	0.27	0.29	0.021	0.20	0.20	16.61	14.25	15.43	14.50	13.55	14.02
F ₈	0.32	0.28	0.30	0.22	0.21	0.21	17.38	14.97	16.79	15.36	14.38	14.87
F ₉	0.33	0.30	0.31	0.23	0.22	0.22	18.16	15.99	17.07	16.63	15.29	15.96
F ₁₀	0.35	0.31	0.33	0.25	0.23	0.24	19.21	17.01	18.11	17.91	16.53	17.23
S.E(m)±	0.003	0.003	0.003	0.002	0.002	0.002	0.159	0.137	0.151	0.144	0.120	0.141
C.D. (5%)	0.010	0.007	0.008	0.006	0.006	0.006	0.457	0.394	0.436	0.415	0.346	0.406

Table 3. Effect of tillage practices and fertilization levels on potassium content and in grain and straw of wheat

Treatment	Potassium content (%)						Potassium uptake (kg ha ⁻¹)					
	Grain			Straw			Grain			Straw		
Tillage Practices	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Conventional tillage	0.42	0.41	0.420	1.38	1.36	1.375	22.15	21.09	21.62	93.88	91.03	92.46
Reduce tillage	0.41	0.40	0.408	1.36	1.35	1.360	20.84	19.56	20.20	91.52	88.73	90.13
S.E(m)±	0.003	0.001	0.001	0.006	0.004	0.006	0.097	0.025	0.067	0.113	0.259	0.191
C.D. (5%)	0.008	0.003	0.005	0.019	0.010	0.019	0.637	0.166	0.193	0.743	1.700	1.253
Fertilization Levels												
F ₁	0.37	0.36	0.368	1.31	1.30	1.310	16.99	15.93	16.46	82.41	80.07	81.24
F ₂	0.39	0.38	0.385	1.35	1.33	1.343	18.81	17.45	18.13	86.70	83.37	85.04
F ₃	0.40	0.40	0.398	1.36	1.34	1.353	19.69	18.55	19.12	88.17	85.44	86.80
F ₄	0.41	0.41	0.410	1.37	1.34	1.358	20.57	19.65	20.11	90.23	86.82	88.85
F ₅	0.42	0.41	0.415	1.37	1.35	1.365	21.49	20.05	20.77	92.12	89.01	90.56
F ₆	0.42	0.42	0.420	1.38	1.37	1.378	21.86	20.96	21.41	94.25	91.43	92.84
F ₇	0.43	0.43	0.428	1.38	1.37	1.380	22.92	21.75	22.34	95.62	93.13	93.7
F ₈	0.44	0.43	0.433	1.39	1.38	1.390	23.52	22.31	22.92	97.37	94.86	96.11
F ₉	0.44	0.44	0.438	1.40	1.39	1.395	24.11	22.90	23.50	99.11	96.58	97.85
F ₁₀	0.45	0.45	0.448	1.41	1.39	1.403	24.97	23.74	24.36	101.03	98.12	99.58
S.E(m)±	0.004	0.005	0.004	0.013	0.015	0.014	0.204	0.177	0.193	1.130	1.051	0.827
C.D. (5%)	0.013	0.014	0.012	0.037	0.041	0.041	0.587	0.510	0.555	3.254	3.027	2.381

4. CONCLUSION

With rice management the management varied significantly in respect of soil organic carbon and available nutrients as NPK in soil and soil organic matter improve with treatment Bio-decomposer Treated Residue statically at par with Urea Treated Residue (5% urea) The treatment and at different stage of wheat during both the years of study. Different nutrient management option varied significantly in respect of soil organic carbon and available nutrients as NPK in soil and soil organic matter improve with treatment 75% RDF + 10 t FYM + Growth Regulator (Chlormequat chloride @ 0.2% + Tebuconazole @ 0.1%) statically at par with treatment 125% RDF + Growth Regulator (Chlormequat chloride @ 0.2% + Tebuconazole @ 0.1%). The treatment and at different stage of wheat during both the years of study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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