

Original Research Article

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Analysis of Available Nitrogen of Wheat Cultivated Soil Treated with Organic and Inorganic Source of Fertilizers

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ABSTRACT

Keywords

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The present study was carried out in Randomized Block Design with three replications and seven treatments with a variety of wheat HD2967 to identify the effect of organic and inorganic fertilizers under wheat cultivation. The result was recorded with the intervals of observation at 30, 60 and 90 DAS. Application of Neem coated urea can increase the nitrogen content in wheat and availability of nitrogen was there, for a long period of time. The maximum significant effect was found in T₃ with 443.76 kg ha⁻¹ and 440.51 kg ha⁻¹ at 60 and 90 DAS. The percentage increase in T₃ was 82 and 81 at 60 and 90 DAS as compare to the other treatments.

Introduction

Wheat is a cereal crop that cultivated extensively throughout the world. It is *Rabi* seasonal crop and is widely grown in various climatic zones. Soil fertility is estimated by three major components such as nitrogen, phosphorus, and potassium (N, P, and K). Among these their essential nutrient nitrogen plays a major role to improve soil fertility. Even a slight deficiency of these nutrients will directly decline soil fertility level and as well as yield (Robertson *et al.*, 2009). To improve the efficiency level of urea, it is coated with neem oil, to avoid the leaching losses and

insect pest attack in field condition. Agronomical trial on Paddy and Wheat crops with Neem coated Urea as a source of Nitrogen has produced significantly higher yield at research and farm level. The use of Neem Coated Urea has been found to improve the uptake of N, P and K significantly. Since 2008, the Ministry of Chemicals and Fertilizers allowed Neem Coated Urea manufacturer to sell NCU at 5% above the MRP, to recover the cost of coating, however, cost of Neem kernel Oil and production as such of Neem Coated Urea has increased significantly. Neem oil is gotten by chilly squeezing neem seeds pursued by extraction

with natural solvents (Nicoletti *et al.*, 2012). The coating of urea was considered as one of the promising advances and is going about as productive slow release fertilizer. Beforehand, a ton of research work was done to test a number of covering materials, containing urease inhibitors and nitrification inhibitor, biodegradable polymers, and different polymers, yet surprising expense and powerful hazards limit their field applications. Though, right now just neem coated urea (NCU) is being made and used in the nation because of its low generation cost (Yang *et al.*, 2012). The neem coated urea increment NUE by just 5-6% over urea in cereals even under best administration prepares (Singh *et al.*, 2016). Utilization of neem cake mixed urea expanded the grain yield and nitrogen take-up. Neem cake covered urea expanded the percent nitrogen content. As the population is increasing day by day so, to minimize the hunger of the world need to improve wheat crop production (Spiertz, 2012). So, the application of organic and inorganic fertilizer is the best way to improve wheat production. Soil fertility is estimated by three major components such as nitrogen, phosphorus, and potassium (N, P and K). Among these there essential nutrient nitrogen plays a major role to improve soil fertility. Even a slight deficiency of these nutrients will directly decline soil fertility level and as well as yield (Robertson *et al.*, 2009).

Materials and Methods

The trial was led at the Agricultural research farmstead of Lovely Professional University, Phagwara. The farmstead is geographically arranged at 31 degrees 22 minutes and 31.81 seconds' north scope and 75 degrees and 23 minutes and 3.02 seconds' east longitude with an elevation of around 252 meters over the ocean level. The present investigation entitled "Available Nitrogen of Wheat Cultivated Soil Treated with Organic and Inorganic Source of

Fertilizers" was carried out of the year 2017-2018 at the Agricultural research farm, Lovely Professional University, Phagwara. The observation was done at 30, 60, and 90 DAS. The observed parameter was soil available nitrogen (N). The soil was collected from each plot of different treatments and replications.

Analysis of Available Nitrogen (Subbiah and Asija 1956)

In the test, the field was determined to utilize the technique which is present in the amount of available nitrogen.

Reagent

Potassium permanganate (KMnO₄)

Boric acid

Mixed indicator

Sodium hydroxide (NaOH)

Sulphuric acid (H₂SO₄)

$N\% = (S-B) \times 0.0014 \times 100 / \text{weight of soil}$

$Kg/ha = \% \times 22400$

Where,

S = Reading of sample

B = Reading or blank sample

A total of 20 g of soil sample was poured in Kjeldahl flask (800ml). 1ml of liquid paraffin was added in 1ml of liquid paraffin.

Add total 100ml of 0.32% of KMnO₄ and 2.5% of NaOH solutions simultaneously.

In Kjeldhal assemblage distillation of the solution was done. Collected ammonia in 250ml of Erlenmeyer flask which is having 25ml of the boric acid solution and then add a mixed indicator 2-3 drops.

The absorption of ammonia changed the colour of pink boric acid to green.

Titration was done with 0.01N H₂SO₄ to the pink colour.

Results and Discussion

The soil available nitrogen at 30 DAS results in maximum significant effect in T₃ with 436.4 kg ha⁻¹. The percentage increase in T₃ was 80 at 30 DAS as compare to the other treatments. The lowest value was found in T₁ with 286.33 k kg ha⁻¹ at 30 DAS. And the percentage increase in T₁ was 18 as compared to the control (T₀). The maximum significant effect was found in T₃ with 443.76 kg ha⁻¹ and 440.51 kg ha⁻¹ at 60 and 90 DAS. The percentage increase in T₃ was 82 and 81 at 60 and 90 DAS as compare to the other treatments. The lowest soil available nitrogen was found in T₅ with 308.45 kg ha⁻¹ and 307.42 kg ha⁻¹, respectively. The percentage increase in T₅ was 26 for both dates as compare to the control (T₀).

Nitrogen is an element which is very much crucial for plant growth and reproduction. Nitrogen also helps in high biomass production. The application of nitrogen more than or less than the optimal level is not good for the plants. Soil available nitrogen is a part of nitrogen which can easily be absorbed by the plants (Table 1). The nitrogen has been reported in two major forms inorganic and organic (Dey *et al.*, 2019a, b).

Minerals nitrogen is as the inorganic forms, whereas the organic matter is the form of organic matter and plant residues (www.grdc.com.au/Updates). It is reported that, 90 per cent nitrogen in the soil is organic in nature. Its availability is not easy to the plants [http://anz.ipni.net/]. Because, before its utilization, it must be converted into the soluble form of the compound like organic acid, amino acid and ammonia. These, conversion mediated through microorganism present in the soil. The parent material is plant

residue and organic material. Nitrogen can be removed from organic matter and crops residue, decomposition, immobilization, solubilization and mineralization (www.grdc.com.au/Updates). Within the alkaline soil, urea always remain at the high risk to leach more and more within the soil around the dissolving granules. That why, the top dressing should be avoided in such type of soil (www.grdc.com.au/Updates). To avoid the ammonia volatilization the precision guidance to top-dress urea with direct delivery.

It is reported that, increasing legumes residues increases the soil organic matter through mineralization. The mineralization rate in summer and autumn may be high. This means that in the following crop, the rate of mineralization is the same or less than soil with no legume residues. Growers need to keep this in mind when budgeting fertilizer application rates (www.soilquality.org.au). Surface acidification can be achieved through the large amounts of soil mineral nitrogen at the time of sowing and leaching can be done beyond the root zone of coarse-textured soils (www.grdc.com.au/GCS96).

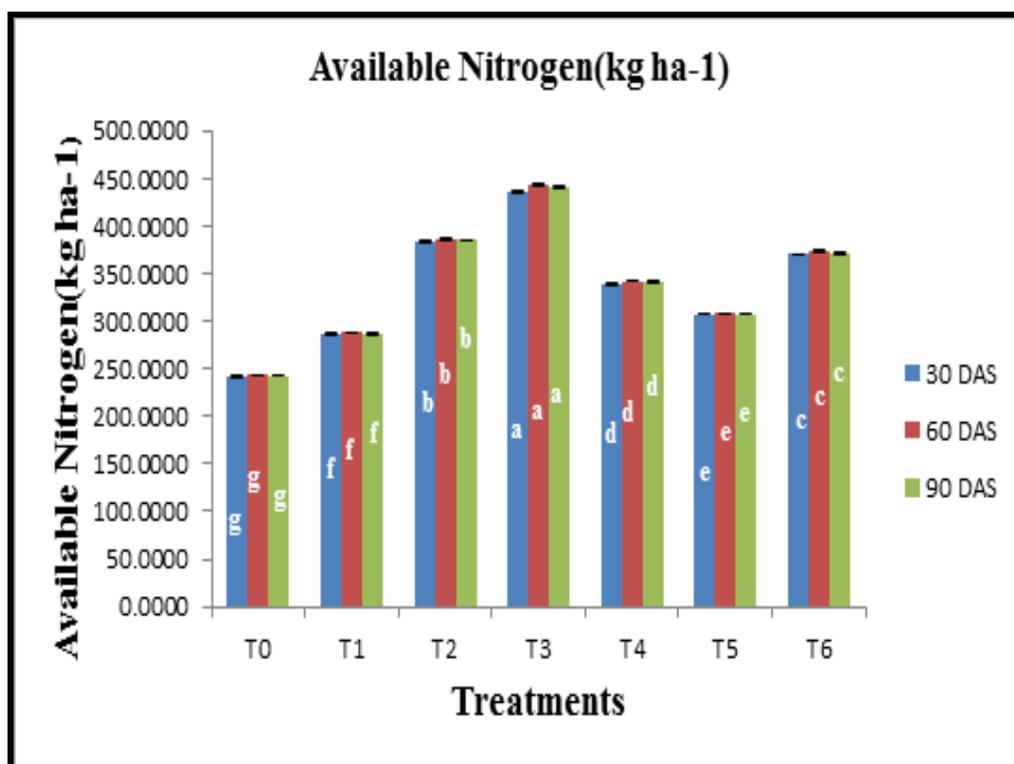
It is reported that, application of nitrogen in excess in early season can leads to the risk of haying of crops, if moisture are absent in the season. Agronomic practice results changes in soil organic matter, which leads to alteration in types of carbon and nitrogen present in the soil. It is the facts that, increase in the organic matter in the soil leads to more organic nitrogen in the soil available for the plants (www.grdc.com.au/GCS96). If the C/N ratio is higher in the residue, than nitrogen immobilization will happen more and which leads to the reduced availability of nitrogen to the plants (Barman, 2019). Whereas, the low C: N ratio leads to higher mineralization of nitrogen and increases its availability to the plants (www.grdc.com.au/GCS97).

Table.1 Soil available nitrogen in the treated soil

Treatments	30DAS	60DAS	90DAS
T0	241.76 ^g ± 0.78	243.53 ^g ± 0.29	242.80 ^g ± 0.31
T1	286.33 ^f ± 0.63	287.91 ^f ± 0.08	286.75 ^f ± 0.48
T2	382.89 ^b ± 1.07	386.82 ^b ± 0.93	385.30 ^b ± 0.48
T3	436.4 ^a ± 0.76	443.76 ^a ± 0.81	440.51 ^a ± 0.97
T4	338.78 ^d ± 0.63	341.98 ^d ± 0.06	341.99 ^d ± 0.5
T5	306.86 ^c ± 0.19	308.45 ^c ± 0.31	307.42 ^c ± 0.29
T6	370.23 ^c ± 0.57	374.06 ^c ± 0.47	371.26 ^c ± 0.43

Where, DAS: Days after sowing. Data are in the form of Mean ± SEM at p<0.05. The mean followed by different letters was significantly different at p<0.05, according to DMRT for separation of Means. T₀ = control; T₁ = 100%RDF; T₂ = 75%RDF + 25%Neem coated urea; T₃ = 50%RDF + 50%Neem coated urea; T₄ = 75%RDF + 25%vermicompost; T₅ = 50%RDF + 50%vermicompost; T₆ = 50%RDF + 25%Neem coated urea + 25%vermicompost.

Fig.1 Soil Available Nitrogen (kg ha⁻¹)



Where DAS: Days after sowing. Data are in the form of Mean±SEM at p<0.05. The mean followed by different letters was significantly different at p<0.05, according to DMRT for separation of Means. T₀ = control; T₁ = 100%RDF; T₂ = 75%RDF + 25%Neem coated urea; T₃ = 50%RDF + 50%Neem coated urea; T₄ = 75%RDF + 25%vermicompost; T₅ = 50%RDF+ 50%vermicompost; T₆ = 50%RDF + 25%Neem coated urea + 25%vermicompost.

The soil available nitrogen at 30 DAS resulted from maximum significant effect in T₂ with 449 kg ha⁻¹. The percentage increase in T₂ was 85 at 30 DAS as compare to the other treatments. The lowest soil available nitrogen was found in T₅ with 308.45 kg ha⁻¹ and 307.42 kg ha⁻¹, respectively. The percentage increase in T₅ was 26 for both dates as compare to the control (T₀).

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