

Nitrogen Fertilizer's Role in Plant Growth

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Abstract:

Nitrogen (N) is an essential element for plant growth and development that is utilized by all plants in the form of NO_3 and NH_4 ; it accumulates in edible parts of these leaf vegetable due to the environmental pollution and high nitrate concentrations, mostly if excessive part of nitrogen fertilizer has been applied then, it would be dangerous to individual health. Approximately, 78-79% Nitrogen is available in the atmosphere in inert structure that is not useful for plants and not take-up directly. It is available from industries, atmospheric and biological as well as organic fixation. To conduct the randomized experiment to determine the effect of different concentration of nitrogen on growth, biochemical, quality and yield attributes of plant. Plant were supplied with five levels of basal nitrogen which is 0 (control), 40, 80, 120 and 160 kg N/ha (Hectare). Nitrogen fertilizer have no significant effect on plant height and number of outer leaves. In this review paper, going to discuss about the evaluation of different rate of nitrogen fertilizer on growth of plants, crop etc.

Keywords: Nitrogen, Fertilizer, Biochemical, Organic Fixation

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Introduction

For satisfactory crop growth and production, there is a need of proper nutrition to the crop as there are 16 elements that are essential for the growth of plant. These 16 elements are derived from the soil, present in the form of inorganic salts. 94-95% of plant material contains carbon, hydrogen and oxygen. Other 6% contain other nutrients such as calcium, phosphorous, nitrogen etc.

Any compound which contains one or more chemical elements that may be present in organic or inorganic form is known as fertilizers. These fertilizers may be natural or synthetic. In agricultural activities, Fertilization are used to increase the efficiency and better quality of product recovery.

Role of Nitrogen in Plant

For the successful growth of plant, nitrogen element plays a vital role because of the protein and chlorophyll are the essential constituents of the plants. Less than 5% of inorganic nitrogen (NH_4 , NO_2 , and NO_3) in soil that are absorbed by most of the plants. To maintain the nutritional condition of different cropping systems, Inorganic and organic fertilizers are applied to the crops. In an organic agricultural system, the quantity of nitrogen, phosphorous, calcium, magnesium and potassium are increased by the continuous application of manure. After applying the organic fertilizers to the soil, Inorganic nitrogen is released and absorbed by the plants during the beginning of mineralization. Therefore, mineralization rate is controlled by several factors such as agricultural management, microorganism, soil properties, temperature water content and type of organic fertilizer.

Once, agricultural system is treated by the nitrogen fertilizer that is directly absorbed by the plants. This absorbed fertilizer converts into various different forms by the oxidation process. Through the leaching, volatilization and denitrification, excess nitrogen is lost in ionic or gaseous form. Nitrogen fertilizer is carried away by runoff or leaches into the soil with water, if it is not absorbed by the plants. As the large quantity of the nitrogen fertilizer is applied due to which the phytoavailability of nitrogen pool increases and cause the potential threat to the surrounding environment. It shows the close relationship between the excessive nitrogen fertilizers and environmental problems i.e., eutrophication, greenhouse effect, and acid rain (Liu *et al.*, 2014).

A significant role is played by the soil and climate condition in uptake and utilization of Nitrogen. Hence, before conducting any experiment to know the response of nitrogen on the growth and productivity of diverse crop species, the condition of soil and climate of any particular region must be considered. There are some advantages of nitrogen as follows:

- Nitrogen give the dark green color to the plants,
- Promote leaves stem, and other vegetables part's growth and development.
- Stimulate Root growth
- Improve fruit quality
- Enhance the growth of leafy vegetables
- Increase the protein content of fodder crops (Leghari *et al.*, 2016).

Nitrogen Fertilizers

Inorganic Nitrogen (N) Fertilizers: It includes ammonium, nitrate forms and urea.

Ammonium Sulphate: It is a soluble fertilizer that contains nitrogen and sulfur. It is present in two forms; dry form with 21% Nitrogen and 24% sulfur while liquid form. Ammonium sulphate has a lower nitrogen volatilization risk than urea. So, it is compatible for the topdressing application. Ammonium sulfate is a good source of sulphur. Hence, where sulphur is needed, ammonium sulphate is used.

Anhydrous Ammonia: This compound has highest composition of nitrogen (82%) compare to other compounds and it is the cheapest nitrogen source. It is a high pressure liquid that is injected 6-8 inches deep into soil to prevent the ammonia loss. The high pressure, specially designed and well maintained equipment is required for storing the anhydrous ammonia for safety reasons. Personal protective equipment should be used during the application of it.

Ammonium Nitrate: It is the oldest salt that contains only 33 to 34% nitrogen. It can be used by applying on the surface or by incorporating into the soil. It has a low risk of volatilization as compared to urea because of the presence of ammonium and nitrate. The soil has the low pH as it contain ammonium.

Potassium Nitrate: It is also known as saltpeter or nitric acid, used as a fertilizer. It is found in the form of white colored powder or colorless transparent crystal that contains 14% nitrogen and 46% potassium. The soil does not have low pH in the presence of potassium nitrate.

Chilean Nitrate: It contains 16% of plant available form of nitrate-N and sodium used in organic cropping systems as well as conventional systems. It is available in two forms; dry and flowable prill form.

Urea: It is a highly soluble dry material. Urea's nitrogen is available after the conversion into ammonium and then in nitrate. It can be used as starter and top dressing application. It has an advantage: 45 to 46% nitrogen with the low cost per pound (lb) of nitrogen. Nitrogen losses to the air and approaches 40% of the applied nitrogen, if it is applied to the surface, not incorporated. Hydrogen ion is formed after the conversion of ammonium into nitrate due to which soil pH is reduced with the repeated use of urea fertilizer.

Urea Ammonium Nitrate: It is readily soluble that contains 28 to 32% nitrogen. It is made by mixing of ammonium nitrate and urea. It is non-pressurized liquid fertilizers used for the side dressing of the crops. Urea ammonium nitrate has the low volatilization compare to urea because of the lower percentage of nitrogen in urea and ammonium form. This product has the benefits such as uniformity, ease of storage, handling and application. Urea ammonium nitrate has the lower soil pH because of the conversion of ammonium to nitrate and release of Hydrogen ion. (<http://nmsp.cals.cornell.edu>).

Review of Literature

Hirel et.al, (2011), studies about the last two decades to identify by means of agronomic, physiological and genetic studies. Nitrogen use efficiency (NUE) has become the second priority after drought both in private and public sector for abiotic stress improvement in crops. To use many tools for crops and cereals for decipher the genetic and physiological basis of NUE. In this paper, improvement in yield for most crops over the last 50 years, approximately 40%, due to improvement in cultural practice and 60% due to genetic grains which is indicating the breeding for improved NUE.

Singh, Khan and Naeem (2014), stated that the application of 120 kg N/ha proved optimum for

enhancing crop productivity, nutrient content of leaf and rhizome as well as biochemical and quality attributes of plants.

Liu et al. (2014), stated that nitrogen fertilizers help in plant growth and development but it accumulate in the edible parts and harms when organic and liquid fertilizers are used and liquid fertilizers with inorganic fertilizers increase the conductivity of the soil due to which growing lettuce crops are affected negatively. They provided the useful information to farmers and policy makers.

Farnia and Ghorbani (2014), proposed by the studying the effect of potassium and nitrogen in the form of bio fertilizers on red bean that these both fertilizers are effective on the component of red bean and says that chemical fertilizers should be removed by these fertilizers.

Selassie (2015), concluded that nitrogen fertilizers have a positive effect on the crop 'Maize' by height, lodging percentage, and grain yield etc. 60 kg nitrogen per hectare gives profit from unit investment.

Woldesenbet and Haileyesus (2016), studied about the mazia crop and the effect of nitrogen on the crop. They concluded that as the nitrogen level is increased, the quality and quantity of yield start to decrease. They suggest that chemical composition of soil should be identified that can have positive and negative effects on the level of fertilization.

Abera, Debele and Wegary (2017), concluded that nitrogen fertilizer application has been increased the production of maize. Problem related to soil fertility is alleviated using crop management practices. They concluded that nitrogen fertilizer is better for the sustainable maize production.

Yeshiwas (2017), studied the effect of nitrogen fertilizer on the growth of cabbage and concluded that Nitrogen rate has a significant effect on the leaf length of cabbage and suggest that 150 kg of nitrogen per hectare should be used by the stakeholder due to crops and its components will become cost-effective.

Walsh, Shafian and Christiaens (2018), by using nitrogen application with timely and efficiency, improve wheat Grain Yield (GY) and quality. Increasing the grain yield (GY), protein content in grain (GP) and Nitrogen use (NUP) values for Nitrogen fertilizer in the 90 kg N/ha but increasing the rate to 135 kg N/ha did not further enhance wheat

production. It indicate the 90 kg N/ha rate was adequate to optimize spring wheat GY and GP.

Megaladevi et al., (2018), concluded that notice the increase in root yield with increasing the nitrogen levels of aphid incidence that indicate the radish crop can yield more at high nitrogen with high aphid incidence but decrease the cost of root quality. Highest population was observed on plants receiving more Nitrogen (450.00 mg N/plant) and minimum population on plants receiving no Nitrogen. Effect of nitrogen on plant height was significant.

Conclusion

The fertilizers play an important role for the production of crop with high quality in the field of agriculture. In these, nitrogen fertilizer that helps in the growth and development of the plant and give color to the plant, leave and stem. But the excess of the nitrogen level can damage the quantity and quality of the crops and the less amount of nitrogen in plant also gives an adverse effect on plant (yellow leave- less chlorophyll). From this review, it can be concluded that the use of nitrogen fertilizers should be in required amount only for the high-quality production.



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