

Excessive Use of Nitrogenous Fertilizers: Ignorance Causing Serious Threats to Environment and Human Health

Dr. Kiran K. Khokhar^{1*}

Incharge, Regional Soil Testing Laboratory, Krishi Vigyan Kendra, CCS HAU, Karnal, Haryana, 132001

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Introduction

Agriculture plays a vital role in Indian economy and it contributes about 17% to the total GDP and provides employment to around 58% of the total population. With the growing population, it is important for the economy to secure its population with food security. In this context fertilizers play an important role in crop production. In order to achieve more profit per unit area, the farmers are indiscriminately using chemical fertilizers at their field, which is severely affecting soil health and its fertility.

Nitrogen (N) is an essential macronutrient, which all plants require for proper growth. It is an important constituent of the chlorophyll, nucleic acids and proteins. Without N, most of the world's crops wouldn't exist. N is to corn, wheat and rice, what water is to fish. Annually, more than 100 million tons of N is being applied to crops in the form of fertilizer worldwide, helping them grow stronger and better. But issue arise when N run-off occurs which pollutes air, water and land in the process. Since, urea is a cheap alternative to meet N requirement of the crop therefore, farmers use it indiscriminately which is harmful to the crops and environment also.

Role of Nitrogen in crop growth:

N is a major limiting nutrient to sustain crop yields and quality. Application of N fertilizers has increased crop yields and helped in achieving self-sufficiency in food production in many developing countries. Excessive application of N fertilizers beyond crops' demand, however, has resulted in undesirable consequences of degradation in soil, water, and air quality. These include soil acidification, N leaching in groundwater and emissions of nitrous oxide (N₂O), a potent greenhouse gas that contributes to global warming. It has been reviewed that globally farmers apply around 115 million tons of N to the crops every year. Only around 35% of

applied N is used by the plant, which means 75 million tons of N runs off into our rivers, lakes and natural environments. This is so called “excess N”. It is quite staggering that almost two-thirds of our applied N becomes an environmental pollutant.

N imparts dark green color to the crop and makes the crop more succulent. N promotes vegetative growth and increases the production of proteins and carbohydrates to produce good quality leaves. Yields increase when N is used in proper proportion with other nutrients. Due to the lack of N, the size of the leaves of the plants becomes smaller, the stem becomes thinner and there is less growth and development. In N deficient conditions, the color of the lower leaves of the plant gradually turns yellow. The growth of the roots of the plant stops.

N is needed for the growth and development of the plant immediately after the germination of the plant. Therefore, N applied to the soil at the time of sowing and first and second irrigation is more effective than foliar spray. Since, foliar spray of urea for 40 to 45 days is not very effective because the size of the leaves of the plant is very small. However, if the standing crop shows visible signs of N deficiency, then foliar spray of urea can correct the N deficiency very quickly.

Measures to meet N deficiency:

If N deficiency symptoms have started appearing in the standing crop we may spray 2-3% urea solution depending on the age, stage and type of standing crop. Concentration of urea needed to be sprayed will depend on the vegetative growth of the crop and the spraying device. For cereal crops, 5 kg of urea has to be mixed in 200-250 liters of water in order to uniformly spray the urea solution on crop foliage of one acre through manual spray machine. N deficiency in the crop can be rectified by applying two to three sprays at an interval of 12 - 15 days as per the requirement.

Points to be kept in mind during foliar spray of urea

- It must be ensured that there is sufficient moisture in the fields before foliar spray.
- Avoid spraying during hotter period of the day. Spraying in the evening is preferred. Foliar spray of urea must be done after 5 o'clock in the evening, in summers.
- Spray again if it rains immediately after spraying.
- Urea used for foliar application must not contain more than 1.5% biuret, a compound which is highly harmful to the plants.

- Foliar application of fertilizers should be avoided on the crops having very small leaves i.e. compound leaf system.
- Never make a more concentrated solution of urea (more than three percent) and it must be ensured that the concentration of N must be uniform throughout. Urea solution in the pump should be stirred intermittently while spraying.
- If due to any reason more concentrated urea solution has been sprayed by mistake and the plants have started showing the symptoms of leaf burning and scorching then immediately irrigate the field. If water is not available for irrigation, then plain water should be sprayed again on the foliage.
- If there is more dew in the field or if wind is blowing or the sky is cloudy, then foliar spray of urea should be avoided.
- If any chemical, insecticide, weedicide etc. is to be mixed in the urea solution, then mix it with the advice of agricultural experts.

Measures to increase N use efficiency of Urea:

- At the time of sowing, urea should be drilled 4-6 cm below the seed, alone or along with other fertilizer.
- In the fields, use of indigenous manure, compost, vermicompost, biofertilizer etc. should be regularly applied from time to time.
- In loamy and sandy loam soil, do light irrigation after adding urea to the standing crop.
- Urea should never be applied along with the seeds.
- If the day temperature is high, then broadcast or spray urea in the evening. Do not apply urea in the field if the crop foliage is wet due to dew.
- N volatilize in the form of ammonia gas in saline land. In such conditions foliar spray of urea is more beneficial.
- Fertilizers must be applied keeping in mind the soil type and crop. In order to increase the fertilizer use efficiency, it must be ensured that the soils are not deficient in that particular nutrient.

Consequences of excessive use of Nitrogenous fertilizers

- One of the major functions of N is to increase the chlorophyll production. Energy which has to be channelized for flower growth is redirected to foliage proliferation.

As a consequence plants are unable to produce their necessary reproductive organs during the growing season and reproductive phase is delayed.

- Due to excessive use of N, the crop maturity is delayed and straw to grain ratio increases.
- The fiber of the crops becomes weak and crop lodging is frequently observed in excessively N fed crops.
- Excessive N causes "luxuriant" growth of leaves, resulting in the plant being attractive to insects /pathogens and/or diseases.
- The excessive nitrogen in the soil slowly leaches out of the soil through water runoff; Since, N is effectively in the form of nitrates due to microbial conversion when it leaches down therefore, groundwater and drinking water become contaminated with nitrate.

Conclusion:

While applying fertilizers, we must keep in mind various measures to increase the nutrient use efficiency so that we may minimize the nutrients losses. We may use neem coated urea so that more benefit may be availed because of slow release of N through it and thus we may also prevent ground water from getting polluted due to leaching of excessive N as nitrate. Along with increasing agricultural production, we have to find safe alternates to sustain crop productivity, without effecting soil health. Our life depends on the health of the land. That is why we should protect the land from indiscriminate use of agricultural chemicals in every possible way.