



NITROGEN

NITROGEN IN SOILS

Nitrogen is a required nutrient for all living things. It is a key element of the DNA blueprint that builds all plants and animals, and the proteins required living organisms to live and grow. The atmosphere is made up of about 80% nitrogen as gas and in this form it cannot be used directly by living organisms for nutrition.

Available soil nitrogen is formed naturally through the decomposition of plant and animals remains and organic wastes, aided by biological processes and soil bacteria to form soil organic matter. Soil nitrogen is present in the inorganic forms such as ammonium (NH_4^+) or nitrate (NO_3^-). Additional nitrogen can be added to soils as fertiliser to assist in soil management in agricultural applications.

Nitrogen can be lost from the soil in various ways, through volatilization and denitrification to the atmosphere, and leaching below the root zone following heavy rain.

NITROGEN IN PLANTS

As living organisms, plants require the critical nutrients carbon (C), hydrogen (H) and oxygen (O) to survive. These are obtained through absorption of water through the leaves and/or roots and the uptake of CO_2 from the air. Nitrogen is also required by plants, and in greater quantity than any other nutrient, and is needed for healthy growth. It is one of the most common limiting nutrients in agricultural production systems. Interesting, legumes can fix nitrogen directly from the air, however, most other plants are reliant on the available soil and/or fertiliser for their nitrogen source.

Plant uptake from the soil is mainly as nitrate (NO_3^-), although ammonium (NH_4^+) is also taken up.

Like all living things, plants use nitrogen to build DNA and proteins, but most importantly, it is important in the formation of chlorophyll (the green pigment in plants). Chlorophyll is critical for plants to convert sunlight into carbohydrates; a shortage of nitrogen inhibits plants in the basic function of trapping energy. A shortage of nitrogen also impacts on the availability and production of plant proteins which not only affects yield, but also the quality of forage, grain, vegetables, fruit and nuts.

NITROGEN DEFICIENCY SYMPTOMS

The main symptoms of nitrogen deficiency are:

- Stunted growth and reduced tillering in grasses and cereals,
- Pale green or yellow colour, with the older leaves being the first affected,
- Low protein content of grain and herbage.

Legumes display similar symptoms, and root nodules will be absent or poorly developed.

NITROGEN FERTILISERS

Urea (46% N)

Urea [$\text{CO}(\text{NH}_2)_2$] is manufactured by reacting ammonia (NH_3) with carbon dioxide (CO_2). At 46% N, urea is the most concentrated solid nitrogen fertiliser, thereby reducing freight and application costs. Urea has become the most used nitrogen fertiliser in the world, accounting for around 50% of the total global fertiliser N use. Urea has good storage and handling characteristics, and can be blended with many other fertilisers, including DAP, MAP and Muriate of Potash.

Granular grades of Urea, which are applied dry to the soil, are the most used. Other grades of urea with a smaller particle size so that they dissolve more readily in water are available for application in solution, e.g. in fertigation programs and in the preparation of livestock supplements. These include Tech Grade forms (formerly **Liquifert N** and) **Stockfeed Urea**. A low biuret grade of urea, (formerly **Liquifert Lo-Bi**), is used where foliar sprays of urea are applied on a regular basis in horticultural crops.

Cal-Am®

Ammonium nitrate (NH_4NO_3) contains half its nitrogen in the ammonium form and half as nitrate. It is used for topdressing purposes where the fertiliser cannot be incorporated into the soil, as it is less subject to volatilisation than urea and other fertilisers that contain all their nitrogen in the ammonium form, and in situations where a quick response to nitrogen may be required, e.g. vegetables. The nitrate component is immediately available for plant uptake.

Incitec Pivot does not market straight ammonium nitrate which is classified as a Dangerous Good (Oxidising Agent) and must be transported and stored accordingly. Calcium Ammonium Nitrate (CAN) is imported and marketed as Cal-Am® instead. Cal-Am is comprised of 80% ammonium nitrate and 20% calcium carbonate (CaCO_3) and is not classified as a DG.

Cal-Am is classified as a Security Sensitive product. Farmers wishing to purchase and use it must be licensed to do so. Cal-Am is mainly sold and used in blends with other fertilisers, at concentrations up to 55% (45% ammonium nitrate), that are not classified as Security Sensitive. Ammonium nitrate fertilisers are less popular than urea on account of these restrictions on their use and their higher price per kg of nitrogen. They do not store and handle as well as urea.

Gran-Am® (20.2% N – 24% S)

Gran-Am®, a granulated ammonium sulphate [$(\text{NH}_4)_2\text{SO}_4$] fertiliser is manufactured by reacting sulfuric acid with ammonia. Gran-Am is popular in fertiliser programs where both nitrogen and sulphur (S) are required. It is often used in blends with other nitrogen fertilisers to provide a better balance of N:S (nitrogen:sulphur) than provided by straight Gran-Am. Plants take up about ten times more nitrogen than sulphur.

EASY N® (42.5 % w/v N; 32% w/w N)

A concentrated solution of Urea and Ammonium Nitrate. EASY N® is used where liquids offer convenience or provide easier or more uniform coverage than solids, e.g. fertigation (injection into irrigation water), spray application through a boom, or streamed onto the soil.



APPLICATION

In field crops, nitrogen can be applied prior to planting, at planting, or during the growing season (as side or top-dressing), or a combination of these times can be used. There are limits to how much nitrogen can be safely applied with the seed or planting material, without harming germinating seeds or transplants.

In pastures, nitrogen is normally top-dressed after grazing and before regrowth occurs. In tree crops, nitrogen is normally applied on several occasions during the main growing season. It should be spread evenly over the entire root zone to avoid root burn.

If practical, nitrogen fertilisers should be applied into, or incorporated into the soil shortly after application, e.g. by mechanical means or irrigation, rather than left on the soil surface. In rain grown situations where fertiliser is broadcast on the soil surface, it should be applied when the prospects for rain are good.

SAFETY DIRECTIONS

Refer to the Safety Data Sheet (SDS) for more detailed safety advice. Before use, read the Product Label and the SDS. Use safe work practices and avoid contact with the eyes and skin. Avoid ingestion and inhaling dust. Protective clothing, eyewear and dust masks should always be used when dealing with this product. Observe good personal hygiene, including washing hands after use. Avoid loss of fertiliser to waterways.

WARNING

This document contains information of a general nature. Before using fertiliser seek independent agronomic advice. Fertiliser programs may need to be varied depending on the plants being grown, climatic and soil conditions, application methods, irrigation, agricultural and livestock management practices, the soil's fertility, and cultural practices. ('Unforeseen Elements')

Fertiliser may burn and/or damage crop roots or foliage. Foliar burn to the leaves, fruit or other plant parts is most likely to occur when fertilisers are foliar applied at high concentrations and/or on a regular basis, different products are mixed and sprayed together at cumulatively high rates, the water is of poor quality, or the spray is applied under hot dry conditions, e.g. in the heat of the day.

Fertiliser and supplements may affect animal health. Seek independent advice before using any supplements in livestock rations.

DISCLAIMER

As Unforeseen Elements are beyond the control of Incitec Pivot Pty Ltd, in no event Incitec Pivot Pty Ltd and its related bodies corporate be liable or accept any responsibility whatsoever for any direct, indirect, punitive, incidental, special or consequential damages (including but not limited to loss of revenue, crops and livestock), in respect of the illness, injury or death of a person, damage to property (including of a third party), or any other loss whatsoever arising out of or connected with the use or misuse of this fertiliser, or its transport, storage, handling or application. Where Incitec Pivot Pty Ltd and its related bodies corporate's liability cannot be lawfully excused, it and its related bodies corporate's liability shall be limited to the replacement of, or cost of the fertiliser supplied. The buyer accepts and uses this product subject to these conditions.



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