



Water Solution Fertilizers: An Overview

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Abstract

Presently, it is widely believed that approximately 40% of the world's plant species are at risk of extinction. Interestingly, a mere three crops, namely maize, rice, and wheat, make up half of the global food consumption. With the global population steadily increasing, the agricultural industry acknowledges the difficulties of providing sustenance for people while facing limited arable land. As a result, farmers of all types are actively seeking ways to enhance crop production and yield. One of the valuable tools at their disposal is water-soluble fertilizers (WSFs), which have been utilized for many years. These fertilizers can be dissolved in water and directly administered to plants through drip irrigation and foliar application, thus increasing the efficiency of nutrient usage. Notably, drip irrigation significantly reduces nitrous oxide (N₂O) emissions compared to alternative methods like furrow or sprinkler irrigation. Conversely, foliar application represents a targeted approach where liquid fertilizer is applied directly to the leaves rather than the soil. This technique ensures that nutrients are delivered straight to the plant tissues during critical growth stages. Nevertheless, it is important to recognize that foliar applications supplement soil-fertility programs since the nutrients absorbed through this method are limited and cannot completely replace them.

Introduction

Over the past three years, there has been a steady rise in the global demand for water-soluble fertilizers (WSFs), and this trend is expected to continue with a compound annual growth rate (CAGR) of 4.4% over the next five years. It is projected that by 2027, the market value of WSFs will reach \$20.64 billion. This significant growth can be attributed to the increasing global need for environmentally friendly fertilizers that effectively enhance the absorption of nutrients by crops.

The use of liquid fertilizers offers various advantages, with the most evident being the elimination of the requirement to handle or dilute the substance in its pure form. The process involves placing a large tank strategically in the cultivated field and connecting a pre-programmed fertilizer injector to the



irrigation system. This simplifies the task for growers as it minimizes physical handling of the fertilizer, with the injection pump performing most of the calculations.

Water-soluble fertilizers enable farmers to easily adjust nutrient concentrations according to the changing requirements of the plants throughout their growth cycle. Although working with these fertilizers requires a more hands-on approach, it is widely recognized as highly advantageous from a professional perspective, as it allows for maximum value extraction in a shorter timeframe.

Implementing intensive fertilization across a large area throughout an entire growing season can be costly. However, by applying fertilizer in a soluble form near the plant's root zone, it becomes a more cost-effective method while achieving comparable, if not superior, results. Experienced irrigators possess the knowledge and skills to ensure uniform distribution of the diluted fertilizer through irrigation. With proper care and attention, fertilizer distribution can be perfectly synchronized.

The Importance of Water Quality when using Water Soluble Fertilizers

To ensure the desired outcomes, the irrigator must engage in basic computations to guarantee an even dispersal of fertilizer across the irrigated region. These calculations play a crucial role in maintaining a suitable water pressure differential, ideally around 10%, between the tank's input and output points. This consistent differential is necessary for effective dissolution and unrestricted flow of the salt. Controlling the input and output pressures can be easily achieved by utilizing a valve and dependable pressure gauges. By precisely calculating and strictly adhering to this straightforward procedure, the water-soluble fertilizer can be uniformly distributed over extensive areas within predetermined time frames, with the utmost accuracy. It is essential to recognize that water-soluble fertilizers have a specific limit of solubility, and surpassing the manufacturer's recommended threshold will not improve fertilizer distribution. These outcomes can be achieved regardless of the irrigation method employed, whether it is drip irrigation, sprinklers, or even large-scale open-field cultivation with extensive irrigation pivots.

What are the Core Components in WSFs?

Water-soluble fertilizers contain the crucial macronutrients nitrogen (N), phosphorus (P), and potassium (K), which are necessary for plant development. These fertilizers primarily consist of N-P-K, which are the key elements among the sixteen elements needed for supporting plant life. When



these fertilizers are applied to the leaves, N-P-K act as mobile nutrients that can move both upwards and downwards from the point of absorption. Subsequently, they are transported from the leaves to plant areas with higher demands, such as buds, young leaves, and developing roots.

Nitrogen

Nitrogen is of utmost importance in the formation of essential structural, genetic, and metabolic components found in plant cells. It serves as a fundamental building block for a range of organic substances including amino acids, proteins, nucleic acids, enzymes, and chlorophyll. Among the essential nutrients required for robust crop growth, development, and productivity, nitrogen stands out as the most crucial element.

Phosphorus

Phosphorus is an indispensable element for the growth and development of plants as it serves as a vital nutrient. It is present in several crucial plant compounds and acts as a catalyst in essential biochemical reactions. One of the main roles of phosphorus is to harness solar energy and convert it into valuable compounds that plants can utilize.

Potassium

Potassium plays a crucial role as a necessary macronutrient essential for the overall growth and progress of plants. Plants acquire a considerable amount of potassium from the soil. Its presence within plants leads to several benefits such as increased crop yields, improved quality and nutritional content, and heightened resilience against diseases, insects, cold temperatures, drought, and adverse conditions. Furthermore, potassium plays a vital role in promoting the development of strong and healthy root systems while also enhancing the absorption and utilization of nitrogen and other vital nutrients.

What are the Principal Benefits of applying WSFs?

Water-soluble fertilizers offer various benefits in terms of precise and even distribution of nutrients throughout the growth cycle. This reduces the risk of uneven salt application and potential harm to the cultivated area. Additionally, the use of soluble fertilizers helps minimize fluctuations in soil nutrient



levels. This approach also reduces fertilizer leaching, leading to a smaller environmental impact, while allowing accurate application of trace elements such as boron, copper, iron, molybdenum, manganese, and zinc.

Although water-soluble fertilizers contain small amounts of these micronutrients, they play a vital role in facilitating interactions between macronutrients (the main components of fertilizers necessary for continuous plant growth) and promoting healthy plant development, even in minute quantities. It's worth noting that when applied through foliar application, micronutrients are considered immobile and primarily remain within the leaves without significant movement to other parts of the plant, unlike macronutrients.

What are controlled release fertilizers?

ICL, a renowned global fertilizer manufacturer, offers a diverse range of liquid and water-soluble fertilizers designed to tackle various agricultural issues, including those encountered in public parks, sports arenas, and gardens of all sizes. One of our flagship products is Micromax®, a granulated fertilizer that belongs to the ICL family. Micromax® is formulated to boost plant growth by increasing micronutrient levels in the root zone while optimizing the efficiency of major nutrient programs. Its consistent composition guarantees that each granule contains a comprehensive combination of secondary and micronutrient elements, ensuring uniformity when mixed. The Agrolution range, also from ICL, provides the appropriate nutrient balance for crop growth and comes in different formulations suitable for various water conditions.

Agrolution stands out for its pure ingredients and chelation of trace elements, making it an innovative soluble fertilizer. This makes it particularly suitable for large-scale drip irrigation projects as it significantly reduces the accumulation of limescale in integral drippers, allowing water and fertilizer to flow freely across extensive areas. For fruit and vegetable growers, particularly in greenhouse environments, Solinure water-soluble fertilizer has gained a reputation for consistently delivering excellent results at a low cost per acre. With its complete macronutrient profile and added magnesium, Solinure consistently achieves high-performance outcomes in large-scale crop cultivation. SolinurePolymarine is an inventive range of chloride-free, seaweed-enhanced water-soluble N-P-K fertilizers suitable for all types of crops. The seaweed component aids plants in managing various



stresses, promoting root development, and stimulating vigorous growth throughout all stages of plant growth.

Acknowledging the diverse combinations of crops, climates, and soil conditions, ICL's agronomy team has developed the Nova® portfolio of water-soluble fertilizers. Comprising eleven products, the Nova portfolio provides a comprehensive solution to meet the nutritional requirements of various cultivation scenarios. ICL's global technical support team is available to provide additional assistance to ensure optimal fertilizer usage.

In the field of foliar applications, ICL offers an innovative line-up of liquid and water-soluble fertilizers, including Agroleaf Power, Agroleaf Special, Agroleaf Liquid, Agroleaf Crop, Nutrivant, and a foliar liquid range from Fuentes. Farmers should select the appropriate ICL product formula based on the quality of water used, as they are specifically designed for both hard and soft water conditions.

Liquid fertilizers are suitable for smaller-scale projects in orchards, open fields, and greenhouses, while water-soluble fertilizers excel in large-scale field crop cultivation projects with a short growing season. They are also ideal for applying turf fertilizers in public gardens and sports arenas where consistent coverage is crucial. Regardless of the challenges faced, ICL fertilizers are dependable, sustainable, and environmentally friendly.

What are the Principal Benefits of applying WSFs?

Water-soluble fertilizers provide precise and evenly distributed nutrition throughout the entire growth cycle, reducing the risk of uneven salt distribution and potential harm to cultivated areas. They also help minimize variations in nutrient concentration in the soil and decrease fertilizer leaching, thereby reducing environmental impact. Moreover, these fertilizers enable accurate application of trace elements such as boron, copper, iron, molybdenum, manganese, and zinc.

Although water-soluble fertilizers contain micronutrients in small amounts, they play a vital role in facilitating the interaction between macronutrients and promoting healthy plant growth, even in minute quantities. Unlike macronutrients, micronutrients applied via foliar application stay within the leaves and are not extensively transported to other parts of the plant.

ICL, a prominent fertilizer manufacturer, offers a diverse range of liquid and water-soluble fertilizers tailored to meet the challenges of agriculture, public parks, sports arenas, and home gardens.



Micromax, one of their standout products, is a granulated fertilizer designed to optimize plant growth by enhancing micronutrient levels in the root zone and improving the efficiency of major nutrient programs. The Agrolution range from ICL ensures precise nutrient delivery to crops and prevents the build-up of limescale in drip irrigation systems, ensuring uninterrupted water and fertilizer flow across large areas.

For fruit and vegetable growers, particularly in greenhouse environments, Solinure water-soluble fertilizer consistently delivers professional-grade results at a cost-effective rate per acre. It contains all the necessary macronutrients and a touch of magnesium, promoting high-performance outcomes in large-scale crop cultivation. SolinurePolymarine, another chloride-free water-soluble fertilizer with added seaweed, proves beneficial for all types of crops by helping plants withstand stress, stimulating root development, and fostering vigorous growth.

ICL's Nova portfolio of water-soluble fertilizers provides a comprehensive solution to meet the nutritional requirements of different crops, climates, and soil conditions. With eleven products in the line-up, the Nova portfolio is backed by ICL's global technical support team.

In the field of foliar applications, ICL introduces an innovative portfolio of liquid and water-soluble fertilizers, including Agroleaf Power, Agroleaf Special, Agroleaf Liquid, Agroleaf Crop, Nutrivant, and a foliar liquid range from Fuentes. These products cater to different water qualities, whether hard or soft. Liquid fertilizers are suitable for smaller-scale projects in orchards, open fields, and greenhouses, while water-soluble fertilizers excel in large-scale field crop cultivation projects with short growing periods or when applying turf fertilizers in public gardens and sports arenas, where consistent coverage is crucial.

Conclusion

There is a great opportunity to increase the use of liquid and water soluble fertilizers in horticultural crop production in order to maximize productivity and improve fertilizer efficiency. However, the involvement of research institutes such as ICAR and agricultural universities is limited, and there are no recommendations for water soluble fertilizers in the standard practices for horticulture crops. The use of liquid and water soluble fertilizers holds promising prospects, especially as farmers are increasingly shifting towards high-value crops for greater profitability. While the government



provides assistance for the installation of drip irrigation systems, there is currently no subsidy or financial support for water soluble fertilizers, which is a matter of concern.

Moreover, the Asia Pacific region, including countries like China, India, Thailand, and Australia, is expected to experience significant growth in agricultural yield. Factors such as population growth, rising incomes, and an expanding middle class will drive the demand for food and agricultural products, consequently fueling the expansion of the market for water-soluble fertilizers. The Indian Government's subsidies and agricultural loans, along with the implementation of the "Make in India" policy, will contribute to the growth of the water-soluble fertilizers market in the foreseeable future.

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