

ESSENTIAL ELEMENTS FOR PLANT NUTRITION

"An essential element is defined as one whose absence prevents a plant from completing its life cycle or one that has a clear physiological role"

With the exception of hydrogen, carbon and oxygen, the others described below are essential, as these three are obtained in primary form through water or carbon dioxide (photosynthesis).

The nutrients are classified as primary macro nutrients (N, P, K), secondary macro nutrients (Ca, Mg, S), and micronutrients (B, Cl, Co, Cu, Fe, Mn, Mo, Ni, Si, and Zn). Some authors include Sodium (Na). But currently there are 16 important nutrients for plants.

Plant Nutrition Technology

Several authors and also many agri-related journals already use the term technology in plant nutrition as a kind of new scientific phenomenon.

It is extremely desirable that plant nutrition develops increasingly faster, more efficient, and more balanced techniques of nutritional sources for plants.

Fast, because they must reach, within the natural rules of metabolism of each species of agricultural crop, its objective, and therefore the correct time of mobility and assimilation of a given nutrient.

Efficient, because once a certain nutrient is assimilated, it was certainly accompanied by some chemical compound that helped it in its metabolic route, causing the nutritional destination of any elements to take a shorter path, thus avoiding energy expenditure by the plant.

Balanced, because the costs of nutrient sources are high, and with the competitive demand for cheaper and higher quality food, require that the nutrients are delivered to the field precisely in quantity and volume.

The three plant nutrition techniques described above are also linked to precision agriculture, without which the nutrient supply would not reach the maximum objectives by the developed PNT. to achieve the perfect relationship between cost and benefit for a

sustainable and environmentally viable agricultural production both in the field and at the end of the agro value chain, which is the final consumer's table.

But the concept of PNT (Plant Nutrition Technology) is much broader than the brief introduction above. According to ABISOLO - Associação Brasileira Das Indústrias De Tecnologia Em Nutrição Vegetal (2019, p.12), the plant nutrition technology industry is initially defined as follows: "Plant Nutrition Technology complements the traditional fertilizer industry by adding value with differentiated raw materials and increasing technologies in production processes.

Plant Nutrition Technology is the branch of agribusiness that aims to study, through qualitative and quantitative statistical results, the implications that the fertilizer industries provide through the interactions involved in agricultural production, especially the relationship climate/soil/plant, formulating effective products through research and techniques that promote greater productivity, within the proper management, including the principles of sustainability, generating value to the agrifood chain, culminating with the rapid development of world agriculture.

Such compounds can be chelating products, complexing products, and other additives allowed for an agrochemical (not only fertilizer, be it mineral, organic, organo-mineral, or any other kind of plant stimulants) to have the above characteristics.