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for a good growth

Research | Development | Innovation

PROFESSIONAL TECHNOLOGIES

NUTRI-TOP®

N-GUARD®

TERRAM®

NUTRIFOLIUM®

NĂVODARI CHEMICAL FERTILIZER FACTORY

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NUTRI-TOP®

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THE ROLE OF THE ESSENTIAL NUTRIENTS

To be classified as essential, a nutrient must meet the following criteria:

- The plant should not be able to complete its life cycle without it;
- Its functionality con not be replaced by another element;
- To be directly involved in the growth and the reproduction of the plant.

Element	Source	Role	Concentration in tissues
Carbon (C)	Air	Carbohydrate component - required in the photosynthesis process.	45%
Oxygen (O)	Air / Water	Carbohydrate component - required in the respiration process.	45%
Hydrogen (H)	Water	Carbohydrate component - maintains osmotic balance, participates in biochemical reactions.	5 – 6%
Nitrogen (N)	Air / Soil	Component of amino acids, proteins, chlorophyll and nucleic acids. It sustains the rapid growth and the complete vegetative and productive development of plants.	1-5%
Phosphorus (P)	Soil	Component of proteins, coenzymes, nucleic acids - involved in photosynthesis / energy transfer. It sustains the processes of nutrition, growth, flowering and fruiting.	0,1 – 0,5%
Potassium (K)	Soil	Involved in photosynthesis, carbohydrate translocation and the protein synthesis. It regulates the use of water by its involvement in the stomatal activity - it increases the ability of plants to absorb water and resist to frost and drought. Maintains functional transport / circulatory systems and enhances the intensity of photosynthesis.	0,5 – 1%
Calcium (Ca)	Soil	Structural element of cell walls and membranes. Maintains acid-base balance in cells, binds them together and sustains their proper divisions and elongations (e.g., root length growth, etc.). It protects plants against thermal stress by its involvement in controlling the functionality of stomata and, respectively, by participating in the induction of protein synthesis specific to the thermal shocks. It slows down the aging process and influences the fruit quality.	0,5 - 1%
Magnesium (Mg)	Soil	Soil enzymes activator, component of chlorophyll. Involved in metabolic and enzymatic processes, in the absorption of other nutrients (e.g., phosphorus) and sustains the production of amino acids / proteins.	0,1 – 0,4%
Sulphur (S)	Soil	Component of some enzymes and proteins. Involved in the production of amino acids, vitamins and enzymatic processes.	0,1 – 0,4%
Chloride (Cl)	Soil	Involved in the oxygen production and photosynthesis. Involved in the elongation of root and leaf cells, the growth of fresh and dried biomass, and the use of CO_2. Enhances the efficient use of water and nitrogen.	0,01 – 0,1%
Iron (Fe)	Soil	Involved in the synthesis of chlorophyll and the electron transfer, in respiratory processes, in the synthesis of hormones and in the assimilation of some nutrients, nitrogen metabolism, as well as in the formation of carbohydrates.	50 – 250 ppm

Manganese (Mn)	Soil	Controls oxidation, reduction and photosynthesis processes. Accelerates and improves seed germination. It is involved in the metabolism of carbohydrates, nitrogen and in the absorption of iron, carotene and vitamin C - it combines with iron, copper and zinc to ensure hormonal balance.	20 – 200 ppm
Boron (B)	Soil	Involved in sugar translocation and carbohydrate metabolism. Essential role in cell divisions and elongations and in calcium translocation, pollen viability, fruiting and seed formation.	6 – 60 ppm
Zinc (Zn)	Soil	Involved in the enzymatic activity, synthesis of hormones (auxin) and nucleic acids. Play an important role in the protein synthesis, the carbohydrate metabolism (increases the soluble sugar content) and in the absorption and efficiency of water use.	25 – 150 ppm
Copper (Cu)	Soil	Enzyme component - catalyst of the respiration process. Involved in photosynthesis and water transport in tissues.	5 – 20 ppm
Molybdenum (Mo)	Soil	Involved in nitrogen fixation, transformation of nitrate into ammonium in the plant, protein synthesis, enzymatic processes, phosphate and iron metabolism.	0,5 – 0,2 ppm
Nickel (Ni)	Soil	It sustains the operation of urease and seed germination	0,1 – 1 ppm

Most of the published scientific research shows that, in all the cropping environments, whether we are talking about open field agricultural land or the protected areas, the nutrients have a low availability and are often deficient to ensure the optimized vegetative and productive growth. While the total amount of soil nutrients is increased by the annual application of fertilizers, the efficient uptake of nutrients by the roots is a critical issue, considering the fact that their availability is governed by a wide range of physical and chemical soil parameters, the environment conditions, and the multiple biological interactions that are determining important biochemical changes in the rhizosphere.

The competition for an efficient soil exploration among different species of cultivated plants and weeds, among different root systems and microorganisms is significant - the growth rate of roots and the plasticity of the root architecture along with the development of the rhizosphere (through root growth or through the expanding root hairs) are obviously important for the interception and the efficient absorption of the nutrients.

For the nutrients available in low concentrations in the soil solution and / or that have low diffusivity (phosphorus, either as $HPO4^{2-}$ or H_2PO^4 and micronutrients, such as Fe and Zn), the root growth and proliferation in new soil regions and the release of root exudates are of particular importance, while for the nutrients available in high concentrations (K^+, NH^{4-}) or with higher diffusion coefficients (NO_3, SO_4 and Ca^{2+}) that are able to move freely to the root, the distribution of the root and its architectural features that facilitate the absorption of water and nutrients are very important.

INTERDEPENDENCES OF SOIL NUTRIENTS

The quartet of the soil cations (calcium, magnesium, potassium and sodium) is the primary example of the interdependency between soil nutrients, being as well both productive and destructive.

Thus, excessive amounts of potassium can reduce the absorption of magnesium, while high amounts of potassium can replace plant calcium creating multiple problems, and excess sodium can replace potassium, generating another set of inherent problems.

The calcium / magnesium ratio is the most important nutrient ratio in soil fertility management, because the soil structure, the nutrient availability and the biological activity are all governed by the relative balance between this pair of elements.

The iron / manganese ratio: iron chlorosis often occurs when iron levels in the leaf analysis results fall below 50 ppm or when manganese exceeds iron levels twice or more. In soil analysis, iron should always be higher than manganese to avoid potential iron blockage.

The calcium / boron ratio: in the scientific literature there are many opinions on the partnership / interdependence between these two elements, but one of them mentions: "Calcium is the truck of all minerals, and boron is its driver". Boron can be toxic in the absence of enough calcium. The synergy between this pair of nutrients is such that, ideally, their deficiencies should be addressed together.

The phosphorus / magnesium ratio: phosphorus is often taken up by plants as a magnesium compound, so, in some cases magnesium can attenuate phosphate deficiency more effectively than the applied phosphate.

The phosphorus / zinc ratio: there is a very strong interdependence between phosphorus and zinc.
Excess phosphorus will invariably reduce the absorption of zinc, and excess zinc will have the same effect on phosphorus. The ideal phosphorus / zinc ratio is about 10: 1 in favor of phosphorus.

The molybdenum / nitrogen synergy: the nitrogen-fixing bacteria cannot fix atmospheric nitrogen in the soil without an adequate molybdenum content.

In order to make more efficient use of the available soil nutrients and maximize the yields, we recommend complex soil analysis on small predetermined control areas identified by GPS devices or thorough standard agrochemical and pedological mapping and analysis when aiming to implement variable rate fertilization (with sampling modules in this case of 1-2 ha).

A proper professional fertilization plan must take into account:

- **Specific nutrient consumption in kilograms of active ingredient**
  per ton of yield for each one of the cultivated species
  (to determine the previous crop nutrient export and / or the estimated yield).
- **The level of soil** nutrient supply resulted from soil analysis
  (total amount of nutrients in the soil vs. the amount of mobile / available nutrients).
- **Crop's ability to assimilate nutrients**
  according to each of the cultivated species rooting system and the soil's reaction (pH value).
- **Recommended type of fertilizer / method of application / time of application**.

Crop	Product	Yield (tons)	Export of nutrients per ton of product				
			N	P_2O_5	K_2O	SO_3	MgO
Autumn oilseed rape	Seeds (kg/t)	4	35.0	18.0	12.0	10.0	3.5
	Vegetative tissues (kg/t)	5	15.0	6.0	30.0	20.0	3.0
	Total exported (seeds & vegetal)		**215.0**	**102.0**	**198.0**	**140.0**	**29.0**
Wheat	Grains (kg/t)	8	20.0	8.0	5.0	4.5	1.9
	Straw (kg/t)	8	9.0	2.5	20.0	6.5	0.9
	Total exported (grains & straw)		**232.0**	**84.0**	**200.0**	**88.0**	**22.0**
Barley	Grains (kg/t)	6	20.0	8.0	6.5	4.5	1.5
	Straw (kg/t)	6	8.5	2.6	20.0	5.5	0,5
	Total exported (grains & straw)		**171.0**	**63.6**	**159.0**	**60.0**	**13.5**
Maize	Grains (kg/t)	10	12.0	6.0	5.0	4.0	1,3
	Vegetative tissues (kg/t)	8	9.0	2.7	19.5	3.5	1,2
	Total exported (seeds & vegetal)		**192.0**	**81.6**	**206.0**	**68.0**	**22.6**
Sunflower	Seeds (kg/t)	4	26.0	11.0	10.0	6.5	4,5
	Vegetative tissues (kg/t)	3	20.0	4.0	17.0	6.5	4,5
	Total exported (seeds & vegetal)		**164.0**	**56.0**	**91.0**	**45.5**	**31.5**
Sugar beet	Roots (kg/t)	60	1.8	1.0	3.7	0.7	0,4
	Vegetative tissues (kg/t)	40	3.5	2.0	9.5	0.7	0,7
	Total exported (roots & vegetal)		**248.0**	**140.0**	**602.0**	**70.0**	**49.0**
Potato	Tubers (kg/t)	45	2.8	1.5	6.0	0.5	0,3
	Vegetative tissues (kg/t)	15	2.2	0.8	3.5	0.6	0,4
	Total exported (tubers & vegetal)		**159.0**	**78.8**	**322.5**	**36.0**	**18.8**

WHAT IS NUTRI-TOP TECHNOLOGY?

Developed by Cich throught specific research, development and innvation activities,

THE NUTRI-TOP TECHNOLOGY:

1. OPTIMIZE THE NITROGEN'S AVAILABILITY AND ABSORPTION IN THE INITIAL VEGETATIIVE STAGES

NUTRI-TOP TECHNOLOGY is based on the DCD nitrification inhibitor for the stabilization, complete assimilation and optimization of the availability of NH_4^+ (ammoniacal nitrogen) in the initial vegetation stages, for a period of 4 to 6 weeks (depending on the amount of the applied mineral nitrogen and the soil's temperature), without losses and negative impact on the environment.

DCD (dicyandiamide) has a bacteriostatic effect on the population of nitrifying bacteria Nitrosomonas - the bacteria are not completely killed even on successive applications, but their activity is suppressed or inhibited for a certain period of time. DCD is completely biodegradable and leaves no residue in the soil.

Nitrogen is present in the soil in both the organic and inorganic forms, being characterized by its seasonal changes in availability and respectively by an inhomogeneous distribution on the soil profile and between its various "basins / reservoirs". The availability of the nitrogen forms is influenced by the nitrogen's fixation reactions (symbiotic and / or potential through diazotrophic microorganisms) and by microorganism-mediated transformations between different basins, aspects of important and significant implications for the plant growth and soil's nitrogen losses.

Soil temperature	Urea hydrolysis in NH_4^+ (ammonium N)	Soil temperature	Nitrification of NH_4^+ (ammonium) into NO_3^- (nitrate)
2 degrees C	4 days	5 degrees C	6 weeks
10 degrees C	2 days	10 degrees C	2 weeks
20 degrees C	1 day	20 degrees C	1 week

The mineralization of the organic forms of nitrogen in ammonium (NH_4^+) as well as its subsequent nitrification to nitrates (NO_3^-) have a major significance for the availability of the nitrogen, directly influencing the behavior of the root system and the dynamics of the rhizosphere.

Although it is believed in the literature that mineral forms of nitrogen dominate in the plant nutrient absorption, there is research showing that the soluble organic forms, such as amino acids and other low molecular weight compounds, may play an important role in absorption and, consequently, in nutrition.

Of particular significance in the rhizosphere is the effect of the absorption of various forms of nitrogen on the soil's reaction (pH values) in the immediate vicinity of the root and, subsequently, the influence of changing the soil's reaction on the uptake of other nutrients such as phosphorus, zinc, manganese and iron.

Changes in the soil's reaction in the rhizosphere caused by the absorption of protons (H^+) that occurs along with the absorption of NO_3^-, or by the release of protons for the absorption of ammonium NH_4^+ can also bring changes in the nature / typology of substrates and the amount of the root exudates, and, consequently, may have a major impact on the structure of the microbial community around the root system.

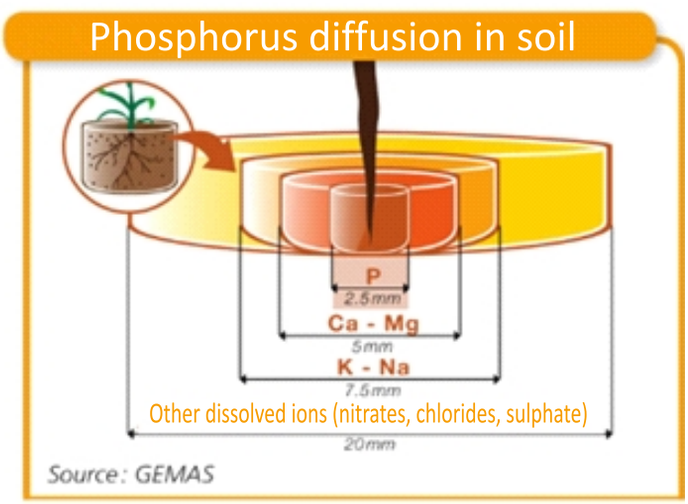
Both forms of nitrogen NO_3^- and NH_4^+ reach the root surface through a combination of mass flow and diffusion, respectively - nitrate is mobile and potentially able to move in the soil by up to a few mm per day, while ammonium is less mobile because it is easily adsorbed on soil cation exchange sites, having lower rates for both mass flow and diffusion. However, diffusion and mass flow are the main pathways for inorganic nitrogen uptake - although it is difficult to differentiate the nitrogen diffusion from the root interception, it is generally considered that the interception of the nitrogen in the soil's solution by root extensions accounts for only a small percentage of the total nitrogen absorbed by plants.

The uptake by plants of the NO_3^- and NH_4^+ nitrogen forms is dependent on their concentrations in the soil / soil's solution, on the root distribution, soil's moisture and the plant's growth rates - the growth rate is important on the available nitrogen intake, while the concentration of the mineral nitrogen in the soil and the distribution of the root are critical in nitrogen limited availability conditions. While some species of plants prefer absorbing one or the other form of nitrogen, NO_3^- or NH_4^+, in the case of agro-ecosystems in open field conditions, the importance of this aspect is diminished - the concentrations of both forms of nitrogen in the soil along with the development stage of the plant significantly influence their absorption.

2. OPTIMIZE THE PHOSPHORUS AVAILABILITY AND ITS ABSORBATION FOR THE WHOLE CROP PRODUCTION CYCLE

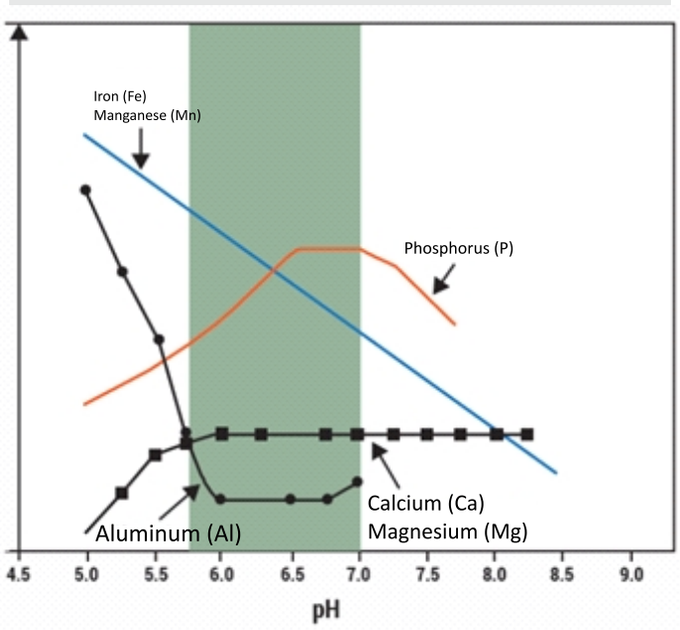
Phosphorus (P) is considered to be the second most important mineral nutrient in the agricultural production. An adequate amount of P during the initial development stages is essential for the initiation and the growth of the rooting system and the reproductive primordia of plants.

Although quite present in soils in its total organic and inorganic forms, phosphorus is the least available element to plants due to its fixation in most soils and its slow diffusion. Therefore, phosphorus can be a major limiting nutrient for plants during the critical and peak consumptive stages in many soils around the world.



Plants get phosphorus from the soil solution in the form of orthophosphate anions (predominantly as HPO_4^{2} and H_2PO^{2-}). The orthophosphates concentration in the soil's solution is low and therefore phosphorus needs to be supplemented from another "reservoir" to meet plant requirements. Orthophosphates deplete rapidly in the immediate vicinity of the plant roots and, consequently, a gradually different concentration of phosphorus is found in the rhizosphere, compared to the roots surface - for most soils the diffusion rate of orthophosphate is insufficient to ensure nutrition in "localized" areas, which, in most of the cases, limits the absorption of phosphorus.

However, there is also research that, based on the published results, suggests that the plants are well adapted for low phosphorus uptake and argue that the rate / capacity of phosphorus uptake at the root surface is unlikely to be limiting the plant's growth — thus, the ability of roots to exploit new soil regions, change the soil's reaction, emits root exudates and form associations with microorganisms are of greater importance for the acquisition of phosphorus than its associated kinetics in soils.



Conventional phosphorus (P) based fertilizers do not achieve their goal, given the high reactivity of phosphate ions to the other's soil solution's components - after the application of conventional P fertilizers, their efficiency is low resulting in insufficient concentrations of available phosphorus (P) compared to the optimal requirements of each of the crops.

In acidic soils, phosphorus (P) forms insoluble complexes with iron (Fe) and aluminum (Al) hydroxides (Fe and Al phosphates) and, in basic soils rich in limestone, it reacts with calcium (Ca) to form (by its retrogradation) dicalcium phosphate or tricalcium phosphate, thus becoming unavailable to crops.

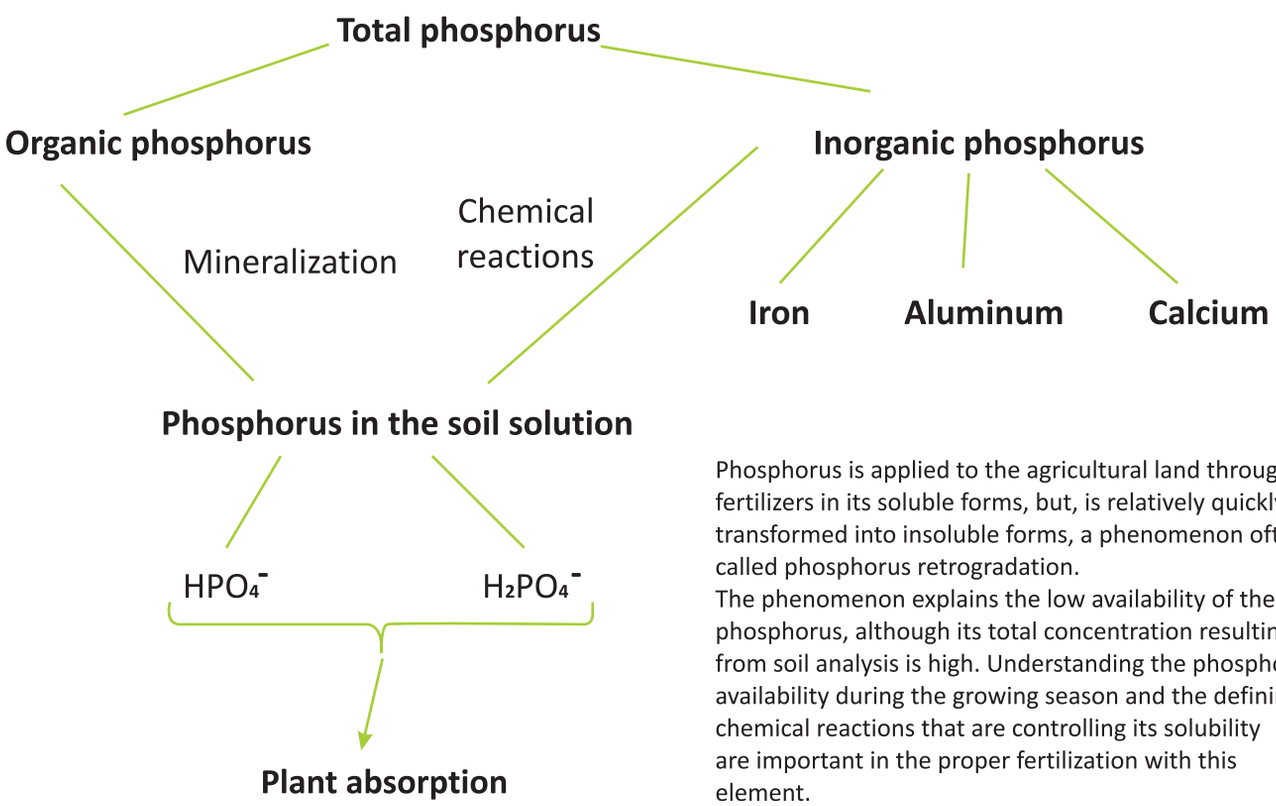
The best availability of phosphorus in the soil's solution can be recorded in the pH range of 6.5 - 7.

NUTRI-TOP TECHNOLOGY is based on a new generation polymer, with a specific molecular structure that determines a high cation exchange capacity. The polymer binds preferentially to metal cations such as aluminum and iron and, with calcium on acidic and respectively on alkaline soils, including the neutral soils.

This binding mechanism protects the phosphorus present in the CICh fertilizer granules from the retrogradation / blocking phenomena. Therefore, phosphorus (P) will be available to crops during the critical and peak consumption stages, with a performance that tends to double the phosphorus efficiency and dynamics per the applied units throughout the whole growing season compared to the conventional P fertilizers.

According to the soil analysis performed by CICh in accredited laboratories from Romania and the European Union, the soils generally have a high amount of total nutrients. In the case of phosphorus, on alkaline soils with low organic matter content, even extreme values of up to 700 times higher total phosphorus than the available phosphorus are highlighted in the soil - the results show that, from the conventional NP / NPK annually applied fertilizers, only a small ratio of 5 - 25% of their phosphorus content is available to be taken up by plants during the growing season, both on acidic and alkaline soils, with values often below the crop requirements including on the neutral soils.

Sample no. / Specification	P 1	P 4	P 5	P 6	P 7	P 9	P 10	P 11	P 13	P 16	P 17
pH	7,5	**8,3**	8,2	8,2	**6,7**	6,8	6,4	**5,9**	6,0	6,2	6,1
Available phosphorus (ppm)	7	**4**	6	6	**17**	28	19	**16**	30	10	18
Total phosphorus (ppm)	328	**2896**	240	357	**990**	570	487	**489**	439	339	421
Magnesium (ppm)	263	205	108	154	207	186	371	355	222	323	347
Calcium (ppm)	4711	3732	2984	4201	3827	3752	3507	3134	1961	2816	3113
Iron (ppm)	188	37	35	57	203	296	356	367	479	315	323
Organic matter (%)	2,2	1,3	0,8	2,6	2,8	2,5	3,2	3,9	2,0	2,2	2,7

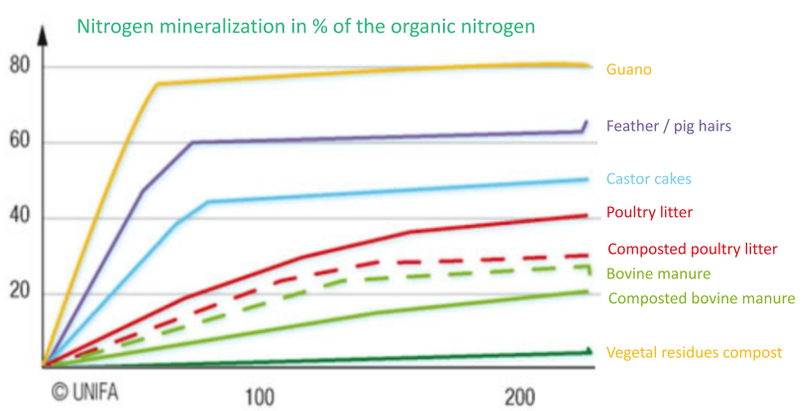


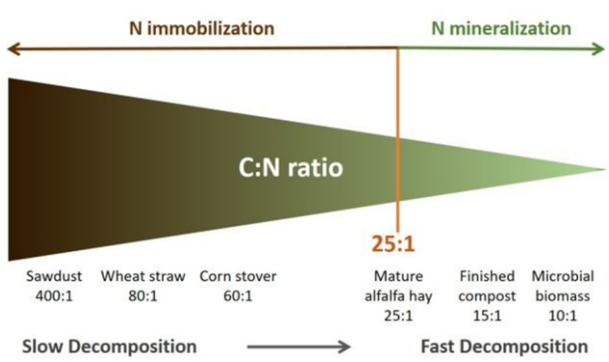
Phosphorus is applied to the agricultural land through fertilizers in its soluble forms, but, is relatively quickly transformed into insoluble forms, a phenomenon often called phosphorus retrogradation.
The phenomenon explains the low availability of the phosphorus, although its total concentration resulting from soil analysis is high. Understanding the phosphorus availability during the growing season and the defining chemical reactions that are controlling its solubility are important in the proper fertilization with this element.

3. OPTIMIZE THE SOIL'S STRUCTURE AND WATER RETENTION, THE CROP'S ABSORPTION OF THE TRACE ELEMENTS, SUSTAIN AND STIMULATE THE SOIL MICROBIAL ACTIVITY AND IMPROVE THE MINERALIZATION OF PLANT RESIDUES.

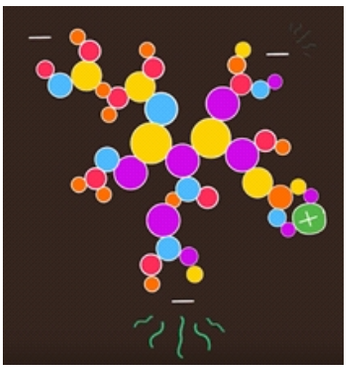
THE NUTRI-TOP TECHNOLOGY is an important source of nutrients, amino acids, vitamins and organic carbon for plants and energy source for soil's organisms (algae, bacteria, mycorrhizae, etc.) that support important functions, such as improving the natural fertility and physical and mechanical properties of the soil (structure, color, consistency, drainage and aeration, etc.) the growth and balanced development of plants and the induction of their resistance against various pathogens. Last but not least, the improved microbial activity of the soil leads to a faster and better decomposition / mineralization of plant residues.

Biota	Function	Contribution to the ecosystem
Ants	Infiltration, Homogenization of organic matter	Increase nutrient availability, seed dispersal
Earthworms	Infiltration, Decomposition of plant residues and redistribution of nutrients	Increase nutrient availability, reduce losses through surface runoff
Beetles (dung beetles)	Incorporation into the soil of plant / organic matter debris / residues	Soil restructuring, carbon retention, increased nutrient availability
Bacteria	Nitrogen fixation	Increase nitrogen availability
	Nitrogen (N) mineralization	Increase the availability of mineral nitrogen forms (NH_4^+ and NO_3^-)
	Mineralization of phosphorus (P) and sulfur (S)	Increase availability of phosphorus and sulfur
	Molecular signaling systems	Control a number of pathogens
	Production of antibiotics and / or probiotics	Protect against pathogens by suppressing root-borne diseases
	Hormone production	Support for root growth for improved absorption of water and nutrients
	Degradation of pesticides	Reduction of pesticide accumulations in ecosystems (plant and animal toxicity)
	Fe and Zn chelation	Improve Fe and Zn nutrition
	Polysaccharide production	Soil structuring and water retention - reducing soil erosion
Fungi	Filaments / hyphae growth	Improve soil structure and aeration - reduce erosion
	Glomalin production - mycorrhizal fungi	Improve soil structure and water retention capacity - reduce erosion
Bacteria and fungi	Decomposition of cellulose and lignin	Decomposition of plant debris and carbon retention / transfer

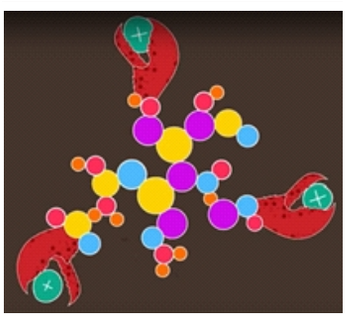




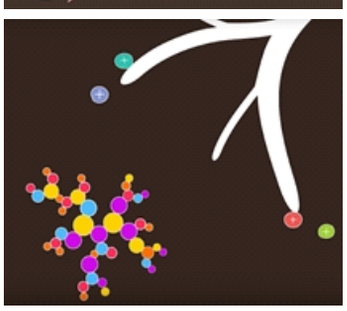
THE NUTRI-TOP TECHNOLOGY is also based on the major impact of the humic extracts in increasing the soil's water retention capacity, soil's structuring and on the soil's physical and chemical properties such as soil exchange and buffering capacities - properties that are of particular importance not only in terms of the control of the absorption of nutrients by plants and their retention in the soil, but also in minimizing the harmful impact of the soil's acidity and / or salinity.



There is conclusive evidence in the scientific literature that, when incorporated into fertilizers, some of the organic substances derived from humic extracts such as the humic and fulvic acids, vitamins and amino acids, have a positive effect on the bioavailability of nutrients, the balanced growth and development of plants and, implicitly, on the maximization of the agricultural productions.

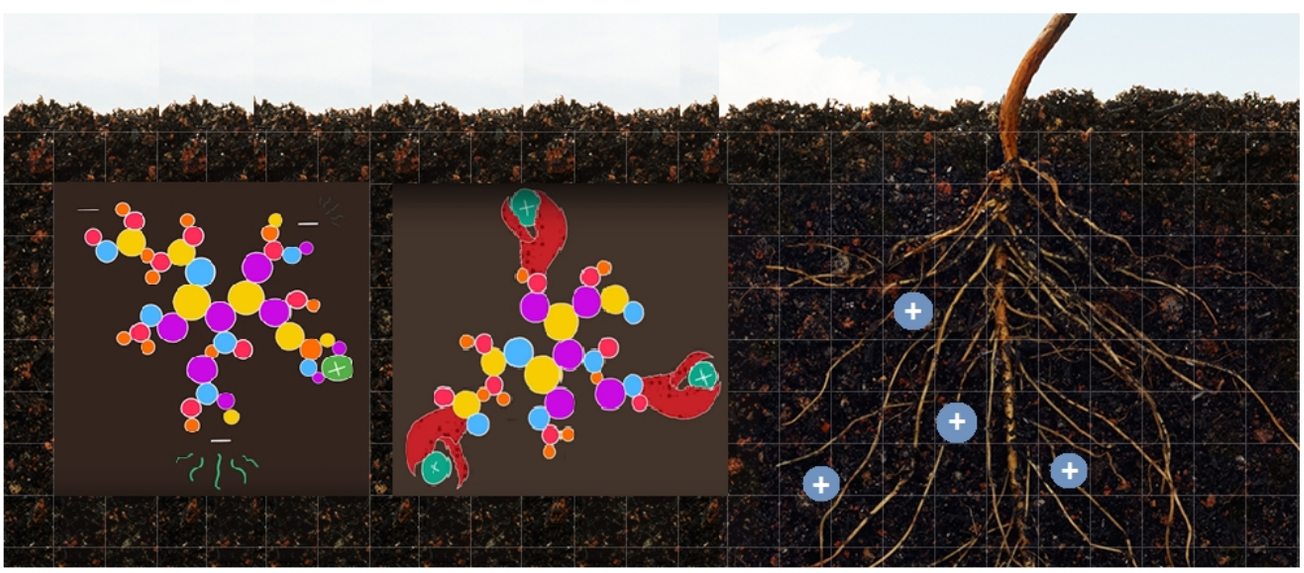


Through their specific colloidal activity, humic acids increase the storage capacity of nutrients and water (the ability of humic acids to retain water in the root area is about seven times greater than that of the clay particles) and buffer the soil's reaction in the surrounding area of the applied fertilizer granules making available the ”blocked” soil nutrients – this way it is additionally ensured the insolubility of toxic aluminum (Al) compounds that will no longer be absorbed into the plant structures, and the metal compounds such as Fe, Cu, Zn, Mg, Mn become more accessible to plants and are used as trace elements.



Fulvic acids improve the permeability of the plant membranes and optimize the use of nutrients by "chelating" them into organic forms much easier to be absorbed by the root system - through the synergistic effect, humic and fulvic acids stimulate and support germination, seed viability and uniform crop growth

THE CICH NPK NUTRI-TOP range of products favor and sustain the rapid growth and development of the root mass, especially in length, optimizing the nutrient uptake from the applied fertilizers throughout the whole growing season - thus preventing deep nutrient losses by leaching. With respect to the impact of the humic substances on the growth of the rooting system, it was concluded in the scientific literature that the rooting systems that benefited from applications of humic substances or found a soil rich in humic substances, were 20-50% more developed.



NUTRI-TOP 80

CHEMICAL COMPOSITION

P_2O_5 20% + 32% SO_3 + 28% CaO

MAIN MACROELEMENTS	SECONDARY MACROELEMENTS	TRACE ELEMENTS
20% P_2O_5	32% SO_3, 28% CaO	

TECHNOLOGY

AMESAL, Humic extracts (organic carbon, humic and fulvic acids, amino acids).

NUTRI-TOP CEREALFOS

CHEMICAL COMPOSITION

P_2O_5 40% + 10% SO_3 + 22% CaO
+ MgO 0,5% + Fe 0,3% + Zn 0,03%

MAIN MACROELEMENTS	SECONDARY MACROELEMENTS	TRACE ELEMENTS
40% P_2O_5	10% SO_3, 22% CaO	0,5% MgO, 0,3% Fe, 0,03% Zn

TECHNOLOGY

AMESAL, Humic extracts (organic carbon, humic and fulvic acids, amino acids).

NUTRI-TOP PERFORMANCE NP 5.30

CHEMICAL COMPOSITION

N 5% + P_2O_5 30% + SO_3 15%
+ CaO 6% + MgO 0,65% + Fe 1,65%
+ B 0,05% + Mn 0,04% + Zn 0,01%

MAIN MACROELEMENTS	SECONDARY MACROELEMENTS	TRACE ELEMENTS
5% N, 30% P_2O_5	15% SO_3, 6% CaO, 0,65% MgO	1,65% Fe, 0,05% B, 0,04% Mn, 0,01% Zn

TECHNOLOGY

NGOOO, AMESAL, Humic extracts (organic carbon, humic and fulvic acids, amino acids).

NUTRI-TOP COMPLEX

NPK 4.20.10

CHEMICAL COMPOSITION

N 4% + P_2O5 20% + K_2O 10% + SO_3 12%
+ CaO 12% + MgO 1% + Fe 0,1% + B 0,07%
+ Mn 0,07% + Zn 0,05% + Cu 0,02%

MAIN MACROELEMENTS	SECONDARY MACROELEMENTS	TRACE ELEMENTS
4% N, 20% P_2O_5, 10% K_2O	12% SO_3, 12% CaO, 1% MgO	0,1% Fe, 0,07% B, 0,07% Mn, 0,05% Zn, 0,02% Cu

TECHNOLOGY

NGOOO, AMESAL, Humic extracts (organic carbon, humic and fulvic acids, amino acids).

NUTRI-TOP SPECIAL NPK 4.12.24

CHEMICAL COMPOSITION

N 4% + P_2O_5 12% + K_2O 24% + SO_3 12%
+ CaO 7,6% + MgO 0,34% + Fe 0,5%
+ B 0,01% + Mn 0,01% + Zn 0,01%

MAIN MACROELEMENTS	SECONDARY MACROELEMENTS	TRACE ELEMENTS
4% N, 12% P_2O_5, 24% K_2O	12% SO_3, 7,6% CaO, 0,34% MgO	0,5% Fe, 0,01% B, 0,01% Mn, 0,01% Zn

TECHNOLOGY

NGOOO, AMESAL, Humic extracts (organic carbon, humic and fulvic acids, amino acids).

import

POTASSIUM SULPHATE

CHEMICAL COMPOSITION

K_2O 50% + SO_3 45%

MAIN MACROELEMENTS	SECONDARY MACROELEMENTS	TRACE ELEMENTS
50% K_2O	45% SO_3	

CICh®

for a good growth

Research Developement Innovation

for 10 YEARS

Cich Romania has been for the last 10 years the only N-Guard controlled-release fertilizers producer in Europe.

N-GUARD®

DIFFERENCES BETWEEN INHIBITORS *	N-GUARD	NBPT	NPPT	DMPP	DCD	NITRAPYRIN
RELEASE DATE	2011	1970/1980	2006	2001	1960/1970	1960/1970
FORMULATION	LIQUID	POWDER/ LIQUID/ SOLID (WHITE)	POWDER (WHITE)	SOLID	SOLID (COLORLESS)	CRYSTALLINE SOLID (COLORLESS)
COMPOUND	VEGETAL EXTRACTS	ORGANO-PHOSPHOROUS	ORGANO-PHOSPHOROUS	PHOSPHATE SALT	CYANAMIDE / CYANO-GUANIDINE	CLOROPYRIDINE
FORMULA		$C_4H_{14}N_3PS$	$C_3H_{12}N_3PS$	$C_5H_{11}N_2O_4P$	$C_2H_4N_4$	$C_6H_3Cl_4N$
REQUIRE SOIL INCORPORATION	✗	✗	✗	✗	✗	✓
VOLATILISATION PROTECTION	✓	✓	✓	✗	✗	✗
NITRIFICATION PROTECTION	✓	✗	✗	✓	✓	✓
PROTECTION BETWEEN 0-20 DAYS	✓	✓	✓	✓	✓	✓
PROTECTION BETWEEN 0-40 DAYS	✓	✗	✗	✓	✓	✓
PROTECTION BETWEEN 0-110 DAYS	✓	✗	✗	✗	✗	✗
REPELLENT OF NEMATODES	✓	✗	✗	✗	✗	✗
REPELLENT OF INSECTS (trips larvae, flies, moths, etc.)	✓	✗	✗	✗	✗	✗
BIOCIDAL BEHAVIOR	✗	✗	✗	✓	✓	✓
SUSTAINS ACTIVE BACTERIA DEVELOPMENT	✓	✗	✗	✗	✗	✗
SUSTAINS ACTIVE FUNGI DEVELOPMENT	✓	✗	✗	✗	✗	✗
USED ALONG WITH SEEDING WITHOUT GERMINATION ISSUES	✓	✓	✓	✓	✓	✗

TECHNOLOGY

* information from the specific literature

N-GUARD TECHNOLOGY
SOIL MICROBIOLOGY ANALYSIS RESULTS

To ensure their growth and development, plants rely during their cropping cycle on the support of the soil beneficial microorganisms, which play an essential role in the decomposition of organic matter and mineralization of nutrients. Being actively involved in the research and development of fertilizers with state-of-the-art technologies that maintain and improve the soil quality, CICh ROMANIA demonstrates through the analysis performed on the soil microbiological activity, the positive impact of the N-GUARD technology:

GV1D – FERTILIZED WITH UREA NG AUTUMN AND SPRING SPLIT APPLICATION	
Total Bacteria (µg/g)	**998**
Total Fungi (µg/g)	**225**
Active Bacteria (µg/g)	**20.1**
Active Fungi (µg/g)	**17.6**
Hypal diameter (µm)	2.89
Active Fungi / Active Bacteria	**0.88**

GV2D FERTILIZED WITH NG SPRING SINGLE DOSE	
Total Bacteria (µg/g)	**531**
Total Fungi (µg/g)	**183**
Active Bacteria (µg/g)	**22.9**
Active Fungi (µg/g)	**26.0**
Hifal diameter (µm)	2.87
Active Fungi / Active Bacteria	**1.14**

GVMD NON-FERTILIZED CONTROL	
Total Bacteria (µg/g)	**651**
Total Fungi (µg/g)	**217**
Active Bacteria (µg/g)	**16.9**
Active Fungi (µg/g)	**12.6**
Hifal diameter (µm)	2.92
Fungi Activi / Bacterii Active	**0.74**

The results of the research carried out within the technical department of CICh ROMANIA on the impact of the use of N-GUARD professional technology on soil microbiology, highlighted the following:

- **total bacteria and fungi biomass** is high in all the tested variants, with values well above the optimal limits. It should be noted, however, that the application of **UREA NG** in fractionated / split doses during vegetation, respectively one third at the beginning of winter and two thirds at the beginning of March 2020, shows, after harvest, values of the microorganism biomass over 50% higher compared to the non-fertilized control.

- **the values of the active bacteria and active fungi** are low on the control / **non-fertilized soils**, compared to the soils on which **N-GUARD** technology was used, indicating that in non-fertilized soil, the activity of anaerobic microorganisms is predominant. It is preferable that the activity of aerobic microorganisms to prevail, so as to maximize the mineralization of the plant residues and thus the decomposition of simple carbon compounds, thus ensuring the soil retention and continuous supply of nutrients to crops. The positive impact of the activity of aerobic microorganisms in soil restructuring should not be neglected.

- **the recorded values of the active fungi / active bacteria** ratio indicate that, when using the N-GUARD technology, the balanced development of both bacteria and aerobic fungi is stimulated - values close to 1 are preferred.

NG TECHNOLOGY vs. CONVENTIONAL NITROGEN FERTILIZED CONTROL FOR MAIZE CROP

Determination / Specification	Reference LIMITS	CICh 1		Control		CICh 2	
		Available elements	TOTAL (mg/kg)	Available elements	TOTAL (mg/kg)	Available elements	TOTAL (mg/kg)
pH	6.5	6.1		6.4		6.5	
N (mg / kg)	-	-	2098		2357		1891
Phosphorus (ppm)	16	12	488	12	534	7	472
Potassium (ppm)	121	283	6572	284	6777	198	6221
Organic matter (%)	3.00	3.9	-	4.2	-	3.1	-
Potentially mineralizable nitrogen (kg N / ha)	-	5.8	-	43	-	55	-
Microbial biomass (mg / kg)	-	2076	-	1482	-	1834	-
C: N Ratio	10-12	10.8	-	10.2	-	9.5	-
Total nitrogen (%)	-	0.210	-	0.240	-	0.190	-
CO_2 -C (mg / kg)	> 70	93	-	66	-	82	-
Organic carbon (%)	-	2.3	-	2.4	-	1.8	-

Research performed on the professional N-GUARD technology use in maize cultivation compared to control areas fertilized with conventional nitrogen fertilizers, showed that the N-GUARD technology positively influences the soil's microbiology, resulting in a significant increase of the microbial biomass, ranging between 20-40% (soil analysis methodology based on the measurement of CO_2 content, mainly resulted from the microflora respiration).

NG TECHNOLOGY FERTILIZATION OF RAPESEED CROP

Determination / Specification	Reference LIMITS				
		Available elements	TOTAL (mg/kg, ppm)	Available elements	TOTAL (mg/kg, ppm)
pH	6.5	6.0		5.9	
N (Kg/ha) N- NH_4 (ppm) N- NO_3 (ppm)	-	21 1.6 5.4	 130	38 4,0 8,6	 1170
Phosphorus (ppm)	16	26	510	24	506
Potassium (ppm)	121	266	6031	239	5528
Potentially mineralizable nitrogen (kg N / ha)	-	46	-	81	-
Microbial biomass (mg / kg)	-	1768	-	3528	-
C: N Ratio	10-12	11.6	-	13.1	-
Total nitrogen (%)	-	0.130	-	0.120	-
CO_2 -C (mg / kg)	> 70	79	-	159	-
Organic carbon (%)	-	1.5	-	1.6	-

Soil analysis performed in rapeseed crop plots before the application of the N-GUARD technology (single spring dose) and immediately after harvest, show a significant increase (almost double) in the amount of potentially mineralizable nitrogen and in the activity of the soil microorganisms, as well as an improved retention of the organic carbon into the soil.

It is also interesting that NUTRI-TOP and N-GUARD technologies ensure particularly high utilization coefficients of the active ingredients from the applied fertilizers - the yields obtained in this case were achieved practically without significant changes in the available and total phosphorus soil content.

RATIONAL FERTILIZATION GENERAL PRINCIPLES

- **Fertilization must be carried out in a controlled manner** so to ensure the optimal use of the available soil nutrients and of the applied mineral and organic fertilizers;
- A good agricultural practice is considered **to adapt the fertilization and its timing** to the specific cultivars, the fertilizer's enclosed technology and to the soil's properties;
- **Rational fertilization - for a crop to reach a quantitative and qualitative high yield level**, in favorable environmental conditions, it must have available throughout the growing season all the necessary mineral nutrients in appropriate quantities and ratios;
- **Soil is the main source of water and plant nutrients;**
- **The soil's natural fertility level can decrease** if the cropping technologies are incorrect or, it can increase, if the cultivation technologies are adequate and meant to improve its chemical, physical and biological properties;
- **It is essential to draw up a fertilization plan corresponding to the technological level of each agricultural holding;**
- **Nitrogen (N) is, by excellence, a nutrient specific to plant growth and development;**
- Due to the nitrogen's behavior (high mobility) in the soil, it is compulsory that the fertilization management of this nutrient and the cultivation techniques that influence its dynamics in the soil, to be conducted such way **to minimize soil water losses**, reducing the risk of nitrate leaching and pollution;
- **The transformations of nitrogen fertilizers in the soil** (conversion of nitrogen from one chemical form to another), can often lead to readily available mineral nitrogen losses and to the soil reaction's change, which can **reduce the efficiency of the fertilizers**;
- **The processes of leaching and volatilization** are those that produce nitrogen losses.

Crop	Critical growth stages	Period of maximum nutrition consumption
Straw grains	*Emergence of 3-leaf *Tillering *Stem extension *Earing	*in spring, after tillering *until flowering
Maize	*Emergence of 3-leaf * Emergence of 50% of the total number of leaves *Emergence of tassel *Silking	*flowering and milky kernel stage *80% of the necessary N is absorbed during milky kernel stage
Sunflower	* Emergence of the first pair of true leaves *Beginning of inflorescence formation *Flowering	*period of flowering and seed maturation
Sugar beet	* Emergence of the 2nd and 3rd pair of leaves *Beginning of root thickening *Beginning of intense sugar deposition	* in the middle of the vegetation period
Potato	*Formation of pairs of 2 to 4 leaves *Beginning of the inflorescence *Beginning of flowering	*beginning of flowering and the formation of tubers

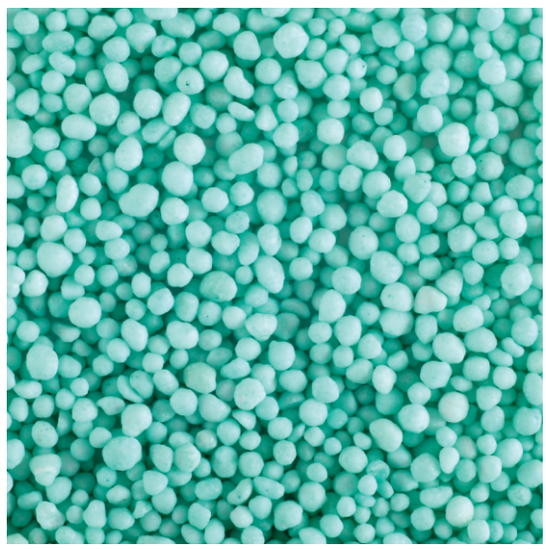
For an increased efficiency > CICh Solution > Technology NG

- **N-GUARD natural nitrification inhibitor**
- **N-GUARD – insect repellent effect**
- **N-GUARD in CICh - based on N and NS**
- **It drastically reduces N losses due to leaching, denitrification or volatilization**
- **Controlled release of N in 90 – 110 days**
- **N available to the plant during critical and maximum consumption stages**
- **N-GUARD – N application during the vegetation period**
  - **in single dose**
  - **with cost reduction**
  - **and increasing profitability**

> **MAXIMUM EFFICIENCY**

CICh® for a good growth

UREE NG 46% N



CHEMICAL COMPOSITION

of which				
Nitric nitrogen (NO_3)	Ammoniacal nitrogen (NH_4)	**Urea (amide) nitrogen**		
-	-	**46%**	-	-

CHARACTERISTICS

Appearance	Color	***Technology***	Grading 2 - 4 mm	ph
Granules	Green	***NG***	95%	8,5 - 9,0

AMOSULF NG 33% N

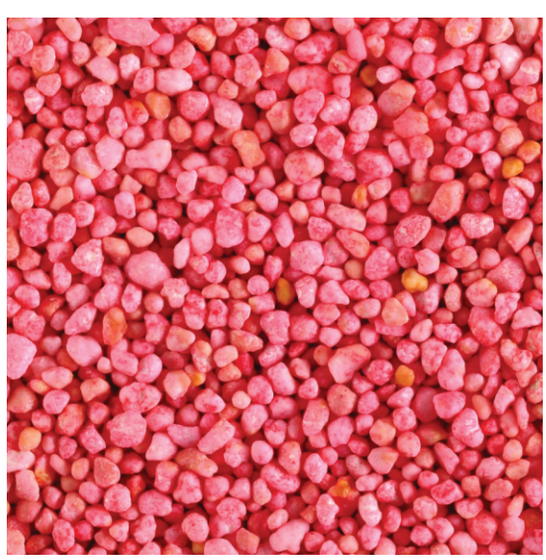
CHEMICAL COMPOSITION

of which				
Nitric nitrogen (NO_3)	**Ammoniacal nitrogen (NH_4)**	**Urea (amide) nitrogen**		**Water soluble sulphur (SO_3)**
-	**10,0%**	**23%**	-	**29,0%**

CHARACTERISTICS

Appearance	Color	***Technology***	Grading 2 - 5 mm	ph
Granules	Yellow	***NG***	95%	6,8 - 7,2

UTIL SAN NG 21% N



CHEMICAL COMPOSITION

of which				
Nitric nitrogen (NO_3)	**Ammoniacal nitrogen (NH_4)**	**Urea (amide) nitrogen**		**Water soluble sulphur (SO_3)**
-	**21%**	-	-	**58,0%**

CHARACTERISTICS

Appearance	Color	***Technology***	Grading 2 - 5 mm	ph
Granules	Pink	***NG***	95%	4,0 - 5,0

SPECIAL PRODUCTS

CICh®
for a good growth

SPECIAL PRODUCTS

1. TERRAM - PROFESSIONAL BIOSTIMULANTS OF THE ROOT SYSTEM, CROP TOLERANCE TO STRESS FACTORS AND OF THE BENEFICIAL MICROFLORA ACTIVITY IN THE RHIZOSPHERE

- **TERRAM NUMBER ONE**
- **TERRAM TOP-CAL**
- **TERRAM FACTOR**
- **TERRAM WELFARE**

2. NUTRIFOLIUM - BIOSTIMULANTS OF THE CROP STRESS TOLERANCE AND OF THE CROP VEGETATIVE AND PRODUCTIVE STAGES

- **NUTRIFOLIUM MISTER X**
- **NUTRIFOLIUM UPPER**
- **NUTRIFOLIUM P-MAX**
- **NUTRIFOLIUM MEGA-N**

3. ILSAMIN - BIOSTIMULANT OF STRESS TOLERANCE, FLOWERING AND CROP QUALITY

4. ADJUVANTS / PENETRANTING AGENTS / ANTIFOAMING AGENTS / WATER CONDITIONERS

- **MAGNET**
- **P-HIDRO**

6. ORGANIC SOLID PRODUCTS / GRANULES - PELLETS

- **FERTIL 12,5**
- **BIOPHOS**
- **POLYSULPHATE**
- **PROGRESS MICRO 6 – 5 – 13**

CICh®
for a good growth

PROFESSIONAL BIOSTIMULANTS
TERRAM AND NUTRIFOLIUM MOLECULAR COMPLEXES

Plants work both on the surface and inside the soil and thus have access to a variety of resources available in both of the areas.

This unique feature of the plants implies the need for continuous adaptation to very different environmental conditions in both "worlds" - plant strategies to maximize resource uptake and adaptation to stress factors are different inside the soil compared to those on its surface.

At the soil surface, the main objectives of young plants are to capture sun energy / light and CO_2 for the proper photosynthesis and biosynthesis of carbohydrates and for the management of available water in their tissues (transpiration, etc.).

In the soil, the objectives consist in capturing of the underground resources: water (a resource that has been increasingly scarce in the last years) and the macro and micro nutrients that are essential for survival and productivity. In many cases, plants face the negative impact of high levels (which can become toxic) of elements such as anions of aluminum, manganese, sodium or chlorine.

In addition, plants have a greater number of underground interactions with the soil's microflora and fauna than above-ground interactions, in terms of their higher biomass in soils but also of a superior / high biodiversity - the literature mentions in some research an amount of up to 15 t/ha of organisms.

For the implementation in the partner farms of an integrated soil - plant nutrition management to ensure to the cultivated plants a superior development of the root and of the vegetative and productive systems, CICh Romania has developed two new lines of professional biostimulants based on the TERRAM and NUTRIFOLIUM molecular complexes, designated to be applied during the intense growth and development stages of crops, according to the recommended fertilization programs, or immediately after the occurrence of unfavorable vegetation conditions.

TERRAM®

NUTRIFOLIUM®

by CICh® for a good growth

TERRAM®

TERRAM MOLECULAR COMPLEX

- stimulates and sustains the accelerated and balanced initiation, growth and development of the absorbent hairs and of the lateral roots, ensuring an improved start of the crops;
- stimulates and sustains the photosynthetic activity, the improved absorption of nutrients in root cells and streamlines their transport in the plant, preventing nutritional imbalances in the early stages of growth;
- improves endogenous protections against fungi, bacteria, viruses and abiotic stress by sustaining and enhancing the production of phytoalexins (anti-pathogenic and anti-oxidative substances);
- enhances and sustains the activity of the beneficial microorganisms in the rhizosphere;
- improves the soil's structure and air-water regime, having properties that determine a high capacity for water retention and nutrient availability in all soil types.

NUTRIFOLIUM®

NUTRIFOLIUM MOLECULAR COMPLEX

- improves membranes permeability for an improved nutrient absorption;
- stimulates phytohormone production, intensifies cell multiplication, growth, elongation and branching - ensures balanced growth and vegetative and reproductive development;
- stimulates photosynthesis, transport of sugars to the rhizosphere and maximizes the absorption of water and nutrients in root cells and vegetative tissues in full growth and development;
- aids reproductive stages and maximizes production - reduces the risk of flower abortion and post-flowering fruit loss;
- stimulates the synthesis of amino acids, polypeptides and proteins, maximizing stress tolerance and crop quality.

CICh®
for a good growth

PROFESSIONAL BIOSTIMULANTS OF THE ROOT SYSTEM, CROP TOLERANCE TO STRESS FACTORS AND OF THE BENEFICIAL MICROFLORA ACTIVITY IN THE RHIZOSPHERE

TERRAM®

TERRAM NUMBER ONE

applicability to soil and foliar with coarse nozzles and by fertigation as a biostimulant of rooting, stress tolerance in all crops and the activity of microorganisms in the rhizosphere (product label *).

Biostimulant of the root system, plant tolerance to stress factors and the activity of microorganisms in the rhizosphere
with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Total nitrogen (N)	1	1,2
Soluble (N) organic nitrogen	1	1,2
Organic carbon (C) of biological origin	10	11,8
Potassium oxide (K_2O)	6-7	7-8
Organic substance with nominal molecular weight <50 kDa	30	35,4
Alginic acids	<6	<7
Mannitol	1-2	1,2 - 2,4
Betaine	3	3,54

- root and leaf absorption with rapid migration inside the tissues - has systemic action (ascending and descending);

- stimulates rooting, root mass production and optimizes root architecture for improved use of mineral resources - increases the efficiency coefficient of soil applied fertilizers;

- stimulates and optimizes photosynthesis and transport of water in tissues and sugars, ensuring the improved and balanced growth and development of young plants in the initial stages of vegetation;

- minimizes the impact of water stress and reduces stress induced by other abiotic factors - herbicides, drought, frost and increases plant tolerance in salinity conditions.

Characteristics:
pH (1%) 6,6
Density (20°C) approx. 1,18 kg/l

Recommended dose:
2 – 3 l/ha in autumn at 2-leaf - 4-leaf and / or spring at the start of vegetation

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TERRAM TOP-CAL

soil and foliar application with coarse nozzles and by fertigation as a biostimulant of rooting, stress tolerance in all crops and the activity of microorganisms in the rhizosphere (product label *).

Biostimulant of the root system, plant tolerance to stress factors and the activity of microorganisms in the rhizosphere
with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Total nitrogen (N)	8	11,4
Nitrogen ($N\text{-}NO_3$)	5,8	8,2
Ammoniacal nitrogen ($N\text{-}NH_4$)	1,2	1,7
Soluble (N) organic nitrogen	1	1,4
Calcium oxide (CaO)	11	15,6
Water soluble boron (B)	0,01	0,014
Copper (Cu) chelated with EDTA	0,01	0,014
Iron (Fe) chelated with EDTA	0,02	0,028
Manganese (Mn) chelated with EDTA	0,01	0,014
Soluble Molybdenum (Mo)	0,001	0,0014
Zinc (Zn) chelated with EDTA Organic carbon (C) of vegetable origin	0,01 6	0,014 8,5

- root and leaf absorption with rapid migration inside the tissues - has systemic action (ascending and descending);

- specific action to prevent nutritional imbalances and to biostimulate metabolic processes;

- ensures the functional integrity of cell membranes and protection against the attack of pathogens and pests;

- stimulates tissue growth - rooting, root mass production and optimizes root architecture for improved use of mineral resources;

- increases the efficiency coefficient of soil applied fertilizers;

- stimulates and optimizes photosynthesis;

- reduces the stress induced by abiotic factors.

Characteristics:
pH (20°C) 2,5 – 3,0
Density (20°C) approx. 1,42 kg/l

Recommended dose:
2-4 foliar applications in doses of 2 – 3 l/ha

TERRAM®

TERRAM FACTOR

*foliar and fertigation applicability as a biostimulant of rooting, stress tolerance to all cultures and of the activity of microorganisms in the rhizosphere (product label *).*

Biostimulant of the root system, plant tolerance to stress factors and the activity of microorganisms in the rhizosphere
with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Water-soluble boron (Bo)	10,5	14,2
Water-soluble molybdenum (Mo)	0,1	0,135

Characteristics

pH (20°C)	7 - 8
Density (20°C)	1,35 kg/l

- root and leaf absorption with rapid migration inside the tissues - has systemic action (ascending and descending);
- ensures the availability, absorption and rapid assimilation of nutrients when applied in critical nutritional stages of the growing season;
- ensures the functional integrity of cell membranes, stimulates the growth of tissues and apical meristems and aids the mobility and assimilation of calcium;
- improves the migration of sugars in tissues;
- modulates uniform flowering and pollen viability;
- influences the synthesis and enzymatic activity and the symbiotic process of nitrogen fixation by Rhizobium bacteria to legumes / nodules.
- increases the yields level and quality.

Recommended dose:
2 – 3 l/ha in autumn at 2-leaf-4-leaf and / or spring at the beginning of vegetation and before flowering

TERRAM WELFARE

*foliar and fertigation applicability as a biostimulant of rooting, stress tolerance to all crops and of the activity of microorganisms in the rhizosphere (product label *).*

Biostimulant of the root system, plant tolerance to stress factors and the activity of microorganisms in the rhizosphere
with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Phosphorus (P_2O_2)	25.5	35.2
Potassium oxide (K_2O)	17	23.5
Water-soluble boron (B)	0.1	0.14
Copper (Cu) chelated with EDTA	0.1	0.138
Iron (Fe) chelated with EDTA	0.2	0.28
Manganese (Mn) chelated with EDTA	0.1	0.14
Soluble Molybdenum (Mo)	0.01	0.014
Zinc (Zn) chelated with EDTA	0.1	0.138

Characteristics:

pH (20°C)	4,5 – 5
Density (20°C)	cca. 1,38 kg/l

- absorption and high mobility of the elements inside the plant with specific action to prevent nutritional imbalances and biostimulate the metabolic processes;
- ensures the availability of macroelements and trace elements when applied in critical stages of the vegetation period;
- provides energy for the synthesis of chlorophyll, enzymes and proteins;
- increases the active resistance of plants to the attack of pathogens - has IMMUNOSTIMULATORY effect - stimulates the natural mechanisms of plant protection against pathogens and against stress and / or unfavorable cultural situations;
- sustains the reproductive stages - reduces the risk of post-flowering abortion, helping to maximize the productive genetic potential of plants;
- contributes to fruit ripening, increasing color, taste and shelf life.

Recommended dose:
2 – 3 l/ha

PROFESSIONAL BIOSTIMULANTS OF THE VEGETATIVE AND PRODUCTIVE STAGES AND OF THE STRESS TOLERANCE IN ALL CROPS

NUTRIFOLIUM®

NUTRIFOLIUM MISTER X

foliar applicability to all crops as a biostimulant of vegetative, productive stages and tolerance to stress factors (product label *).

Biostimulant of vegetative, productive stages and tolerance to stress factors
with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Organic (N) nitrogen	4,0	4,5
Soluble (N) organic nitrogen	4,0	4,5
Soluble boron (B)	0,03	0,03
Soluble manganese (Mn)	0,1	0,1
Soluble zinc (Zn)	0,05	0,06
Soluble molybdenum (Mo)	0,001	0,001
Carbon (C) of biological origin	14	16
Total amino acids	25,5	29
Free amino acids	3	3,4
Betaine	4	4,5

- absorption and high mobility of the elements inside the plant with specific action to prevent nutritional imbalances and to biostimulate the metabolic processes;

- aids balanced and vigorous vegetative growth;

- prevents premature tissue aging;

- stimulates and sustains flowering and high yields;

- reduces the stress induced by abiotic factors - pesticides, hail, drought, excess moisture, frost and increases the plant tolerance to soil salinity.

Characteristics:
pH (20°C) 8 – 8,5
Density (20°C) approx. 1,14 kg/l

Recommended dose:
2-4 foliar applications
in dose of 2 – 3 l/ha

NUTRIFOLIUM P-MAX

foliar applicability to all crops as a biostimulant of vegetative, productive stages and tolerance to stress factors (product label *).

Biostimulant of vegetative, productive stages and tolerance to stress factors
with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Total nitrogen (N)	7	8,7
Ammoniacal nitrogen ($N\text{-}NH_4$)	7	8,7
Phosphorus pentoxide (P_2O_5)	23	29

- absorption and high mobility of the elements inside the plant with specific action to prevent nutritional imbalances and to biostimulate the metabolic processes;

- favors and stimulates photosynthetic activity;

- sustains the balanced and vigorous vegetative growth;

- stimulates and sustains flowering and high yields.

Characteristics:
pH (20°C) 6 – 6,5
Density (20°C) approx. 1,25 kg/l

Recommended dose:
2-4 foliar applications
in doses of 2 – 3 l/ha

NUTRIFOLIUM UPPER

foliar applicability to all crops as a biostimulant of vegetative, productive stages and tolerance to stress factors (product label *).

Biostimulant of vegetative, productive stages and tolerance to stress factors with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Total nitrogen (N)	16	20,8
Nitric nitrogen (N-NO_3)	2	2,6
Ammoniacal nitrogen (N-NH_4)	10	13
Urea nitrogen (N-NH_2 amide)	4	5,2
Water-soluble sulfur (SO_3)	45,5	59,2
Water-soluble boron (B)	0,01	0,013
Copper (Cu) chelated EDTA	0,01	0,013
Iron (Fe) chelated EDTA	0,02	0,026
Manganese (Mn) chelated EDTA	0,01	0,013
Water-soluble molybdenum (Mo)	0,001	0,0013
Zinc (Zn) chelated EDTA	0,01	0,013

Characteristics:

pH (20°C)	7 – 8
Density (20°C)	approx. 1,31 kg/l

- solubility, rapid absorption, efficiency and high mobility of the elements inside the plant with specific action to prevent nutritional imbalances and biostimulate metabolic processes;

- enhances the ability of the plant to synthesize growth regulators - stimulates and aids vegetative growth / development of the foliar apparatus;

- supplements the sulfur requirements of plants (sulfur consumption is directly related to nitrogen needs, so crops with high nitrogen requirements also need an appropriate amount of sulfur);

- stimulates the absorption of other nutrients;

- prevents the increase of aspartic acid content to the detriment of other amino acids in cereals as in the case of sulfur deficiencies, improving crop yields both quantitatively and, especially qualitatively.

Recommended dose:
2 – 5 l/ha

NUTRIFOLIUM MEGA-N

foliar applicability to all crops as a biostimulant of vegetative, productive stages and tolerance to stress factors (product label *).

Biostimulant of vegetative, productive stages and tolerance to stress factors with the TERRAM molecular complex

Composition	%, w/w	%,w/v
Total nitrogen (N)	25	31
Ammoniacal nitrogen (N-NH_4)	6	7,5
Nitric nitrogen (N-NO_2)	6	7,5
Urea nitrogen (amide N-NH_2)	13	16,1
Zinc (Zn) chelated with EDTA	0,1	0,12

Characteristics:

pH (20°C)	7 – 7,5
Density (20°C)	approx. 1,24 kg/l

- solubility, rapid absorption, efficiency and high mobility of the elements inside the plant with specific action to prevent nutritional imbalances and biostimulate metabolic processes;

- stimulates and sustains rapid vegetative growth;

- urea nitrogen is rapidly absorbed and converted to ammonia and carbon dioxide by urease enzyme from leaves - young / active growth tissues have a more intense urease activity.

Recommended dose:
Foliar: 3-5 l/ha in multiple applications and in sufficient volumes of water in all field crops fruit trees, vines and horticultural crops;
Fertilization: 10 – 20 l/ha.

ILSAMIN N90

BIOSTIMULANT OF STRESS TOLERANCE, VEGETATIVE STAGES, FLOWERING AND CROP QUALITY

ILSAMIN N90

foliar applicability to all crops as a biostimulant of stress tolerance and / or as a fertilizer (product label *).

Biostimulant of plant tolerance to stress factors and of flowering and organic liquid foliar fertilizer with a high content of nitrogen and free amino acids

ALLOWED FOR ECOLOGICAL AGRICULTURE

Soluble organic nitrogen (N)	8,9%
Organic carbon (C)	25,0%
Free amino acids	> 10%
Mainly levorotatory	

Characteristics:

pH (20°C)	5,6 ± 0,5
Density (20°C)	approx. 1,22 kg/l

Liquid product with high stability and low salinity

Recommended dose:
1,5 – 2 l/ha

ORGANIC FARMING

- high quality biostimulant and fertilizer with high nutritional properties, obtained from GELAMIN® by enzymatic hydrolysis of collagen, mediated by a mixture of specific and selected enzymes at low temperature;

- high content of peptides, polypeptides and levorotatory amino acids, which are biologically active and recognized by plants, with their direct integration into metabolic cellular processes and with a strong balancing action on plant activities;

- stimulates plant metabolism allowing fast, balanced and efficient nutrition in all difficult vegetative situations, including regeneration and rapid recovery of damaged plant tissues;

- regular use of the product helps the plants to always keep active all biochemical pathways both under normal conditions and in critical moments of extreme stress;

- increases stress tolerance and rapid plant regeneration;

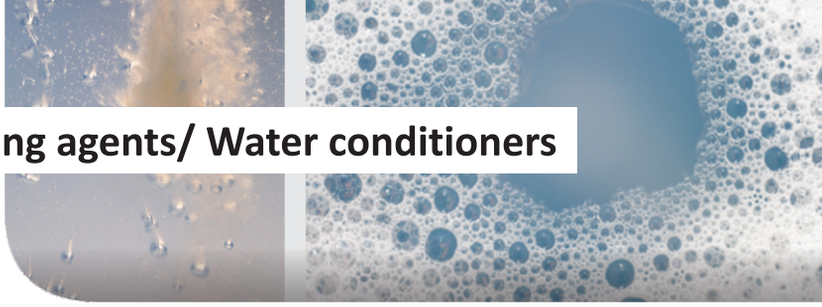
- increases the efficacity and safety of agrochemical treatments;

- supports plant tolerance to soil salinity;

- increases the active resistance of plants to the attack of pathogens;

- stimulates flowering and allows the quantitative and qualitative improvement of productions, increasing the level of proteins.

CICh® for a good growth



MAGNET

Co-adjuvant, penetrant, antifoaming agent

Glycols	6.5%
Dimethylpolysiloxane emulsion in a concentration of	10%, 5%

Characteristics:

Density (20°C)	1 kg/l

Recommended dose:
50 – 100 ml per 100 liters of water.
Apply with all treatments and do not mix with other adjuvants / water conditioners.

- is an adjuvant which, due to the presence of particular substances, stimulates homogeneous distribution of fertilizers on the laminar surface of the treated leaves;

- high penetration power produces an increase in the contact surface between the nutrient solutions and the plant tissue, thus achieving a more effective penetration and a consistent assimilation of fertilizers and of other inputs;

- has a significant antifoaming action.

Magnet

P-HIDRO

Product for water conditioning and cleaning of treatment equipment

Total P2O5 phosphoric anhydride	25,0%

Characteristics:

pH (20°C)	0,61 - 0,73
Density (20°C)	approx. 1,24 kg/l

Recommended dose:
The recommended dose to reduce the pH of water from 8-9 to pH 5 is 75-115 ml per 100 liters of water.

A 1.5% solution (1.2 liters per 100 liters of water) is prepared for cleaning the equipment.
Treatment time is 15 minutes.

P-Hidro

- corrects the alkaline reaction of the water used for specific treatments - in general the waters in Romania have an alkaline reaction (high pH values), not being suitable for the application of foliar products;

- the high pH level of the spray solution can cause some of the pesticides to be rapidly degraded by precipitation or hydrolysis;

P-HIDRO is the solution, in this case, being a product with intense acidifying action:

- significantly reduces the pH values of nutrient and protection solutions applied to crops;

- improves foliar absorption of nutrients and increases the efficiency of phytosanitary treatments;

- it can be used to perform deep cleaning of pipes / installations used to perform treatments and equipment (tanks, cisterns, containers, etc.), as well as to clean drip irrigation systems and remove mineral salt deposits.

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BIOLOGICAL SOLID PRODUCTS

ORGANIC FARMING

FERTIL 12,5

Organic solid fertilizer with high content of nitrogen, with modulated slow natural release, complexed trace elements and organic matter

ORGANIC FARMING

Obtained from AGROGEL - solid hydrolyzed gelatin stabilized by protein nitrogen

Total organic nitrogen (N)	12,5%
-Soluble organic nitrogen (N)	5,0%
Organic carbon (C)	40,0%
-Extractable organic carbon (C)	95,0%
Organic matter	70%

RECOMMENDED DOSE / 4,5 mm pellets:
150 – 300 kg/ha

- applicability to soil at land preparation for all crops (product label *).

- high quality organic nitrogen fertilizer with modulated / slow natural release;

- AGROGEL® ensures maximum safety in terms of composition - the product is homogeneous, standardized and characterized by the presence of protein chains of different sizes and according to predetermined schemes, which allow the controlled release of nitrogen into the soil by microorganisms - as opposed to those more organic fertilizers on the market, which do not usually have a constant matrix and scientific approach;

- soluble organic nitrogen indicates the technical quality of the product, and the ratio of extractable organic carbon to total organic carbon indicates its biological affinity;

- high content of completely bioavailable organic substance with complex biostimulating action that improves the natural conditions of the soil allowing to the plants to achieve, in any situation, their full production potential;

-all elements are absorbed by crops continuously during the vegetation period, depending on the absorption curves of the nutrients, without losses and negative impact on the environment.

BIOPHOS

Solid granular fertilizer with high content of phosphorus, calcium and magnesium

ORGANIC FARMING

Total P_2O_5 phosphoric anhydride	26,0%
Calcium Oxide CaO	46%
Magnesium oxide MgO	0,35%

RECOMMENDED DOSE
/ granules between 2 and 5 mm, minimum 90%:
150 – 300 kg/ha

- applicability to soil at land preparation for all crops (product label *).

- 100% natural product;

- important source of colloidal phosphorus and calcium, containing magnesium and trace elements;

- helps re-mineralize soils

- has electromagnetic activity - improves soil;

- exchange capacity, allowing the retention of cations - calcium, potassium, trace elements until their use by plants, without losses;

- soil amendment agent (including sandy soils) through its colloidal activity - colloidal minerals provide benefits for the health of the soil microflora, and support the activity of earthworms;

- easy to distribute - granular product;

- retains ammonia that is subject to volatilization losses when used to make composts;

- composting with BIOPHOS favors the release of nutrients in soluble ionic form.

BIOLOGICAL SOLID PRODUCTS

POLYSULPHATE

Solid granular fertilizer with high content of potassium, sulfur, calcium and magnesium

ORGANIC FARMING

Potassium oxide K_2O	13%
Sulfur dioxide SO_3	48%
CaO	17%
MgO	6%

RECOMMENDED DOSE

/ granules between 2 and 5 mm, minimum 90% :

150 – 300 kg/ha

- applicability to soil at land preparation for all crops (product label *).

- concentrated fertilizer based on potassium, sulfur, calcium and magnesium;

- potassium sustains the activation of enzymatic reactions, protein synthesis, starch and sugar formation and regulation of water flow in cells and leaves;

- 90-95% of the total potassium in the soil is retained between the clay layers and is unavailable to plants - 5-10% of the total potassium becomes slowly available to plants through the disintegration of clays.

- about 1-2% of the total potassium in the soil is available to plants being partly dissolved in the soil solution and partly as exchangeable potassium, which is retained on the surface of clay particles - as potassium is absorbed by plants, the exchangeable potassium replaces the dissolved potassium to maintain the balance between the two forms;

- source of potassium for chlorine-sensitive crops;

- supplies and balances nutrition with sulfur and calcium - sulfur is an essential nutrient for plants and the sulphur requirements of plants are quantitatively important (large areas of soils have a low sulfur content and the supply of sulfur from the atmosphere is low);

- easy to distribute - granular product.

PROGRESS MICRO 6-5-13

Solid organic-mineral fertilizer with high content of organic matter, macroelements and complexed trace elements

ORGANIC FARMING

Obtained from AGROGEL - solid hydrolyzed gelatin stabilized by protein nitrogen

Azot organic total (N)	6,0%
-Azot organic (N)	6,0%
Anhidridă fosforică P_2O_5 totală	5,0%
Oxid de potasiu K_2O solubil	13,0%
Oxid de magneziu MgO solubil	2,0%
Anhidridă sulfurică SO_3 solubilă	10,0%
Carbon organic (C)	18,0%
Substanță organică	43%

RECOMMENDED DOSE / 4mm pellets

150 – 300 kg/ha

- applicability to soil at land preparation for all crops (product label *).

- organic fertilizer with high quality nitrogen content with modulated / slow natural release, phosphorus, potassium, magnesium and sulfur;

- AGROGEL® ensures maximum safety in terms of composition - the product is homogeneous, standardized and characterized by the presence of protein chains of different sizes according to pre-established schemes, allowing the controlled release of nitrogen into the soil by microorganisms;

- soluble organic nitrogen indicates the technical quality of the product, and the ratio of extractable organic carbon to total organic carbon indicates its biological affinity;

- high content of completely bioavailable organic substance with complex biostimulating action that improves the natural conditions of the land and allows the plants to express, in any situation, the entire production potential;

- all elements are absorbed in crops continuously during the growing season, depending on the absorption curves of the nutrients, without losses and without any negative impact on the environment.

TANK-MIX ORDER OF PRODUCTS

Fill half of the clean tank of the spraying installation with clean water, keep stirring and add products in the following order:

1. Products formulated as water-soluble packages / bags (WSB)
2. **Dry formulated products** - water soluble granules (WSG / SG), wettable powders (WP), water dispersible granules (WDG / WG)
3. Compatibility agents and / or half the amount of antifoaming agent - wait 2-3 minutes before adding other products, keep stirring
4. Suspension concentrates (SC), suspo-emulsions (SE), water emulsions (EW), micro capsules (CS)
5. Liquid anti-drift agents before adding concentrated emulsion (EC) formulations
6. **Liquid formulated products** such as emulsion concentrates (EC) based on oils or solvents, micro-emulsion formulations (MEC) and / or oil dispersion (OD) formulations - shake the liquid formulated products before adding them to the tank-mixing solution
7. Water soluble concentrates (WSC), aqueous solutions (AS / SN) and soluble liquids (SL)
8. Concentrated oil-based adjuvants (COCs), surfactants, stickers, etc.
9. Liquid fertilizers, biostimulants and the rest of the water until the tank is full
10. Products for pH correction to the desired final value and the remaining half of the amount of anti-foaming agent.

VISUAL TISSUE ASSESSMENT

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MOBILE nutrients

Older/lower leaves affected

YES

Effects mostly generalized; plants dark or light green

YES

Plants dark green, often becoming purple or red

YES

PHOSPHORUS (P)

NO

Plants light green with leaves light green or yellow; no necrotic spotting

DA

AZOT (N)

NO

Plants light green; necrotic spotting on leaves; pale leaves sometimes scorched cupped or rolled

DA

*** MOLYBDENUM (Mo)**

NO

Effects mostly localized; chlorosis with or w/out spotting

YES

Interveinal chlorosis; leaves sometimes red or with dead spots

YES

MAGNESIUM (Mg)

NO

No interveinal chlorosis; chlorotic areas with a burning or spotting along leaf margins

YES

POTASSIUM (K)

NO

No interveinal chlorosis; distinct chlorotic and necrotic lesions (spotting) with abrupt boundary between dead and alive tissue

YES

*** CHLORIDE (Cl)**

IMMOBILE nutrients

NO

Newer or younger leaves

DA

Growing point (terminal bud) dies

NO

Growing point typically stays alive

DA

Leaves of terminal bud become light green at bases; leaves become twisted and brittle and die back at growing point; chlorosis of young leaves

YES

BORON (B)

NO

Young leaves of terminal bud hooked at first, finally turning brown and dying

YES

CALCIUM (Ca)

NO

Dark green zone next to blunted necrotic leaf tip, thickened curling leaves

YES

NICKEL (NI)

DA

Chlorosis w/out interveinal chlorosis

YES

Leaves light green; typically no chlorotic spotting or striping

YES

SULFUR (S)

NO

Chlorosis of young leaves; tips appear withered and will eventually die

YES

*** COPPER (Cu)**

NO

Young leaves with interveninal chlorosis

YES

Sharp distinction betweenveins and chlorotic areas

YES

IRON (Fe)

NO

No sharp distinction between veins and chlorotic areas; spotty appearance

YES

MANGANESE (Mn)

NO

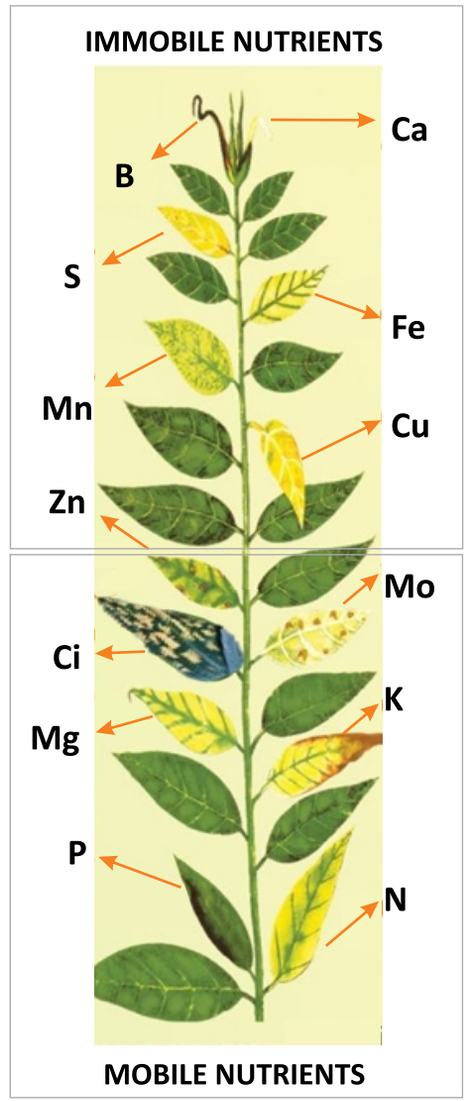
Middle leaves with interveinal chlorosis stunted growth

YES

*** ZINC (Zn)**

(Initially in middle leaves, young and/or old leaves become chlorotic in later stages of deficiency)

* If symptoms do not meet any of the descriptions, either see the description again or see the text for a more specific description.



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