

AGROGEL[®]

gelatine for agricultural use



M A T R I X D O S S I E R





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AGROGEL®: *technological innovation and guarantee of efficiency in total respect of the environment*

ILSA, which has always been at the forefront in the field of technological innovation in agriculture, has been working for many years to make products based on organic farming, capable of combining agronomic efficiency with the increasingly pressing environmental issues, without ever neglecting the farmers' budgetary needs.

As a result of over 60 years of innovation, research and experimentation, organic matrix **AGROGEL®** is a completely natural hydrolysed gelatin for agricultural use that from 2007, in virtue of its effectiveness, has been officially inserted as "**type designation**" of the matrix within the nomenclature of law that regulates the use of organic fertilisers in Italy.

The essential component of **ILSA AGROGEL®** solid fertilisers, is produced through an exclusive thermal hydrolysis process at low temperatures, referred to as **FCH®**. This process confers to the matrix the ability to ensure, over time, a modulated release of Nitrogen, without gas dispersion and leaching in the environment, by making available the nutritive elements which the crops need for their uptake.

For this reason **AGROGEL®** based fertilisers, allow a reduced number of operations in the field by improving the nutrition of plants and soil, increasing yields, respecting the environment and ensuring indisputable economic benefits for the farmer.

AGROGEL®

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Distinctive characteristics

- **AGROGEL®** is recognized as a new "MATRIX" since 2007;
- **AGROGEL®** is a new legally recognized denomination of type;
- only the **FCH®** process can generate the matrix **AGROGEL®**;
- the nitrogen contained is progressively made available to crops during the entire vegetative cycle, as it is obtained with a specific process of collagen hydrolysis;
- **AGROGEL®** is a totally organic product;
- soluble nitrogen and extractable carbon measure manufacturing quality ;
- because of its unique natural features, it allows avoiding waste and losses of nitrogen by leaching and volatilization;
- highly nutritional and high energy matrix for the soil-plant system;
- it contributes to the formation of N reserves in the soil;
- it allows the integration of consumption or the lack of organic matter;
- agronomic value higher than for other matrices;
- it allows cost savings for the farmer, given its high agronomic efficiency.

The key to success of **AGROGEL®** lies in its fertilizer action. In fact, this does not end within a short period of time, but determines in the soil a natural balance of absorption and release of the fertility elements between organic matter, soil and vegetal matter, which is the unique characteristic of the product. And this is proven by both laboratory tests and results in the field.



AGROGEL[®]:
THE NEW
ORGANIC
MATRIX
LEGALLY
RECOGNIZED



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Hydrolyzed gelatin for agricultural use

March 16th, 2007, is an important date because, with the outcomes of years of research, efforts in the direction of ongoing technological improvement were rewarded. The result is total and complete recognition of the denomination of the matrix type, namely "**hydrolyzed gelatin for agricultural use**".

This gelatin is the result of a process which only **ILSA** is capable of today. Legal recognition of the product confirms its difference from the most traditional and well-known matrices. This is concrete proof of the company's efforts towards ongoing process improvement and innovation, for products which are increasingly efficient and which more closely meet the real needs of a more sustainable, efficient and specialized agricultural sector.

THE TURNING POINT

Decree of the Ministry of Agriculture and Forestry dated January 18th 2007, published on the Official Gazette No. 63 dated March 16th, 2007.

No.	Denomination of type	Preparation mode and essential components.	Minimum titre of fertilizing elements (weight percentage). Indications on the evaluation of the fertilizing elements. Other requirements needed.	Other indications regarding type denomination.	Elements whose titre must be indicated. Shape and solubility of the fertilizing elements. Other criteria.	Notes
1	2	3	4	5	6	7
21.	Hydrolyzed gelatine for agricultural use	Product obtained from hydrolysis of leathers previously treated in technical plants (Reg. EC/1774/2002).	Organic nitrogen (N) 10% Water-soluble organic nitrogen (N) 5% Total organic carbon (C) 30% Extractable organic carbon/Total organic carbon 90% pH in water <6		Organic nitrogen Water-soluble organic nitrogen Organic carbon of biological origin Extractable organic carbon/Total organic carbon pH	The hydrolyzed gelatin is identified by electrofocalization on polyacrylamide plate with preformed pH gradient between 3.5 and 9.5





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Why a new "Type denomination"?

Below, the reason why **AGROGEL**® was legally recognized as a new "**Denomination of type**" by the Italian legislation in fertilizers area:

- 1 because product is recognized as an organic matrix;**
- 2 because product is obtained through a specific manufacturing process;**
- 3 because product has characteristics not comparable with other matrices.**

1

BECAUSE PRODUCT IS RECOGNIZED AS AN ORGANIC MATRIX

The regulation introduces specific characteristics for the new matrix:

- The production process can be carried out only starting out from material free from sanitary risks (Regulation EC/1774). This hydrolyzed gelatin for agricultural use is, therefore, totally free from use limitations.
- Besides chemical properties it must be also possible to analytically assess exact production chain origin (type of original matrix, type of treatment, technical fraction, etc); **this Hydrolyzed Gelatin for agricultural use** is the first organic matrix of which the official identification method is also specified, thus guaranteeing quality of origin.

ILSA holds the registered trademark for this matrix:



2

BECAUSE PRODUCT IS OBTAINED THROUGH A SPECIFIC MANUFACTURING PROCESS

AGROGEL® production encompasses procedures at various process stages:

- RAW MATERIAL SELECTION
- TIME
- PRESSURE
- HYDROLYSIS TEMPERATURE
- TEMPERATURE AT DRYING STAGE
- DRYING TIME
- SCREENING

At present, only **ILSA** has the necessary technological know-how to produce **AGROGEL®**. The industrial processes, besides being technologically advanced, generate low environmental and energy impact. They are highly specific and specialized processes derived from years of research and hands-on experience. Thermal hydrolysis and stabilization are controlled at every stage, and all parameters are monitored by an IT system enabling total process standardization, for a product with consistent titre and, above all, higher quality.

HYDROTHERMAL PROCESS KEY STAGES

The process includes three hydrolysis stages the intensity of which may vary. By varying parameters such as temperature, steam and pressure, rupture of collagen bonds can be achieved at different levels, for products with targeted chemical and physical characteristics.

LIGHT HYDROLYSIS 90°C

- MORE HIGHLY STRUCTURED ORGANIC FRACTION
- LOW PRESENCE OF SOLUBLE ORGANIC NITROGEN
- LONG-PERIOD NUTRITION

MEDIUM HYDROLYSIS 135°C

- ORGANIC FRACTION OF MEDIUM DIMENSIONS
- BALANCED FORMATION OF SOLUBLE ORGANIC NITROGEN
- MID-PERIOD NUTRITION

FORCED HYDROLYSIS 165°C

- ORGANIC FRACTION WITH SIMPLER STRUCTURES
- ALL ORGANIC NITROGEN IS SOLUBLE
- SHORT-PERIOD NUTRITION

3

BECAUSE PRODUCT HAS CHARACTERISTICS NOT COMPARABLE WITH OTHER MATRICES

AGROGEL® innovations in the composition Minimum titles declarable on the label:

TOTAL ORGANIC NITROGEN	10%
WATER-SOLUBLE ORGANIC NITROGEN	5%
TOTAL ORGANIC CARBON	30%
EXTRACTABLE ORGANIC C/TOTAL ORGANIC C	90%
pH IN WATER (MAXIMUM VALUE)	< 6

A highly selective and upgraded hydrolytic process is needed to obtain specific and constant concentrations of soluble organic nitrogen. Traditional processes cannot predetermine the content of soluble organic nitrogen, and the

product is therefore indicated only in total organic nitrogen. Moreover, the C/N ratio is lower than 4 and is, therefore, ready to be attacked by the soil bacterial pool. The main component is collagen, a combination of fibrous proteins typical of animal skins and characterized by high amino acid presence (glycine, proline, alanine, glutamic acid and hydroxyproline, which is the marker amino acid).





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A stable and over time composition

The specifically determined composition of **AGROGEL**[®] is highly stable over time because it comes from proteins with specific characteristics. This means **ILSA** fertilizers, whose main component is this matrix, grant absolute safety in terms of composition. This is not the case with most commercially available fertilizers which generally do not display matrix consistency and are not subject to scientific assessment.

- **AGROGEL**[®] allows all elements to be transferred to the soil and therefore absorbed by plants constantly over time, without generating waste or pollution;
- **AGROGEL**[®] with this product, it is possible to pinpoint the timing of release into the soil of the elements by the various fractions;
- **AGROGEL**[®] is the first organic matrix which displays possible responses of the soil system to application of these forms of nitrogen and carbon;
- **AGROGEL**[®] soluble organic nitrogen is an indication of the technical quality of this product;
- **AGROGEL**[®] extractable organic carbon ratio on total organic carbon proves the biological affinity of this product.



An example of an release pre-set at the production stage: Fertorganico

Label news

- Organic Nitrogen percentage is integrated by the soluble organic Nitrogen value;
- organic Carbon percentage is integrated by the ratio between extractable organic Carbon and total organic Carbon;
- consequently, the concept of extractable organic Carbon is introduced;
- the pH value is introduced as a characterizing element.

NEW AGROGEL® LABEL



Example ILSA products

Organic nitrogen fertilizer

HYDROLYZED GELATIN FOR AGRICULTURAL USE N 13

ORGANIC NITROGEN (N)	13%
WATER-SOLUBLE ORGANIC NITROGEN (N)	5%
ORGANIC CARBON (C) OF BIOLOGICAL ORIGIN	40%
EXTRACTABLE ORGANIC CARBON (C) ON TOTAL ORGANIC CARBON (C)	95%
pH	4,5

COMPETITOR LABEL



Organic nitrogen fertilizer

HYDROLYZED LEATHER AND HIDES

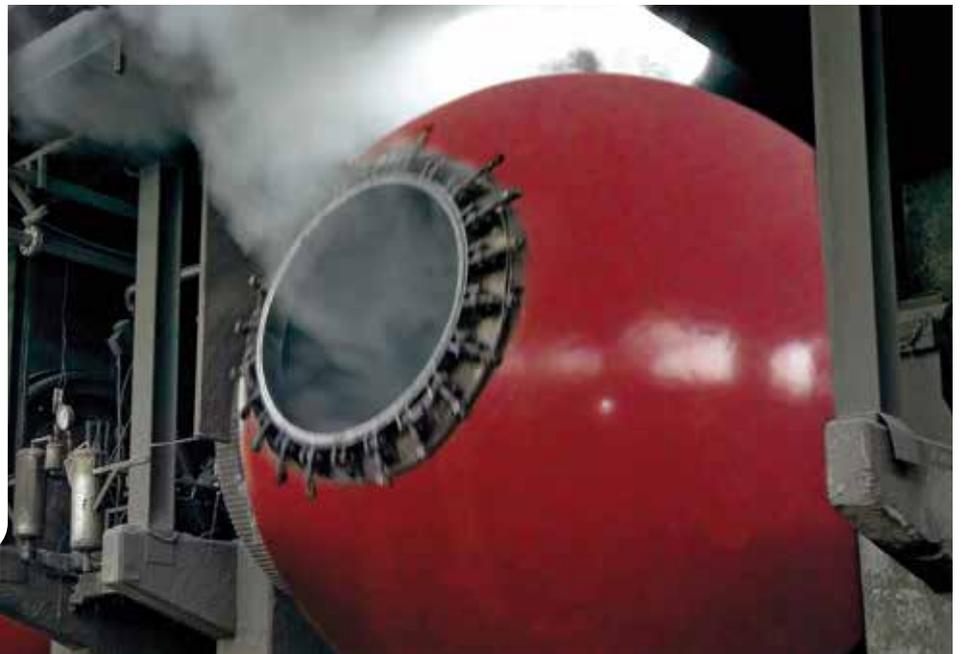
ORGANIC NITROGEN (N)	12,0%
ORGANIC CARBON (C) OF BIOLOGICAL ORIGIN	40%



THE PRODUCTION PROCESS FOR **AGROGEL**[®]



FULLY
CONTROLLED
HYDROLYSIS



The thermal hydrolysis FCH®

The production process required for **AGROGEL®**, characterized by total control of each parameter, has been defined by **ILSA**: Fully Controlled Hydrolysis (**FCH®**).

Collagen-rich leathers are stored in appropriate areas and are then placed in reactors, where they undergo thermal hydrolysis.

Collagen thermal hydrolysis takes place in dynamic autoclaves; the process develops in three consecutive stages of varying duration and at distinct and controlled temperatures.

The jelly-like product retrieved from the four reactors is transferred to the continuous dehydration plant, where, in a controlled environment at a low temperature (100°C), the collagen is finally transformed into gelatin for agricultural use.

Humidity, temperature and **AGROGEL®** extraction speed are constantly and automatically monitored for a homogeneous and standardized product. This latter is characterized by the presence of protein chains of various sizes, according to a

predefined scheme such as allows nitrogen release in normal soil, naturally mediated by micro-organisms.

This release mode, already determined at the production stage, means **AGROGEL®** can meet the agronomic needs of crops on the basis of nutrient absorption curves.

AGROGEL® is a solid hydrolyzed gelatin stabilized by means of protein nitrogen; it is obtained through the innovative **ILSA FCH®** process. **AGROGEL®** is naturally decomposed by soil micro-organisms, and nitrogen is progressively and completely made available for plants when temperatures exceed 8-10°C.

AGROGEL® has a biostimulating and complexing effect.



AGROGEL® IN 13 STEPS

RAW MATERIAL PREPARATION



1

RAW MATERIAL:
PREPARATION



2

THE RAW MATERIAL
IS SCREENED AND
SEPARATED ACCORDING
TO SIZE



3

STERILIZATION,
STABILIZATION AND
SELECTION ACCORDING
TO SIZE

IMPLEMENTATION AND LAUNCH



13

PACKAGING AND
PRODUCT LAUNCH



12

LAUNCH PLAN
APPROVAL AND
INDUSTRIAL START-UP



11

IDENTIFICATION OF
EFFECTS, DOSES AND
BENEFITS OF THE FINAL
PRODUCT

AGROGEL®

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PROCESSO FCH®



6

AVAILABILITY OF THREE DIFFERENT GRANULE SIZES:

- POWDER
- MICROGRANULE
- GRANULE



4

ROTATING DYNAMIC AUTOCLAVE



5

THE DYNAMIC STABILIZER EMPLOYS VAPOUR AND WORKS AT CONTROLLED TEMPERATURES AND HUMIDITY

TEST



7

LAB TEST AND PROTOTYPE CHARACTERISATION



10

TEST IN OPEN FIELD



9

TEST IN CONTROLLED ENVIRONMENT OR IN GREENHOUSE



8

TEST IN GROWTH CHAMBER

ILSA
The green evolution

AGROGEL®
IN THE
RHIZOSPHERE
AND THE SOIL



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AGROGEL® in the rhizosphere

The soil has a very limited potential for exchange with roots. The rhizosphere is generated by the action of plants that modify their environment for needs which are fundamental to their survival.

It substantially differs from the rest of the soil due to:

- specific microbial symbiosis;
- marked presence of organic compounds;
- lower ion concentration;
- lower pH;
- Lower oxygen content.

The rhizosphere is inhabited by a large, very active population whose existence depends essentially on the organic compounds released into the soil by roots. The high availability of **soluble Organic Carbon** in **AGROGEL**® grants a highly active rhizosphere: a most important factor because bacteria feed on organic carbon and plants feed on the elements that bacteria and fungi provide them with. Living beings suffer constant energy loss (they intake energy from the external world), as their vital activities produce energy forms that are mostly unusable for metabolic purposes (for example: heat). The main energy form in the environment is light.

Definitions

AUTOTROPHS: are organisms that procure energy from light (photoautotrophs). They transform air carbon dioxide and nitrogen from nitrates and mineral salts into organic matter. The most important autotrophs for the carbon cycle are mainland forest trees and phytoplankton in the oceans. The photosynthesis reaction is $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

HETEROTROPHS: are unable to exploit light or inorganic substances. They are forced to intake carbon and, in the eventuality, nitrogen by using compounds synthesized by other living beings. The existence of heterotrophs requires organic matter producers. Fungi and bacteria use organic residues and turn carbon into CO_2 when oxygen is present, and into CH_4 when oxygen is absent.





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AGROGEL® *efficiency in soil*

Soil can be considered a living system formed of numerous entities that:

- breathe (oxygen consumption and carbon dioxide release);
- degrade and decompose complex molecules such as carbohydrates (cellulose), proteins, fats, etc;
- develop several metabolic functions;
- release heat during organic matter decomposition.

Soil fertility is affected by all these environmental, physical and chemical factors related to plant nutrition, and it is closely related to soil organic matter, through the biological actions of micro-organisms. The level of micro-organisms in soil and the intensity of their activity depend on the presence of organic matter. Both are greatly influenced by conditions of the system: **soil-plant-environment**.

The various forms of soil fertility (physical, chemical and biological) are linked in a dynamic equilibrium that is affected to considerable by the quantity and quality of the organic matter (natural and/or added). The conditions regulating intensity of the vegetative stages of crops are the same as those that regulate the release of the “**hydrolyzed gelatin for agronomic use**” produced by **ILSA**.

The nitrogen organic matrices oxidative processes taking place in the soil, are:

MINERALIZATION: decomposers (such as earthworms, termites, slugs, snails, bacteria and fungi) turn the matrix organic nitrogen into inorganic nitrogen (ammonia and its salts NH_4+R).

NITRIFICATION: conversion of ammonia into nitrites and nitrates by nitrifying bacteria.

Carbon is an essential part of life on Earth, and plays an important role in the biochemical structure and nutrition of all living cells. To reproduce itself and properly work, an organism must have:

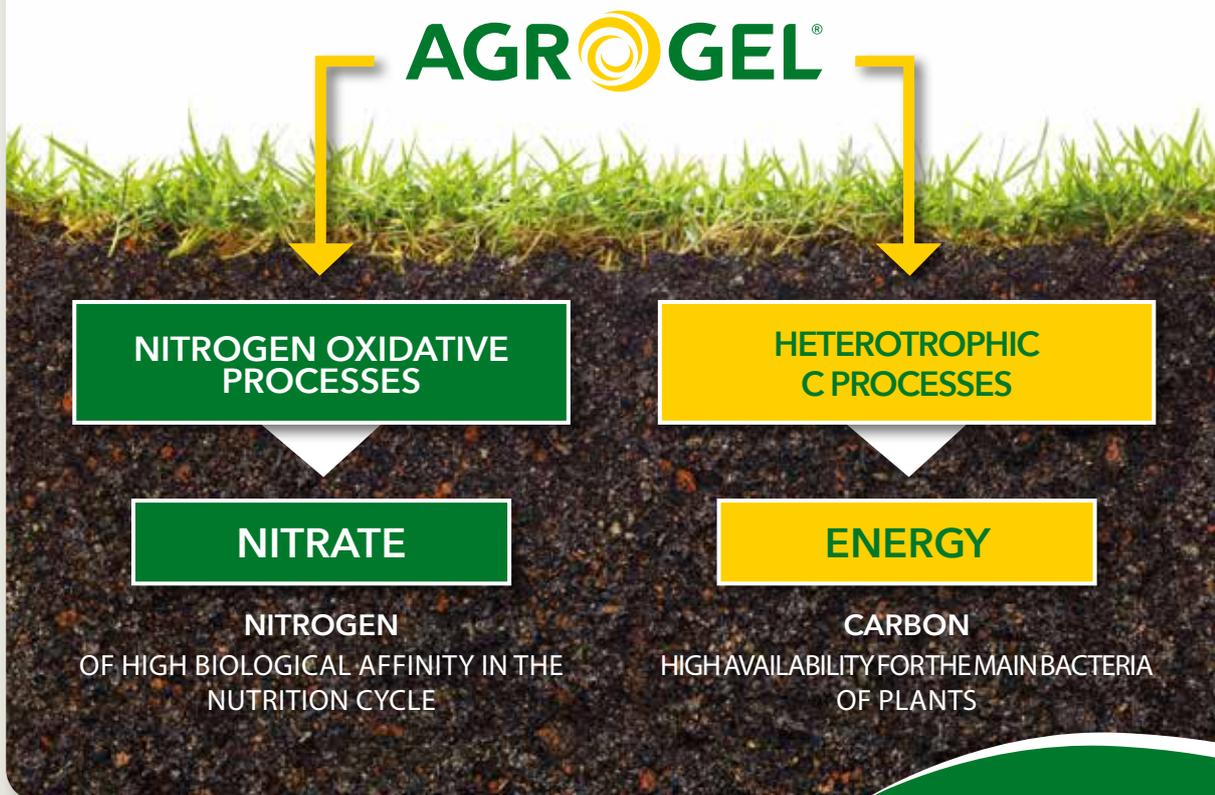
- energy source;
- carbon for the synthesis of new cellular matter;
- nutrients.

and two of the most common sources of cellular carbon for micro-organisms are carbon dioxide, CO_2 , and organic carbon.



AGROGEL® RELEASE INTO THE SOIL

- **AGROGEL®** displays release modes which are closely related to the state of the system;
- **AGROGEL®** positively affects biological fertility;
- **AGROGEL®** has action timings related to the physical and climatic situation of soils.



AGROGEL®
**WITH NITROGEN,
PHOSPHORUS
AND POTASSIUM**

The logo for AGROGEL features the word "AGROGEL" in a bold, green, sans-serif font. The letter "O" is replaced by a stylized yellow and green circular graphic consisting of three concentric, slightly offset rings.

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AGROGEL[®] *and the other elements*

AGROGEL[®] when used in formulating organo-mineral fertilizers with mineral nitrogen, phosphorus or potassium, modifies the behaviour of the mineral elements in the soil and increases their nutritional efficiency.

AGROGEL[®] has all the characteristics of a natural colloid, complexing nutrient elements, with both chemical bonds and specific physical bonds.

AGROGEL[®] rapidly binds one of its parts to soil crop residues (e.g. lignin) to create humus.

AGROGEL[®] and macroelements display:

-
- urease inhibition action;
 - colloidal adsorption action;
 - chemical complexation action.
-





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AGROGEL[®] with ureic Nitrogen

Ureic nitrogen in soil is found at the stage immediately preceding mineralization, (NH₄⁺ formation), which stage is reached after enzymatic hydrolysis regulated by the action of the urease enzyme. This enzyme requires near-neutral pH values. **AGROGEL[®]** solubilization and its slow mineralization act on ureic nitrogen to:

- prevent urea from rapidly solubilizing;
- prevent urease attack for as long as ureic Nitrogen is bound to the matrix;
- release ureic nitrogen progressively, according to **AGROGEL[®]** mineralization processes;
- maintain in the solubility areas of ureic Nitrogen acid pH values that block urease action.

ADVANTAGES

BENEFITS

- | | | |
|--|---|---|
| • slow release regulated by the environment and soil; | ▶ | • what is needed, when it is needed; |
| • reduction of the need for repeat nitrogen fertilization; | ▶ | • healthy produce, no harmful for produce; |
| • no loss due to leaching or volatilization; | ▶ | • greater efficiency, no environmental risk, energy saving; |
| • vegetative equilibrium of crop; | ▶ | • no surplus, no imbalance; |
| • absence of toxic nitrates accumulation in plant tissues; | ▶ | • healthy produce, no harmful for produce; |
| • production quantity and quality; | ▶ | • increase in production income; |
| • lower proneness to cryptogamic diseases. | ▶ | • higher resistance, less waste, reduced pesticide. |

AGROGEL[®] with Phosphorus

Plants can use phosphorus only in soluble phosphate form. Phosphorus absorption by active roots only takes place through the complexation of soluble phosphate with the organic compounds that the rhizosphere is rich in. In the presence of calcium carbonates and basic soils, soluble phosphates are quickly (few weeks) “retrograded” into inert forms for vegetable nutrition.

EFFECTS

Phosphorus complexation with **AGROGEL[®]** has useful effects targeted to:

- slowing down insolubilization;
- blocking bond-formation between phosphorus and calcium (retrogradation);
- maintaining phosphorus in an organic complex already adapted to the rhizosphere.

ADVANTAGES

The advantages of complexed **AGROGEL[®] phosphate** are appreciable in all cultivation environments:

- maintains phosphorus in an available form for much longer periods of time than traditional phosphate fertilizers;
- increases the nutritional efficiency of phosphorus as plants double their ability to absorb phosphorus from the fertilizer.

BENEFITS

The benefits in comparison to traditional phosphate minerals:

- greater “push” at the germination stage;
- quick release of the root apparatus, also during transplants;
- better tillering of graminaceous plants;
- improved preparation for the germination stage;
- optimal development at the flowering and fruit set stages;
- quantity and quality of yield.





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AGROGEL[®] with Potassium

Potassium exists in the soil in various forms in equilibrium with each other:

K+ in solution <> K+ readily exchangeable <> K+ not readily exchangeable <> K+ fixed

Potassium in solution is leachable. Exchangeable potassium is related to the exchange capacity of soil colloids (organic matter and clay). This element, normally present in high total quantities, has, over the last few decades, seen its exchangeable quotient fall, due to the reduction of organic matter content in cultivated land. This quotient is derived from that which is weakly adsorbed by soil colloids and which can be released in solution.

Reduction of soil humidity increases the capacity of clays to retain potassium. Clays with older "structures" may fix potassium irreversibly.

AGROGEL[®] complexed potassium forms colloidal bonds that release potassium progressively, as a function of **AGROGEL[®]** mineralization. This translates into potassium remaining available for longer periods, with its nutritional efficiency thereby doubled.

CONCLUSIONS

-
- High production quality in order to enable optimal colloidal complexation of macroelements.
 - Complete solubility in order to guarantee great efficiency in organo-mineral fertilizers.
 - **AGROGEL[®]** is the ideal matrix for formulating organo-mineral fertilizers.
-



AGROGEL[®] **AND TEMPERATURE**



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The role of temperature on the behaviour of AGROGEL®

Hydrolyzed jelly-based fertilizers for agricultural use are nitrogenous organic fertilizers that modulate in time the release of nitrogenous forms that can be assimilated by plants. The protein nitrogen in the gelatin can be used by plants, following mineralization processes capable of turning it into mineral nitrogen (N-NH₄ and N-NO₃).

These processes:

- are carried out through several organic matrix degradation stages;
- depend on metabolism of numerous micro-organisms.

CULTURE CELLS: AGROGEL® (N 300 MG/KG)



CONDITIONS

CULTURE CELLS: CORE SAMPLE



CONSTANT
AIR
HUMIDITY:
70%

5°C

CONSTANT
SOIL
HUMIDITY:
CdC

23°C

The following tests were carried out by:

Nicola Antonio Ramieri, Claudio Marzadori, Claudio Ciavatta
Department of Agroenvironmental Sciences and Technologies - DiSTA
Alma Mater Studiorum - University of Bologna



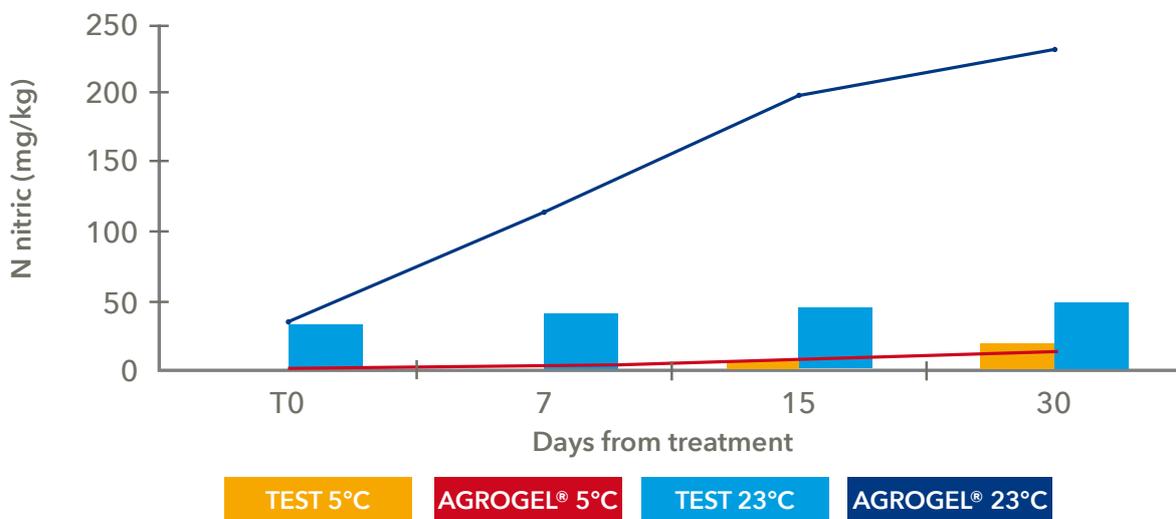


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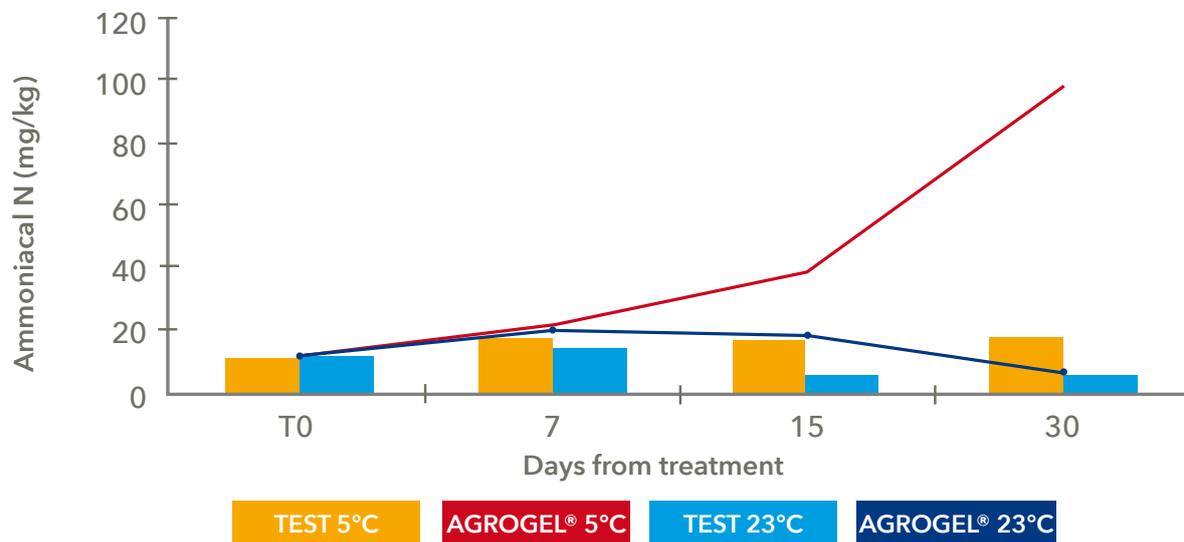
Graphic synthesis of experimental data

These are experiments with no cultivations under way, on soil without vegetation at two different temperatures. Control consists in non-fertilized soil.

NITRIC NITROGEN ACCUMULATION AT DIFFERENT TEMPERATURES



AMMONIACAL NITROGEN ACCUMULATION AT DIFFERENT TEMPERATURES



We may note that:

- at 23°C nitrate accumulation is significant already at the first week, and displays an increase trend;
- this increase trend holds for all the nitrogen that can be assimilated (nitric and ammoniacal) with respect to control, from the first week already.

CONCLUSIONS

- During the winter season (5°C), the processes that produce N-ammoniacal are not particularly marked, and ensure, when spring temperatures arrive, ready availability of nitrogen that can be quickly turned into N-nitric.
- The amount of N-ammoniacal obtained at winter temperatures is adsorbed by the soil and does not cause losses from leaching.



AGROGEL[®] **AND BIODIVERSITY**

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Collagen studies in relation to the microbial biodiversity

The cycle of soil nutrients is affected by the activity of micro-organisms, and soil fertility depends on the equilibrium of the organic matter controlled by the microbial biomass.

Many studies have been carried out on the impact of collagen on soil microbial activity (although most of the work was aimed at assessing the impact on soil metabolic activity rather than at characterizing the microbial biomass from a phylogenetic point of view) (Editor's note: measurement of variations in bacterial composition caused by an external agent).

However, a functional characterization (respirometry) does not enable highlighting of changes in the composition of the microbial biomass.

Indeed, the microbial biomass can maintain its own efficiency unchanged in the short period while entailing a loss of efficiency in the long period.

Thanks to molecular techniques developed methodologically over the last decade, a study of the problem has been prepared. The work has been on the molecular characterization of the microbial communities raised in the presence of hydrolyzed gelatin and on the metabolic fingerprint of micro-organisms.

The tests were carried out by:

Stefano Mocali e Anna Benedetti dell'Istituto Sperimentale per la Nutrizione delle Piante, Roma, Italy e da **Kornelia Smalla**, Federal Biological research Centre for Agriculture and Forestry Institute for Plant Virology, Microbiology and Biosafety, Braunschweig, Germany.





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Analysis of the microbial community in fertilized soils

The effects of fertilization processes on the composition of soil microbial communities have been evaluated through the use of molecular DNA assessment techniques.

Two types of soil were treated with three different fertilizers:

- 26 N with DMPP;
- Fertorganico by **AGROGEL**[®];
- formulation from organic fertilizer mixture.

After 0, 60 and 120 days, samples were taken to perform molecular assessment.

RESULTS

- The fertilizer with DMPP, regardless of the soil, always **MODIFIES** microbial composition.
- Fertorganico by **AGROGEL**[®] does **NOT MODIFY** the microbial community in any soil type.
- Mixtures of nitrogen organic fertilizers cause **MODIFICATIONS**, mainly in light soil, of medium intensity.

*The above comparison was made by:
**Scandellari F., Cavani L., Marzadori C.,
Ciavatta C., Gessa C.E.** del Dipartimento di Scienze e
Tecnologie Agroambientali-DiSTA
Alma Mater Studiorum - Università di Bologna*



CONCLUSIONS

- **AGROGEL**[®] enhances the ability of soil bacteria to carry out their biological activity.
- **AGROGEL**[®] does not modify bacterial populations nor does it cause selection of any specific population.

AGRONOMIC VALUE
OF **AGROGEL**[®] IS
HIGHER THAN
OTHER MATRICES



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