BioAg World CONGRESS

AN EVENT BY THE INDUSTRY, FOR THE INDUSTRY

by GlobalBioAg Linkages
Locally Global

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Needs and Wants from BioAg Products for Soil Health

Jesus Yañez

CEO and Founder

GreenCorp Group

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Speaker Profile

CEO and Founder of GreenCorp Group-15 Years now

Founder of >15 Ag-Companies in Mexico

Has developed and Innovated > 150 Ag products

With a portfolio of >40 Biological products for Plant Protection, Nutrition and Biostimulation in the market

Former Proffesor and Researcher for 8 years in an Agricultural University in Mexico

Master Degree in Horticulture (minor in Plant Nutrition and Phyisiology) in TAMU

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MEXICAN AGRIBUSINESS COMPANY GROUP

(*FOUNDED IN MAY, 2006*)

VISION

*GreenCorp is determined to be a world leader by partnering with leading stakeholders, in innovating and developing **BioProtection and BioHealth solutions** to improve agriculture production sustainably, for delivering safe and quality food, globally.*

MISION

To provide growers and stakeholders of Global AgMarkets with one of the most complete portfolio of Innovative products, and BioSources as Effective Solutions and Options for Biocontrol, Bio-Stimulation and Bio-Remediation

OPERATIONAL BASE
AT SALTILLO, COAHUILA, MEXICO
LOCATED AT NORTH-CENTRAL MEXICO

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GOALS AND WISHES FOR THIS TALK

I wish after this talk all the global audience in this outstanding event can have a better comprehension about Needs and Wants for Soil Health.

One goal of my presentation is to engage everybody in the audience to make a commitment of considering Soil Health Care as a main tool for Integral Crop management and sustainability.

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NEEDS FOR SOIL HEALTH

Only "living" things can have health, so viewing soil as a living ecosystem reflects a fundamental shift in the way we care for our global soils.

Soil isn't an inert growing medium, but rather is teaming with billions of bacteria, fungi, and other microbes that are the foundation of an elegant symbiotic ecosystem.

Soil is an ecosystem that can be managed to provide nutrients for plant growth, absorb and hold rainwater for use during dryer periods, filter and buffer potential pollutants from leaving our fields, serve as a firm foundation for agricultural activities, and provide habitat for soil microbes to flourish and diversify to keep the ecosystem running smoothly.

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NEEDS FOR SOIL HEALTH

SOIL QUALITY ASSESMENT

ADEQUATE SOIL MANAGEMENT

ADJUSTING OF SOIL ORGANIC MATTER, PHYSICAL, CHEMICAL AND BIOLOGICAL, CHARACTERISTICS

FOOD SAFETY, CROPS, LANDS & ENVIRONMENT SUSTAINABILITY

CROPS YIELD INCREASE AND QUALITY IMPROVEMENT

NEEDS FOR SOIL HEALTH

Indicators and its Relationship to Soil Health

- **Soil organic matter** => nutrient retention; soil fertility; soil structure; soil stability; and soil erosion

- **Physical**: bulk density, infiltration, soil structure and macropores, soil depth, and water holding capacity => retention and transport of water and nutrients; habitat for soil microbes; estimate of crop productivity potential; compaction, plow pan, water movement; porosity; and tilth

- **Chemical**: electrical conductivity, reactive carbon, soil nitrate, soil pH, and extractable phosphorus and potassium => biological and chemical activity thresholds; plant and microbial activity thresholds; and plant available nutrients and potential for N and P loss

- **Biological:** earthworms, microbial biomass C and N, particulate organic matter, potentially mineralizable N, soil enzymes, soil respiration, and total organic carbon => microbial catalytic potential and repository for C and N; soil productivity and N supplying potential; and microbial activity measure

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MICROBIAL DIVERSITY

The soil microflora contains a wide range of microbial strains.

Microorganisms in soil are essential for the maintenance of soil functions in both natural and managed soils due to their involvement in key processes including soil structure formation, toxin removal, decomposition of organic matter, and the recycling of carbon, nitrogen, phosphorus, and sulphur.

Microorganisms play vital roles in promoting plant growth, suppressing soilborne plant diseases, and creating vegetation.

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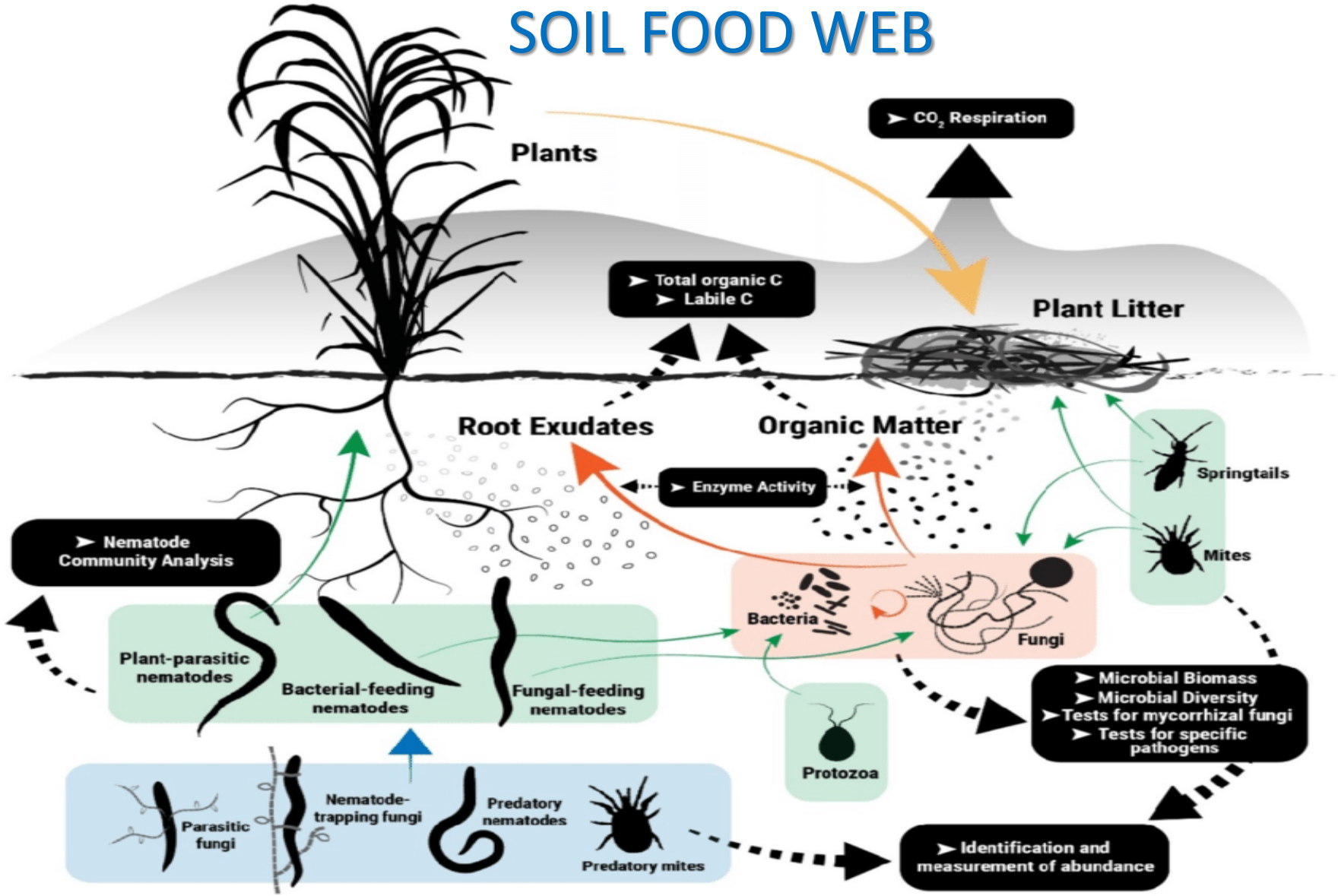
SOIL FOOD WEB

PHYTOPATOGENIC AND BENEFITIAL:

BACTERIA
FUNGI
NEMATODES



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Importance of Rhizosphere

Living plants maintain a rhizosphere, an area of concentrated microbial activity close to the root.

The rhizosphere is the most active part of the soil ecosystem because it is where the most readily available food is, and where peak nutrient and water cycling occurs.

Microbial food is exuded by plant roots to attract and feed microbes that provide nutrients (and other compounds) to the plant at the root-soil interface where the plants can take them up.

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KEY FACTOR NEEDS FOR SOIL HEALTH ASSESMENT

ORGANIC MATTER

organic manure applied alone or in combination with chemical fertilizers would increase soil fertility and functional diversity of soil microbial communities

MICROBIAL BIODIVERSITY & BIOMASS

Microbial Biomass in Soil

Soil microbial biomass constitutes <5% of SOC in most soils although it is the primary agent of organic C transformation as well as a source and sink of N, P, and S in Soils.

PLANT BIODIVERSITY

MANIPULATION OF THE RHIZOSPHERE

COVER CROPS

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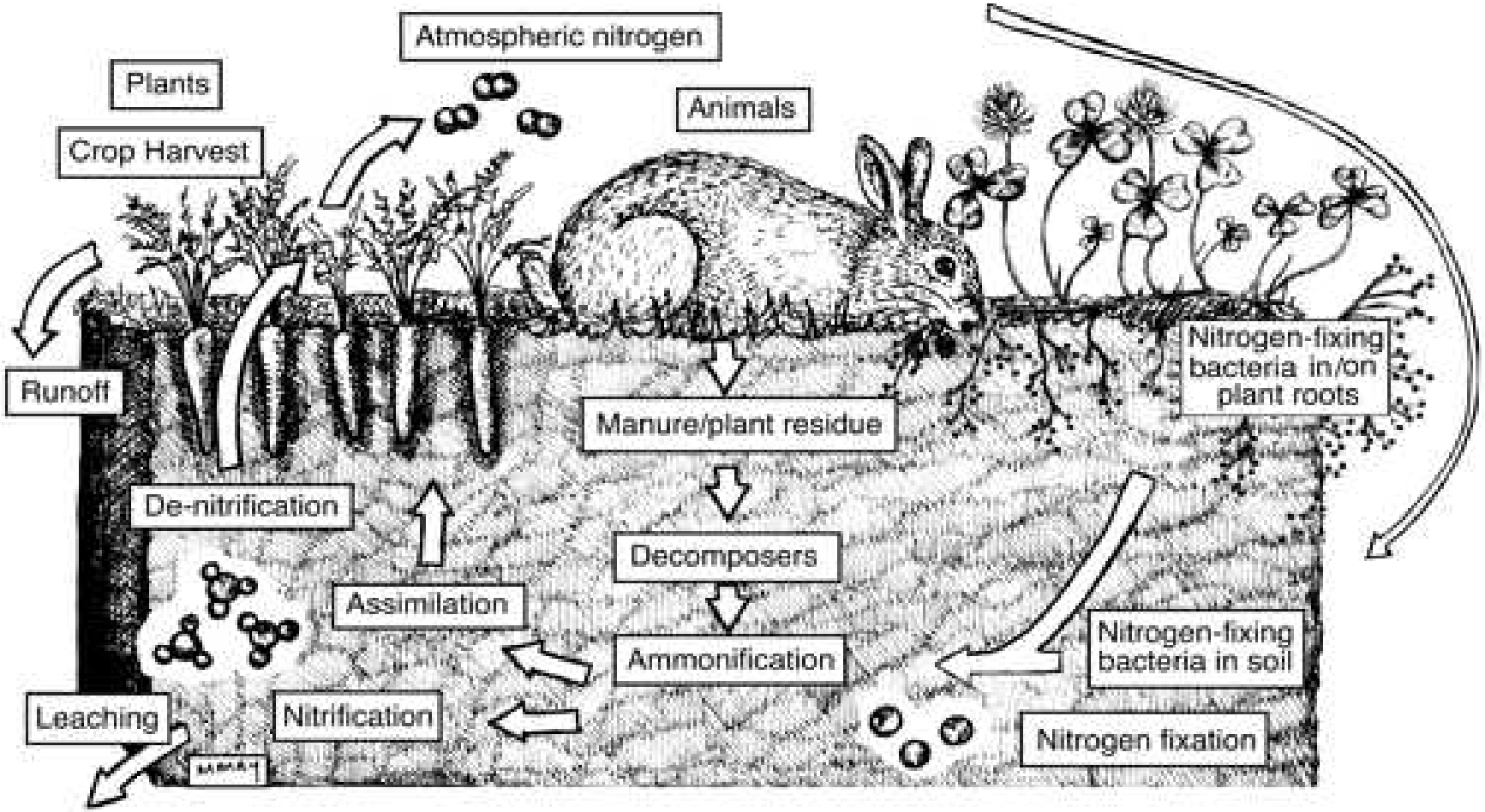
How nitrogen moves from the atmosphere into the soil, through the bodies of every living organism, back into soil and the atmosphere.



NITROGEN CYCLE

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AZOTOBACTER

AZOSPIRILLUM

RHIZOBIA

NITROSOMONAS

NITROBACTER

BEIJERINCKIA

Not all **Nitrogen-Fixing Bacteria** are created equal. Some live in water, some in soil, some in both. Some are free-living and some live in symbiosis with certain plants. Some symbionts, called rhizospheric, live on the root tissues of plants, and some, endophytic, live in the cellular spaces of the host plant.

Some go back and forth. Some form nodules and some just do it on the fly.

But all convert atmospheric nitrogen gas (N_2) to plant-available forms—ammonium, nitrites and nitrates—and also back to N_2.

The bacteria retain the nitrogen in appropriate forms near plant roots, while maintaining a dynamic flow that keeps the cycle healthy.

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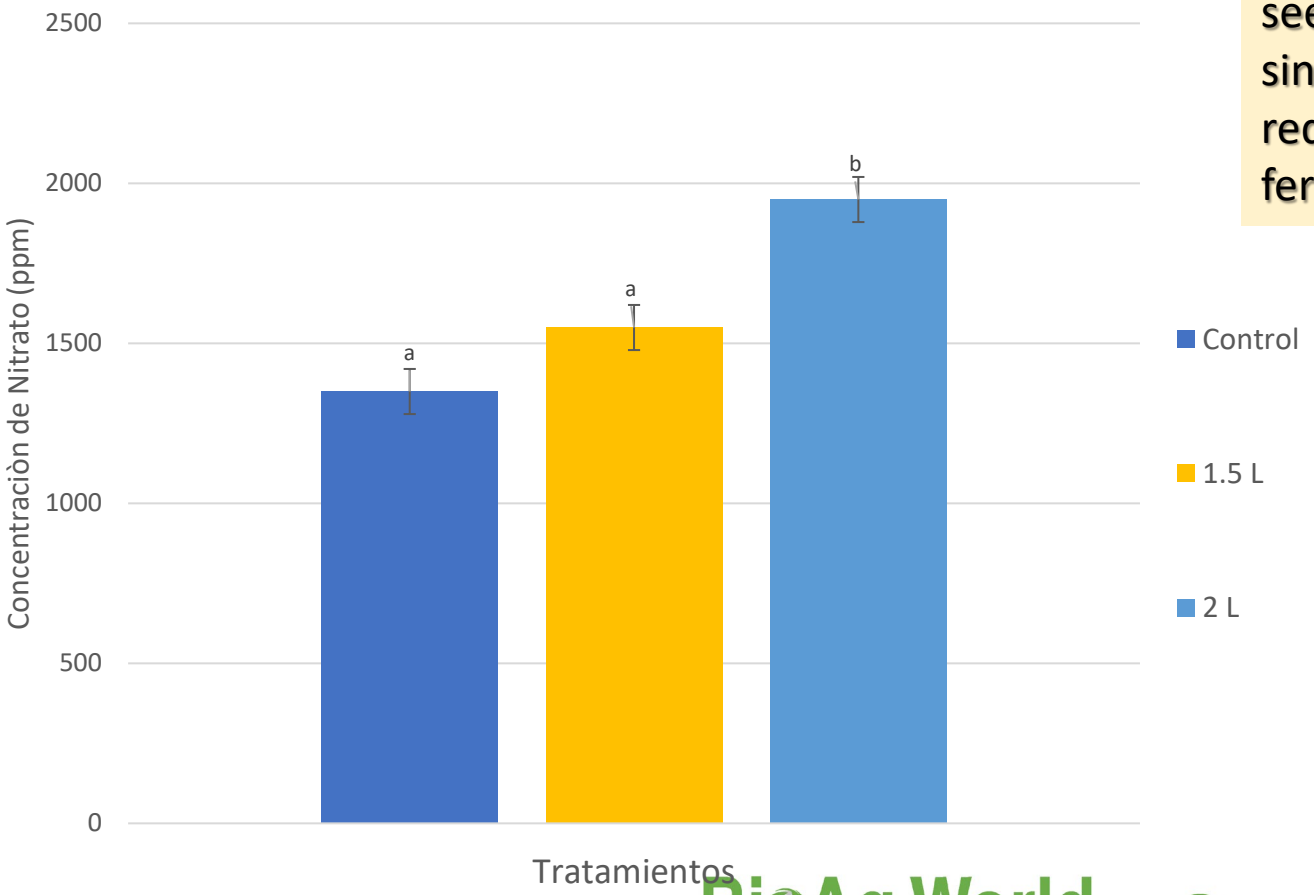
NITRATE CONCENTRATION IN STRAWBERRY LEAVES TISSUE AFTER APPLYING AZOTON AA PLUS



The application of inoculants is seen as being very attractive since it would substantially reduce the use of chemical fertilizers and pesticides.

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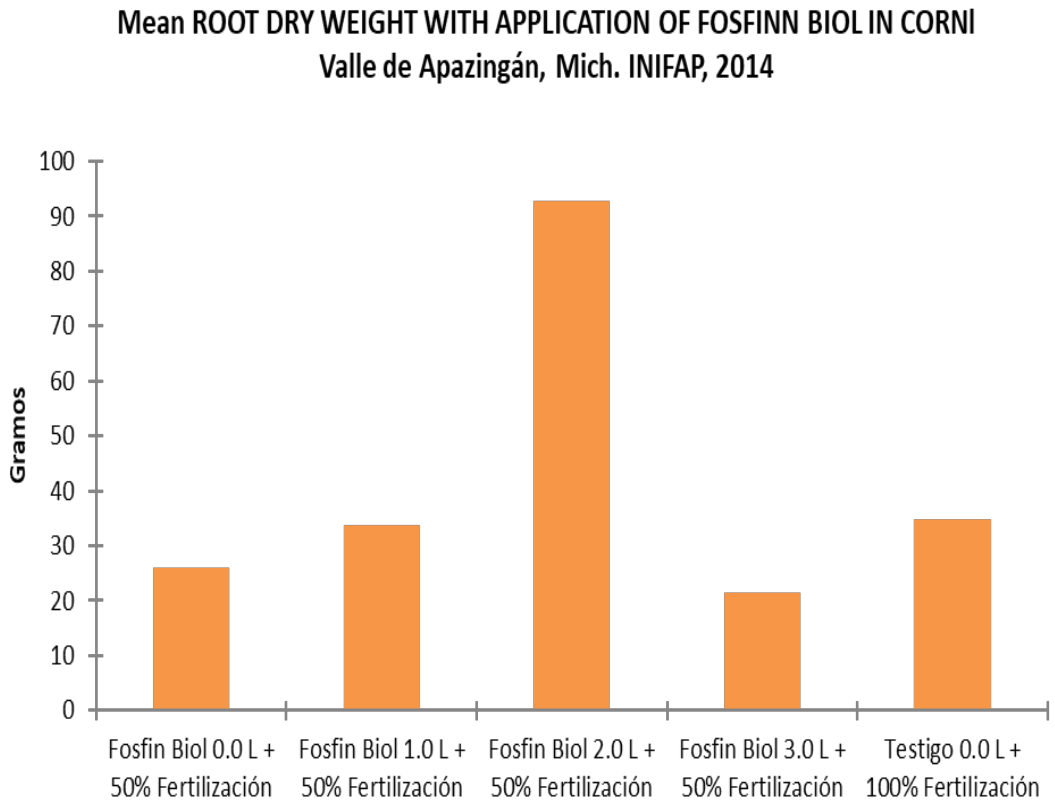
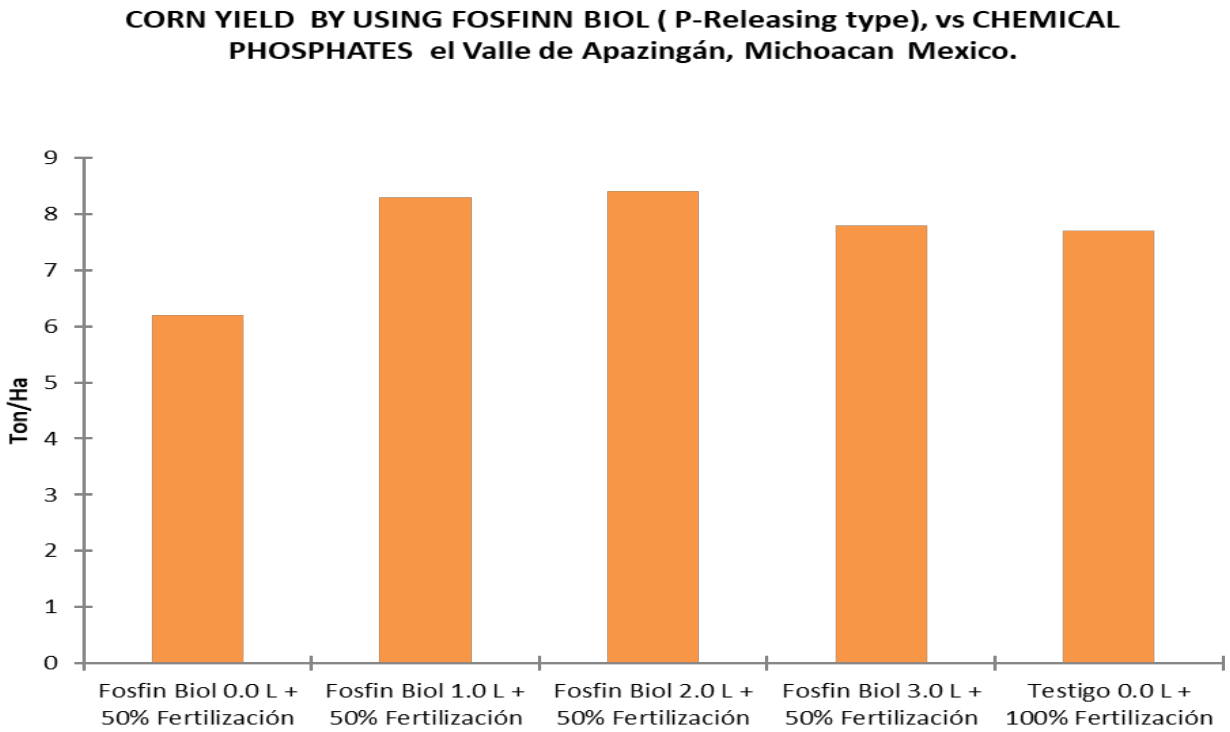
PHOSPHATE RELEASING BIOFERTILIZERS

. Some examples of phosphate-solubilizing microbes are aspergillus, penicillium and Trichoderma Bacillus, Pseudomonas, Enterobacter, Azotobacter, and even some Rhizobium species





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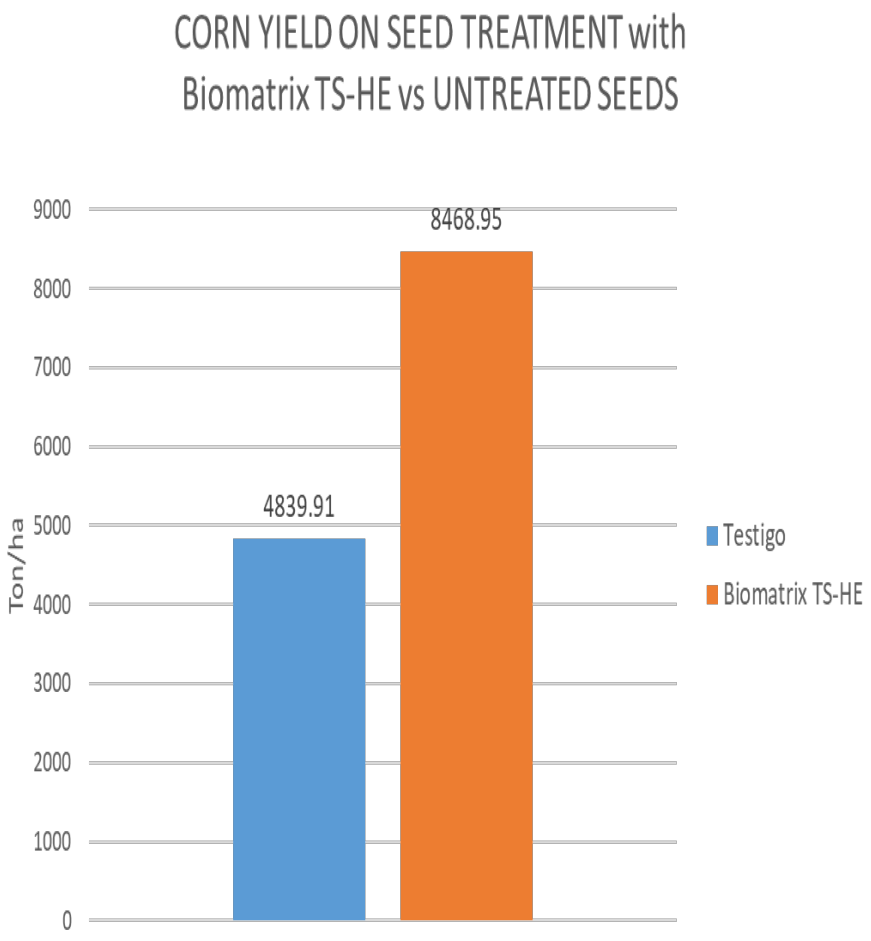
MYCORRHIZAL FUNGI

Mycorrhizal fungi play an especially important role in freeing minerals that are chemically locked up in the soil: especially phosphorus, but also copper, calcium, magnesium, zinc and others.

A by-product of mycorrhizal activity is the production of glomalin, a primary compound that improves soil tilth. In simple terms, glomalin glues the tiny clay particles together into larger aggregates, thereby increasing the amount of large pore space, which in turn creates an ideal environment for roots.



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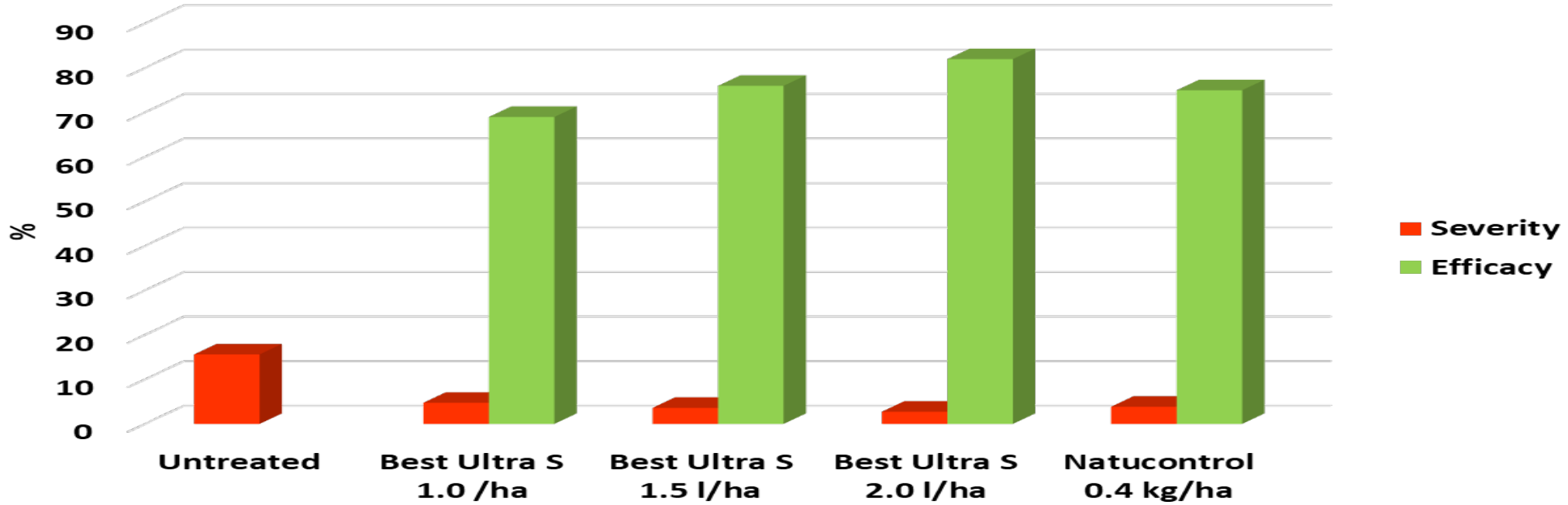
INOCULATION OF BIOCONTROL BACTERIA AND FUNGI BASED FORMULATIONS

Percentage of efficacy by Best Ultra S, and of the severity of wilt by *Fusarium oxysporum* in strawberry plants, Camino Real var., in the evaluation of severity (20 DA CA). Tamándaro, Michoacán, Méixco. 2019.



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Biofumigate Or N against *Fusarium sp.*

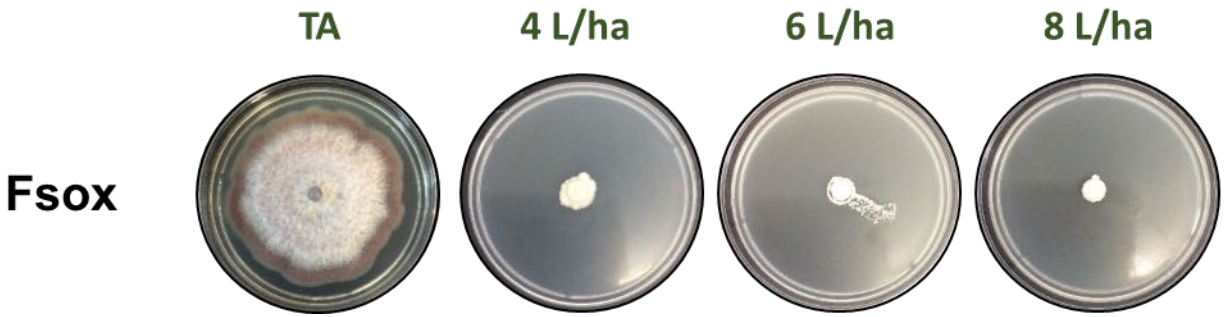
OBJECTIVE: Evaluate the antifungal capacity of the Biofumigate Or N product against *Fusarium sp.*

PLANT EXTRACT BLEND FORMULATION PRODUCT

INOCULATION OF BENEFITIAL BIOCONSORTIA SUGGESTED AFTER APPLICATION

Table 1. Percentages of phytopathogen inhibition with BiofumigateOr N product

Microorganismo	BiofumigateOr (%)		
	4L/ha	6 L/ha	8 L/ha
Fsox	80.9	85.3	88.6



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Biological efficacy of Nemato-X-Empt (Prot 3-1) on *Meloidogyne spp.* in vitro

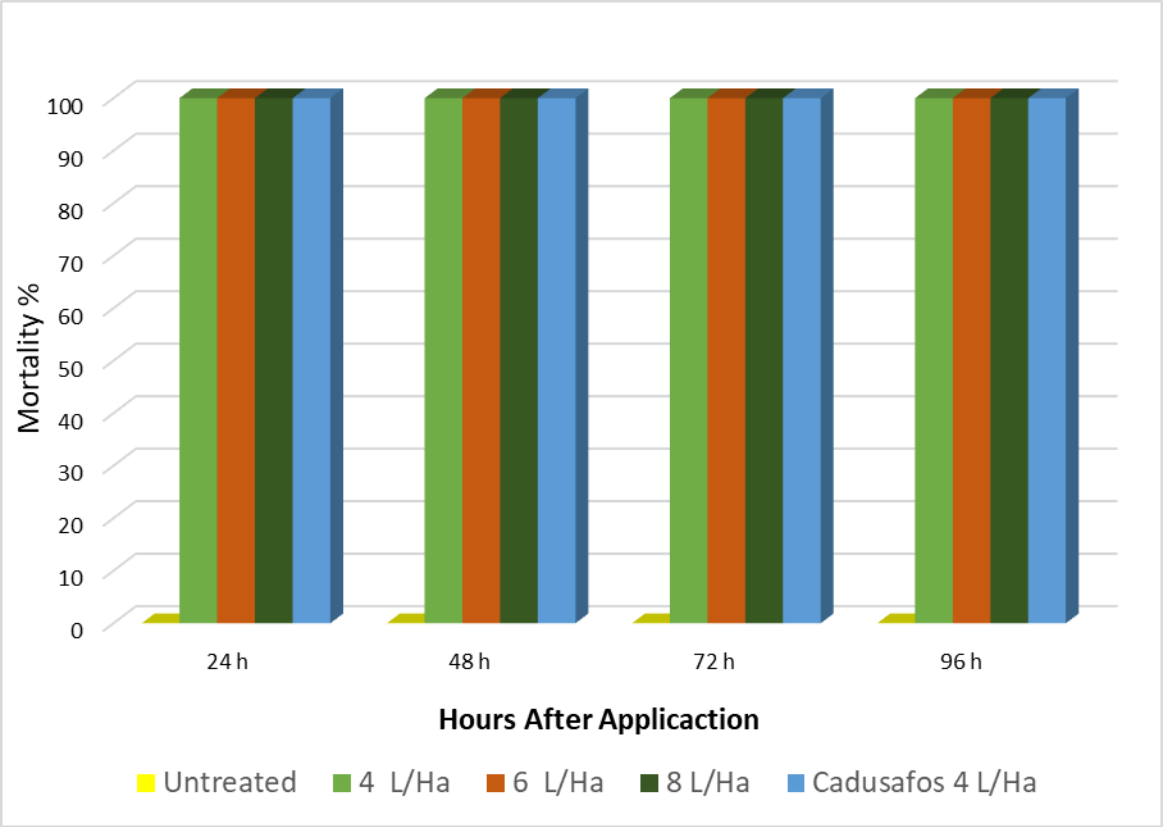

Figure 2. Juveniles of *Meloidogyne* spp. (J2) after 24 h of Nemato-X-Empt (N-X-E) application. **A**.- untreated with J2 in active form; **B**.- Dose of 4 L / ha of N-X-E in J2 with resting form (dead).

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Conclusions

SOIL HEALTH CARE IS THE KEY FOR SUSTAINABLE AGRICULTURE

SOIL HEALTH MANAGEMENT THROUGH THE RHIZOSPHERE MANIPULATION AND MICROBIAL INOCULATION AND DIVERSITY IS REQUIRED FOR BETTER PLANT GROWTH AND DEVELOPMENT, DISEASE CONTROL, AS WELL AS INCREASING CROP YIELDS AND QUALITY .

PLANT EXTRACTS BASED PRODUCTS FOLLOWED BY MICROBIAL INOCULATIONS, CAN BE USED TO IMPROVE SOIL HEALTH BY SUPPRESSING HIGH POPULATIONS OF PHYTOPATOGENIC FUNGI, BACTERIA AND NEMATODES