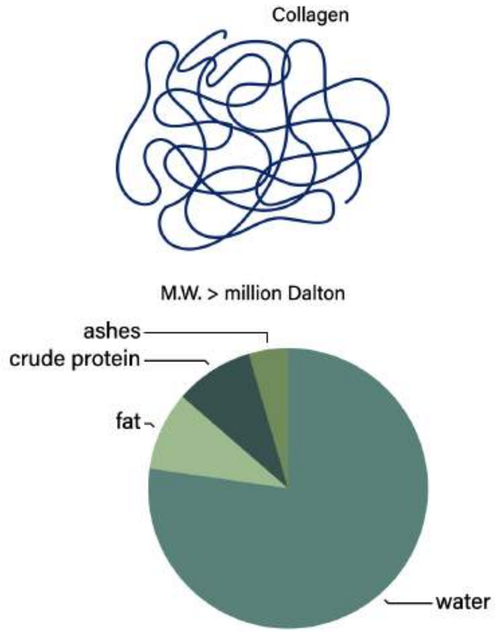
SICIT GROUP

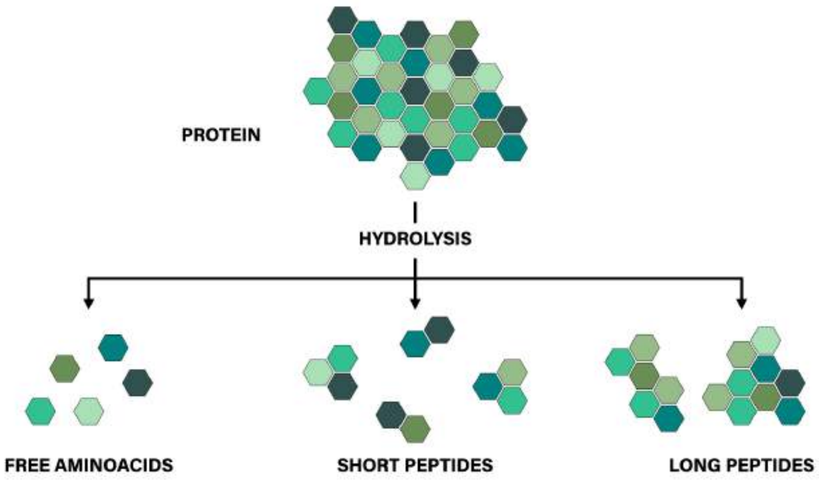
BIOSTIMULANTS

WHAT WE DO

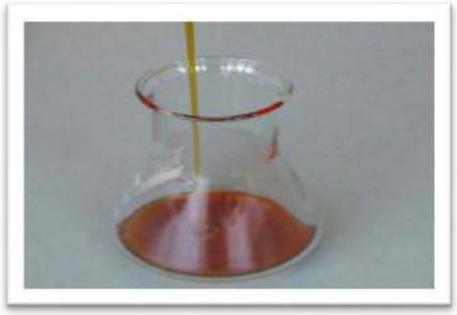
1. ANIMAL BY PRODUCTS

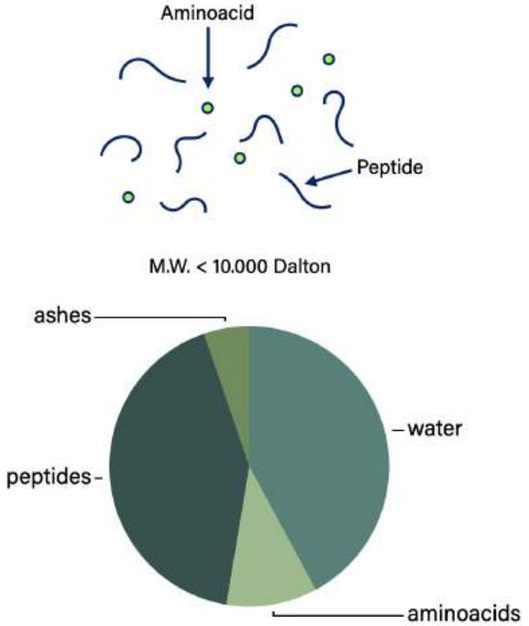


2. CHEMICAL HYDROLYSIS

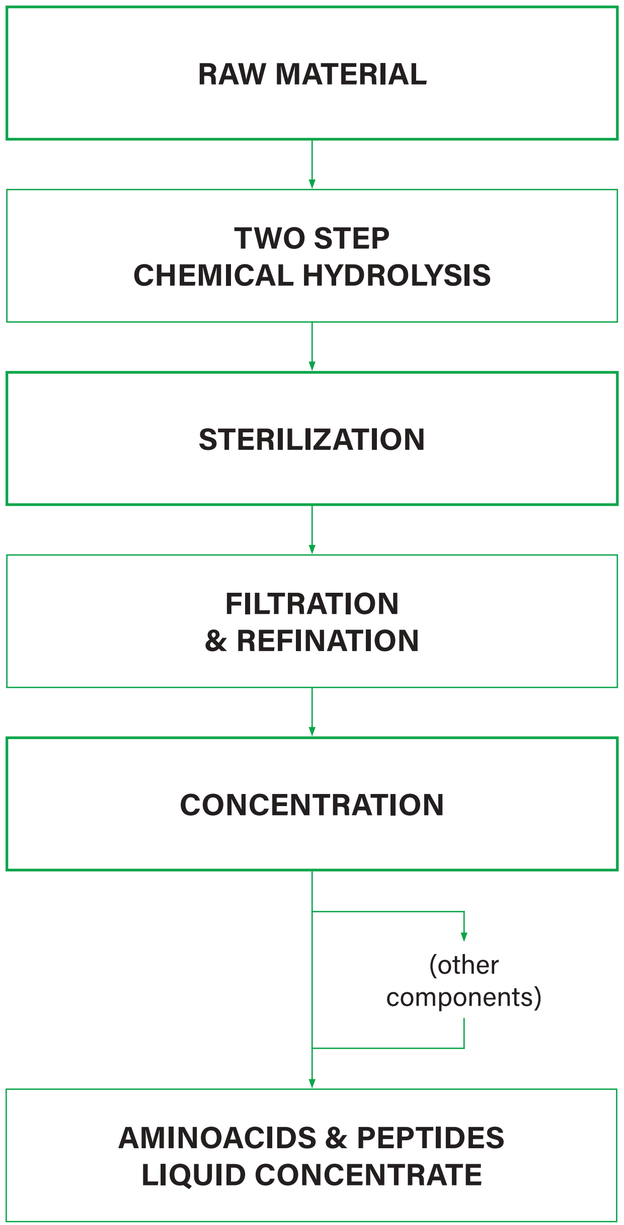


3. HYDROLYSED PROTEIN





MANUFACTURING PROCESS



Collagen (cow skin): high quality (animal feed, dietary supplement, cosmetics, etc) rich in glycine and proline

Complete control & high flexibility of the process

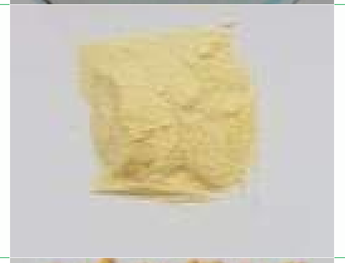
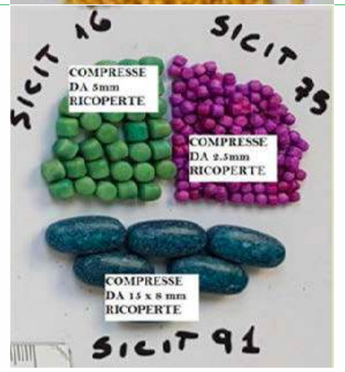
Performed pursuant the Reg. Ec 142/2011 (animal by-products) to eliminate any biological contamination

Clear and stable product, free from sediments
Treatment with activated carbon and ionic resins to eliminate any micro contaminants

Up to 60 (85)% of amino acids in liquid (solid) products

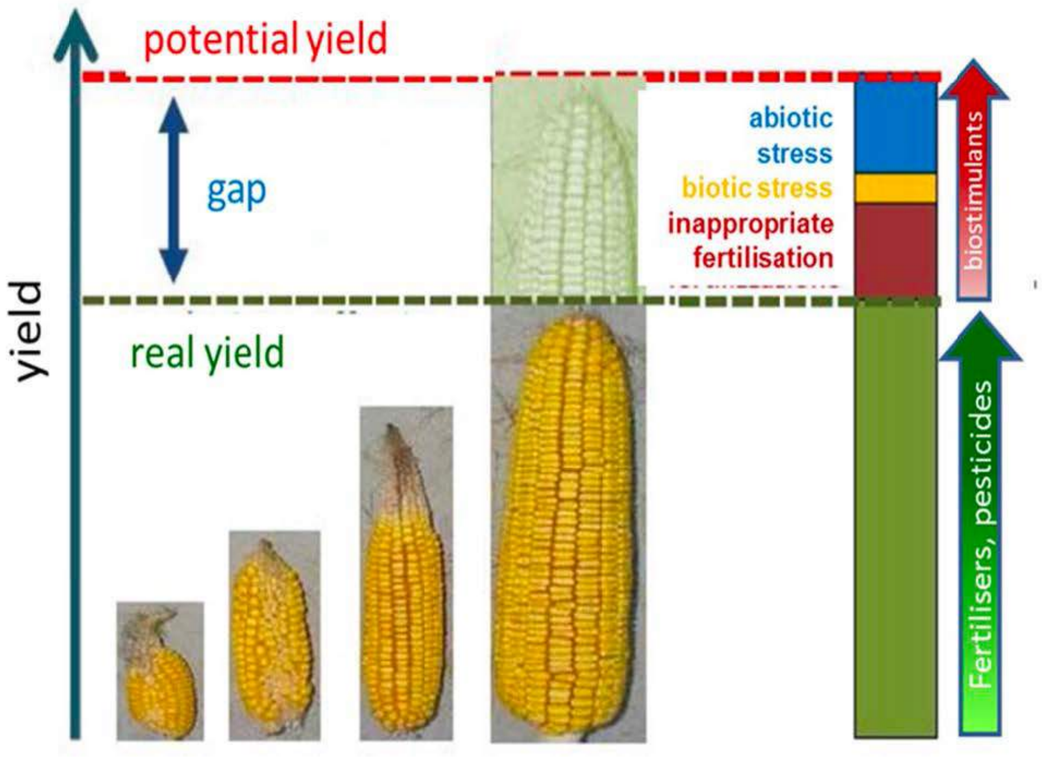
High compatibility with nutrients and other biostimulants

SICIT PRODUCT RANGE

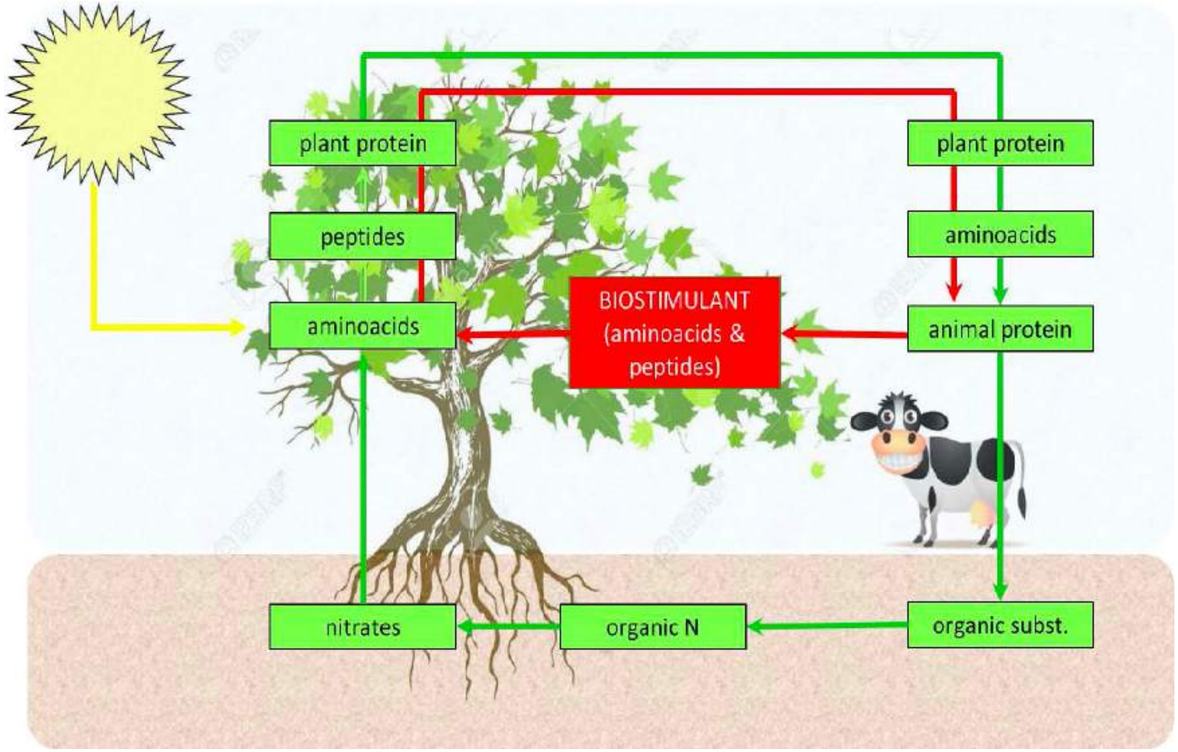
Product	Process Technology		Soluble	WP	SR	Size (mm)	Possible Use
LIQUID	Hydrolysis		XXX			-	Foliar spray, fertigation, seed treatment
POWDER	Spray drying from liquid		XXX			0,05	Foliar spray, fertigation, seed treatment
GRANULES	Fluid bed drying from liquid		XX	XX	XX	2 - 3	• Foliar spray, fertigationfertigation, seed treatment • Mix with ws or granular NPK / TE • In furrow or broadcast (sowing or transplant)
TABS	Compression and molding from powder			X	XXX	2 - 20	• In furrow or broadcast (sowing or transplant – boost effect) • Mix with other components

WHAT ARE BIO STIMULANTS

WHAT ARE “PLANT BIO-STIMULANTS”? How to express the concept of efficiency and sustainability



courtesy Assofertilizzanti



HIGHER EFFICIENCY

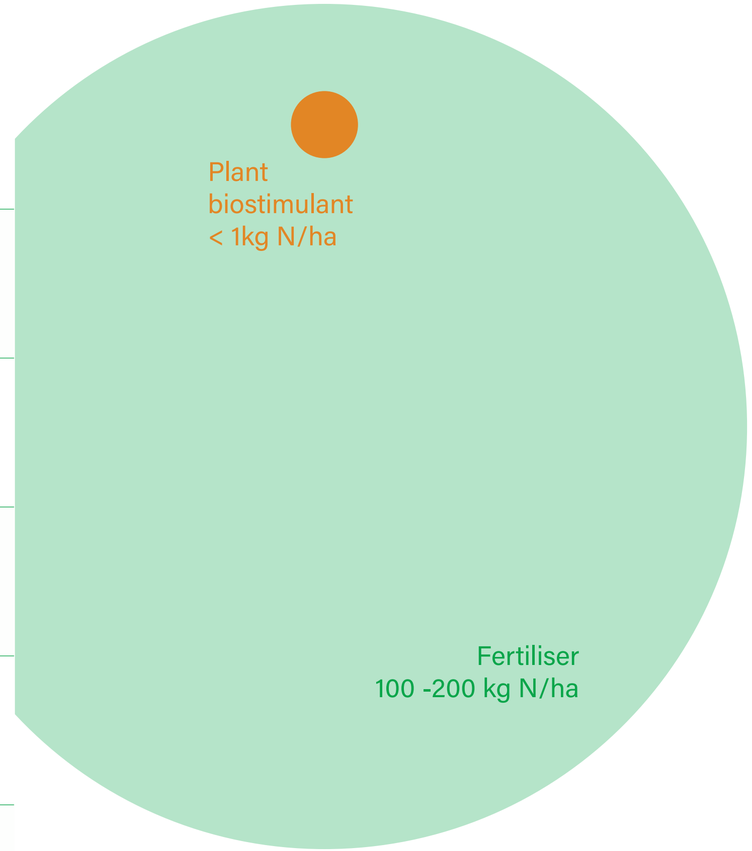
- Improve crop yield and quality
- Relieve abiotic stress conditions
- Improve nutrient and C.P. efficiency

SUSTAINABILITY

- Natural products from circular economy

WHAT ARE “PLANT BIO-STIMULANTS”? Differences between fertilisers and biostimulants

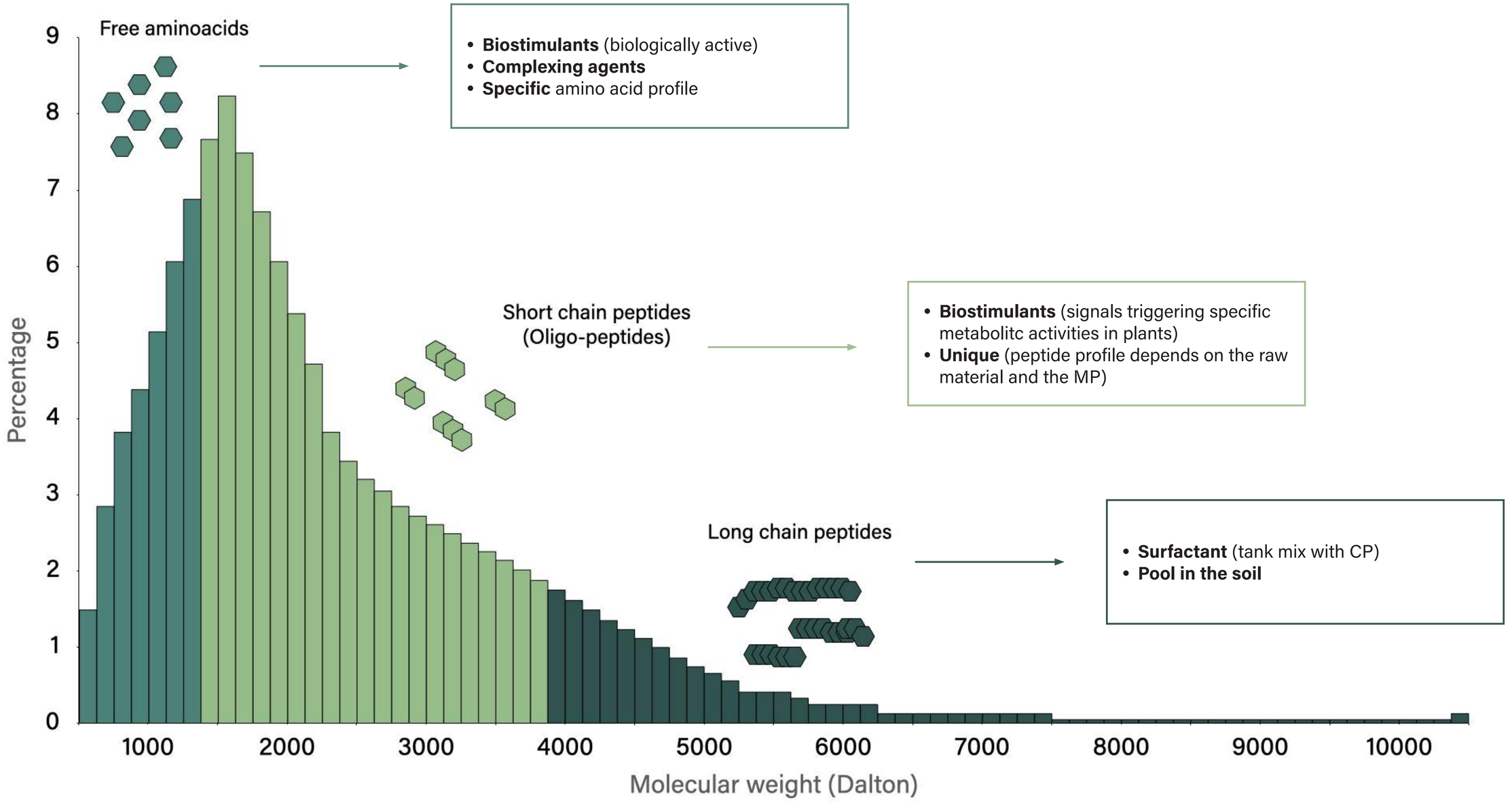
	Fertilisers	Plant Biostimulants
Function	Provide nutrients for plants • Macro-nutrients (N, P, K) • Meso-nutrients (Ca, Mg, S, Na) • Micro-nutrients (B, Co, Cu, Fe, Mn, Mo, Zn)	Stimulate plant nutrition • Improve crop yield and quality • Relieve abiotic stress conditions • Improve nutrient and C.P. efficiency • Sustainable (natural products)
Dosage rate	High (100-200 kg n/ha)	Low (0.3 0.3-0.7 Kg N/ha)
Application	Tipically to soil sometimes foliar spray	Foliar spray or fertigation
Price and margin	Low(commodities)	High (specialties)
Product value	Depends on the concentration	Depends on the recipe
Sustainability	Low (linear economy)	High (circular economy)
Technical expertise	Medium/ low	Very high

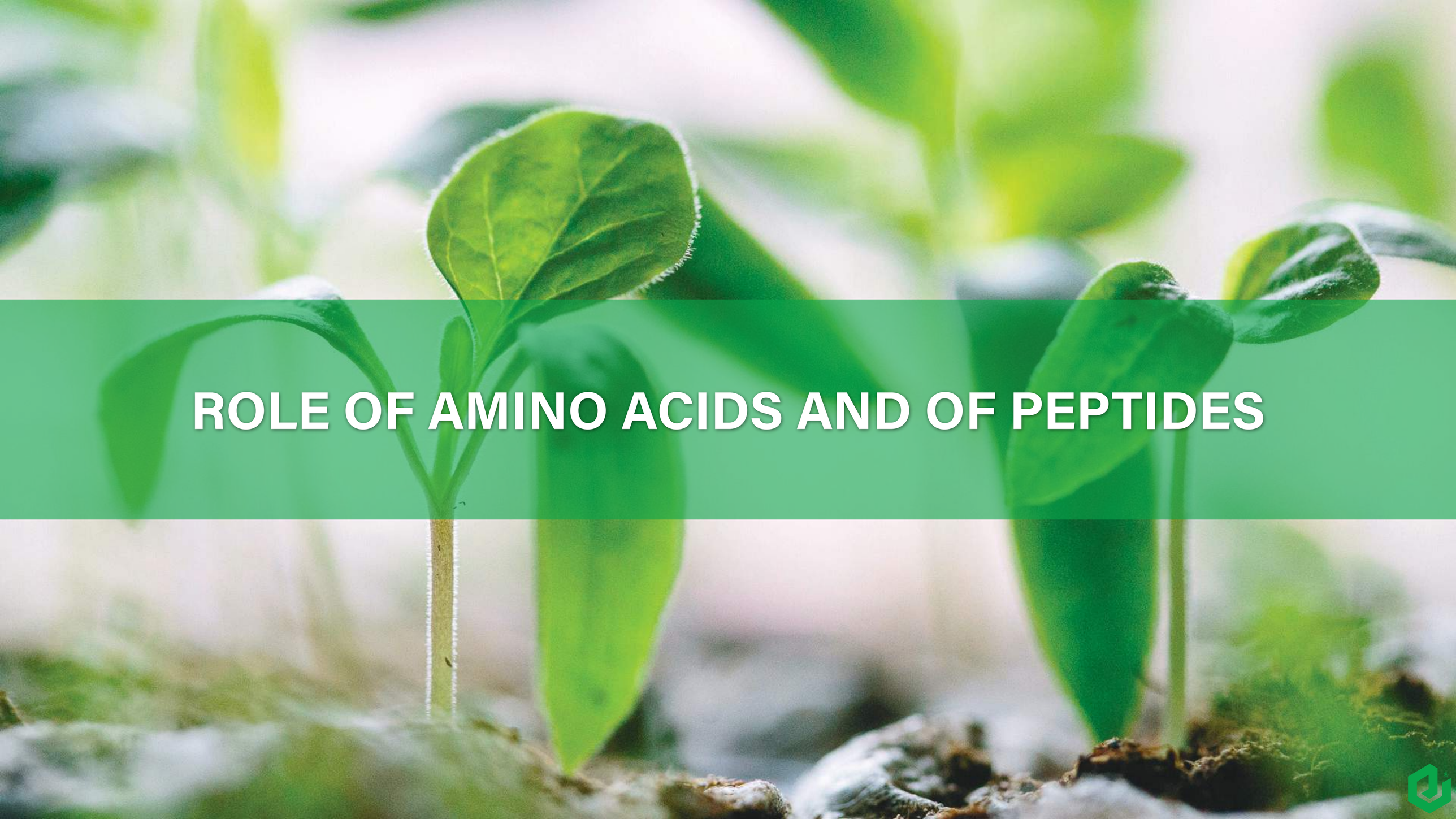


BIOSTIMULANT BENEFITS

Benefit	Effect
1. NUTRIENT EFFICIENCY AND BIO-AVAILABILITY	• Chelating action and uptake increase • Better soil availability of micro-nutrients the soil • Better accumulation of nutrients inside the plant
2. GROWTH, FERTILITY AND YIELD	• More efficient growth of root and shoot • Improve flower fertility (e.g. «alternation» problem of olive trees) and fruit fruit-setting • Improve fruit growth
3. QUALITY TRAITS	• Better fruit quality (color, sugar accumulation) • Greening effect • Educing the accumulation of nitrates (nitrites, nitrosamines)
4. ABIOTIC STRESS	• Increased tolerance to extreme temperatures, salinity, drought, low light availability
5. SOIL FERTILITY	• Stimulate the activity of the helpful microflora rhizosphere

EACH COMPONENT PLAYS A SPECIFIC ROLE ON THE CROP





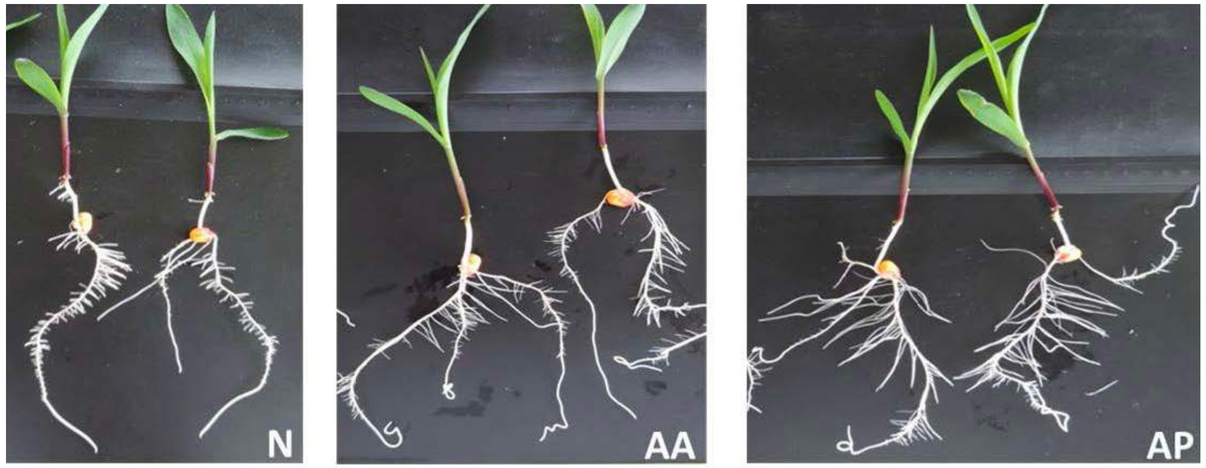
ROLE OF AMINO ACIDS AND OF PEPTIDES

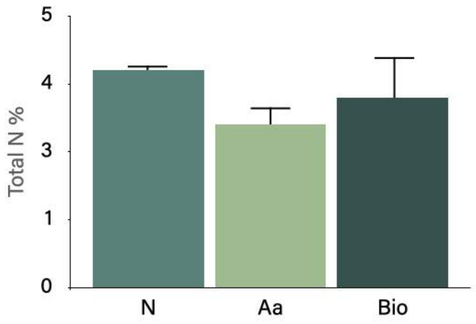
ROLE OF AMINO ACIDS AND OF PEPTIDES

AMINO ACID	PHYSIOLOGICAL FUNCTIONS (H. Arjona , Bogota 200)
Proline hydroxy-proline	• **Regulator of water equilibrium** (strong anti stress & anti senescence effect). Proline content increases every time the plant is stressed • Formation of the cell walls (nematostatic action) • **Essential for forming fertile pollen** in flowers (better fruit-setting) • Synergize GA action • Helps stomata opening
Glycine	• **Strong chelating agent** • **Chlorophyll precursor** (pirrolic group) • Helps bud and leaf growth • Takes part in the plant resistance system with lysine
Alanine	• Helps the chlorophyll synthesis • Plays a very important role in the **hormone metabolism** and in the mechanisms of virus resistance
Glutamic acid	• **Precursor of other AA synthesis** (organic nitrogen reserve to form other amino acids and proteins via trans-aminase reactions) • **Stimulates plant growth** • Takes part in the plant resistance system (SAR) • Improves pollen germination and pollen tube elongation

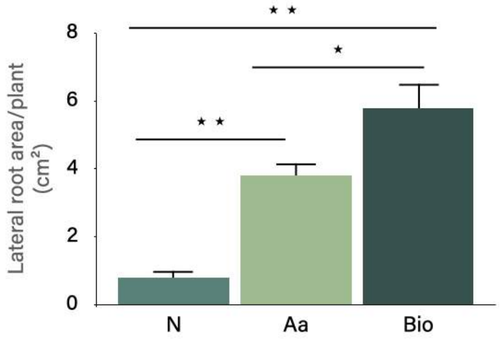
Some peptides are **BIOLOGICALLY ACTIVE MOLECULES**, actingas «signals » able to trigger specific metabolic activities such as:

- **Hormone metabolism (IAA and CK)**
- **Micro-nutrient and sugar transport**
- **Stress response**

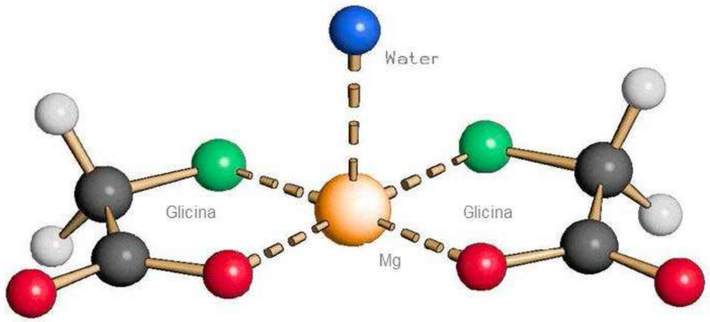




The root total N content is unchanged

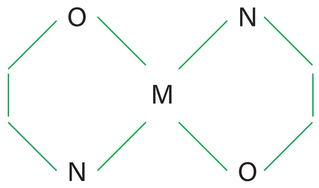


The lateral root growth is improved



Representation of an amino acid chelate with a molar ratio of 2 glycine molecules to a cation atom (Mg)

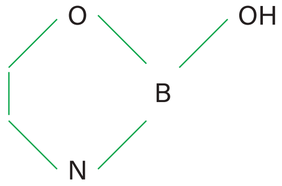
Trace Element Chelates with Amino Acids,
M = Cu, Fe, Mn, Zn



Typical structure (bidentate) when two amino acids are bonded to a metal ion.

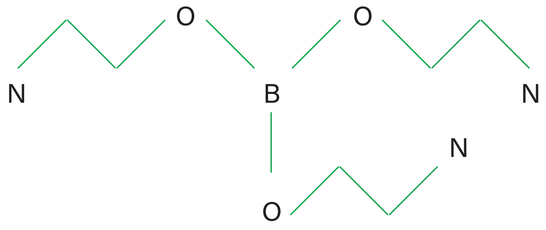
The bonding to the metal ion is through both the Nitrogen and Oxygen atoms, thereby forming a five-membered chelate ring

Boron Chelates and Complexes with Amino Acids



Ratio 1:1 - Chelate amino acid is bidentate bonding with N and O.

This structure has been reported in the literature by Das.



Ratio 1:3 - Complex Three Amino Acids are bonded to Boron with O only.

Each Boron is bonded to three Glycinate anions through Oxygen only. This structure occurs when solutions of Glycine (3 moles) and Boric acid (one mole) are crystallised from water. Elemental analysis by SICIT confirms this composition.

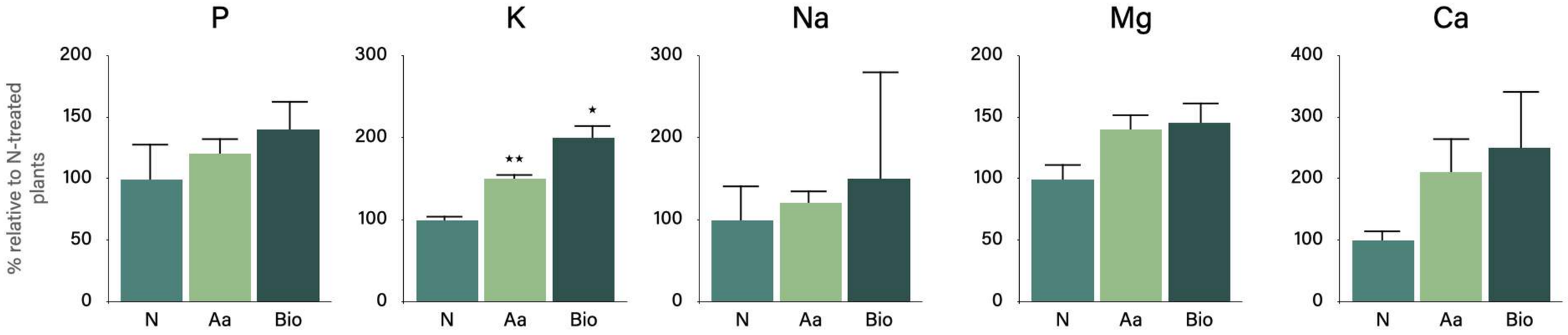
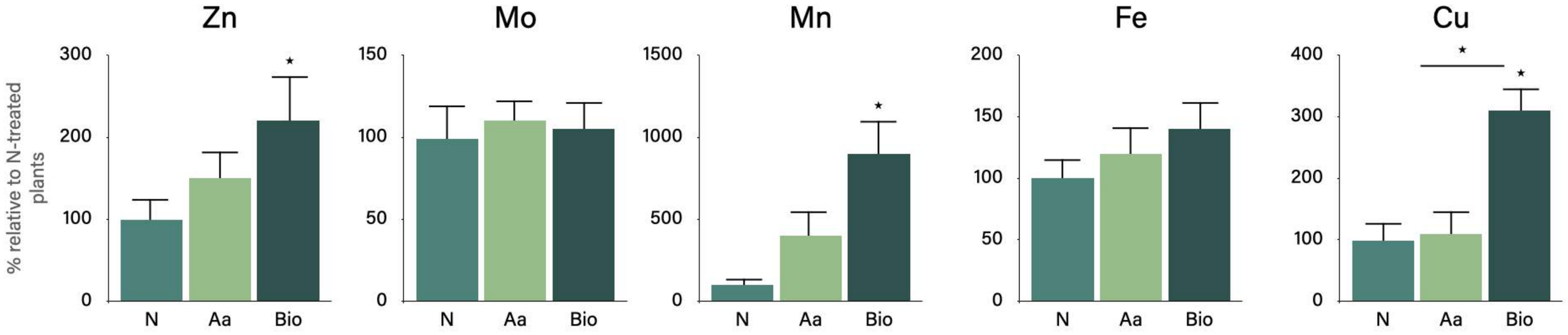
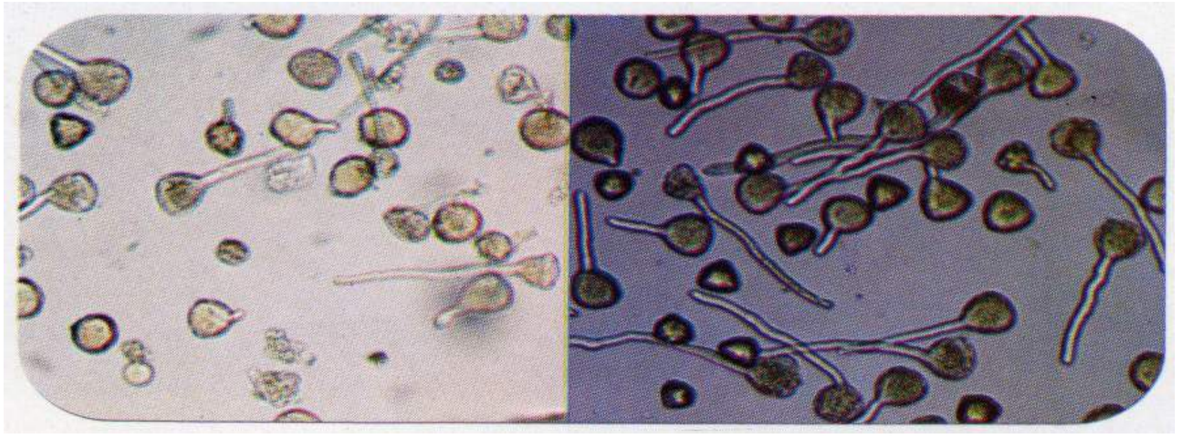


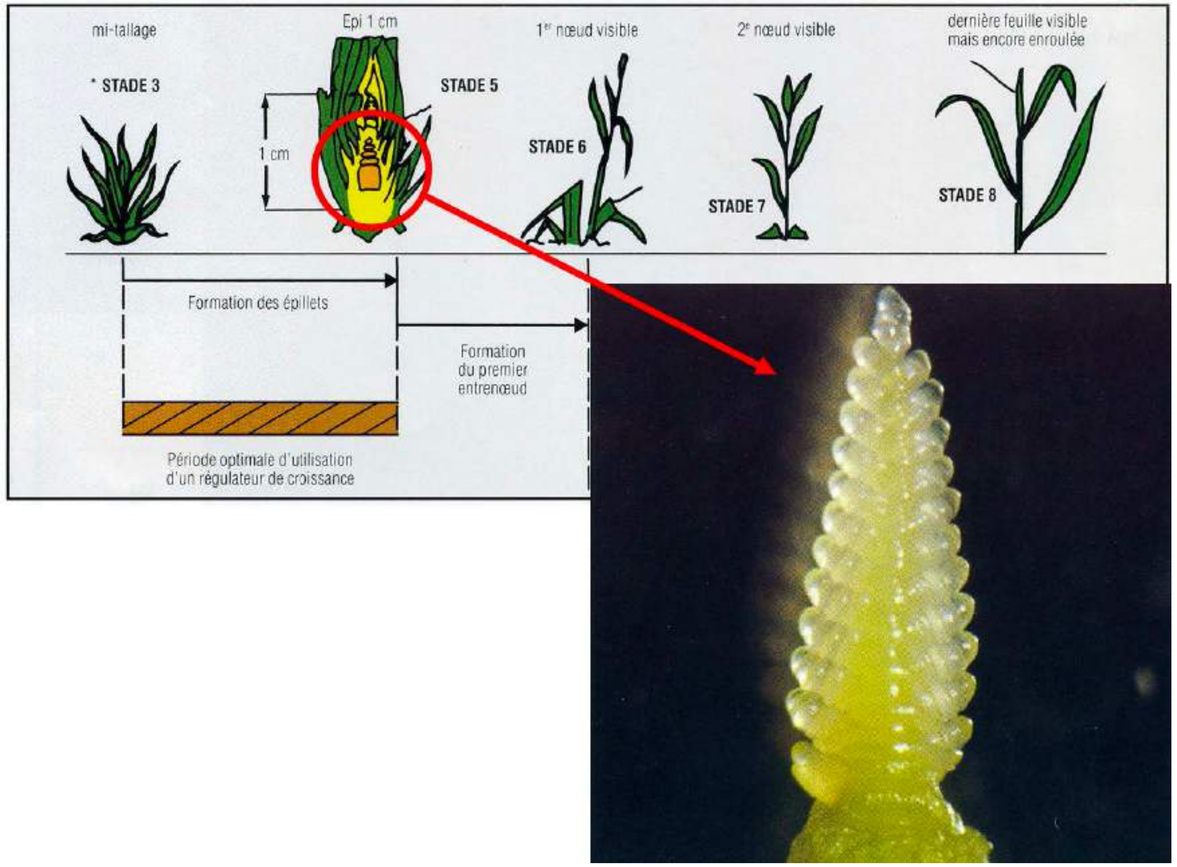
FIGURE 2 | Concentrations of macro- and micro-nutrients in the roots of seedling treated with protein hydrolysate, free amino acids and inorganic N.

Mg, K, Mn, Fe, Cu, Zn, Na, Ca, Mo, P root concentration was measured by means of high throughput inductively coupled plasma-mass spectroscopy (ICP-MS). In all the treatments, the total N supply was equal to 11.3 mgL^{-1}. The nutrient concentrations are expressed ad percentage of concentrations measured in seedlings treated with inorganic nitrogen. The average values are reported. Bars represent the standard error (SEM) ($n = 3$). If not otherwise specifies, Student's *t*-test was applied vs. N-treated plants, *$P < 0.05$; **$P < 0.01$.

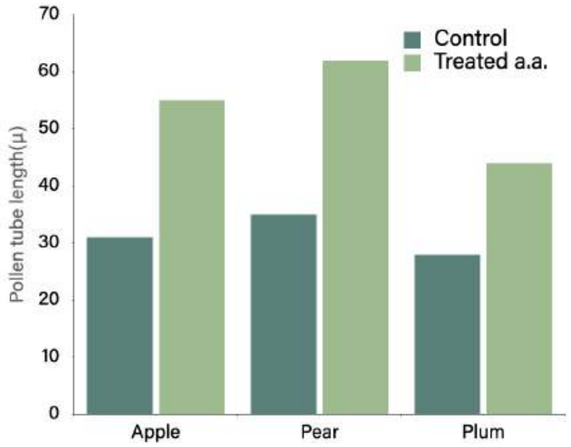


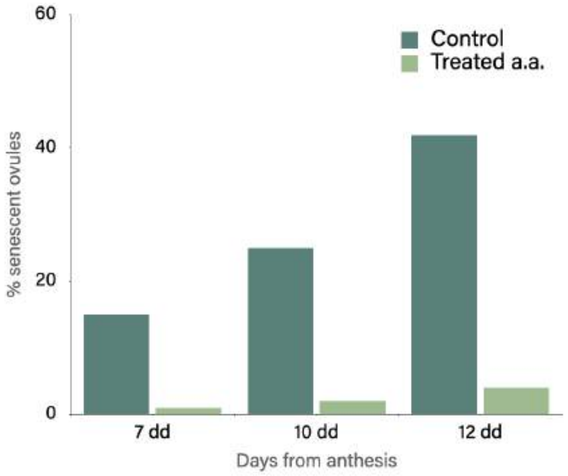


pollentube elongation

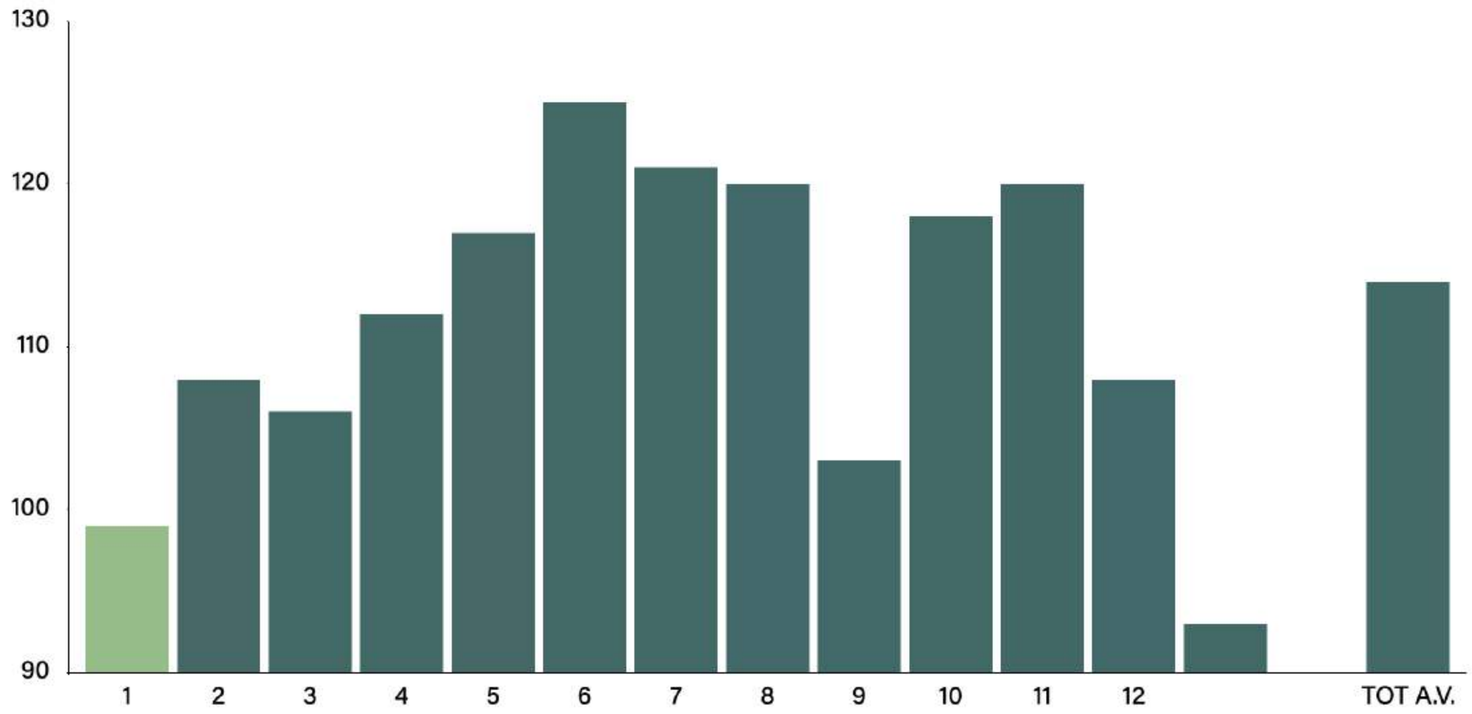


ovule senescence (apple)





3) YIELD, VIGOUR & GREENING



POTATO - France & Belgium

Total mean yield (4 years), kg/ha = 35.080 (Untreated)
40.130 (Treated) + 15%

Treated

No deformation, no small tuber (small fraction), better uniformity and shape, less waste

Untreated

Deformation, small tuber (small fraction), lack of uniformity

11 days of FeEDTA

11 days of Fe deprivation

7 days of Fe deprivation
4 days of resupply with Fe
+ amino acids and peptides

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