The New Frontier Of

BIOSCIENCE

for your innovative and successful products

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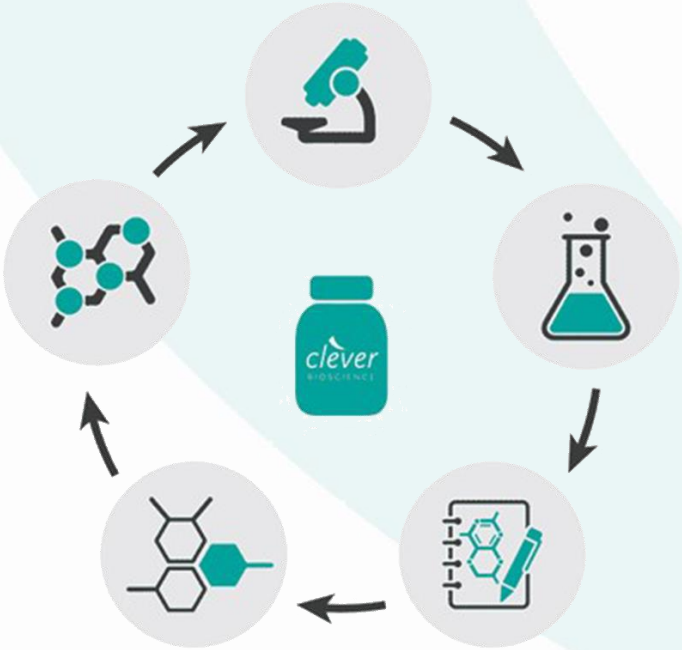
Who is Clever?



Clever Bioscience is a private company that offers the development and the production of innovative products and services, for agro-food, cosmetic, nutraceutical and pharmaceutical companies.
Through the use of advanced techniques of microbiology, molecular biology and biochemistry Clever Bioscience is able to develop products opportunely formulated.

LabAnalysis
HIGH QUALITY CONTROLS

As part of the Labanalysis group (accredited, GMP, GLP) we carry out studies on products of interest to support the registration phase and in the quality control process.

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Where we are

> 12000 m² facilities
Offices and laboratories

> 500 employees
> 75% graduated

6 branches in Italy
Head office in Casanova Lonati (PV)

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Clever Bioscience & Lab Analysis

Our services and mission

MANAGEMENT OF THE WHOLE PROCESS:

MICROBIOLOGY

- Lab-scale and industrial scale of Solid State Fermentation (SSF) Submerged Fermentation (SmF) in flasks and in bioreactors
- Evaluation of the product efficacy against pathogens
- Microbial isolation and strain improvement
- Microbial identification and quantification in several final products
- Evaluation of the product efficacy in promoting the growth of beneficial soil bacteria
- Fermentation for new postbiotics to use as biostimulants

MOLECULAR BIOLOGY

- Genomic analysis
- Heterologous expression of proteins and peptides in bacteria and yeast
- Homology modeling, docking and molecular dynamic
- CRISPR-Cas9 technology
- Transcriptomic analysis
- Metabolic engineering

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Our services

BIOCATALYSIS

- Production and purification of bioactive peptides
- Production and purification of active ingredients
- Set-up and optimization of enzymatic assays and analytical methods
- New Iron-chelators
- Enzymatic hydrolysis of natural biomasses for new biostimulants
- Semisynthetic approaches for biocides

CHEMISTRY

- Metabolomic analysis
- Recovery and identification of target metabolites
- Production of analytical standard
- Residual analysis
- Process validation

FORMULATION

- Optimization of the mechanism of action for microorganisms, microbial metabolites, peptides and natural extracts
- Improvement of the stability
- Protection of the active substance up to the target
- Efficacy enhancement
- New formulas development and engineering

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The Touch of Bioscience

New products for phytosanitary defence and crop quality with low environmental impact

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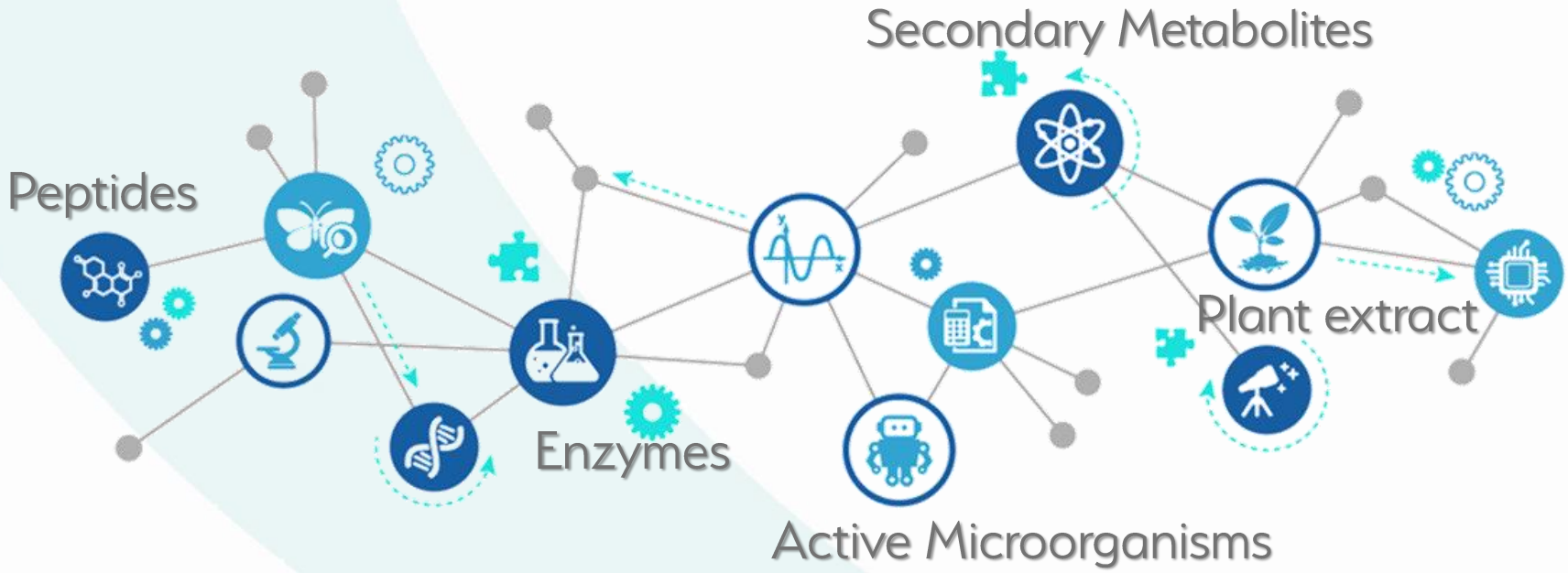
AGRO DIVISION

From active …


Secondary Metabolites
Peptides
Plant extract
Enzymes
Active Microorganisms

...to the formulated product

Aim:

- ✓ Optimization of the mechanism of action for microorganisms, microbial metabolites, peptides and natural extracts.
- ✓ Protection of the active substance up to the target.
- ✓ Improvement of stability

Our know-how permits to develop different types of formulation on the new biospeticides based on:

- ✓ Microorganism (WP$_{\text{water powder}}$, WDG$_{\text{water dispersible granule}}$, OD$_{\text{oil dispersion}}$, etc.)
- ✓ Plant extract (EC$_{\text{emulsifiable concentrate}}$, SL$_{\text{Soluble (liquid) concentrate}}$, SC$_{\text{suspension concentrate}}$, etc.)
- ✓ Peptide (SL$_{\text{Soluble (liquid) concentrate}}$ or SC$_{\text{suspension concentrate}}$ and ZC if the peptide is prepared together with conventional pesticides)

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BIOSTIMULANT
Vegetable Biomass hydrolysated

Product obtained by biocatalysis to overcame the abiotic stress (e.g. extreme temperatures, drought, etc)

BIOSTIMULANT
Based on microorganisms

G (granule) - slow release - dispersed on the soil or in furrow by granule spreader.

WDG (water dispersible granule) – fast release - fertigation with drip and alternative irrigation systems.

CLEVER TRICHO® WDG

CLEVER TRICHO is a biostimulant based on *Trichoderma spp.* (minimum concentration $2 \cdot 10^8$ spore/g) and bacteria from rhizosphere (minimum concentration $2 \cdot 10^6$ CFU/g) able to promote the radical development of horticultural and flower plants. The application in pre-transplantation and through drip-irrigation leads to an improvement in the vigor of the plants and consequently a greater production of the fruit.

PRE TRASPLANTING

DRENCH APPLICATION	RATE	TREATMENTS & TIMING
Tomato	0,5-1 kg/hl	Before transplanting
Lettuce	0,5-1 kg/hl	Before transplanting
Floreal	0,5-1 kg/hl	Before transplanting

POST TRASPLANTING

DRIP IRRIGATION APPLICATION	RATE	TREATMENTS & TIMING
Pepper	5-10 kg/ha	after transplanting
	5 kg/ha	after 14 days (max 3 application)
Eggplant	5-10 kg/ha	after transplanting
	5 kg/ha	after 14 days (max 3 application)
Tomato	5-10 kg/ha	after transplanting
	5 kg/ha	after 14 days (max 3 application)
Lettuce	5 kg/ha	after transplanting
	5 kg/ha	after 7days (max 2 application)
Floreal	1 kg/hl	after transplanting
	1 kg/hl	after 10-14 days (max 4 application)

FORMULATION: Water Dispersable Granule

STORAGE: 4°C - 25°C

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CLEVER TRICHO® OD

CLEVER TRICHO is a biostimulant based on *Trichoderma spp.* (minimum concentration $2 \cdot 10^8$ spore/g) and bacteria from rhizosphere (minimum concentration $2 \cdot 10^6$ CFU/g) able to promote the radical development of horticultural and flower plants. The application in pre-transplantation and through drip-irrigation leads to an improvement in the vigor of the plants and consequently a greater production of the fruit.

PRE TRASPLANTING

DRENCH APPLICATION	RATE	TREATMENTS & TIMING
Tomato	0,5-1 kg/hl	Before transplanting
Lettuce	0,5-1 kg/hl	Before transplanting
Floreal	0,5-1 kg/hl	Before transplanting

POST TRASPLANTING

DRIP IRRIGATION APPLICATION	RATE	TREATMENTS & TIMING
Pepper	2,5 kg/ha	after transplanting
	1 kg/ha	After 10- 14 days (max 3 application)
Eggplant	2,5 kg/ha	after transplanting
	1 kg/ha	After 10-14 days (max 3 application)
Tomato	2,5 kg/ha	after transplanting
	1 kg/ha	after 10-14 days (max 3 application)
Lettuce	1,5 kg/ha per week	Maximum 3 applications
Floreal	250g/hl	after transplanting
	250g/hl	after 10 days (max 4 applications)

FORMULATION: OD

STORAGE: 4°C - 25°C

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CLEVER TRICHO® G

CLEVER TRICHO is a biostimulant based on *Trichoderma spp.* (minimum concentration $2 \cdot 10^7$ spore/g) and arbuscular mycorrhizal fungi (1% w/w) able to promote the radical development of horticultural and flower plants. The application at sowing or at transplanting leads to an improvement in the vigor of the plants and consequently a greater production of the fruit.

DISTRIBUTION ON THE ROW OR IN POTS	RATE	TREATMENTS & TIMING
Pepper	5 kg/ha	Application starting from transplanting Max 4 application (every 10-14 days)
Eggplant	5 kg/ha	Application starting from transplanting Max 4 application (every 10-14 days)
Tomato	5 kg/ha	Application starting from transplanting Max 4 application (every 10-14 days)
Lettuce	3 kg/ha	Application starting from transplanting Max 3application (every 7 days)
Floreal	50-100 g/pots	Application starting from transplanting or sowing Max 4 application (every 10-14 days)

FORMULATION: Granule

STORAGE: 4°C - 25°C

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CLEVER TRICHO ® is a biostimulant ables to promote the radical development of horticultural and flower plants. Its application leads to an improvement in the vigor of the plants and consequently a greater production of the fruit.

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ACTION of OUR BIOSTIMULANTS

TREATED

ASSAY

G (granule) in furrow
+
WDG (water dispersible granule) in drip irrigation

UNTREATED

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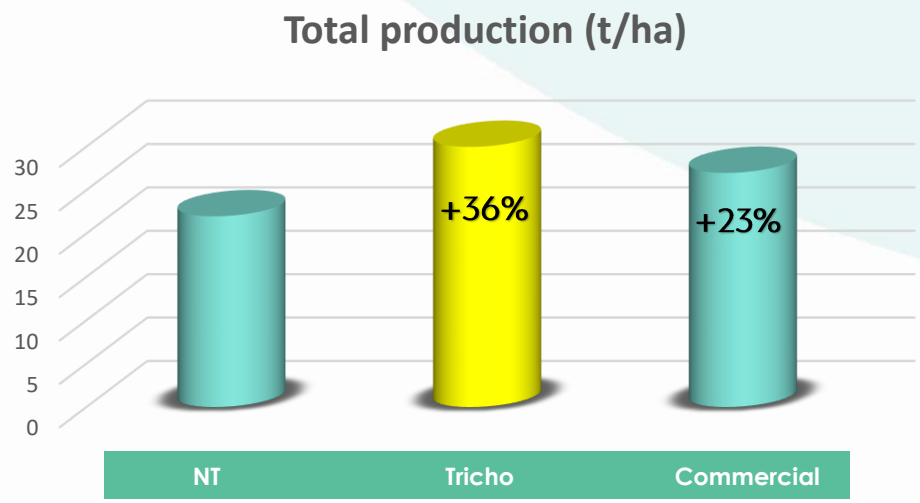
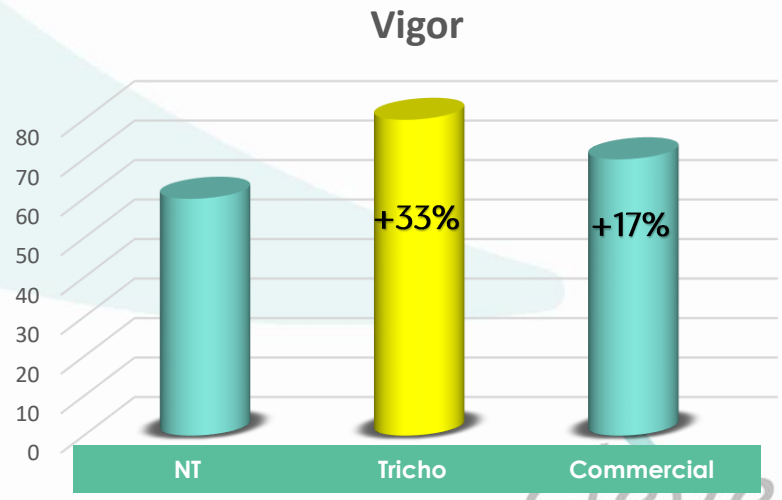
ACTION of OUR BIOSTIMULANTS

Trial Design – Tomato (open field)

Application of 5kg/ha – 10 days (no. 2 applications)





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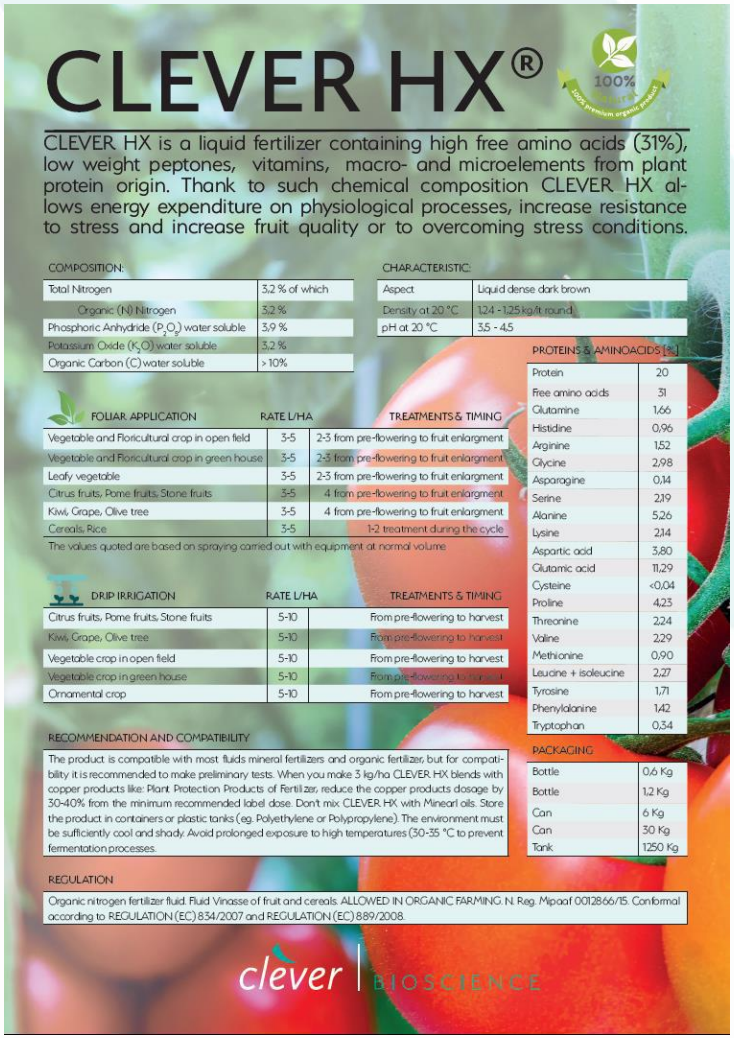

CLEVER HX ® is a biostimulant able to promote the root and vegetative development increasing also plant resistance against abiotics stress.

Thanks its new formula reach in aminoacids it is possible to enhance the plant growth and obtain major productivity yields in terms of fruits.

CLEVER HX ® is also authorized in organic farming.

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ACTION of OUR BIOSTIMULANTS

Trial Design – Lettuce (Open Field)

Application: 10 days (no. 4 applications)

T1 UNTREATED	
T2 CLEVER HX 5kg/ha	

8C

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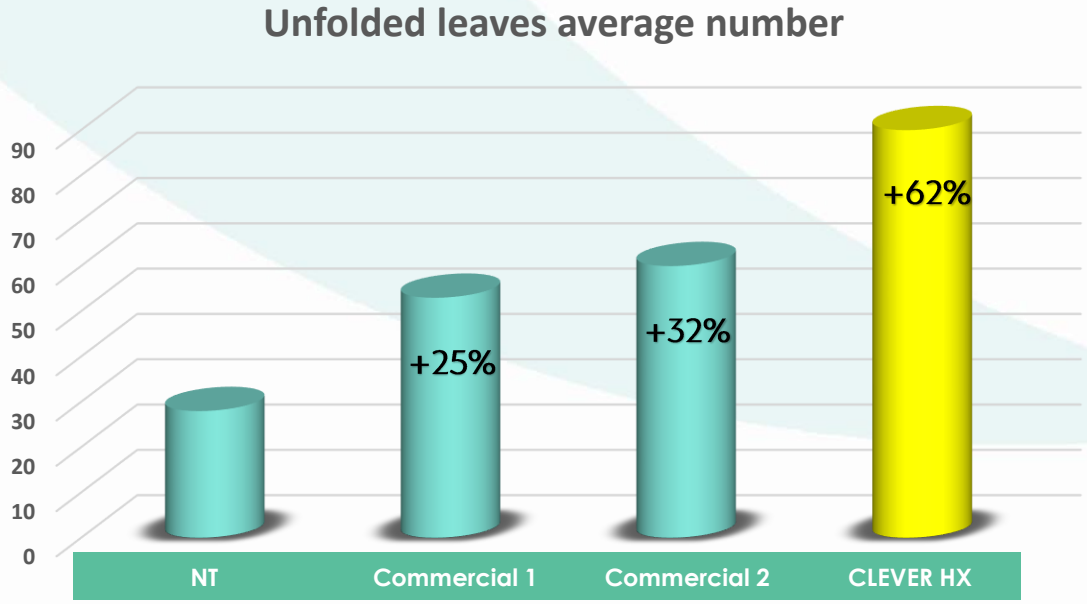
ACTION of OUR BIOSTIMULANTS

Trial Design – Lattuce (Open field)

Application of 5kg/ha – 10 days (no. 4 applications) for each product



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FOCUS ON BIOSTIMULANT & BIOPESTICIDE PRODUCTS

Mechanism of action...

Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilizing products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003.

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Genotype → *Phenotype*

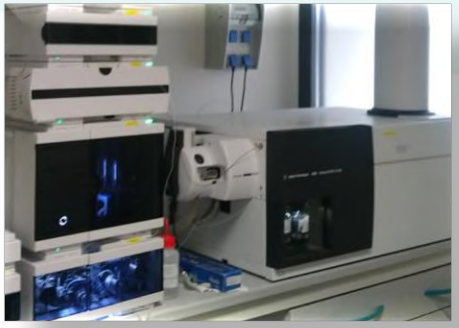
OMICS

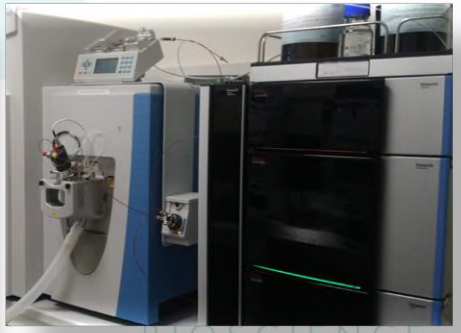
Genomic	Transcriptomic	Proteomic	Metabolomic
What can happen (Potential)	What will happen (Strategy)	What is happening (Process)	What has happened / Outcome (Products)

STUDY OF MICROBIOME/ METAGENOME ➡ Someone else helped to make it happen

Analysis

Genomic	Transcriptomic	Proteomic	Metabolomic
▪ Gene identification ▪ Genetic control	▪ Gene regulation ▪ Expression effect	▪ Protein identification ▪ Protein effect	▪ Metabolic pathway ▪ Metabolite effect





THANKS FOR YOUR ATTENTION

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