EN


DE

Take home message

- Stress makes plants weak and sick
  - Less production
  - Visual defects
- Use of nanometals (silver, copper and iron)
  - Strengthens against stress and increases photosynthesis + productivity
  - Resilience to diseases
- Proven by publications, laboratory tests and many years of preventive use by our customer
- Nanometals must be able to penetrate the plant
- Special quality required: B+H concept - patent protected
- Liquid fertilizer for easy application - individual application protocols

→Less waste and higher productivity

About us

B+H Solutions GmbH

Since 2008

- Developed and „Made in Germany“
- European Patent
- Reference material NM 300 K within the OECD WPMN (worldwide studies on safe use of nanomaterials)
- Unique quality and purity of nanoparticles
- Ongoing research and development

Supported by:

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

Bundesministerium für Wirtschaft und Klimaschutz

ZIM

Neues Projekt.

Mit dem ZIM sollen die Innovationskraft und damit die Wettbewerbsfähigkeit mittelständischer Unternehmen nachhaltig gestärkt werden.

FüE BSFZ - 2024 -

(19) Europäisches Patentamt / European Patent Office / Office européen des brevets

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(54) **METALLNANOPARTIKELHALTIGES, WÄSSRIGES DÜNGEMITTEL**
AQUEOUS FERTILIZER CONTAINING METAL NANOPARTICLES
ENGRAIS AQUEUX CONTENANT DES NANOPARTICULES MÉTALLIQUES

Nanofertilizers

B+H Solutions GmbH

AgroArgentum®

Unique and ecological solution based on the power of **Silver**

The best liquid **Iron** fertilizer

AgroFerrum®

The first fertilizer with elementary **Copper**

AgroCyprum®

Calcium, **Magnesium and Silicon** from naturally degraded rock

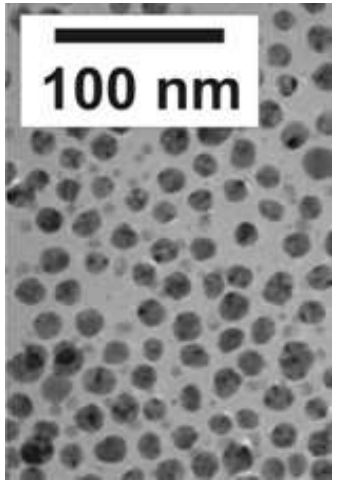
AgroCalcium®

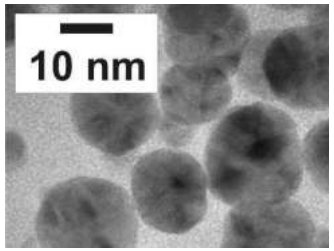
registered as EC fertilizers under Regulations (EC) 2003/2003 and (EU) 1009/2019

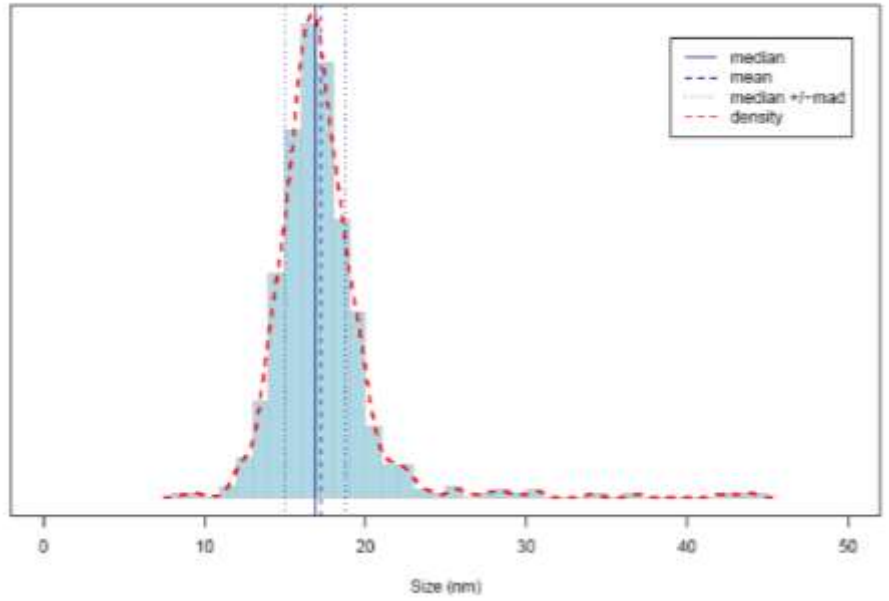
Our product quality

Pure metallic silver nanoparticles in colloidal suspensions:

- 99 % of the particle < 20 nm
- Easy uptake into the plant
- Elicitor for several plant responses
- Special formulation (no ~~chelates~~)
- Independent of pH-Value or EC







NM-series of representative manufactured nanomaterials. NM-300 Silver. Characterisation, stability, homogeneity. Klein, C.L.; et al.

Distribution in the plant

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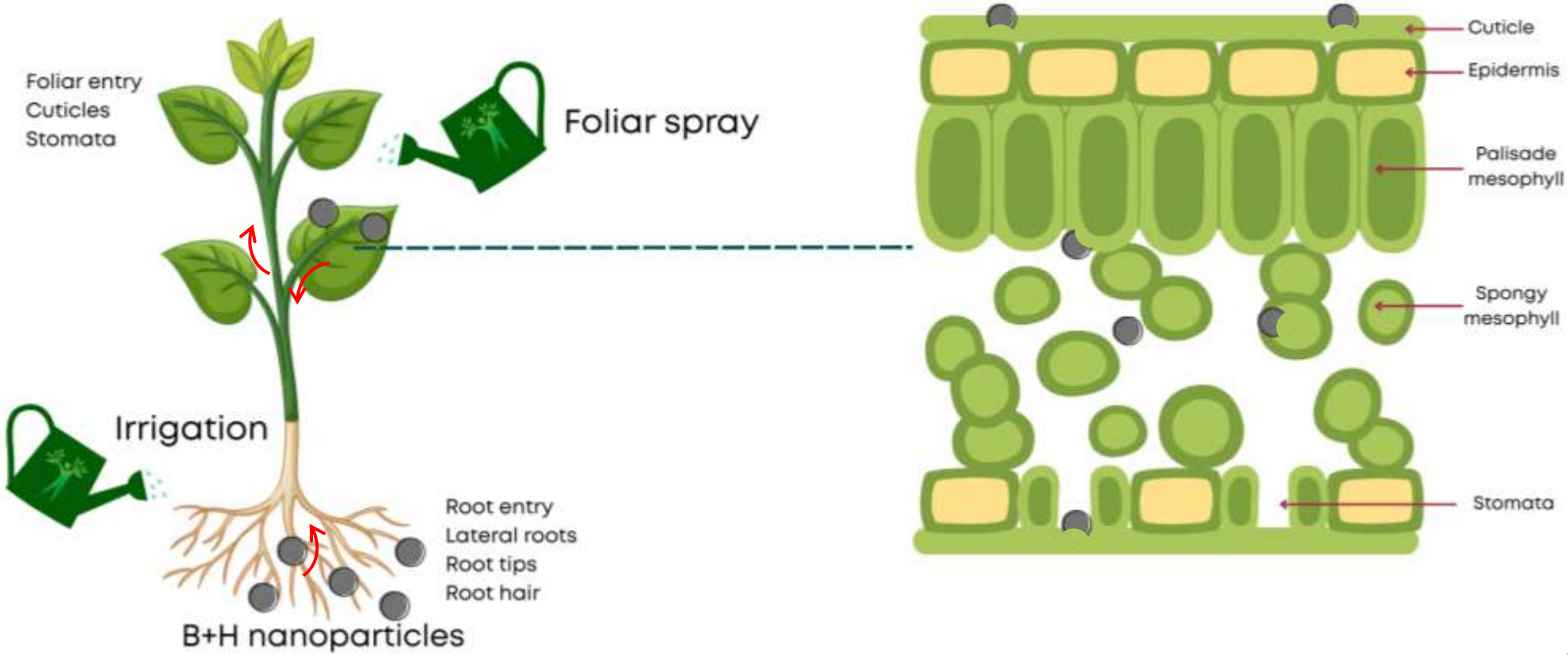
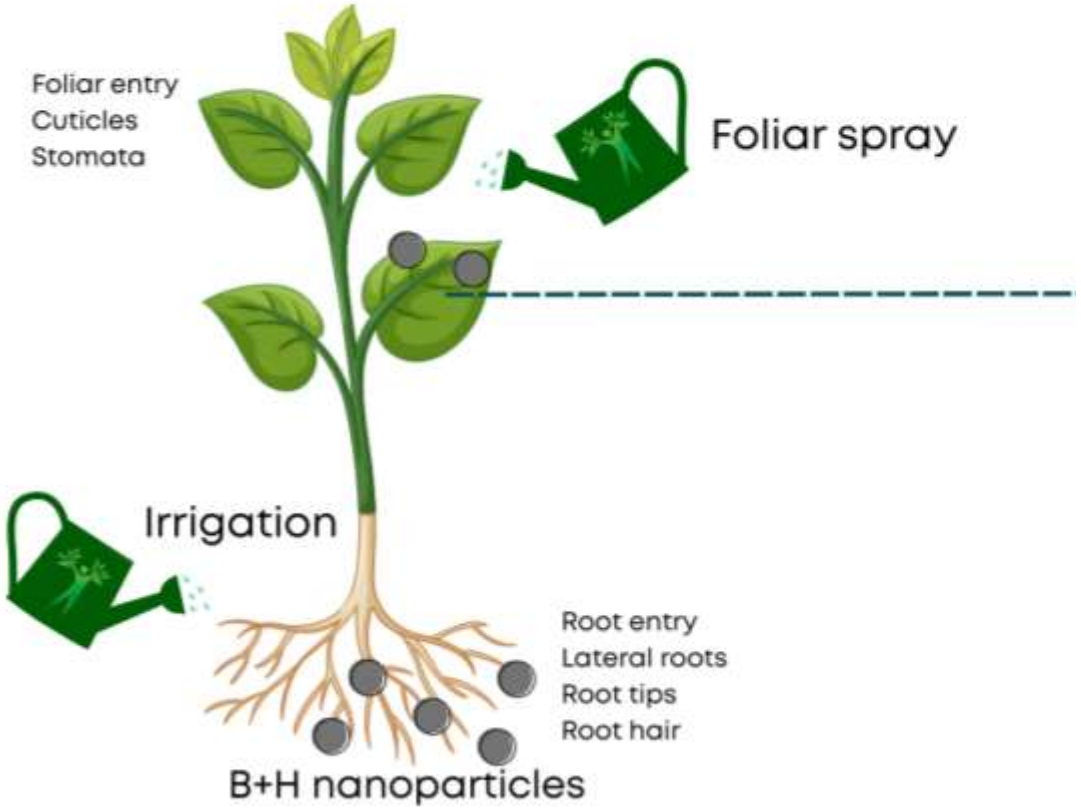
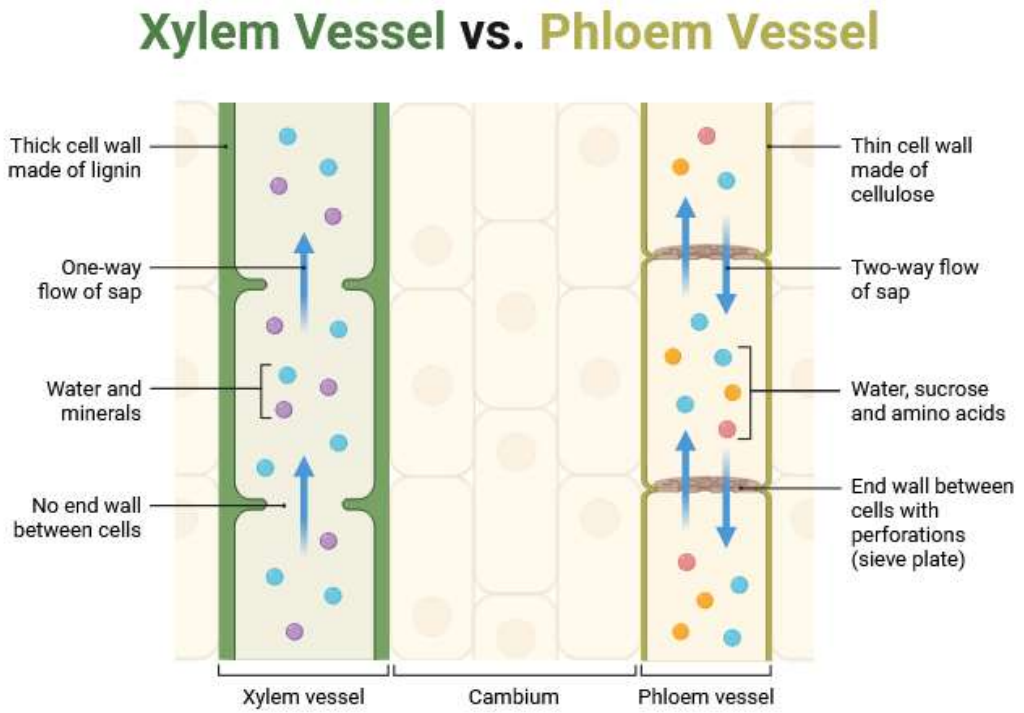
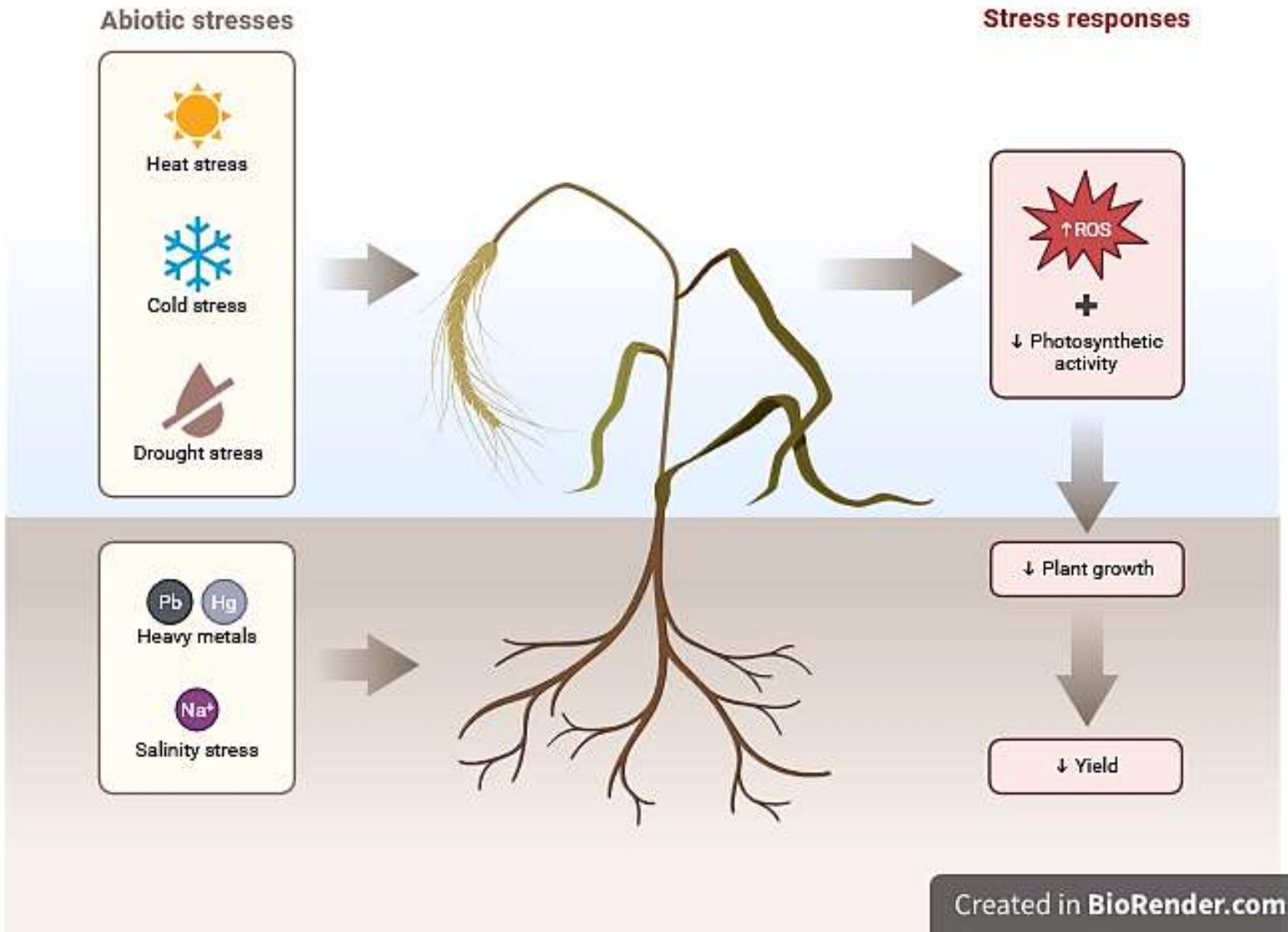


Distribution in the plant

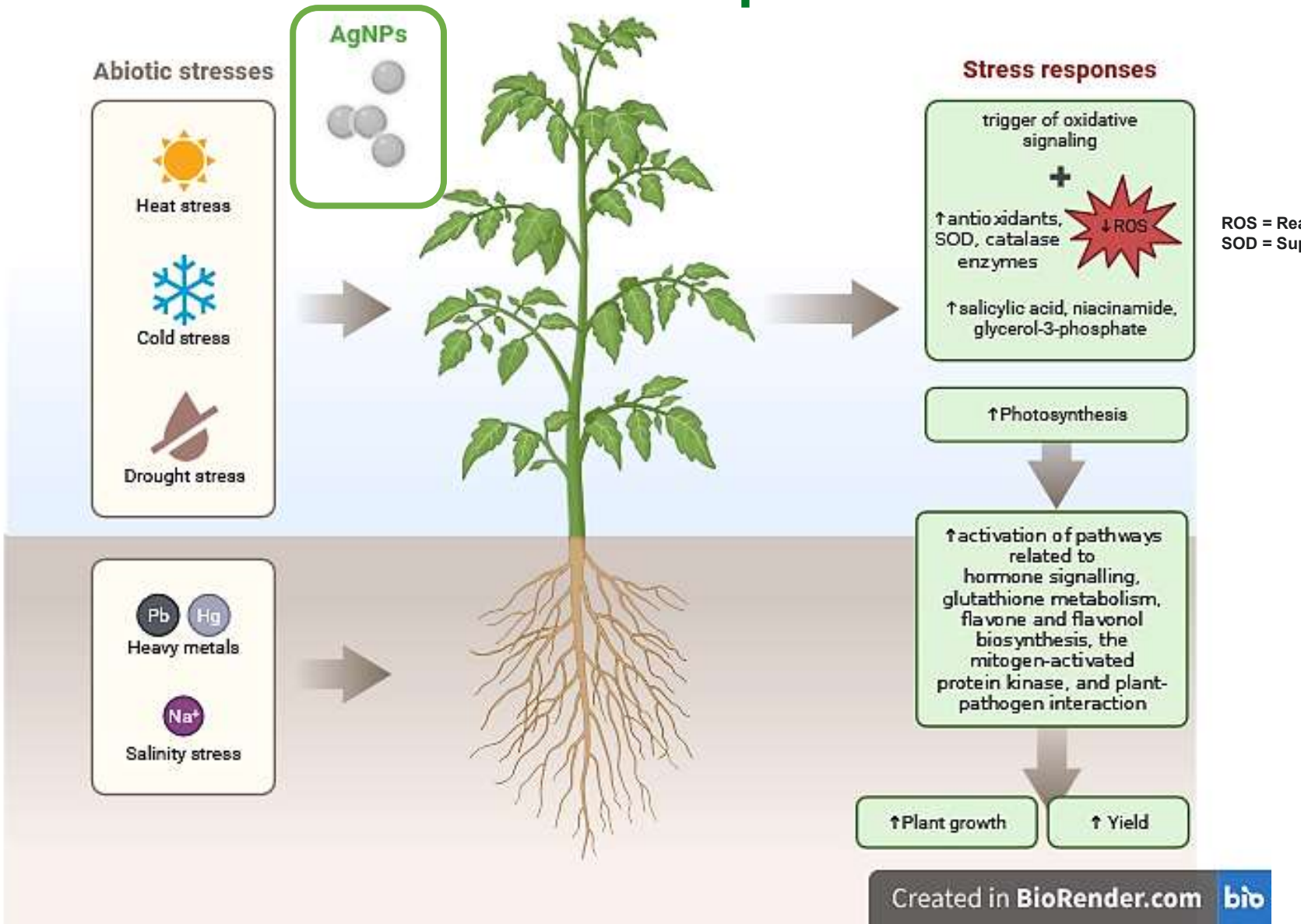




Normal stress response



Increased stress response



ROS = Reactive oxygen species
SOD = Superoxide dismutase

Effects on vegetable plant

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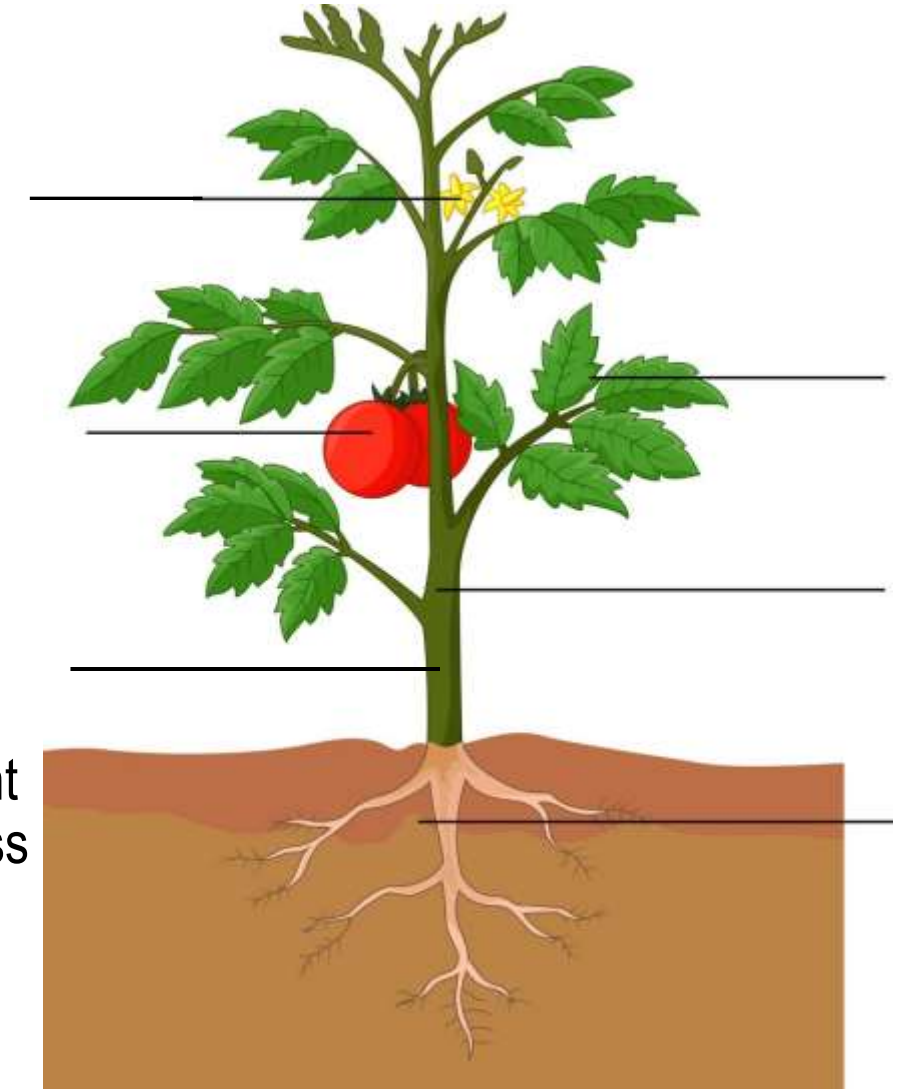
Improved flower formation:
up to 10 % more flowers

Higher brix, fruit mass and dry matter:
More fruit, homogeneous and of better quality

Plant tolerance:
Promotes the formation of **phytoalexins** that helps the plant to react quickly under biotic stress



Improved photosynthesis:
More energetic plants with higher carbohydrate production: greater and earlier harvest

More and shorter internodes:
more flowers and fruits

Root development stimulation:
maximum development of roots with better quality, length and thickness

Effects on ornamentals

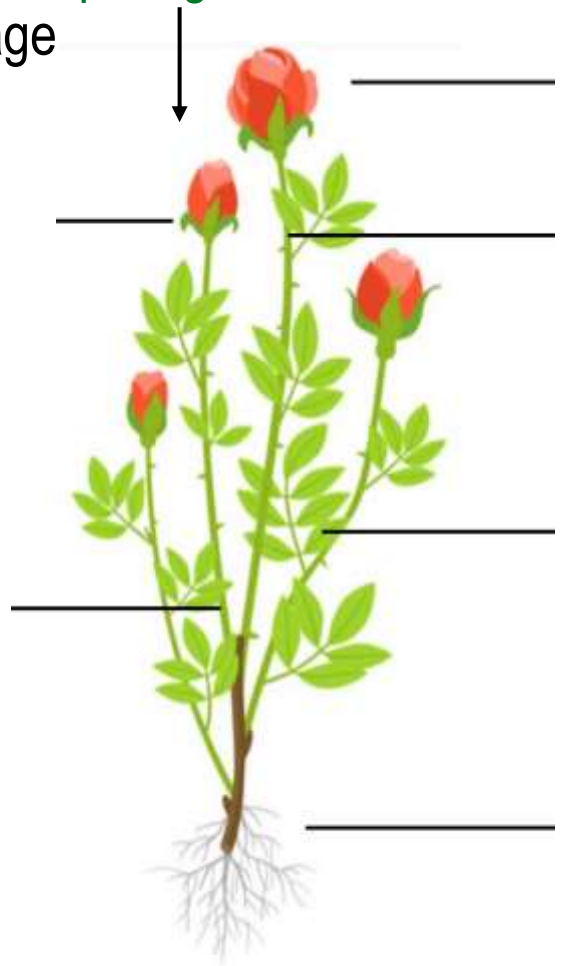
B+H Solutions GmbH

Homogenous and compact growth:
depending on dosage

Improved flower formation:
up to 15 % more flowers

Plant tolerance:
promotes the formation of **phytoalexins** that help the plant to react quickly under biotic stress

Improved photosynthesis:
plant with more energy



Larger flower buds:
active metabolism
improves the buds size

Stronger and longer stems:
the length and thickness of the stems develop to support the high-quality buds

Flawless leaf mass:
enhanced photosynthesis
produces dark green, large, shiny leaves

Root development stimulation:
maximum development of roots with better quality, length and thickness

Root stimulation

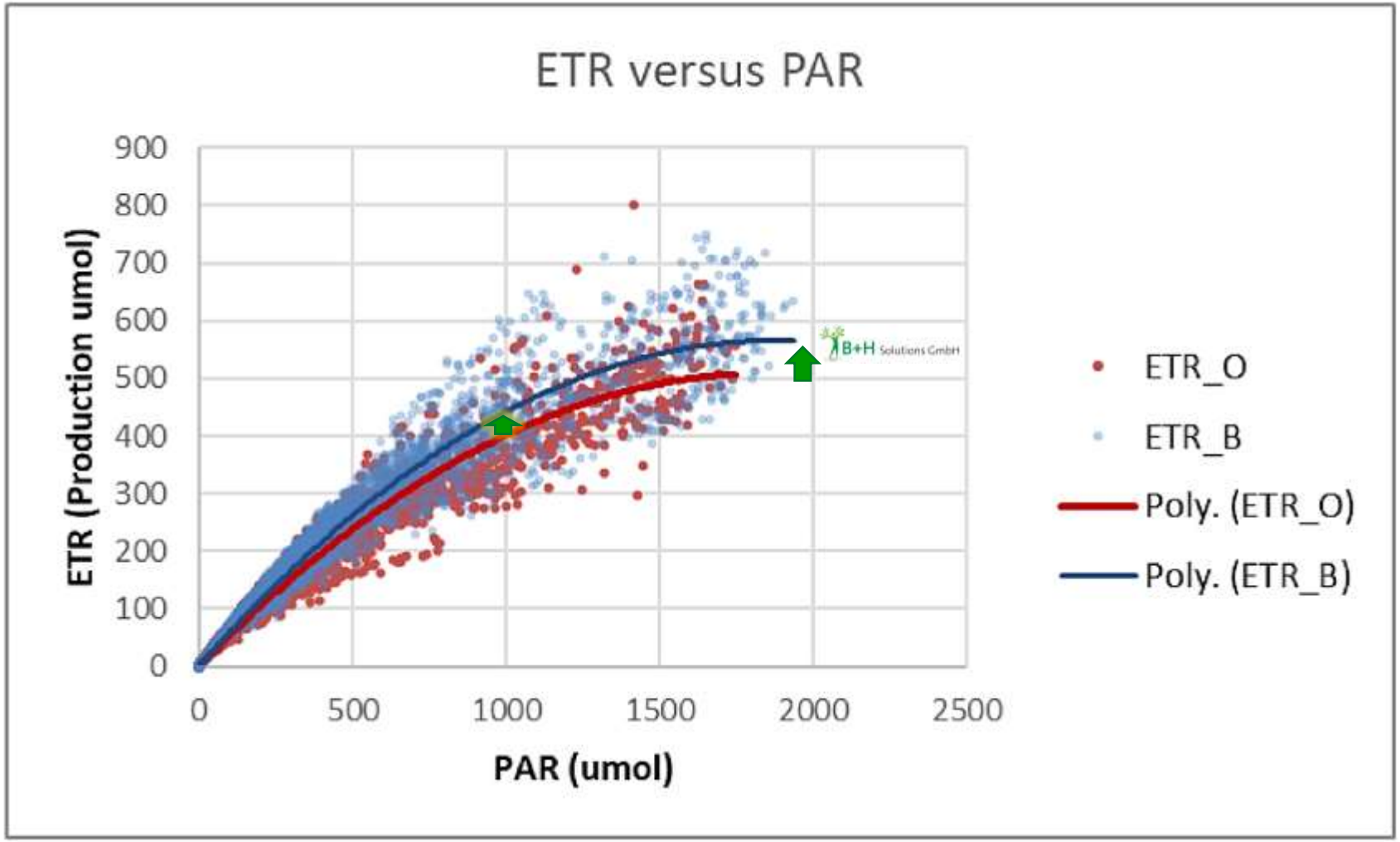
PEPPER / PAPRIKA

HYDRANGEA

CUCUMBER / GURKEN

How to measure increased photosynthesis?

Increased Photosynthesis



- More Chloroplasts→
- Sensors show an increase in photosynthetic activity
- Very obvious using the fit-curves (Poly..)
- ETR_O is control
- ETR_B is treated

More oxygen in root zone

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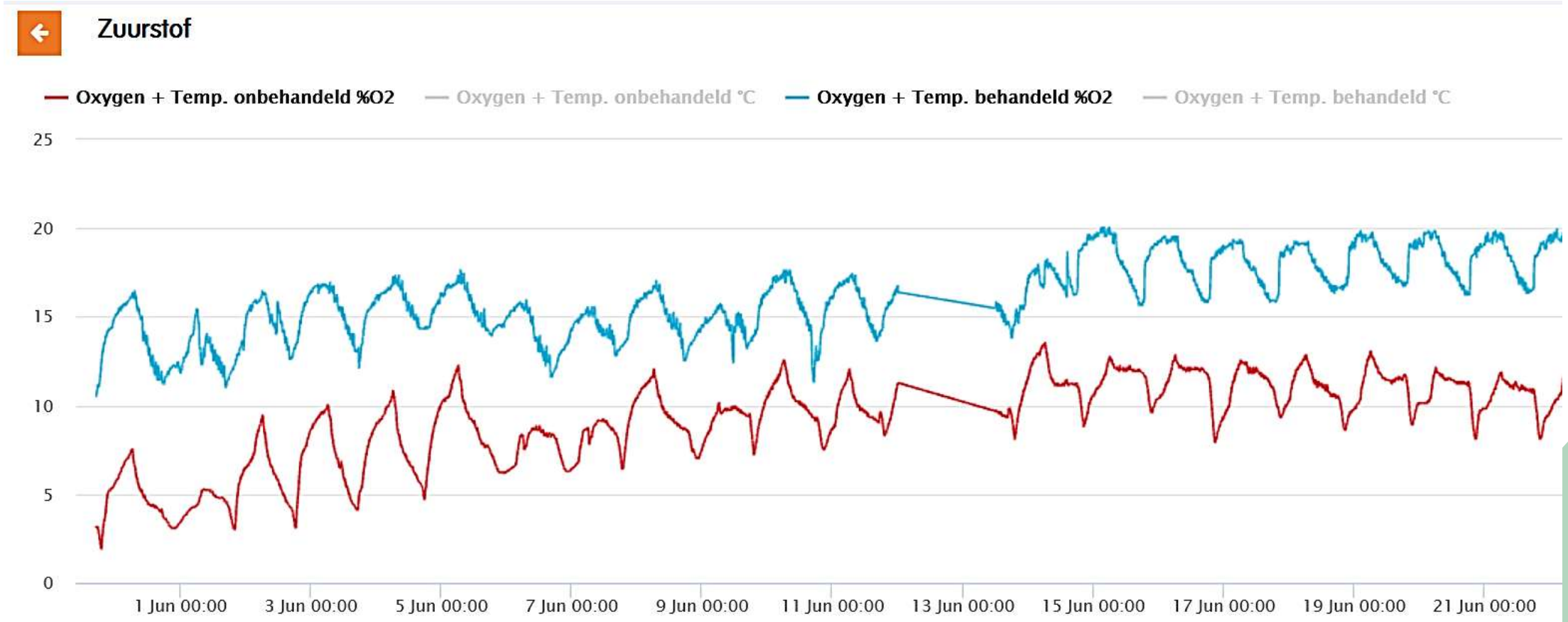
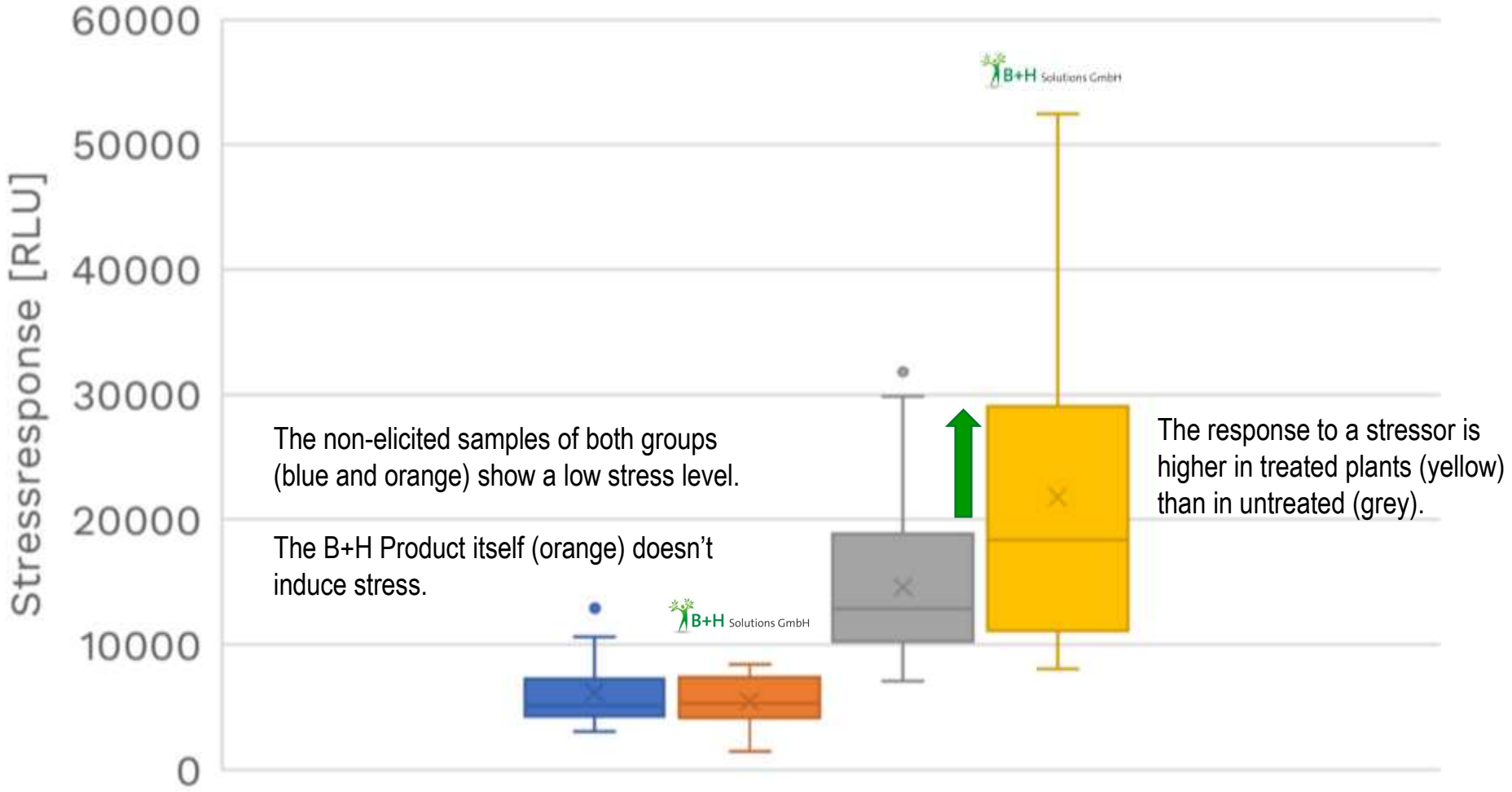


sendot

Enhanced stress response

RLU:
Relative
Luminiscence
Unit



Stressor:
An oxidative stress stimulus, was given. (= elicited)

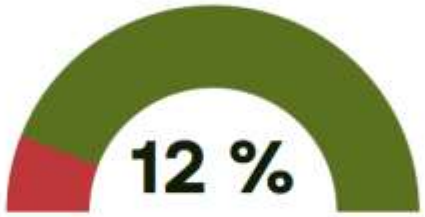
Stress response of treated tomato plants. Source: Bex-Biotec GmbH & Co.KG

Enhanced stress response

B+H Solutions GmbH

SIGNIFICANT INCREASE IN PRODUCT QUALITY

Statistical analysis of laboratory resulted in the following results:



BIGGER FRUITS

The tomatoes in the treated group demonstrated an increase in weight of 12% compared to untreated control.

MORE SUGAR (BRIX)

The tomatoes in the treated group showed an increase in 8% more Brix content compared to untreated control.

INCREASE IN RIPENING

Tomatoes of treated group were about 5% more mature than the ones in the control group based on analysis and color.

Labortests mit Tomatenpflanzen:
Wirkung des B+H Konzeptes auf Tomaten
(Solanum lycopersicum cultivar MicroTom)
Bex-Biotec GmbH & Co.KG

Comparison

Kalanchoe

Begonia

Roses – results of field trial

untreated

plant control

treated weekly with

B+H products

News article

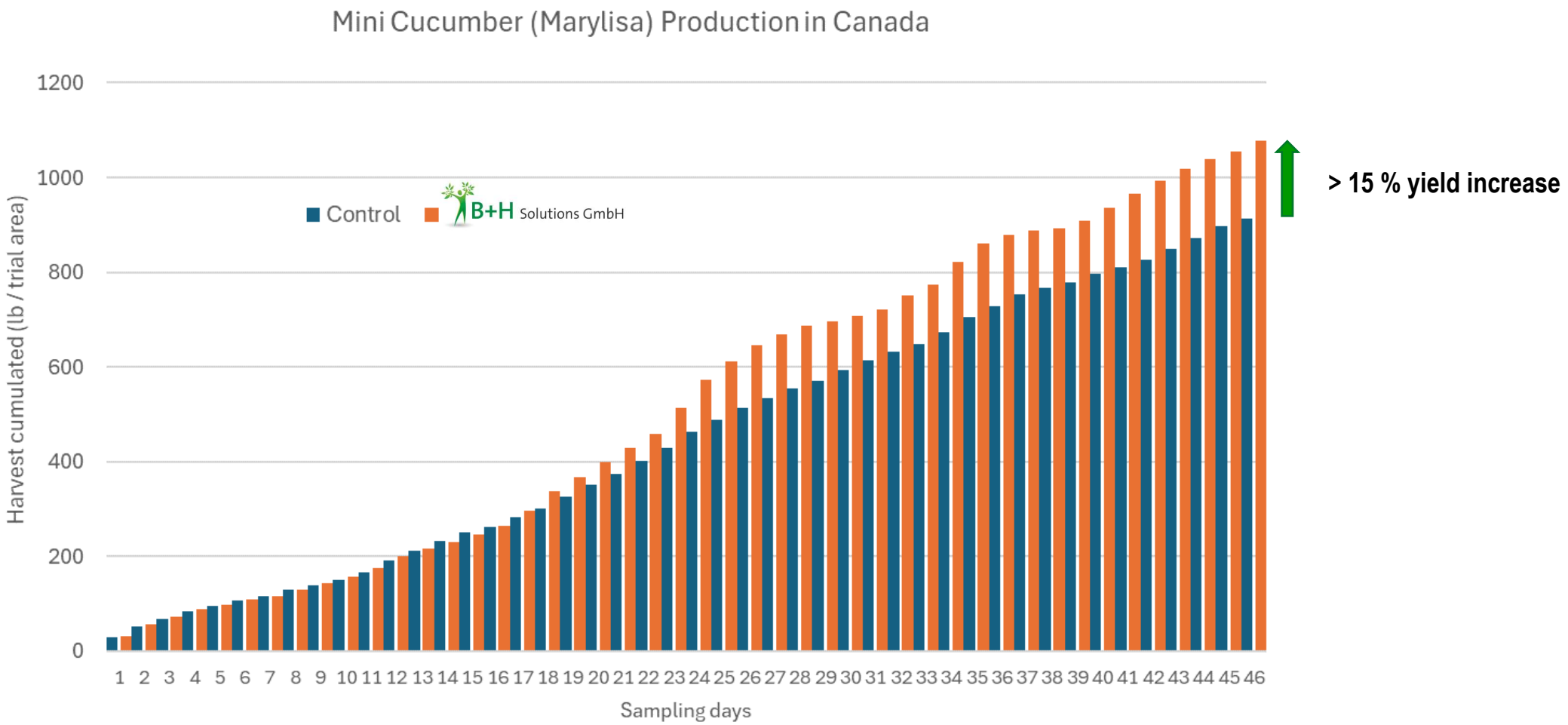
Cucumber grower sees production increase and more efficient cultivations after applying nano-fertilizers

A cucumber grower successfully implemented nano-fertilizers in their crop this summer. B+H Solutions' nano-fertilizers were applied on 2 hectares. The growers saw a whopping 8 percent increase in units and 9 percent weight increase in 12 weeks compared to the other half of the nursery.

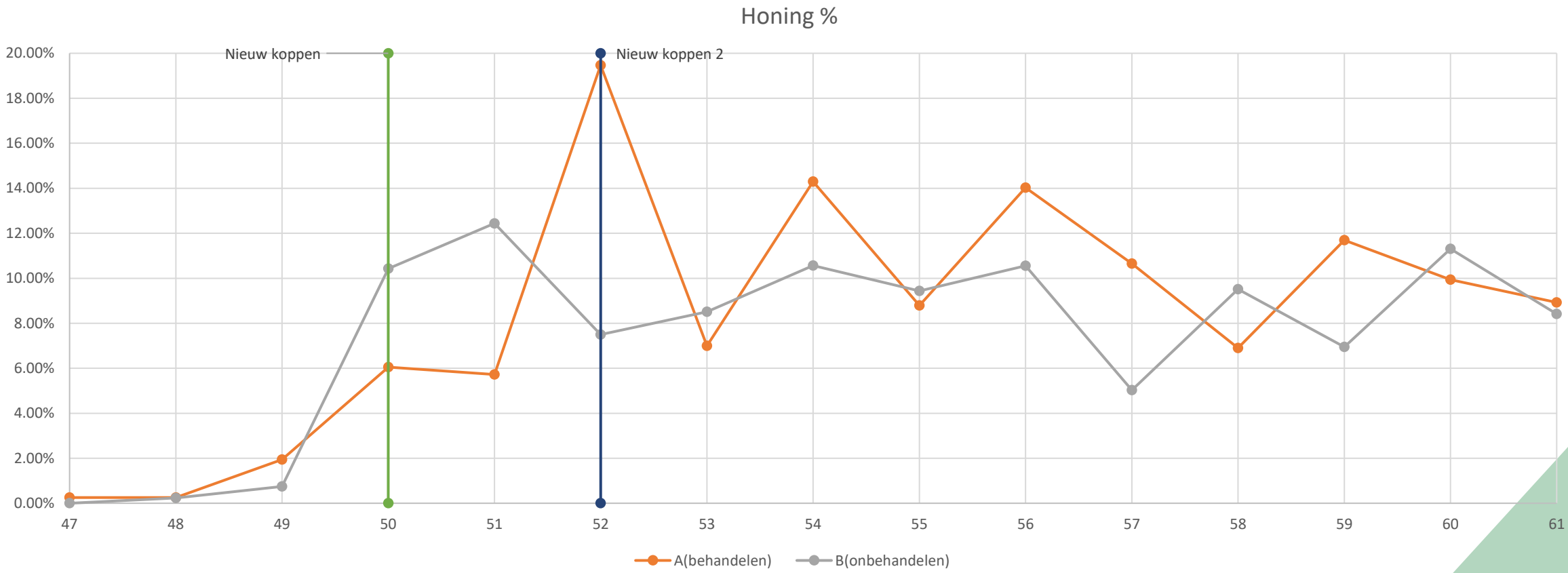
"Our innovative approach to fertilizers not only increased yields but also paved the way for more sustainable and efficient growing practices," observes Robert Zuyderwijk of B+H Solutions. The German company is marketing a special nano-fertilizer based on silver spheres.

https://www.hortidaily.com/article/9560846/cucumber-grower-sees-production-increase-and-more-efficient-cultivations-after-applying-nano-fertilizers/

Greenhouse Cucumber



Sweetness



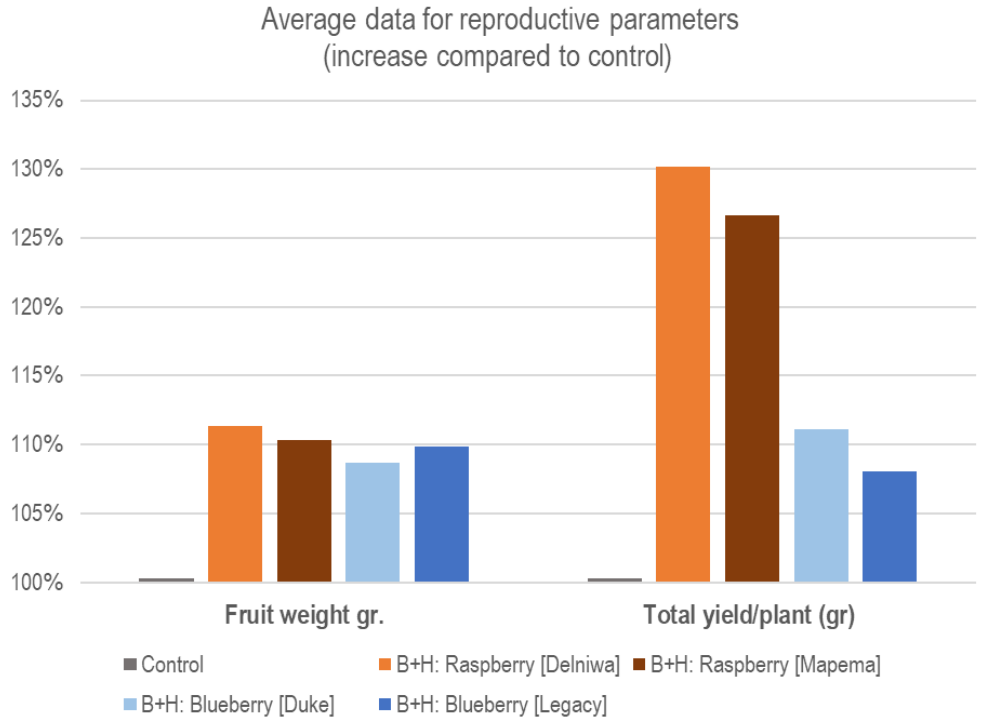
	A	B
tussen het bereik (10%-15%)	4	5
Standard deviation (10%)	4%	4%
Over 15%	1	0
Onder 10%	10	10
Average %	8,39%	7,44%

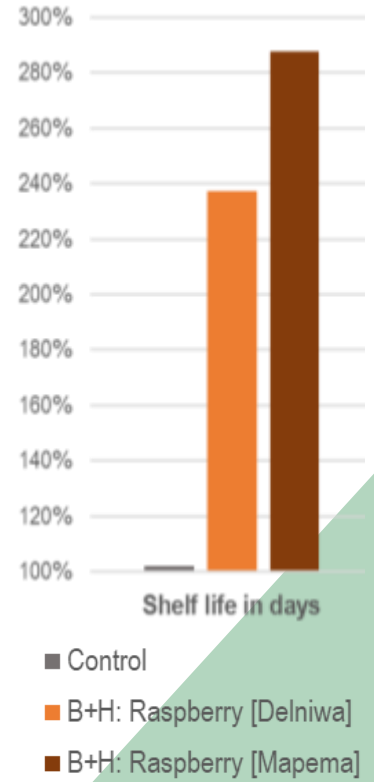
Sugar content A (treated) is 1 grade higher than B (control).
Decisive factor: 12.77% more tomatoes in group A achieve the "Honey" qualification.

Raspberries – results of field trial

untreated plant control

Plants treated 8x / yr with B+H Concept





Service:

- we provide customized protocols e.g.:

Application Protocol for Tomato, Pepper and Cucumber

Products used

Product name	Description	Registration
AgroArgentum® Bor (AAB)	Liquid EC Fertilizer 2% Boron, 1% Silver	Regulation EG 2003/2003 and EU 2019/1009
AgroCyprum® (ACY)	Liquid EC Fertilizer 3% Copper	Regulation EG 2003/2003 and EU 2019/1009
AgroCalcium® (ACA)	Liquid EC Fertilizer 20% Calcium, 1,5 % Magnesium, 3 % Silicium	Regulation EG 2003/2003 and EU 2019/1009
AgroFerrum® (AFE)	Liquid EC Fertilizer 15% Iron	Regulation EG 2003/2003 and EU 2019/1009

Important

- **Do not mix with Sulphur/Sulphates. This includes Bio-Sulphur products as well.**
- **Never use any Hydrogen peroxide.** (No need to use, as Silver/Copper are taking over the function of H_2O_2)

Tomato/Pepper/Cucumber (standard treatment)

Type, time and frequency of application	Relation	AAB	ACY	AFE	ACA
Possible applications: 1. Via irrigation once per week (inject via Dosatron, extra C-Tank, or similar) 2. Via irrigation distributed over the week (refill on the same weekday each) – e.g. in the A-Tank (not in the same tank with Sulphur/Sulphates) 3. Foliar spray 4. Pulsed fog or similar fogging device	Per hectare and week	150 mL	50 mL	---	---
Once a week with separate injection/dosatron or via foliar spray. If applied via Tank, assure sufficient stirring.	Per hectare and week	---	---	50 mL	1000 mL

Tomato/Pepper/Cucumber (intensified treatment)

Type, time and frequency of application	Relation	AAB	ACY	AFE	ACA
Apply as described in standard treatment. Double dosage of AAB for minimum 3 weeks or increase to maximum dosages →	Per hectare and week	600 mL	50 mL	---	---

Service:

- we provide customized protocols e.g.:

Application Protocol for Roses (incl. Gerbera, etc.)

Products used

Product name	Description	Registration
AgroArgentum® Forte (AAF)	Liquid EC Fertilizer N-K/ 9 – 0 - 6, 1% Silver	Regulation EG 2003/2003 and EU 2019/1009
AgroCyprum® (ACY)	Liquid EC Fertilizer 3% Copper	Regulation EG 2003/2003 and EU 2019/1009
AgroFerrum® (AFE)	Liquid EC Fertilizer 15% Iron	Regulation EG 2003/2003 and EU 2019/1009
AgroCalcium® (ACA)	Liquid EC Fertilizer 20% Calcium, 1,5 % Magnesium, 3 % Silicium	Regulation EG 2003/2003 and EU 2019/1009

Program (Cuttings propagation)

Type, time and frequency of application	Relation	AAF	ACY	AFE
Before transplanting, dip cuttings into solution for a few seconds	For 10 L dip Solution	30 mL	---	---

Important

- **Do not mix with Sulphur/Sulphates. This includes Bio-Sulphur products as well.**
- **Never use any Hydrogen peroxide.** (No need to use, as Silver/Copper are taking over the function of H_2O_2)

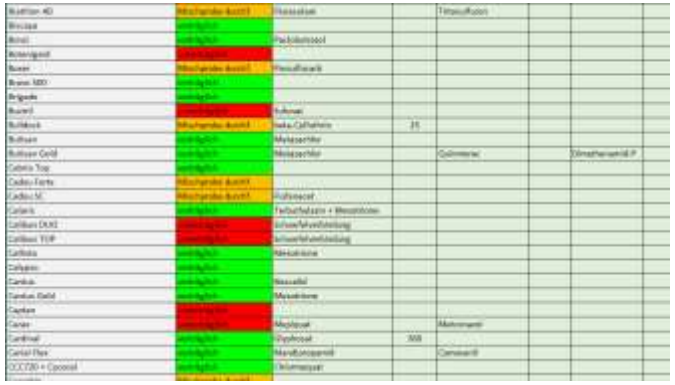
Program (standard treatment)

Type, time and frequency of application	Relation	AAF	ACY	AFE	ACA
Possible applications: 1. Via irrigation once per week (inject via Dosatron, extra C-Tank, or similar) 2. Via irrigation distributed over the week (refill on the same weekday each) – e.g. in the A-Tank (not in the same tank with Sulphur/Sulphates) 3. Foliar spray 4. Pulsed fog or similar fogging device	Per hectare and week	300 mL	50 mL	---	---
Once a week with separate injection/dosatron or via foliar spray. If applied via Tank, assure sufficient stirring.	Per hectare and week	---	---	50 mL	1000 mL

Program (intensified treatment)

Type, time and frequency of application	Relation	AAF	ACY	AFE
Day 1 dripping Day 2 spraying, Day 6 dripping, Day 7 spraying.	Per hectare and week	300 mL	---	---

Antagonists



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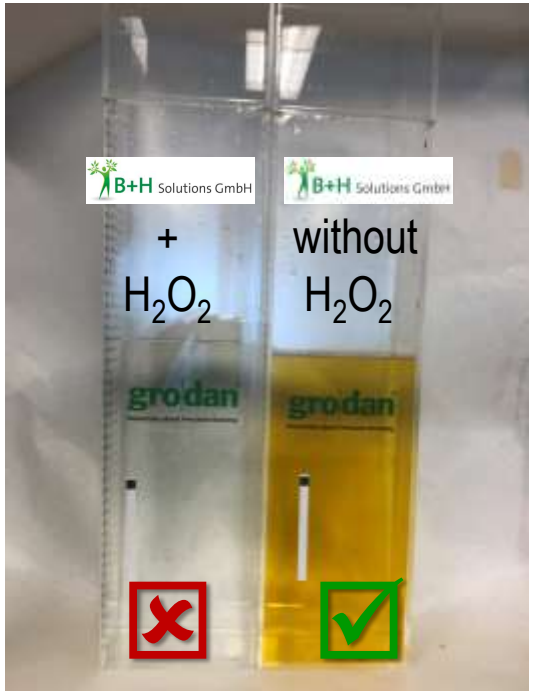
Hydrogenperoxide H_2O_2



other incompatible

(**Sulfur**, Sulfates, Previcur, …)

compatible Products

Better leaf color with AgroFerrum® - Roses

B+H Solutions GmbH

Questions?
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