foliQ®
Biostimulants

TRIPLE POWER OF BIOSTIMULATION

AscoVigor+ • AminoVigor+ • TrioPGA

SMART SUPPORT FOR PLANTS UNDER STRESS
AND THROUGHOUT THEIR DEVELOPMENT

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UNDER THE STRESS OF PLANTS, CIVILIZATIONS FALL – WHY BIOSTIMULATION WILL SAVE US

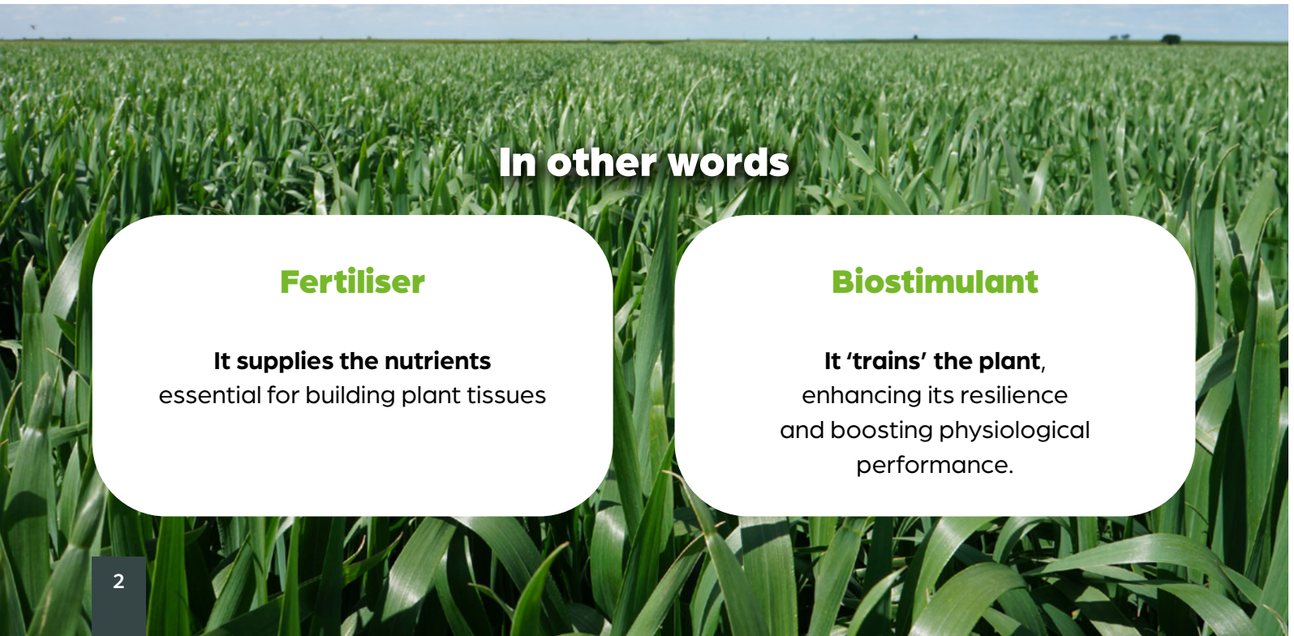
A changing climate, increasingly frequent drought periods, and extreme temperatures pose entirely new challenges for modern agriculture. In the past, the collapse of agriculture led to the downfall of entire civilizations — from Mesopotamia to the Maya. Today, foliQ® biostimulant technology helps prevent such scenarios by strengthening plant resilience and ensuring stable yields. Plant biostimulants represent a modern tool that supports the natural physiological processes of crops, helping them withstand abiotic stress and fully realize their yield potential.

Plant biostimulants should not be confused with fertilizers

A biostimulant is a tool designed to stimulate plant nutrition processes, regardless of its nutrient content, in order to improve nutrient use efficiency, tolerance to abiotic stress, quality traits, or nutrient availability in the rhizosphere. Moreover, biostimulants must not contain nutrients above the specified limits.

Biostimulants **do not nourish the plant in a chemical sense** — they **regulate its metabolism**. So what do they contain? Their composition is based on biologically active substances such as amino acids, phytohormones, polysaccharides, or pyroglutamic acid, which **activate natural defense and growth mechanisms.**

A biostimulant therefore **acts as a biological signal** rather than a source of nutrients.



In other words

Fertiliser

It supplies the nutrients essential for building plant tissues

Biostimulant

It ‘trains’ the plant, enhancing its resilience and boosting physiological performance.

WHAT TYPES OF PLANT STRESS ARE MOST COMMON IN AGRICULTURE?

DROUGHT STRES

It occurs regularly in many agricultural regions from spring to mid-summer, particularly on light soils.
It leads to stomatal closure, reduced photosynthesis, inhibited growth, and lower yields.

Symptoms:
leaf wilting, yellowing, premature aging, and low plant biomass.

COLD STRES

Short-term temperature drops (0 to –3°C) or prolonged spring cold spells lead to tissue damage, necrosis, and, in fruit crops, the loss of buds and fruit set.

Symptoms:
dark leaf spots, blackened flowers, stem cracking, and slowed growth.

HEAT STRES

Increasingly common in many regions, especially in early to mid-summer. High temperatures (>30°C) lead to inhibited photosynthesis and excessive water loss through transpiration.

Symptoms:
leaf rolling, chlorosis, slowed growth, and leaf edge scorching.

SALINITY STRES

It occurs locally—mainly in areas of intensive vegetable production and in cases of over-fertilization—but temporary salinization is increasingly reported even in field crops within a few to several days after applying soil fertilizers. Elevated salt concentrations limit the uptake of water and ions.

Symptoms:
leaf edge desiccation, stunted growth, and drought-like symptoms despite moist soil.

WHAT DETERMINES WHETHER A BIOSTIMULANT IS EFFECTIVE?

A modern plant biostimulant should be a product with **proven biological efficacy, a stable composition, and safe performance**, verified through scientific research and field trials.

foliQ® biostimulants (AscoVigor+, AminoVigor+, TrioPGA) meet all these criteria. Their effectiveness has been confirmed in more than **70 trials** conducted by reputable scientific institutions and research centers, including:

- Institute of Plant Protection – National Research Institute in Poznań
- Poznań University of Life Sciences
- Warsaw University of Life Sciences (SGGW)
- National Research Institute of Animal Production in Kraków
- Institute of Plant Physiology – Polish Academy of Sciences in Kraków
- Institute of Organic Chemistry, Polish Academy of Sciences in Warsaw
- Agro Research Consulting
- Fitosoil Laboratory in Spain
- and in implementation and practical field trials carried out by Agrii Polska

The studies covered 12 agricultural, vegetable, and fruit crops — including **oilseed rape, wheat, maize, sugar beet, potato, apple, and highbush blueberry** — evaluated under various stress conditions (drought, frost, cold, heat).

The results confirmed, among others:

- an 18–25% increase in biomass,
- a 20–30 unit increase in the SPAD index,
- a yield increase of up to 10–15% in field crops,
- a 40–60% reduction in frost-related damage in fruit crops.

! Such a broad research database confirms that foliQ® biostimulants are products with **real and consistent physiological effects.**

CE CERTIFICATION AND POLISH CONFORMITY ASSESSMENT

All **foliQ®** biostimulants hold CE certification, which means they meet the strict requirements of **Regulation (EU) 2019/1009 of the European Parliament and of the Council.**

The CE certificate confirms that:

- their biological efficacy and safety of use have been verified in the conformity assessment process,
- the product meets the standards for purity, stability, and absence of toxic substances,
- it may be freely placed on the market throughout the entire European Union.

foliQ® biostimulants have been certified in Poland by PCBC (Polish Center for Testing and Certification), a notified body accredited by the European Commission.

Moreover, the manufacturer has opted for **voluntary certification of the entire production process.**

As a result, every foliQ® product carries not only the CE marking, but also the **number of the notified body (PCBC), confirming that both the product and its manufacturing process comply with European quality and safety standards.**

foliQ® AscoVigor+

Natural resilience derived from *Ascophyllum nodosum*

foliQ® AscoVigor+ is a high-quality plant biostimulant designed for use in all known crops. Its formulation is based on a natural extract from the marine alga *Ascophyllum nodosum*, rich in polysaccharides, phytohormones, and antioxidants, which act as natural resistance elicitors by activating the plant's defensive mechanisms.

Polysaccharides (laminarin, fucoidan)

Resistance inducers – they activate defense-related genes and antioxidant enzymes, and increase chlorophyll levels.

Stress-related phytohormones (abscisic, jasmonic, and salicylic acids)

They reduce the effects of oxidative stress and activate cryoprotectants that protect plants against frost.

Growth-related phytohormones (auxins, cytokinins)

They induce root and shoot growth under stress conditions — such as drought, frost, or high temperatures — and activate the plant's natural defense mechanisms, helping to maintain proper growth rate and photosynthesis.

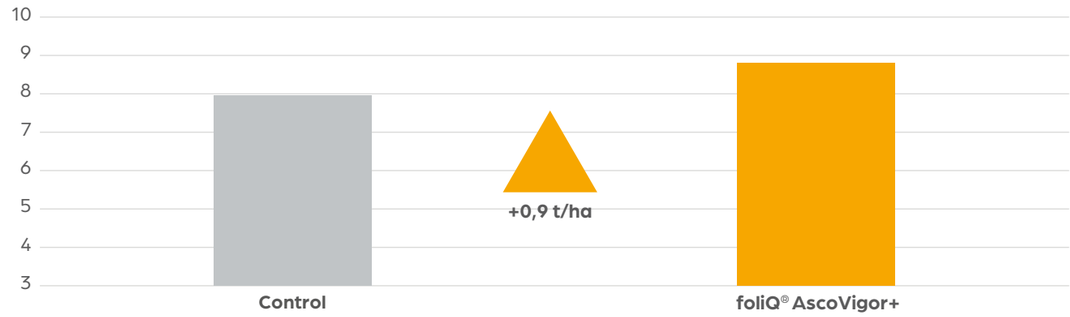
(maize during drought stress trials – IOR-PIB 2024)

Crop	Stress factor	Observed effects	Result
Winter Oil Seed Rape	Drought	Higher plant biomass	▲ **+23%**
Winter wheat	Cold stress	Damage reduction	▼ **–17%**
Maize	Heat stress	Leaf damage	▼ **–39%**
Blueberry	Frosts	Higher yield	▲ **+1,2 t/ha**

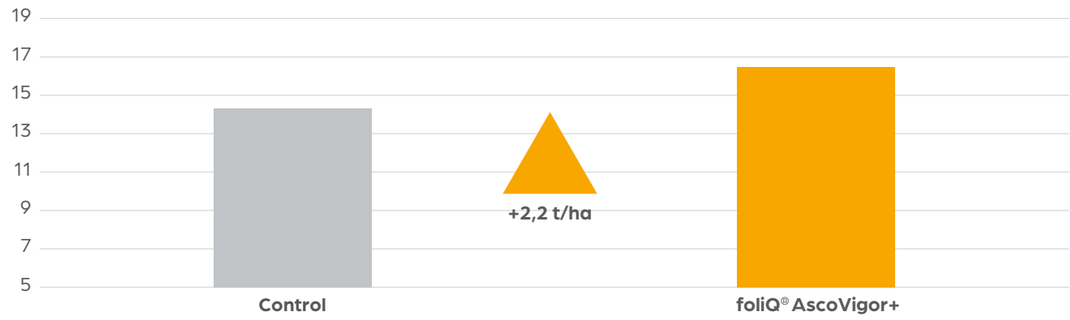
EXAMPLES OF FIELD TRIAL RESULTS (POZNAŃ UNIVERSITY OF LIFE SCIENCES):

Sugar beet (yield [t/ha])

Maize (yield [t/ha])



Blueberry (yield [t/ha])



What you achieve by using foliQ® AscoVigor+:

- ✚ Greater tolerance to drought, frost, and heat stress
- ✚ Activation of natural plant defense mechanisms
- ✚ Higher chlorophyll content and more efficient photosynthesis
- ✚ Improved root development and lateral shoot growth
- ✚ More stable yields and a higher share of marketable produce
- ✚ High application safety — a natural product compliant with EU regulations

Recommendations

Crop	Recommended applications	Recommended dose	recommended volume of working solution per hectare	Time of application	Purpose / expected effects
Cereals	2 – 3	3	150 – 300	From the 3 true leaf stage to the beginning of flowering. BBCH 13 to BBCH 61.	Enhances photosynthesis, strengthens cell walls, and promotes vigorous root growth. Boosts chlorophyll levels for healthier, more productive plants. Increases both the quality and quantity of yield. Helps crops better withstand abiotic stresses such as drought, heat, and low temperatures.
Winter Oil Seed Rape	2 – 3	3	150 – 300	From autumn at the 2 true leaf stage to the beginning of flowering (first flowers open). BBCH 12 to BBCH 61.	Increases chlorophyll levels, enhancing photosynthesis and overall plant vitality. Stimulates root mass development and promotes stronger branching. Improves both the quality and quantity of yield. Helps prepare the plant for abiotic stresses such as drought, heat, and low temperatures.
Maize	1 – 2	3	150 – 300	From the 3 true leaf stage to the last moment the sprayer can enter the field. BBCH 13 to BBCH 61.	Increases chlorophyll content, boosting overall plant vigor. Enhances both the quality and quantity of yield. Helps prepare the plant for abiotic stresses such as drought, heat, and low temperatures.
Sugar beet	1 – 2	3	150 – 300	From the 4 true leaf stage to the moment of row closure. BBCH 14 to BBCH 39.	Increases chlorophyll content in plants, enhancing both yield quality and quantity. Helps prepare the crop for abiotic stresses such as drought, heat, and low temperatures.
Potato	3	3	150 – 400	From the beginning of row–closure to the beginning of flowering. BBCH 31 to BBCH 61.	Improves both the quality and quantity of yield. Helps prepare the plant for abiotic stresses such as drought, heat, and low temperatures.
Legumes	1 – 2	3	150 – 300	From the 4 true leaf stage to the beginning of flowering. BBCH 14 to BBCH 61.	Improves both the quality and quantity of yield. Prepares the plant for abiotic stresses such as drought, high temperatures, and low temperatures.
Sunflower	1 – 2	3	150 – 300	From the second true leaf stage to the last moment the sprayer can enter the field. BBCH 14 to BBCH 61.	Enhances both the quality and quantity of yield. Helps the plant cope with abiotic stresses such as drought, heat, and low temperatures.
Orchards	2 – 4	3	300 – 700	From the green bud stage to the fruit set development stage.	Improved yield quality and quantity
Vegetables	2 – 4	3	300 – 700	10–14 days after transplanting or 14–21 days after crop emergence; subsequent applications every 7–14 days.	Enhances vegetative growth stimulation. Improves both the quality and quantity of yield. Helps prepare the plant for abiotic stresses such as drought and high temperatures.

foliQ® AminoVigor+

Post-stress regeneration and energy boost

foliQ® AminoVigor+ is a leading biostimulant designed for use in all known crops. It contains a high concentration of biologically active, left-handed amino acids of exclusively plant origin, obtained through the enzymatic hydrolysis of proteins using selected strains of *Corynebacterium glutamicum*. It is recommended especially for crops that have already experienced stress, helping to mitigate its effects and accelerate plant recovery.

How amino acids work in foliQ® AminoVigor+

- Micronutrient-chelating agents
- Improved crop quality across many species (120+ trials)
- Improved parameters under drought and heat stress
- Helping plants return to homeostasis after herbicide damage

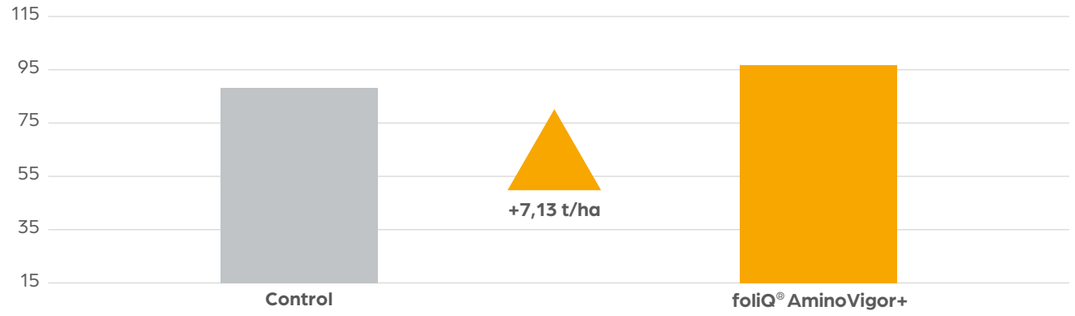
wheat during drought stress trials – IOR-PIB 2024

Crop	Stress factor	Observed effects	Result
Maize	Drought	Higher plant biomass	▲ **+5,5%**
Winter wheat	Frost	Damage reduction	▼ **–23,5%**
Winter Oilseed Rape	Heat stress	Damage reduction	▼ **–44,6%**

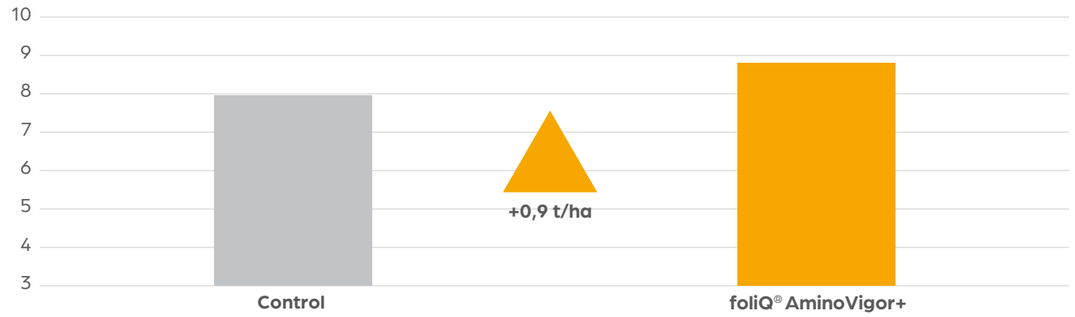
Amino acid and its physiological role in the plant	Seed or pollen germination	Root formation	Tolerancja na stresy biotyczne	Abiotic stress tolerance	Antioxidant activity	Nitrogen metabolism	Photosynthesis and chlorophyll	Control of stomatal function and osmoregulation	Flavor, aroma, and coloration
Cysteine			■	■	■				
Aspartic acid						■			
Metionine		■			■			■	
Threonine			■		■				
Serine				■					
Glutamic acid	■			■		■	■	■	
Glycine							■		■
Alanine							■	■	■
Valine				■					■
Isoleucine									■
Leucine									■
Tyrosine									
Phenylalanine									■
Histidine				■	■				
Lysine				■	■		■		
Arginine		■		■		■			
Proline	■			■		■	■	■	■

EXAMPLES OF FIELD TRIAL RESULTS (POZNAŃ UNIVERSITY OF LIFE SCIENCES):

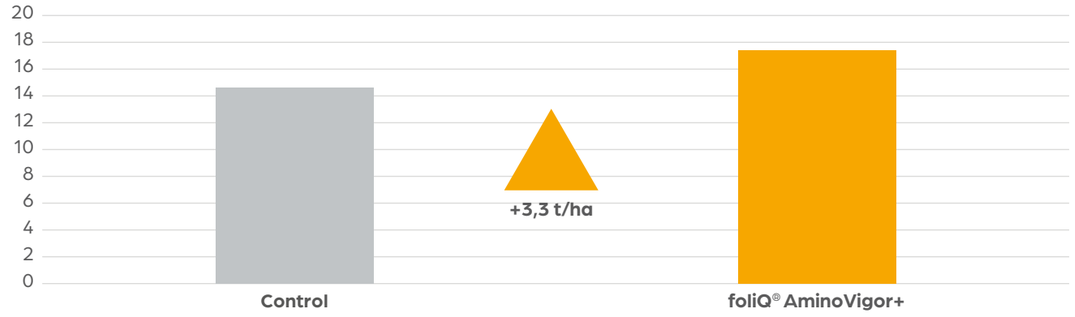
Sugar beet (yield [t/ha])



Maize (yield [t/ha])



Blueberry (yield [t/ha])



Recommendations

Crop	Recommended applications	Recommended dose	recommended volume of working solution per hectare	Time of application	Purpose / expected effects
Cereals	2 – 3	3	150 – 300	From the 3-leaf stage to the beginning of flowering. BBCH 13 to BBCH 61	It has a beneficial effect on the plant's response to stress, including drought and high temperatures. It increases both yield quality and yield size.
Winter Oil Seed Rape	2 – 3	3	150 – 300	From autumn at the 2-leaf stage to the beginning of flowering (first open flowers). BBCH 12 to BBCH 61	It has a beneficial effect on photosynthesis, strengthens cell walls and promotes root mass development. It increases chlorophyll content in plants. It supports the plant's response to stress, including drought and high temperatures. It increases both yield quality and yield size.
Maize	1 – 2	3	150 – 300	From the 3-leaf stage to the last moment the sprayer can enter the field. BBCH 13 to BBCH 61	It has a beneficial effect on the plant's response to stress such as drought and high temperatures. It increases both yield quality and yield size.
Sugar beet	1 – 2	3	150 – 300	From the 4-leaf stage to row closure. BBCH 14 to BBCH 39	It has a beneficial effect on the plant's response to stress, including drought and both high and low temperatures. It increases both yield quality and yield size.
Potato	3	3	150 – 400	From the beginning of row closure to the beginning of flowering. BBCH 31 to BBCH 61	It has a beneficial effect on the plant's response to stress, particularly drought and high temperatures. It increases both yield quality and yield size.
Legumes	1 – 2	3	150 – 300	From the 4-leaf stage to the beginning of flowering. BBCH 14 to BBCH 61	It has a beneficial effect on the plant's response to stress, including drought and high temperatures. It increases both yield quality and yield size.
Sunflower	1 – 2	3	150 – 300	From the second true leaf stage to the last moment the sprayer can enter the field. BBCH 14 to BBCH 61	It has a beneficial effect on the plant's response to stress, including drought and high temperatures. It increases both yield quality and yield size.
Orchards	2 – 4	3	300 – 700	From the green bud stage to the fruitlet growth stage.	It improves fruit set. It increases the diameter of pome fruits and enhances the size and weight of berry fruits. It increases both yield quality and yield size.
Vegetables	2 – 4	3	300 – 700	10–14 days after transplanting or 14–21 days after emergence; subsequent applications every 7–14 days.	It improves the growth rate of vegetative parts. It has a beneficial effect on the plant's response to stress, including drought and high temperatures. It increases both yield quality and yield size.

foliQ® TrioPGA

Photosynthesis at maximum capacity

foliQ® TrioPGA is the only plant biostimulant on the market that enhances photosynthesis — the key process in crop production. It improves the use of CO_2 and nitrogen and increases the plant's metabolic efficiency.

What exactly does foliQ® TrioPGA contain?

PYROGLUTAMIC ACID (PGA)

A natural stimulator of metabolic processes, particularly effective in regulating abiotic stress; an inducer that drives photosynthesis, enabling more efficient CO_2 uptake and biomass production. It enhances nitrogen (N) utilization. 99.9% of PGA is the L-form, readily absorbable by plants.

AMINO ACIDS

A very high content of natural L-amino acids that support nitrogen assimilation and help improve Nitrogen Use Efficiency (NUE) in plants.

PLANT HORMONES

A high content of plant hormones that stimulate physiological processes, support CO_2 fixation through improved photosynthetic activity, and contribute to efficient biomass production.

What makes foliQ® TrioPGA unique?

Most crops grown in temperate climates perform C3 photosynthesis. This means that part of the assimilates produced is lost, for example through photorespiration. A different and much more efficient process is the C4 type of photosynthesis. In Poland, maize is an example of a crop that assimilates in this way. This is one of the reasons why its yield and green biomass usually far exceed those of other cereals.

foliQ® TrioPGA makes C3 plants behave more like C4 plants.

foliQ® TrioPGA helps the plant **take up more CO_2 and maintain this ability under stress**, so photosynthesis **does not slow** down and the plant **produces more sugars** — the fuel for growth and yield.

C3 plants

They occur in temperate climates. They have lower CO_2 uptake efficiency and weaker water management, which makes them less tolerant to drought and high temperatures.

C4 plants

They make optimal use of favourable weather conditions for intensive growth, thanks to more efficient CO_2 uptake, better water management and minimized energy loss.

How is it possible for plants to take up more CO_2 without losing more water?

PGA "boosts" stomatal activity – these structures allow CO_2 to enter the leaf. The result: **higher CO_2 uptake** and **more intensive photosynthesis**. But that's not all. The plant hormones and amino acids in the product work together to help maintain this elevated rate.

Water balance hormones
– ABA, jasmonic acid, salicylic acid

They are responsible for **"water management"**: they regulate stomatal activity so the plant minimizes water loss while still maintaining the CO_2 supply needed for photosynthesis. It is a controlled balance between respiration and resource conservation.

Growth hormones
– auxins and cytokinins

They ensure that the plant **does not "stall"**. They regulate cell division, tissue elongation and the redistribution of assimilates, supporting smooth growth even when conditions are not ideal.

Selected amino acids for plant vitality
– proline, arginine, histidine

They create a natural **"protective cushion"** for cells by stabilizing membranes, proteins, and enzymatic systems, helping to maintain cellular integrity and physiological balance. As a result, the plant sustains stomatal function and metabolic efficiency for a longer period.

Amino acids supporting assimilation
– glutamic acid, glycine, serine, alanine

These are the **"managers of nitrogen and carbon metabolism"**. They enhance the efficiency of photosynthesis, photorespiration and overall anabolic processes. As a result, the plant uses available resources more effectively and maintains a higher level of productivity.

Final physiological effect

- The unique combination of PGA + plant hormones + amino acids provides an advantage that a single substance cannot achieve:
- Higher stomatal conductance (gs)
- Higher CO_2 concentration in chloroplasts (Ci)
- Greater Rubisco and Calvin cycle efficiency
- sustained photosynthesis by balancing CO_2 uptake and water use
- More stable energy and assimilate production
- Treated plants keep performing when others already start to "slow down"

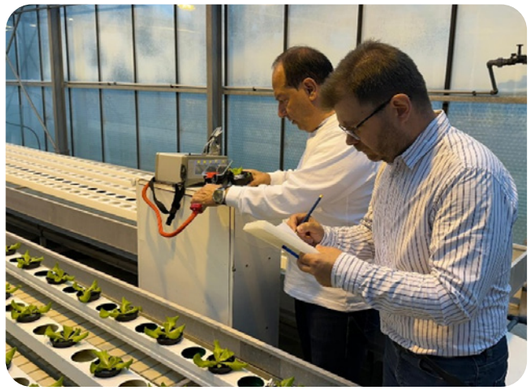
How much does the intensity of photosynthesis increase after applying foliQ® TrioPGA?

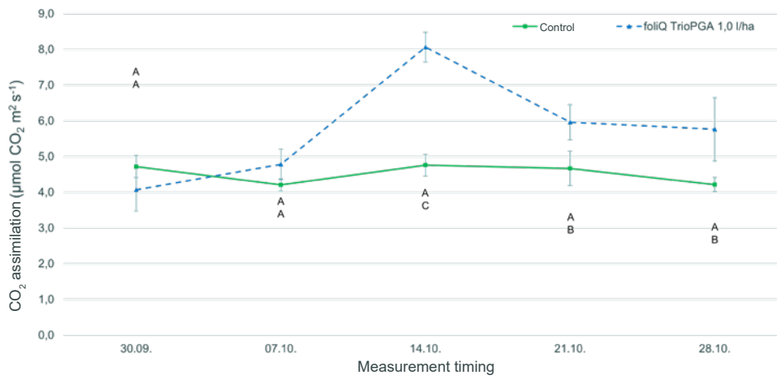
To answer this, we asked scientists from the Warsaw University of Life Sciences (SGGW).

In a greenhouse experiment, highly sensitive equipment was used to measure the following parameters:

- Photosynthesis intensity (CO_2 assimilation),
- Transpiration rate,
- Stomatal conductance,
- Intercellular CO_2 concentration,
- Water-use efficiency in the photosynthetic process (WUE).

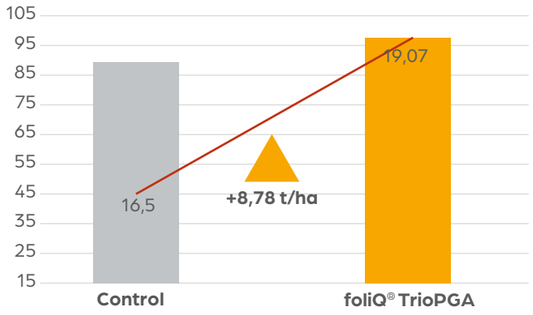
It has been demonstrated that the application of foliQ® TrioPGA increased the intensity of photosynthesis (CO_2 assimilation) by **up to 69%** (on average by around 30%) and improved the water-use efficiency of the photosynthetic process by approximately 30%.





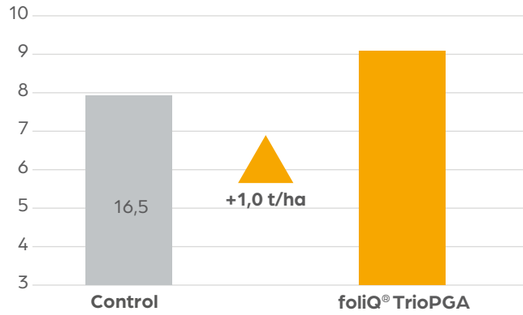
OTHER FIELD TRIALS (UP POZNAŃ)

Sugar beet
(yield [t/ha], sugar content [%])



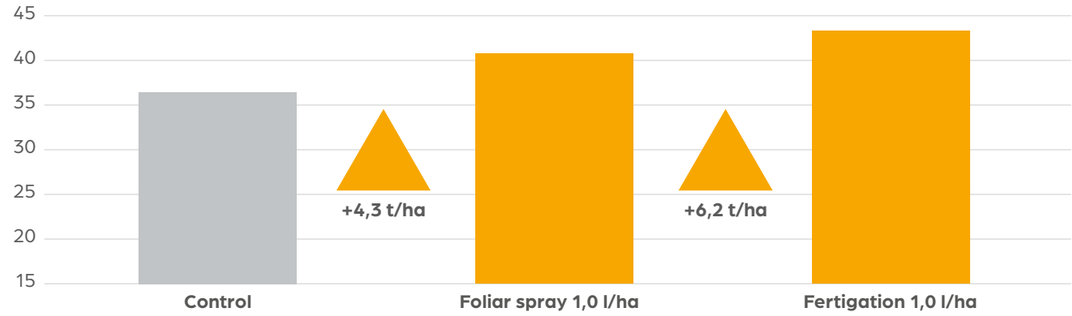
Difference in root yield and sugar yield
+ 780 EUR/ha

Maize
(yield [t/ha])

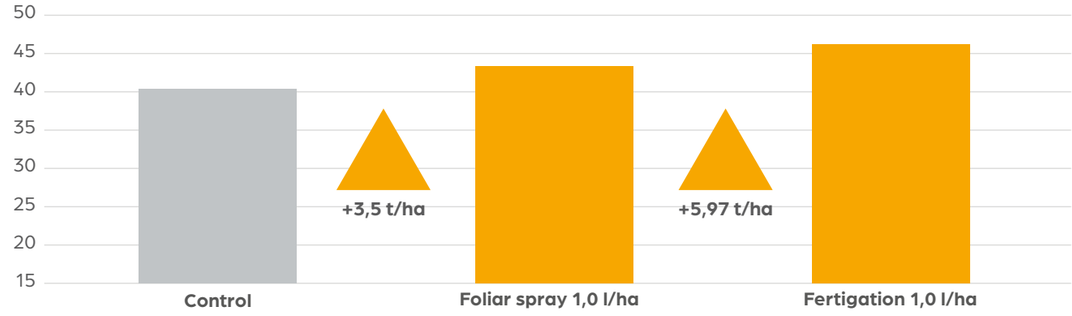


Yield difference + 200 EUR/ha

Tomato var. Bobcat F1 (Agro Research Consulting), yield [t/ha]



Tomato var. Dyno (Agro Research Consulting), yield [t/ha]



Although TrioPGA effectively supports plant physiological performance, the best time for application is when crops are in optimal condition. At this stage, the stimulation of photosynthesis is most pronounced, allowing modern varieties to fully express their yield potential.

Recommendations

Crop	Recommended applications	Recommended dose	recommended volume of working solution per hectare	Time of application	Purpose / expected effects
Cereals	2 – 3	1	150 – 300	From the 3 true leaf stage to the beginning of flowering. BBCH 13 to BBCH 61.	Promotes greater above-ground biomass production.
Winter Oil Seed Rape	2 – 3	1	150 – 300	From autumn at the 4 true leaf stage until the beginning of flowering (first open flowers). BBCH 14 to BBCH 61.	It has a beneficial effect on photosynthesis and strengthens cell walls. It increases chlorophyll content in plants. It contributes to a greater number of branches.
Maize	1 – 2	1	150 – 300	From the 3 true leaf stage until the last moment the sprayer can enter the field. BBCH 13 to BBCH 61.	It increases grain yield. It enhances plant vigor.
Sugar beet	1 – 2	1	150 – 300	From the 4 true leaf stage until row closure. BBCH 14 to BBCH 39.	It increases the size and quality of the yield. It contributes to higher sugar content.
Orchards	3 – 4	1	300 – 700	From the green bud stage to the fruit set development stage.	It increases fruit diameter. It improves fruit size uniformity. It reduces fruit drop.

+ Turbo charged photosynthesis
+ Pure growth energy
+ Maximum water efficiency

www.foliq.pl/en/

HOW TO CHOOSE THE RIGHT foliQ® BIOSTIMULANT

Growing conditions	Recommended product	When to apply	Mode of action
Expected stress factor (drought, frost, heat)	foliQ® AscoVigor+	24–48 h before the occurrence of stress	Immunity activation and tissue preparation
Plant after stress (leaf damage, growth inhibition)	foliQ® AminoVigor+	Directly after the stress subsides	Cell regeneration and recovery
Intensive growth stage	foliQ® TrioPGA	BBCH 30–59	Enhanced photosynthesis and biomass
Orchard crops exposed to frost	AscoVigor+ and AminoVigor+	Before and after stress event	Reduced damage and improved fruit set
Intensive crops (sugar beet, oilseed rape, maize)	foliQ® TrioPGA	During the active vegetation stage	Higher yield and increased sugar / oil content
Prolonged spring cold spells	AscoVigor+ → AminoVigor+	Before cold periods and after frost	Full resistance and recovery cycle

In short:

AscoVigor+

Before stress

AminoVigor+

After stress

TrioPGA™

Growth promoter

Integrated foliQ® technology – three stages of support
By applying foliQ® products in the right sequence, farmers can provide crops with comprehensive protection and support at every stage of growth: AscoVigor+ prepares plants for stress, AminoVigor+ helps them recover after stress, and TrioPGA enhances photosynthetic activity. This is the power of triple biostimulation – ensuring stable yields and healthy crops even under variable climatic conditions.

Contact

We will be happy to answer any inquiries concerning foliar fertilisers foliQ®, their application, and use in your crops. Contact us, to receive assistance and counselling from our specialists.

SŁAWOMIR ZIELIŃSKI – EXPORT MANAGER

Tel. +48 882 799 012

slawomir.zielinski@agrii.pl

MATEUSZ MAZUR – EXPORT MANAGER

Tel. +48 608 488 912

mateusz.mazur@agrii.pl

Agrii Polska Sp. z o.o.

ul. Obornicka 233

60-650 Poznań

bok@agrii.pl

Join us