



biologicals

Embrace balance

An Introduction to Corteva Biologicals Europe

January 2022



Integrated Solutions for European farmers



Biologicals

Biocontrol

Biostimulants

Biochemicals

Pheromones

Microbials

e.g., plant extracts,
fermentation-based
natural substances

e.g., bacteria, fungi,
viruses



Biologicals - EU sustainable agriculture

Harnessing the power of nature

- With **nature as a starting point**, more opportunities to develop solutions with **favourable toxicological and residue profile**
- Fostering the **uptake of Integrated Pest Management** across Europe

Biologicals as part of integrated solutions

- **Not a one-to-one replacement** for conventional crop protection tools; efficacy dependent on crops, location, agronomic conditions and other parameters
- Valuable **as part of integrated solutions**, supporting pesticide use and risk reduction

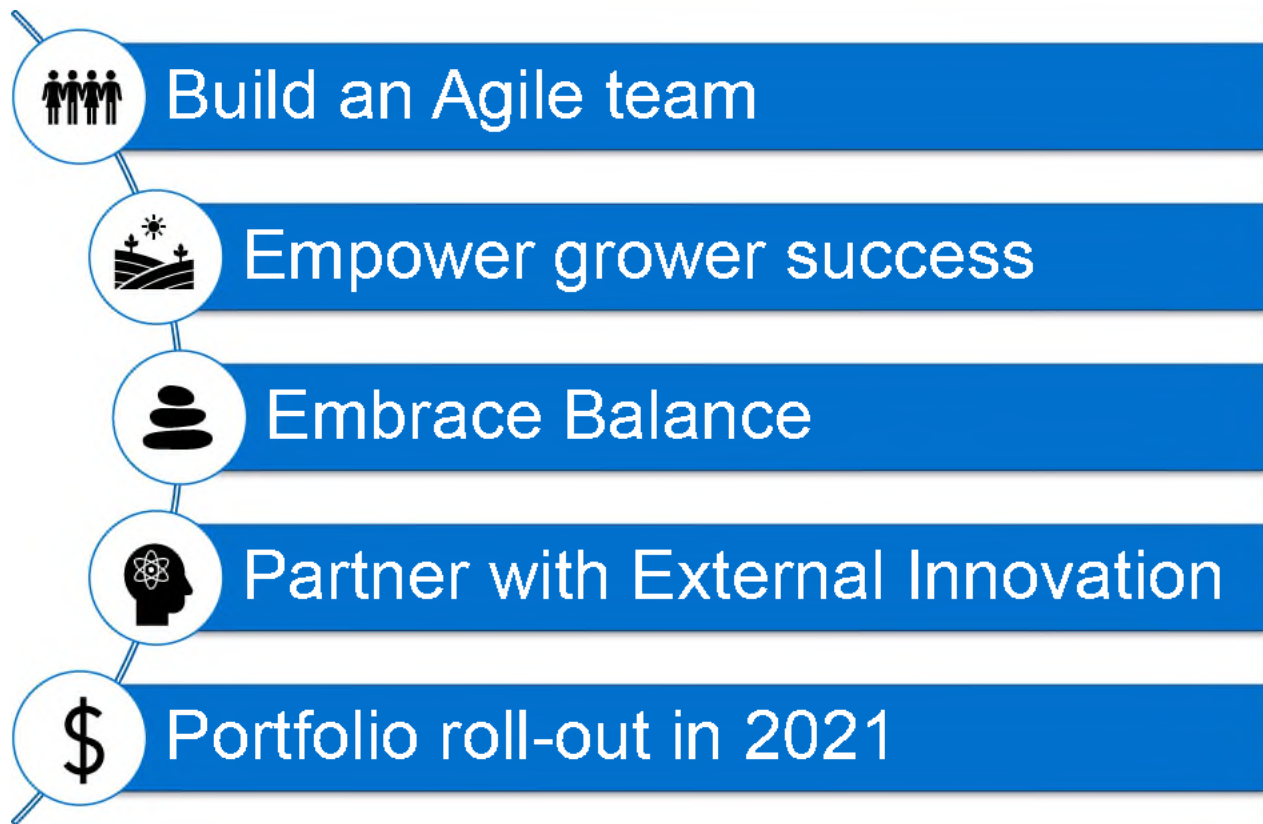
Supporting the EU Green Deal

- EU ambition to **promote alternatives** to conventional pesticides and promote organic farming
- **Societal demand** for more natural solutions, including in agriculture and food

Our industry-wide commitment

- CropLife Europe commitment to **invest 4 billion euros in biopesticides by 2030**
- **Corteva ramping up investment** with dedicated biologicals portfolio

Biologicals – Building on Qalcova leadership



Create a startup mindset with access to corporate resources.

Focus on solving farmers' climate, regulatory and food-chain challenges without compromising profitability

Conventional & Biologicals, side-by-side

Rigorously select the best external innovation and magnify its growth

Fund your own growth, earn investments through short term milestones. 19 launches in 2021/22

Biologicals are becoming an integral part of the solutions growers want



Source: Phillips McDougall, company websites, press search, expert interviews

Two drivers for the inclusion of biologicals into integrated solutions and broader portfolios

1. Solutions efficacy

Biologicals are additive to the efficacy of agronomic solutions and have proven they can enhance efficacy

“...our goal is not to separate biologicals from other crop protection practices, but instead demonstrate how they can complement each other for optimal benefit within conventional farming systems

– **Bayer**

2. Grower demand

Growers are increasingly under pressure to reduce conventional CP and fertilizer applications

“Green Deal is going to put a real damper on how much CP and fertilizer we apply. I expect us to pull back our volume between 10-25% in the next 3 years

– **EU row crop grower**

“Our major grocery customers are now asking us for information on our chemical footprint and applying a penalty if we go over the levels they set

– **US specialty crop grower**

Global Product Launches Timeline (as of Nov 2021)

2021

2022

2023

2024+

Utrisha™N

NUTRIENT EFFICIENCY OPTIMIZER

Capirel™

CONTROLADOR BIOLÓGICO

Amylo-X™SC

FUNGICIDA BIOLÓGICO

Omsuga™P

OTIMIZADOR DA EFICIÊNCIA NUTRICIONAL

Sasdia™

MITIGADOR DE ESTRESSE ABIÓTICO

Kinsidra™Grow

BIOSTIMULADOR

Elagesk™Sf

BIOINSETICIDA

Tezpetix™Isa

BIOINSETICIDA

Inlayon™

BIONEMATOCIDA

Enrapta™

Tuta Press

MATING DISRUPTION PHEROMONES

Bexfond™

BIOLOGICAL FUNGICIDE

Omsuga™FCO

OTIMIZADOR DA EFICIÊNCIA NUTRICIONAL

Sasdia™

Stress Plus

ABIOTIC STRESS MITIGATOR

Kinsidra™Start

STIMULADOR DE CROISSANCE

Hearken™

BIOLOGICAL INSECTICIDE

Tezpetix™Beauve

BIOINSETICIDA

Inlayon™ECO

BIONEMATOCIDA

Enrapta™

Lobesia Press

FEROMONES DE CONFUSÃO SEXUAL

Subelus™

BIOFUNGICIDA

Enrapta™

Graphalita

MATING DISRUPTION PHEROMONE

Enrapta™

Cydia

MATING DISRUPTION PHEROMONE

Holzem™
Biofungicide

GA342
Biofungicide

AFX-1
Biofungicide

NOVO 1020
Bioinsecticide

- We screened over 200 technologies in 2020-21
- 19 we selected to launch in 2021 to 2023
- 2022 represents both the magnitude of our success and the magnitude of our launch bottleneck

Biologicals Product Portfolio



Biologicals Portfolio - Europe

Biochemicals and naturally-derived

Qalcova™ active

- › *Spinosad*: Natural origin insecticide used over 200 crops by both conventional and organic farmers across Europe

Jemvelva™ active

- › *Spinetoram*: Award-winning insecticide of natural origin with broad pest spectrum

Inatreq™ active

- › *Fenpicoxamid*: Natural origin fungicide with unique mode of action for *Septoria* control on wheat

Micro-organisms

AF-X1 2021

- › *Aspergillus flavus* MUCL54911: Innovative natural solution to control aflatoxin levels in maize



Biologicals Portfolio - Europe



Pheromones

Enrapta™
Grapholita Press

- › Highly specific mating disruption method to control the Oriental fruit moth in peaches and other stone fruits

Enrapta™
Tuta Press

- › Mating disruption pheromones against the tomato leafminer (*Tuta absoluta*), a major destructive invasive species

Enrapta™
Lobesia Press

- › Mating disruption tool controlling the European grapevine moth (*Lobesia botrana*)

Enrapta™
Cydia Ball

- › Mating disruption solution encapsulated in balls applied by gun for targeted control of codling moth (*Cydia pomonella*) in nuts – Cydia Press available for orchards



Biostimulants

Utrisha™ N

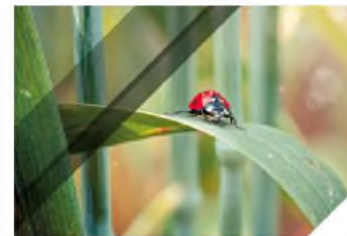
NUTRIENT EFFICIENCY
OPTIMIZER

- › *Methylobacterium symbioticum*: Innovative solution providing nitrogen to the plant by converting dinitrogen into ammonium

Lumidapt™

GROWTH NUTRITION SEED TREATMENT

- › Natural origin seed treatment bio stimulant enhancing nutrient and water uptake for corn, sunflower and oilseed rape - Ympact™ available for cereals



1. Biochemical example: Spinosad

- Product of **natural origin** cleared for **use in organic food production**
 - Fermentation by the naturally-occurring soil bacteria, *Saccharopolyspora spinosa*
- Approved for use on a wide array of crops including extensive range of **minor uses/specialty crops**
 - Over 200 crops in 24 EU Member States
- Controls a **broad spectrum of pests** including problematic and invasive species
 - Including Thrips, Lepidoptera, Diptera, Drosophila Suzukii
- **Unique Mode of Action:** no cross-resistance to any other chemical class
- Uniquely short pre-harvest intervals, majority are 1-3 days
- **Compatible in IPM programs**
- Many years of safe use with no unacceptable environmental effects observed



Saccharopolyspora spinosa (left) and *S. spinosa* entom (right)

➤ An indispensable pest control solution for both conventional and organic farmers in Europe, meeting societal demand for natural origin solutions and a more resilient and sustainable EU agriculture

2. Micro-organism example: AF-X1

Mycotoxins such as aflatoxins are a major food safety concern in the EU

- Aflatoxins are fungi-produced toxins found on crops such as maize
- Climate change is expected to lead to increased aflatoxins occurrence in Europe
- Aflatoxins are known to be carcinogenic and genotoxic for human and animal health
- Maximum limits are set at EU level and aflatoxins management is a priority for the agri-food chain and public authorities



AF-X1 is a natural solution to control aflatoxins in maize

- Developed by Corteva and commercially available since 2015 in Italy
- Based on an atoxigenic *Aspergillus flavus* strain 54911
- Provides an effective reduction in aflatoxin concentration in harvested produce

➤ Mitigating the impact of climate change can start on the field with this natural micro-organism solution against aflatoxins in corn, a major food and feed safety issue

3. Pheromones example: Enrapta™ Tuta Press

Mating disruption method against the Tomato leafminer (*Tuta absoluta*)

- Highly specific solution with no impact on beneficial insects or pollinators
- No residues
- Compatible with organic production



Tuta absoluta is an invasive species causing significant economic damage to EU tomato production

- Spreading across Europe since 2007, *Tuta absoluta* is difficult to control and can cause up to 80-100% yield losses in tomato crops
- In the Netherlands, the economic impact has been estimated at between €5 and 25 million per year
- In Italy, an outbreak of *Tuta absoluta* contributed to damage around 25% of tomato production in the 2018/2019 winter

➤ A natural pheromone to control an economically damaging invasive species on a key crop for EU consumers

Biostimulants Overview

Biostimulants stimulate natural processes to enhance:

1. nutrient uptake, nutrient efficiency
2. tolerance to abiotic stress
3. crop quality

With benefits for yield and vigor

Raw materials include seaweeds, plant extracts, humic and fulvic acids, hydrolysed proteins and micro-organisms, among others



Biostimulants improve nutrient use efficiency.

→ Helps reduce nutrient losses to the environment and improves farmer ROI for fertilizer use

Biostimulants improve crop quality.

→ Improves farmer income and can help meet technical demand with less output (e.g. higher density nutrient content in crops for feed)

Biostimulants improve crop vigour.

→ Improves tolerance to harsh growing conditions (abiotic stress)

Source: European Biostimulant Industry Council

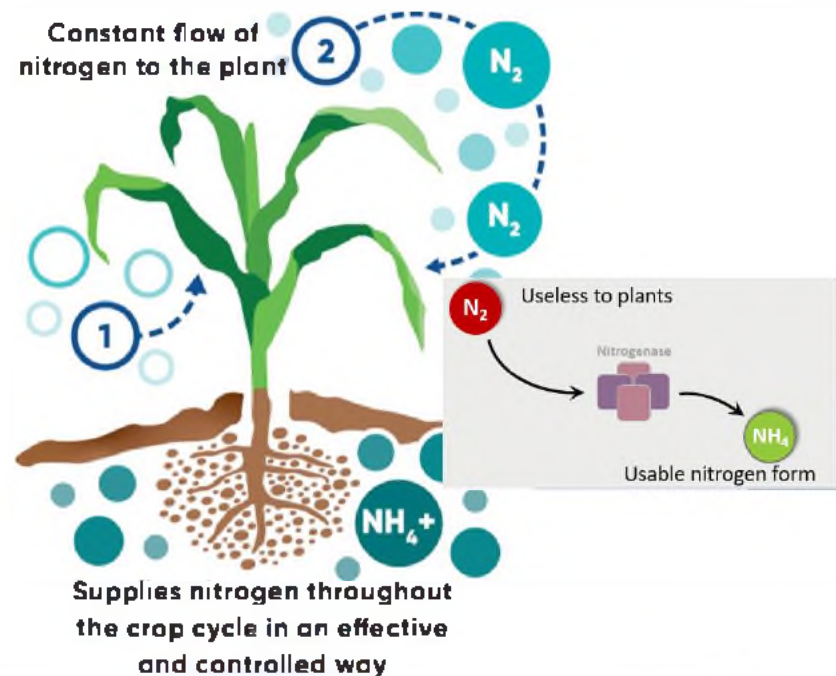
Utrisha™ N

Nitrogen efficiency via air fixation

- *Methylobacterium* converts N_2 from the air into ammonium
- Naturally provides nitrogen to the plant
- Cleared for use in organic agriculture

A natural solution to manage nitrogen

- An alternative source of nitrogen for crops
- No GHG emissions or nitrate leaching to groundwater
- 33kg needed for 100ha v. 50 tons of N fertilizers



➤ A win-win scenario between sustainability and productivity with a natural nitrogen management solution

Biostimulants - EU sustainable agriculture

Supporting the EU Green Deal

- Biostimulants contribute to the **EU objective of 50% nutrient losses reduction** by improving nutrient uptake and use efficiency and enhancing crop quality
- Improving plant **resilience to abiotic stresses** and increase **soil fertility**

Towards a greener Common Agricultural Policy

- **Increasing agricultural productivity** in a sustainable way
- CAP objective to conciliate yield increase with **reduced environmental impact**

Meeting the EU Climate target

- Biostimulants help crops better adapt to climate change with **resilience towards abiotic stresses such as floods and drought and reducing greenhouse gas emissions**
- Improving climate resilience will **regenerate soil health and reduce erosion**

Fostering biodiversity

- Biostimulants can **add beneficial micro-organisms** to the soil and increase soil fertility
- Potential to **reduce impact of nitrification** on biodiversity and reduce gas emissions

A vibrant cornfield at sunset with a barn in the distance and decorative geometric overlays.

Thank you



CORTEVA™

agriscience

www.corteva.com

