



WHERE SCIENCE SERVES NATURE

BEHIND SUSTAINABLE AGRICULTURE, RESEARCH AND INNOVATION BY VALAGRO”

Dr. Alberto Piaggese, PhD
Global R&D Director

RESEARCH & DEVELOPMENT

HAS A PIVOTAL ROLE IN ACHIEVING THE OBJECTIVE OF:

- PRODUCING MORE
- USING LESS RESOURCES

WHAT THE MODERN AGRICULTURE SHOULD ASSURE:



SATISFY THE INCREASED DEMAND FOR FOOD



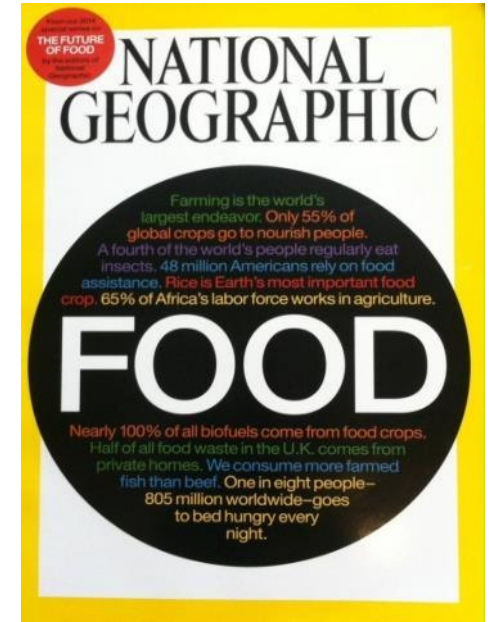
FACE THE SCARCITY OF RESOURCES, INCREASING ITS EFFICIENCY



REDUCE THE IMPACTS OF AGRICULTURAL PRACTICES ON ENVIRONMENT



GUARANTEE SUSTAINABILITY IN THE LONG TERM



PLANT BIOSTIMULANTS

Fruit

- Setting processes
- Fruit size and weight
- Quality

Crouch and van Staden, 1992; Chouliaras et al., 1997; Colapietra and Alexander, 2006; Basak, 2008; Chouliaras et al., 2009; Ross and Holden, 2010; Loyola and Muñoz, 2011; Parađiković et al., 2011; Khan et al., 2012; Parađiković et al., 2013; El-Hamied et al., 2015.

Seeds / Seedlings

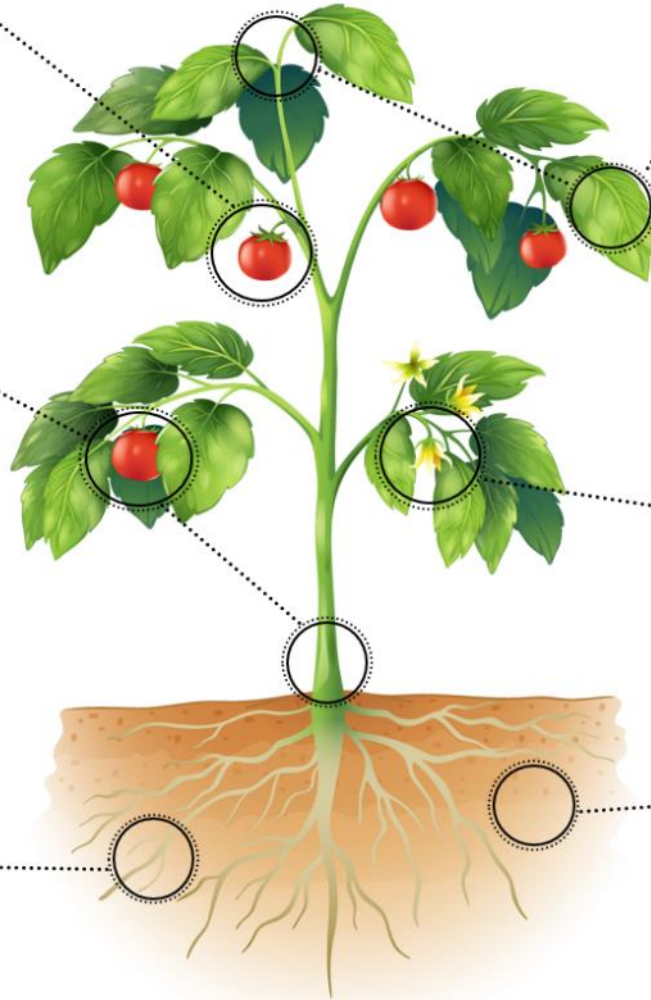
- Germination
- “Starter effect”
- Overcoming transplant stress
- Priming effect
- Seed quality

Aldworth and van Staden, 1987; Featonby-Smith and van Staden, 1987; Crouch and van Staden, 1992; Russo et al., 1993; Moller and Smith, 1998; Demir et al., 2006; Sivasankari et al., 2006; Farooq et al., 2008; Neily et al., 2010; Kumar and Sahoo, 2011; Matysiak et al., 2011; Kalaivanan and Venkatesalu, 2012.

Roots

- Root development
- Young root development
- Rooting of cuttings

Sivasankari et al., 2006; MacDonald et al., 2010; De Lucia and Vecchietti, 2012; Ferrante et al., 2013; Krajnc et al., 2012; Petrozza et al., 2012; MacDonald et al., 2012; Alam et al., 2014.



Plant

- Plant growth/yield and physiological modulation
- Water/nutrient uptake
- Stress response

Beckett and van Staden, 1990; Beckett et al., 1994; Blunden et al., 1996; Adani, 1998; Mancuso et al., 2006; Zhang and Ervin, 2008; Ross and Holden, 2010; Sangeetha and Thevanathan, 2010; Zhang et al., 2010; Fan et al., 2011; Kumar and Sahoo, 2011; Matysiak et al., 2011; Parađiković et al., 2011; De Lucia and Vecchietti, 2012; Petrozza et al., 2012; Parađiković et al., 2013; Alam et al., 2014; Petrozza et al., 2014; Saa et al., 2015.

Flowers

- Flowering and sprouting induction.

Basak, 2008; Petri et al., 2008; Hawerth et al., 2010; Pereira et al., 2011.

Soil

- Physico-chemical properties
- Development of beneficial soil microorganisms
- Water/nutrient retention
- Overcoming salinity stress

Booth, 1969; Guiry and Blunden, 1991; Temple and Bomke, 1988; Chen et al., 2002; Gulser et al., 2010; Ross and Holden, 2010; García-Martínez et al., 2010; Tejada et al., 2011; Alam et al., 2014.

PLANT BIOSTIMULANTS OUR LAST SCIENTIFIC PAPERS

Scientia Horticulturae 225 (2017) 252–263



ELSEVIER

Contents lists available at ScienceDirect

Scientia Horticulturae

journal homepage: www.elsevier.com/locate/scihorti



Next Generation Sequencing to characterise the breaking of bud dormancy using a natural biostimulant in kiwifruit (*Actinidia deliciosa*)



Frank A. Hoeberichts^a, Giovanni Povero^{b,*}, Mireia Ibañez^a, Anneloes Strijker^a, Daniele Pezzolato^b, Richard Mills^b, Alberto Piaggese^b

^a NSure BV, Binnenhaven 5, 6709 PD Wageningen, The Netherlands

^b Valagro SpA, Zona Industriale, Via Cagliari 1, 66041 Atesa, Chieti, Italy

A Systematic Approach to Discover and Characterize Natural Plant Biostimulants

Giovanni Povero^{*}, Juan F. Mejia, Donata Di Tommaso, Alberto Piaggese and Prem Warrior

Global R&D Department, Valagro SpA, Atesa, Italy

published: 05 April 2016
doi: 10.3389/fpls.2016.00435



The most cited and largest open-access plant science journal

IMPACT FACTOR 4.495

Scientia Horticulturae 174 (2014) 185–192



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Contents lists available at ScienceDirect

Scientia Horticulturae

journal homepage: www.elsevier.com/locate/scihorti



Physiological responses to Megafol[®] treatments in tomato plants under drought stress: A phenomic and molecular approach



Angelo Petrozza^{a,1}, Antonietta Santaniello^{b,*}, Stephan Summerer^a, Gianluca Di Tommaso^c, Donata Di Tommaso^c, Eleonora Paparelli^b, Alberto Piaggese^c, Pierdomenico Perata^b, Francesco Cellini^a

^a ALSIA Centro Ricerche Metapontum Agrobios, s.s. Jonica 106, km 448,2, Metaponto, MT 75010, Italy

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journal homepage: www.elsevier.com/locate/scihorti



Zn-localization and anatomical changes in leaf tissues of green beans (*Phaseolus vulgaris* L.) following foliar application of Zn-lignosulfonate and ZnEDTA



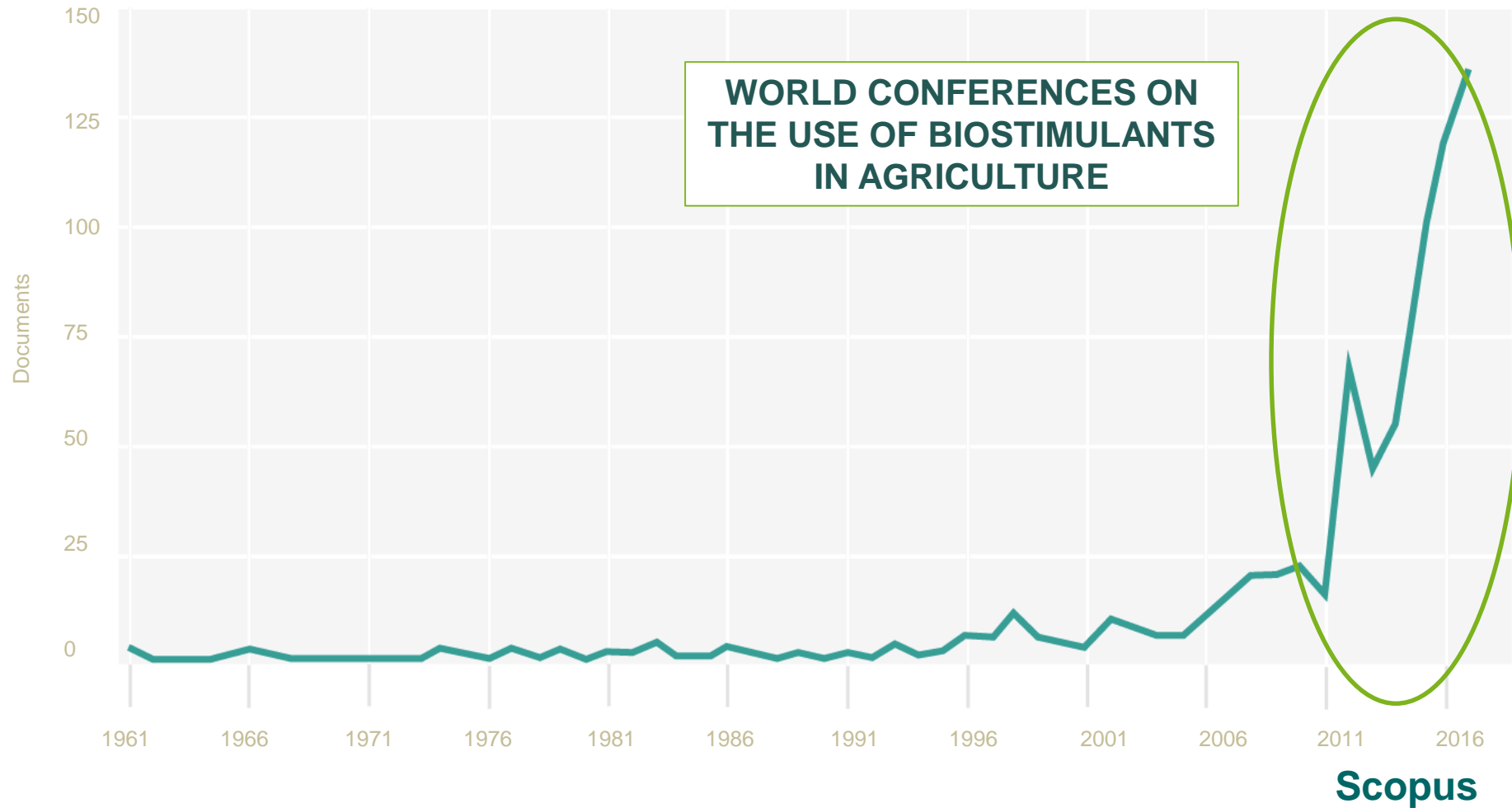
Antonio Minnocci^a, Alessandra Francini^{a,*}, Stefania Romeo^a, Alfredo Daniele Sgrignuoli^b, Giovanni Povero^b, Luca Sebastiani^a

^a BioLabs, Institute of Life Sciences, Scuola Superiore Sant'Anna, Piazza Martiri della Libertà 33, I-56127, Pisa, Italy

^b Valagro SpA, Via Cagliari 1, 66041 Atesa, Chieti, Italy

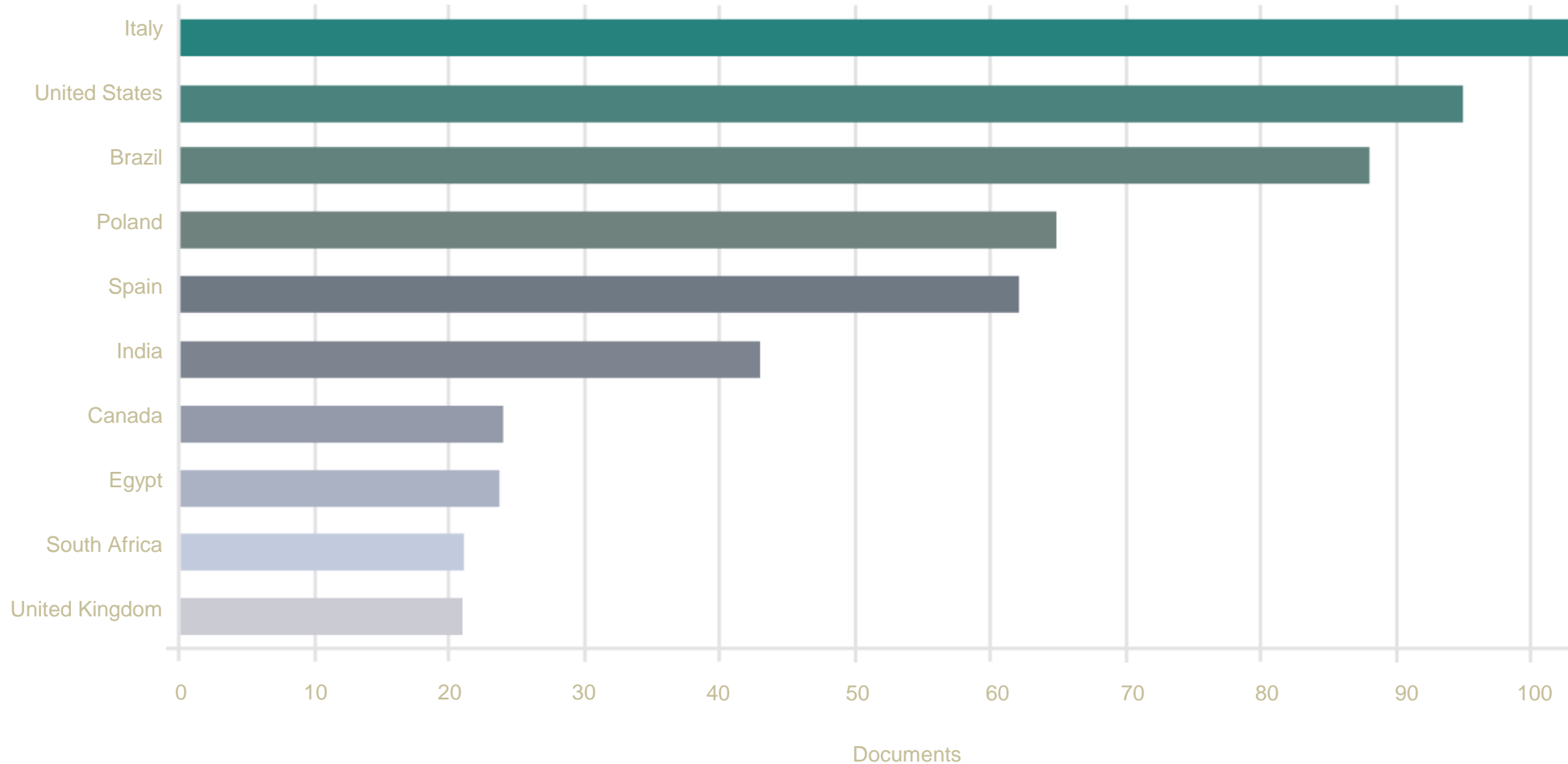
PLANT BIOSTIMULANTS

SCIENTIFIC PAPERS USING THE WORD "BIOSTIMULANT"



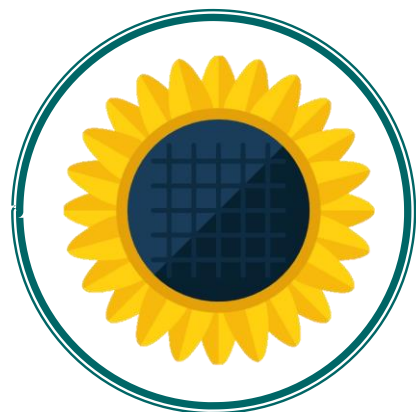
PLANT BIOSTIMULANTS

TOP 10 COUNTRIES IN PAPERS USING THE WORD “BIOSTIMULANT”



PLANT BIOSTIMULANTS

DESCRIPTION



**BIOSTIMULANTS
ARE OFTEN DERIVED FROM NATURAL
SUBSTANCES**



**BIOSTIMULANTS
ARE LOW TOXICITY COMPOUNDS**



**MANY OF THE RAW MATERIALS FOR THE
PRODUCTION OF BIOSTIMULANTS WOULD
OTHERWISE BE CONSIDERED WASTE
MATERIALS**

PLANT BIOSTIMULANTS

THE NEED TO EXPLORE



The knowledge on the benefits of Plant BioStimulants is constantly improving (consistent increase of research papers). Less is known about their **“Mode Of Action”**.

NATURAL BUT COMPLEX MATRICES: WHAT MAKES THEM SO «SPECIAL»?

GLOBAL R&D TECHNOLOGY PLATFORM



GEAPOW
TODAY FOR TOMORROW

GLOBAL R&D TECHNOLOGY PLATFORM

THE AIM OF OUR WORK AS GLOBAL R&D

Answer the question:

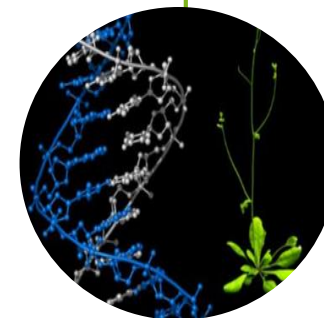
«what makes a prototype/product working?»

«Explain» and predict the function and mode of action of substances

Explore, discover new opportunities
(eg. compounds/complexes with positive effect)

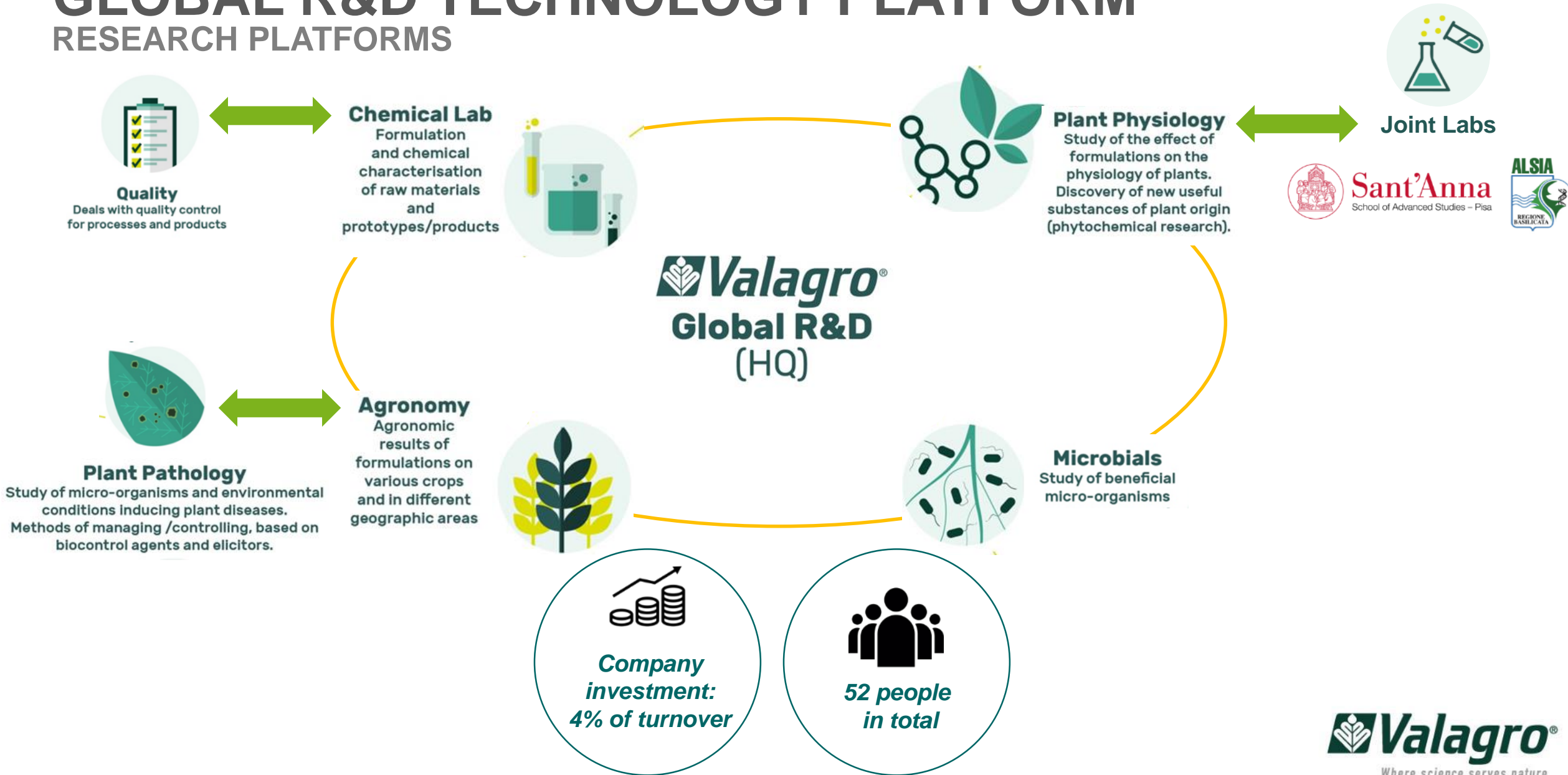
Improve application timing, dosage, and formulation design

Validate our solutions globally



GLOBAL R&D TECHNOLOGY PLATFORM

RESEARCH PLATFORMS



INTRODUCTION ABOUT GLOBAL R&D

ACADEMIA AND INDUSTRY, COMPANIES ON CAMPUS

THE KEYS FOR SUCCESS:



COMMON INTERESTS



TRUST



GOOD COMMUNICATION

Create “ecosystems” in
which **proximity** helps



Business



Science



Jana J. Watson-Capps & Thomas R. Cech (2014)
<http://www.nature.com/news/academia-and-industry-companies-on-campus-1.16127>

INTRODUCTION ABOUT GLOBAL R&D

SCIENTIFIC NETWORKING

Open Innovation Network: our internal R&D as a node in a broader network, in order to speed-up and «catch» innovation across a wide ecosystem.



SCIENTIFIC COMMITTEE



Teodoro Miano
Professor at University of Bari
(Soil Science)



Pierdomenico Perata
Dean at Sant'Anna University
(Plant Physiology & Biotechnology)



Evgenia Blagodatskaya
Georg-August University Göttingen
(Microbiols)



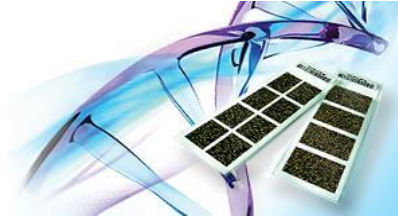
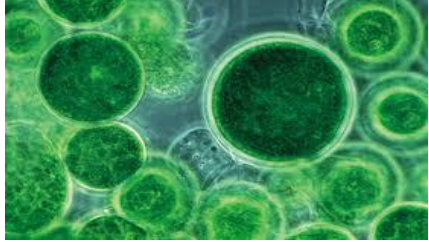
Chris Bowler
Director of Research at CNRS
(Cell & Algae biology)



Aldrik Velders
Professor of BioNanoTechnology
Wageningen
(Nanotech)

GLOBAL R&D TECHNOLOGY PLATFORM

TECHNOLOGY PLATFORM



DISCOVERY

PROTOTYPING

**BIOLOGICAL
SCREENING**

**PRIMARY
SCREENING**

**OPEN-FIELD
TESTING**

Intellectual Property Management (patents)

min. 2 months

min. 3 months

min. 3 months

min. 4 months

24 months (2-seasons)

RESEARCH

DEVELOPMENT

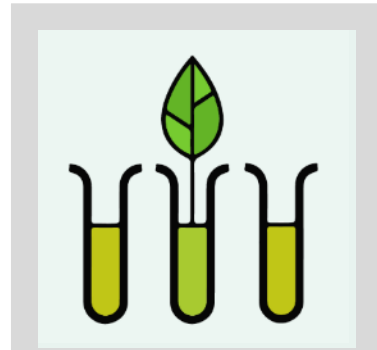
GLOBAL R&D TECHNOLOGY PLATFORM

BIOLOGICAL SCREENING

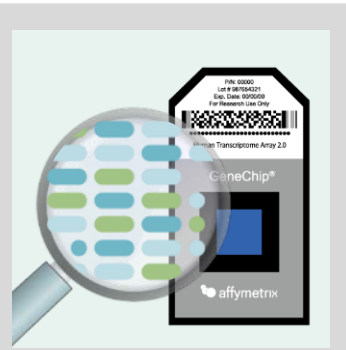
**BIOLOGICAL
SCREENING***

min. 3 months

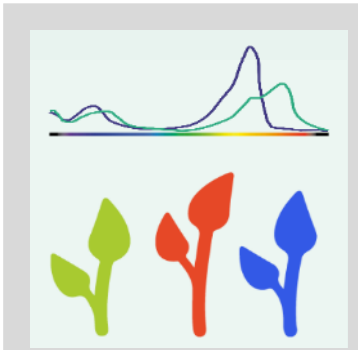
*mainly prototypes, but
also selected raw
materials,
phytochemicals, microbials



BIOASSAYS



GENOMICS



PHENOMICS



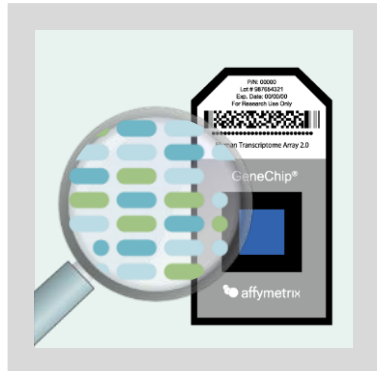
OTHER OMICS

**PRELIMINARY
SELECTION &
EFFICACY
CHARACTERIZATION**
(mode of action)

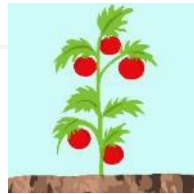
GLOBAL R&D TECHNOLOGY PLATFORM

BIOLOGICAL SCREENING

Functional genomics as powerful tool to decipher the molecular and physiological triggers for specific responses in plant systems



GENOMICS
Microarray, qPCR
and Next Gen.
Sequencing

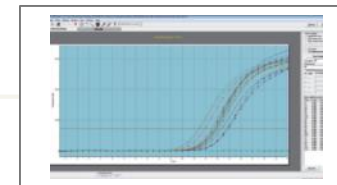


EXTRACTION



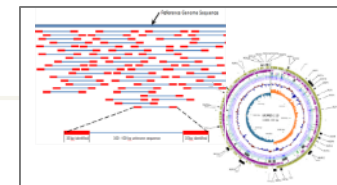
Gene chip

Microarray: high-throughput technology to measure parallel expression of thousands of genes



Real-time qPCR analysis

«Real-time» qPCR to focus on specific physiological processes/pathways or validate microarray data



NGS

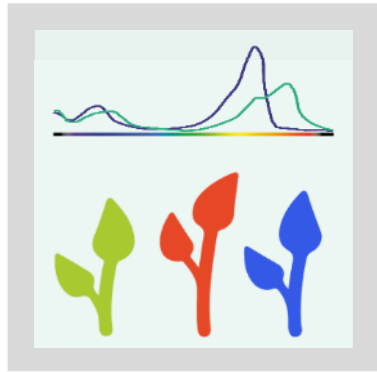
Next Generation Sequencing: genomics «on field», dedicated to non-model plants & microorganisms

OUTCOME: Molecular dissection of the effect of biostimulants and explanation of the mode of action

GLOBAL R&D TECHNOLOGY PLATFORM

BIOLOGICAL SCREENING

High-throughput, multi-spectrum image analysis to detect morphometric and physiological parameters



PHENOMICS

*High throughput
image analysis*



In-hou

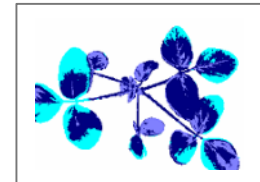
plants



UV (fluorescence): to analyze the photosynthetic efficiency



Visible - RGB: morphology, architecture, digital biomass, green and yellow index



NIR (Near Infra-Red): plant water content

OUTCOME: Phenotype characterization of nutritional, hydrological, physiological state of plants

GLOBAL R&D TECHNOLOGY PLATFORM

PRIMARY SCREENING

PRIMARY
SCREENING

min. 4 months



CONTROLLED
ENVIRONMENT



ON FIELD
TESTING



PLANT GROWTH CHAMBER



BIOLOGICAL INCUBATOR



Collaboration with MKTG

BEST APPLICATION
METHODS,
TIMING, RATES

GLOBAL R&D TECHNOLOGY PLATFORM

OPEN FIELD TESTING

**OPEN-FIELD
TESTING**

24 months
(2 seasons)



Agronomic R&D Coordinators and their team (trials assistants)

- Specific areas
- Most relevant crops

Agronomic R&D Specialists

- Other areas, according to the need

Internal + External (Research Centers) trials on:

- Horticultural crops (greenhouse & open field)
- Row crops
- Orchards
- Tropical and semi-tropical crops

VALIDATION

GLOBAL R&D TECHNOLOGY PLATFORM

LEADING DEVELOPMENT CAPABILITY



GEAPOW REDUCES THE COST OF TAKING A SOLUTION TO MARKET WHILE ENSURING CONSISTENT EFFICACY

1

DEEP KNOWLEDGE OF ACTIVE INGREDIENTS AND RAW MATERIALS



- This enables Valagro to identify, characterize and preserve specific active ingredients that can achieve targeted physiological responses in plants



2

DEEP KNOWLEDGE OF ACTIVE INGREDIENTS AND RAW MATERIALS



- Customized extraction processes help maintain the correct ratio of each ingredient in complex natural mixtures

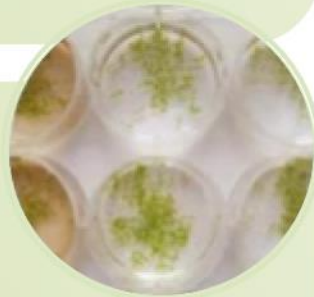


3

ADVANCED SCREENING AND INVESTIGATION TECHNOLOGIES



- Genomics, phenomics and other “omic” sciences allow Valagro to decipher the genetic and molecular triggers for specific physiological responses in plant systems.
- Screening of hundreds of samples per experiment.



4

PROVEN ABILITY TO PROVIDE COMMERCIALLY VIABLE SOLUTIONS



- Extensive experience with field experiments
- Commercial function and research function are closely integrated
- Allows Valagro to fast-track product candidates with the best chance of attaining commercial viability



WIN THE GLOBAL CHALLENGE TOGETHER



Where science serves nature