INFORMA Life Sciences
Crops and Chemicals Europe: Biostimulant and Plant Growth
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# Research and innovation to identify new biostimulants and their formulations

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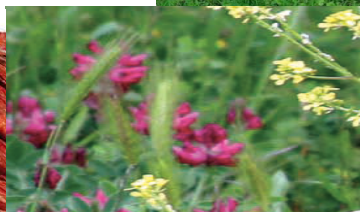
# OVERVIEW

- THE ROLE OF CONSORTIUM INSTM
- PLANT BIOSTIMULANTS AND IPM
- EXPLORING NEW POTENTIAL SOURCES
- THE IMPORTANCE OF NETWORK RESEARCH PROJECTS
- THE TARGET OF CONSISTENT AGRONOMIC RESULTS
- CONCLUSIONS: WHAT'S AHEAD



# THE IMPORTANCE OF NETWORK RESEARCH PROJECTS

- ONLY FEW LARGE INDUSTRIES CAN SUSTAIN COSTS AND TIME LAG TO DEVELOP NEW PRODUCTS: EXTERNALIZATION OF R&D ACTIVITIES MAY BE A SMARTER CHOICE IN VIEW OF THE TARGETS
- HOWEVER, VERY FEW RESEARCH ENTITIES HAVE SCIENTISTS EXPERT IN EACH AND EVERY STEP OF THE R&D PROCESS
- SOMETIMES GOOD IDEAS FAIL TO BECOME GOOD PROJECTS FOR LACK OF PRACTICAL APPROACH DURING TECHNOLOGY "INDUSTRIALIZATION": THE ASPECTS OF FORMULATION AND COMPLIANCE WITH REGULATORY ARE USUALLY THE MOST DIFFICULT ONES
- THEREFORE, NETWORK RESEARCH PROJECTS CAN PROVIDE A GOOD BASIS FOR R&D OF NEW PRODUCTS WHEN THE SINGLE STEPS ARE WELL PLANNED AND PARTICIPANTS OPERATE IN A FUNCTIONAL NETWORK
- **THE CONS OF THIS APPROACH: MOST KEY INFORMATION IS PUBLIC**

# AN EXAMPLE OF A GOOD PROJECT ON BIOSTIMULANTS: LIFE+2013 EVERGREEN - TARGETS

- TO INVESTIGATE ITALIAN **POLYPHENOL** SOURCES: SWEET CHESTNUT, OLIVE TREE, GRAPE MARC AND SEED, ARTICHOKE
- TO DEMONSTRATE THE *IN VIVO* **BIOSTIMULANT EFFECT** OF NON-FOOD AND VEG WASTE BIOMASS EXTRACTED **POLYPHENOLS**, TO INCREASE PLANT RESISTANCE TO DISEASE AND NEMATODES, AND AVOID AGROCHEMICALS AND COPPER SALTS
- TO DEMONSTRATE THE AGRONOMIC AND ENVIRONMENTAL PROs RELATED TO THE "FIELD" USE OF POLYPHENOLS APPLIED AS **HIGH EFFICIENT FORMULATIONS**
- ACCORDING TO **SUSTAINABLE CIRCULAR ECONOMY**, TO IDENTIFY NEW PROCESSES THAT INCLUDE A REACH COMPLIANT EXTRACTION PHASE, AND THE SPENT RESIDUE EXPLOITATION FOR ENERGY AND BIO-BASED MATERIAL

# INSTM PAST ACTIVITY AND LIFE+2013 EVERGREEN

- PAST ACTIVITY: INNOVATIVE USES OF CHESTNUT TANNINS IN AGRICULTURE SINCE 1999, WITH **FIVE PATENTS**. THE FIRST ONE:

BARGIACCHI E., MIELE S., 2000. *Fertilizing composition containing phosphorite and tannins*. European Patent Appl. No. 00123413.7-2111 (priority MI99A02296, 03-11-1999).

- FOR EVERGREEN:
  - ASSESSING **BIOSTIMULANT ACTIVITY** OF CHESTNUT TANNINS **FOR SOIL NEMATODE TOLERANCE,** ALSO IN FORMULATION WITH GRAPE MARC AND ITS EXTRACTS
  - PREPARATION AND TEST OF STABLE **FORMULATIONS** FOR CROP FIELD APPLICATION ACCORDING TO PRESENT ITALIAN REGULATIONS

# FORMULATIONS BASED ON SWEET CHESTNUT TANNINS ALSO WITH GRAPE MARC POLYPHENOLS

## SPRAY-DRIED POWDER TO FORMULATE STARTER MICROGRANULATE FERTILIZERS AND BIOSTIMULANTS FOR SEED / TRANSPLANT SEEDLING APPLICATION AT PLANTING

Courtesy: Color Glass S.p.A.

## SPRAY-DRIED DISPERSIBLE POWDER FOR MICROIRRIGATION TO INCREASE PLANT RESISTANCE TO GALL-NEMATODES AND OTHER SOIL- AND WATER-BORNE DISEASES


Courtesy: Fattoria Autonoma Tabacchi

# THE TARGET OF CONSISTENT AGRONOMIC RESULTS (1)

- ONLY OPERATING AT FARM LEVEL, BUT IN FARMS IN PURSUIT OF EXCELLENCE, IT IS POSSIBLE TO ANALYSE THOROUGHLY EVERY STEP OF THE DEVELOPMENT PROCESS
- FIRST, CONSIDER:
  - THE PROBLEM TO FACE FOR THE GIVEN CROP
  - THE COMPETITORS'S STRATEGIES
  - WHICH ARE THE EMERGING PROBLEMS? RESIDUES, FEW LABELED AGROCHEMICALS AVAILABLE, ANY FAILURES IN AGRONOMIC MANAGEMENT
  - HOW CAN FORMULATION AND APPLICATION METHOD "BUFFER" ANNUAL CLIMATE VARIABILITY AND CROP CHARACTERISTICS (DIFFICULT ROOTING, POOR LEAF ABSORPTION, ETC.) ?
- SECOND, ALWAYS KEEP IN MIND SUSTAINABILITY AND HOW EASY IS TO INCLUDE THE PROPOSED TREATMENT IN THE ORDINARY FARM PROGRAM (APPLICATION TIME, DEDICATED EQUIPMENT, SAFETY DATA SHEET LIMITATIONS, ETC.)

# THE TARGET OF CONSISTENT AGRONOMIC RESULTS (2)

- THIRD, UNEXPECTED PROBLEMS ….:
  - SOMETIMES A GIVEN LEVEL OF PLANT STRESS IS BENEFICIAL TO SOME QUALITY TRAIT … . HOW TO HOLD ON EVERYTHING?
  - GENETIC RESEARCH HAS BEEN PRODUCING TOLERANT OR RESISTANT VARIETIES, e.g. FOR VINEYARD, BUT QUALITY SOMETIMES FAILS: SHOULD WE SWITCH FROM BIOSTIMULANTS TO OVERCOME STRESS TO BIOSTIMULANTS TO DETERMINE A SELECTED STRESS DEGREE, TO KEEP HIGH QUALITY STANDARDS?
  - WE ARE MOVING THIS WAY WITH THE NEW PROJECT WE ARE GOING TO SUBMIT ON H2020

# AN EXAMPLE: TOBACCO VIRGINIA BRIGHT AS A TEST PLANT FOR NEMATODE STUDIES

- IT'S A CROP FREQUENTLY REPEATED ON THE SAME SANDY SOILS, PRONE TO ***Meloidogyne* spp.** INFESTATION, BOTH EARLY AND LATE IN THE SEASON (IN PROXIMITY TO HARVEST TIME)
- FEW LABELED AGROCHEMICALS ARE AVAILABLE, AND **RESIDUES** ARE A PROBLEM
- WE HAVE TESTED ALTERNATIVE PRODUCTS FOR NEMATODES CONTROL SINCE 2012 AT THE MAJOR EUROPEAN TOBACCO PRODUCER, **FATTORIA AUTONOMA TABACCHI** OF CITTA' DI CASTELLO-ITALY. IN 2014 AND 2015 EXPERIMENTS WERE CARRIED OUT ACCORDING TO EVERGREEN **PROTOCOL**
- **ALTERNATIVE PRODUCTS UNDER INVESTIGATION**: BOTANICALS, ANTAGONISTIC MICRO ORGANISMS, BIOSTIMULANTS
- A WORLD CASH CROP, AS TOBACCO, WITH FEW PLAYERS, PERMITS EASIER TECHNOLOGY TRANSFER IN RELATIVELY SHORT TIME vs. OTHER CROPS

# TREATMENTS

| Commercial Product | a.i. & Formulations | Formulation Producer | RATE kg/ha | 2014 | 2015 |
|---|---|---|---|---|---|
| Control | - | - | - | * | * |
| Mocap | Etoprofos 10% MG | Certis Europe | 60 | * | * |
| Vydate | Oxamyl 5% MG | DuPont CropProtection | 60 | * | |
| FlocteR | Bacillus firmus I-1582 5% WG | Bayer CropScience | 80 | * | * |
| Oikos | Azadirachtine 2.4% L | SIPCAM Italy | 1+9 | * | * |
| Experimental 18% + Saviotan WP Low Rate | Chestnut Tannins 18% MG + Chestnut Tannins 73% WP | Gruppo Saviola Italy (2014) Colorglass Italy (2015) | 30 + 45 | * | * |
| Experimental 18%+ Saviotan WP High Rate | Chestnut Tannins 18% MG + Chestnut Tannins 73% WP | Colorglass Italy | 30 + 67.5 | | * |
| Kendal Nem | Gea 99+ NPK (10.8-0-10.8) L | Valagro Italy | 0.12+10 | | * |

MG = microgranules; WG = wettable granules; WP = wettable powder; L = liquid

5

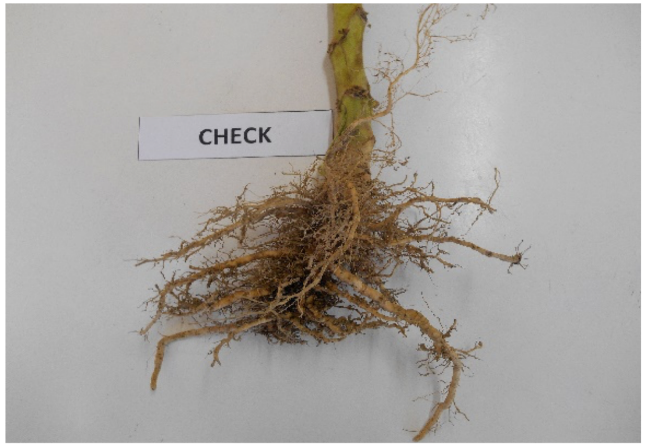
4

3

2

1

0





# BARKER * GRADING

plants are graded according to the No. of pricks or galls on the roots

* Barker, K. R. 1985. *Nematode extraction and bioassays*. Pp. 19-35, *in*, K. R. Barker, J. N. Sasser, and C. C. Carter, eds. An advanced treatise on *Meloidogyne*, Vol.II Methodology. North Carolina State University Graphics: Raleigh, NC.


TANNINS
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# COMMENTS ON THE RESULTS (1)

- THE TWO CROPPING SEASONS DIFFERED MARKEDLY FOR CLIMATIC CONDITIONS AND YIELD POTENTIALS WITH FIELD MEAN YIELDS OF 2.6 E 4.0 t/ha RESP.
- IN **2014** HEAVY RAINS IN JULY FAVORED THOSE PRODUCTS APPLIED IN REPEATED PATTERN (I.E. IN MICROIRRIGATION) vs. ORDINARY AGROCHEMICALS WITH A LABEL REQUIRING A 60 dd. LAG TIME BETWEEN APPLICATION AND HARVEST
- IN **2015**, THE USE OF A RELATIVELY TOLERANT TOBACCO CV (PVH 2310), TO *M. arenaria*, AND LESS INITIAL NEMATODE PRESSURE, MOST TREATMENTS WERE NOT SIGNIFICANTLY DIFFERENT FROM THE CONTROL FOR YIELD AND QUALITY

# COMMENTS ON THE RESULTS (2)

- AT THE END OF THE CROP CYCLE, NEMATODE COUNT IN THE SOIL WAS NOT CORRELATED WITH YIELD RESULT, THE REVERSE WAS TRUE FOR BARKER GRADING
- FOR YIELD AND QUALITY TANNINS OUTPERFORMED ALL THE OTHER TREATMENTS BUT THE MICROBIAL STRAIN BASED PRODUCT (FLOCTER)
- THEY ARE CHARACTERIZED BY A DIFFERENT MECHANISM OF ACTION: BIOSTIMULANT THE TANNINS, NEMATICIDAL THE MICROBIAL STRAIN
- THIS ASPECT COULD NEGATIVELY AFFECT THE EFFICACY OF THIS LATTER PRODUCT IN THE MEDIUM-LONG TERM, INFLUENCING RESURGENCE AND SELECTION OF RESISTANT STRAINS

# CONCLUSIONS: WHAT'S AHEAD

- PLANT BIOSTIMULANTS ARE A PILLAR OF MODERN IPM, AND ALSO OF PRESENT AND FUTURE AGRICULTURE SUSTAINABILITY
- THEY CAN REPRESENT A POWERFUL TOOL TO ACHIEVE CROP ZERO-RESIDUES AND PROMOTE CIRCULAR ECONOMY
- MORE DISSEMINATION OF THE RESULTS OF THE EU FUNDED PROJECTS COULD HELP INDUSTRY'S R&D, BOTH TO IDENTIFY NEW SOURCES AND TO AVOID SOME ERRORS OF COMMUNICATION
- WE SEE SEVERAL CONFLICTS ON THE WAY AS, UNTIL NOW, NO ONE HAS HAD A CLEAR PICTURE OF THE EXACT BOUNDARIES OF THE PLANT BIOSTIMULANT CONCEPT, PER SE
- WHEN ONE CONSIDERS FORMULATIONS, THE PROBLEMS ARE INCREASED: **NANOSTRUCTURED MATERIALS-BASED FORMULATIONS** ARE AN EXAMPLE OF THE CONFLICTS WE'RE GOING TO FACE FOR THE NEXT YEARS

# THANK YOU


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