INTERMAG
EFFECTIVENESS THROUGH KNOWLEDGE

Fundusze Europejskie Inteligentny Rozwój
Rzeczpospolita Polska
Narodowe Centrum Badań i Rozwoju
Unia Europejska Europejski Fundusz Rozwoju Regionalnego

KNOWLEDGE
INNOVATION
EFFICIENCY

Project 4.1.2

BioSafeFood

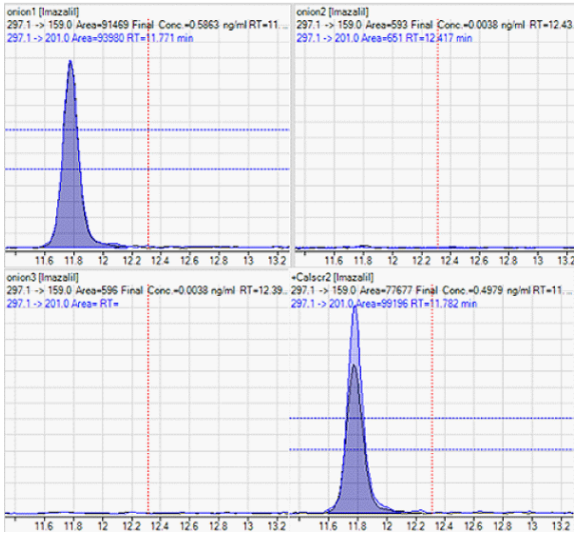
BioSafeFood – developing technology intended for production of consumer safe fruits and vegetables with the use of new bio-fungicides.

Wiesław Ciecierski

Conventional crop protection

Residues - Defined by the WHO (World health organization)

Any substance or mixture of substances in food for man or animals resulting from the use of a pesticide and includes any specified derivatives, such as degradation and conversion products, metabolites, reaction products, and impurities that are considered to be of toxicological significance.



MRL

- A maximum residue level (MRL) is the highest level of a pesticide residue that is legally tolerated in or on food or feed when pesticides are applied correctly (Good Agricultural Practice).

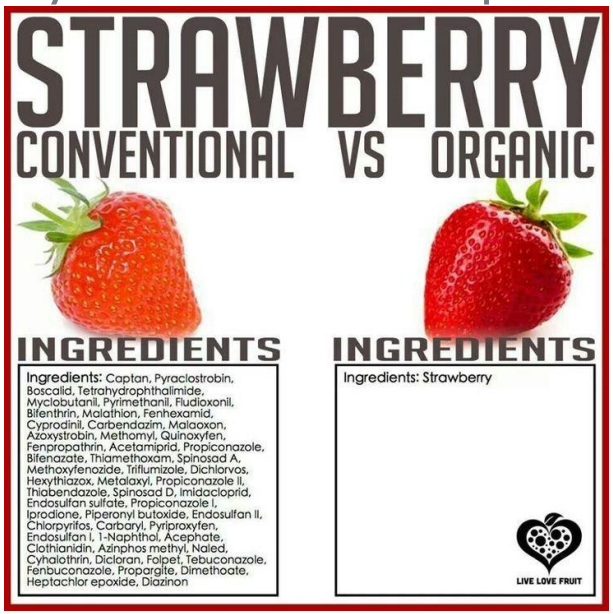
- According to EFSA (European Food Safety Authority) 2016
  - 84 657 samples for 791 pesticides analyzed by reporting countries
  - 96.2% (81,482) of the samples were within limits permitted in EU legislation
    - 50.7% of the tested samples were free of quantifiable residues
    - 3.8% above limits

Consumer preferences

According to International Food and Agribusiness Management Review, Volume 14, Issue 2, 2011

Based on 40 selected studies,

- it seems that people are especially concerned with the potential harm that conventional food production practices may cause to their personal health,



Consumer preferences

- "pesticide free" is perceived as important attribute in consumer buying behavior as respondents were **willing to pay** a premium averaging **15% above the regular price** to buy pesticide-free fresh F&V

Consumer preferences

- only health related aspects are similarly valued across regions, while the importance of others attributes varies considerably by consumers (based on 40 studies)

Methods of disease and pests control

- Breading resistance varieties
  - Relatively quick resistance break
- Mechanical
  - Expensive
  - Time consuming
- Macroorganisms (insects, mites, nematodes)
  - Limited to macroorganisms
- Plant extracts
  - Limited efficacy
- Microorganisms
  - Bacterial diseases control
  - Fungal diseases control
  - Pest control
  - Low risk of resistance development.

Project objectives

- Limit chemicals residue in fruits and vegetables – healthy food production

  - Development of products based on microorganisms.
  - Development of plant protection technology including products based on microorganisms.
  - Environment safe solutions - in line with IPM and sustainable agriculture

Product assumption

- min12 months shelf life in room temperature
- Wide spectrum of controlled diseases
- Low or no impact of fungicides on efficacy of bio-products
- Low rate per hectare
- Unlimited number of application – no phytotoxic effect
- Ready to use

Project 4.1.2 - Goal

- Development of three groups of products for different diseases control:
  - **Fire blight, Botrytis – Pome fruits**
    - Others diseases of blooming period – including stone fruits
  - **Botrytis on berries and vegetables**
    - Other diseases on berries and vegs.
  - **Storage diseases on fruits and vegetables**
    - Citrus and grapes storage diseases

Milestones
July 2018

BioSafe Food

- Searching for microorganisms in natural environment
- Screening in vitro
- Screening in vivo
- Formulation development
- **Formulation effectiveness evaluation in vivo**
- Final formulation selection
- Tox and ecotox evaluation
- Development of crop protection technology
- Products registration

Consortium

BioSafe Food

Research Institute of Horticulture

Institute of Industrial Organic Chemistry

Pomefruit diseases – fire blight

Tests results – apple flowers

Efficacy of strain T14/8 of fire blight control on apple flowers of cv. Idared /M.26:

Treatment	Days after inoculation	
	7	10
Untreated	1.42*	2.05
Copper oxychloride 50 WP 1.5%	0.25 [82.4]**	0.87 [57.6]
Prototype T14/8 (10^7 cfu/ml)	0.11 [92.2]	0.23 [88.8]
Isolate C9-1 (10^7 cfu/ml)	0.13 [90.8]	0.35 [82.9]

- C9-1 - Pantoea agglomerans - active ingredient of registered BP
- * scale of severity: 0 - no symptoms, 4 - total necrosis of whole flower
- ** efficacy

Trials done by Research institute of Horticulture

Pomefruit diseases – fire blight

Tests results – apple shoots

Efficacy of strain T14/8 of fire blight control on apple shoots of cv. Idared/M.9:

Treatment	Days after inoculation					
	6		10		14	
Untreated	18.3*		31.7		68.2	
Copper oxychloride 50 WP 1.5%	7.0	[61.7]**	15.3	[51.7]	38.3	[43.8]
Prototype T14/8 (10^7 cfu/ml)	6.3	[65.5]	11.8	[62.8]	25.6	[62.5]
Isolate C9-1 (10^7 cfu/ml)	7.3	[60.1]	14.1	[55.5]	28.1	[58.8]

- C9-1 - *Pantoea agglomerans*
- * number of infected shoots
- ** efficacy

Trials done by Research institute of Horticulture

Lettuce – gray mold - GH trial

- Curative application – after visual symptoms appearing

Treatment	Assessment before first treatment 22.02.2019	Assessment before second treatment 01.03.2019	Assessment before third treatment 08.03.2019	Assessment on 15.03.2019
	Infestation [%]	Infestation [%]	Infestation [%]	Infestation[%]
Inoculated check	6,9 a	17,0 c	28,0 c	36,3 c
T14/15	6,7 a	9,3 a	14,5 a	18,5 a
T16/8	5,7 a	8,6 a	13,0 a	19,0 a
T14/1A	6,1 a	9,1 a	14,5 a	20,0 ab

Trials done by Research institute of Horticulture

Berries – Gray mold – strawberries

Strawberries

Products	% of infected fruits	Efficacy [%]
Check	5.8 d	-
5 treatments with chemical standards	1.89 a	67.4
2 chemical treatments + 3 treatments Prototype T16/8	1.16 a	80.0

Trials done by Research institute of Horticulture

Storage diseases

- Apples – gray mold

Products	Efficacy [%]	
	Strain 1 *Bc*	Strain 2 *Bc*
Untreated (water)	0.0	0.0
Prototype T14/8 (10^9 cfu/ml)	100.0	98.6
Prototype T14/8 (10^8 cfu/ml)	83.6	80.1
PrototypeT14/8 (10^7 cfu/ml)	75.2	56.7

Trials done by Research institute of Horticulture

Conclusions

- High efficacy comparable to chemical standards
- The best control were obtained when chemicals were applied up to middle of season and biological products after that
- Very low risk of residues and guarantee not exceed MRL when applied in chem/bio program

Our experience

- BACTIM SOIL – 2017
  - ➢ Soil enhancer and conditioner, decomposition of postharvest leftovers

- BACTIM VECTOR – 2019
  - ➢ root system mycorrhization, limits the harmfulness of root crown gall

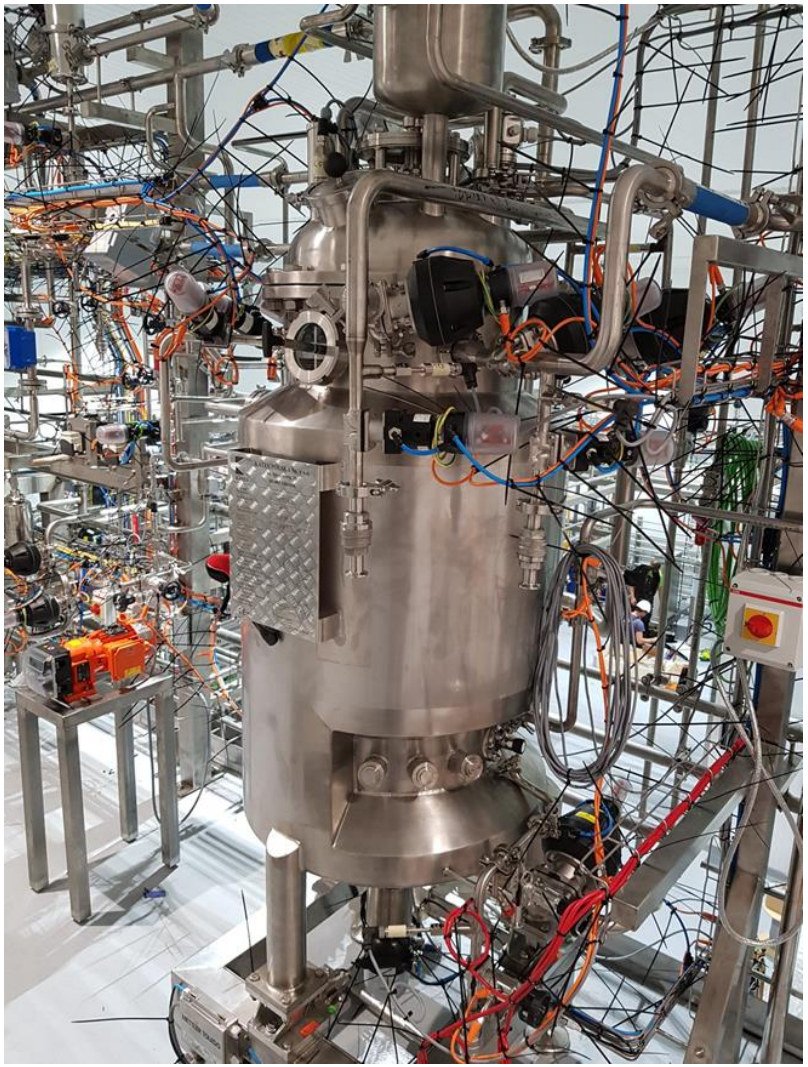
- BACTIM VECTOR Blue – 2019
  - ➢ prevention of crown gall on bare root seedlings, liners and planting stock.

Manufacturing facilities

BioSafe Food

Manufacturing facilities

BioSafe Food



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We invite you to cooperate with us.