

Green Chemistry and the development of co-formulants to maximize the impact of agro formulations

Case study on safer in-can preservation for water-based formulations



Arnold de Maere, CEO
Minagro, Belgium

ABIM 2023

23-25 October 2023

Congress Center Basel, Switzerland

www.abim.ch





MAXIMIZE IMPACT OF AGROCHEMICAL APPLICATIONS

Active substances :

(bio)pesticides and (bio)fertilisers

Formulations technologies

- Actives efficacy :
adjuvant, mix of actives...
- Product properties :
handling, storage, application,...

GREEN CHEMISTRY

Design of chemical products and processes that reduce or eliminate the use or generation of substances hazardous to humans, animals, plants, and the environment.



I U P A C

Greener alternative to existing ingredients defined by

- Production process
 - > green chemistry / safer process
 - > biobased : renewable carbon index
- Ingredient profile
 - > Performance
 - > Biodegradability, Classification
- Allowed in organic agriculture
 - > Performance of organic actives
 - > Marketing added value



We develop a unique range of **biobased ingredients** for the agrochemical industry.

Our co-formulants enable a **performing** agricultural sector that is fully integrated within the **bioeconomy**.

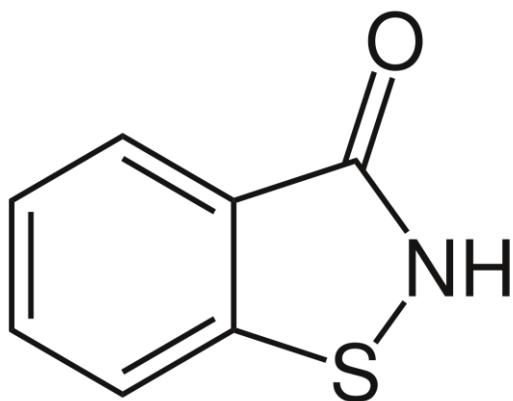


Case Study : In-can preservatives

Application

Inert avoiding microbial development in water-based agrochemicals

Mainly Isothiazolinone based Preservatives



Market challenges

- Production process : linked to Chloronitrobenzene
- Ingredient classified in final formulation
ex : benzisothiazolinone
 - BIT>0,05%
H317 Active skin sensitizer
 - BIT>500ppm
EUH 208 : contains benzisothiazolinone. May produce allergic reaction
- Organic agriculture : Not allowed in Ecocert and OMRI

Greener alternative to existing ingredients defined by

- Production process
 - > green chemistry / safer process
 - > biobased : renewable carbon index
- Ingredient profile
 - > Performance
 - > Biodegradability, Classification
- Allowed in organic agriculture
 - > Performance of organic actives
 - > Marketing added value



Performance Validation

With reference to **ISO 11930:2013-10** used for cosmetic products

- **Inoculate the products** with
 - Pseudomonas aeruginosa (bacteria – gram negative)
 - Staphylococcus aureus (bacteria – gram positive)
 - Escherichia coli (bacteria – gram negative)
 - Candida albicans (fungi - saccharomycetes)
 - Aspergillus brasiliensis (fungi – eurotiomycetes)
- **Calculation of CFU** (colony forming unit) after 7, 14 and 28 days
- **Cosmetic Evaluation**
 - Criteria A : Initial bactericide effect confirmed + no bacterial growth allowed with time
 - Criteria B : Initial bactericide effect confirmed + limited bacterial growth allowed with time

Greener (biobased) chemicals

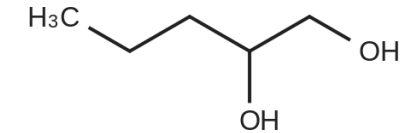
Validate the performance of alternative molecules that can be sourced biobased and petrobased

Develop adapted blends

- Easy to scale-up
 - Formulation compatibility
 - No additional constraints for formulators
 - No additional constraints for farmers
- Complies with certification
ECOCERT, FiBL, OMRI



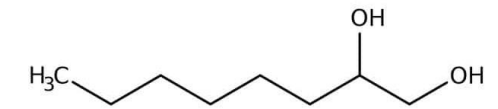
Sugar cane bagasse



1.2 pentanediol



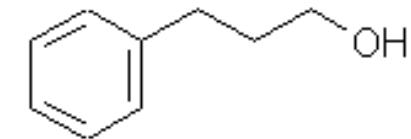
Palm oil



1.2 octanediol











Cassia



Phenylpropanol

Example : Sovinol P850 and P850/N - Properties

| |  | | Traditional Preservative 20% BIT + Sodium Hydroxyde |
|---|--|---|---|
| | Sovinol P850/N | Sovinol P850 | |
| Production process | Biobased Not linked to Chloronitrobenzene | Petrobased Not linked to Chloronitrobenzene | Linked to chloronitrobenzene   |
| Performance | 0.3% | 0.3% | 0.05% |
| Profile | H315 Causes skin irritation H319 Causes serious eye irritation  | | H290 May be corrosive to metals. H302 Harmful if swallowed. H314 Causes severe skin burns and eye damage. H317 May cause an allergic skin reaction. H318 Causes serious eye damage. H335 May cause respiratory irritation    |
| ADR | not applicable | | 1719 (8.II)  |
| CLP final product classification (Regulation (EC) No 1272/2008) | not applicable | | <u>BIT>0,05%</u> → H317 Active skin sensitizer <u>BIT>500ppm</u> → EUH 208 : contains benisothiazolinone. May produce allergic reaction |

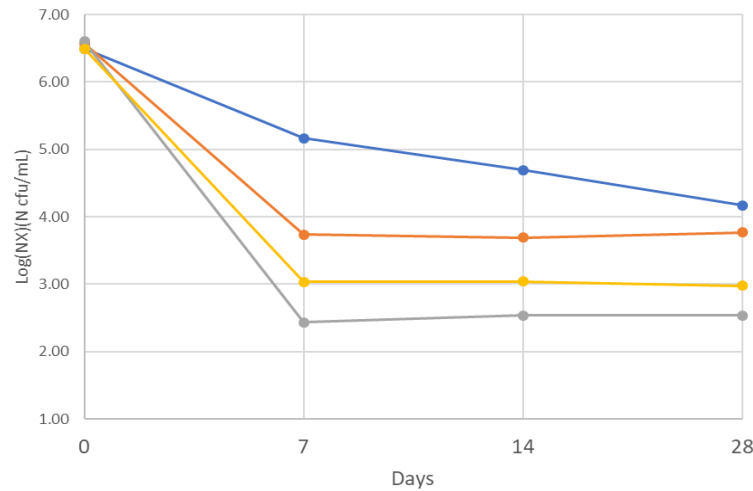
Example : Sovinol P850 and P850/N - Performance

0.3% P850

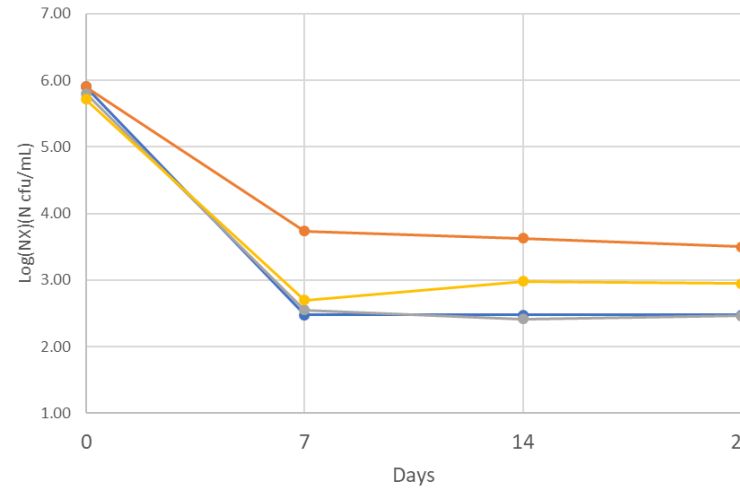
petrobased

(octanediol + phenylpropanol)

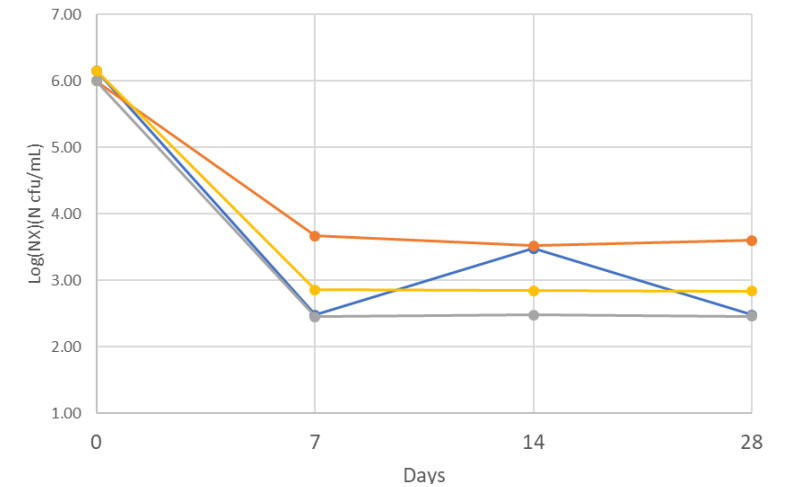
Staphylococcus Aureus



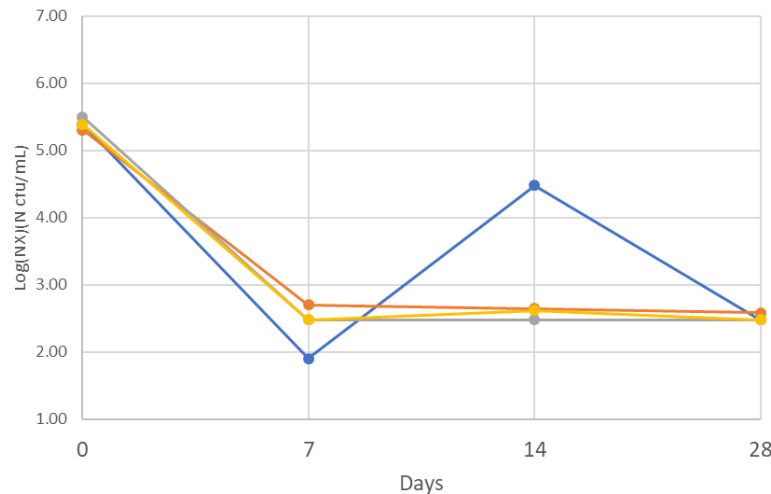
Pseudomonas Aeruginosa



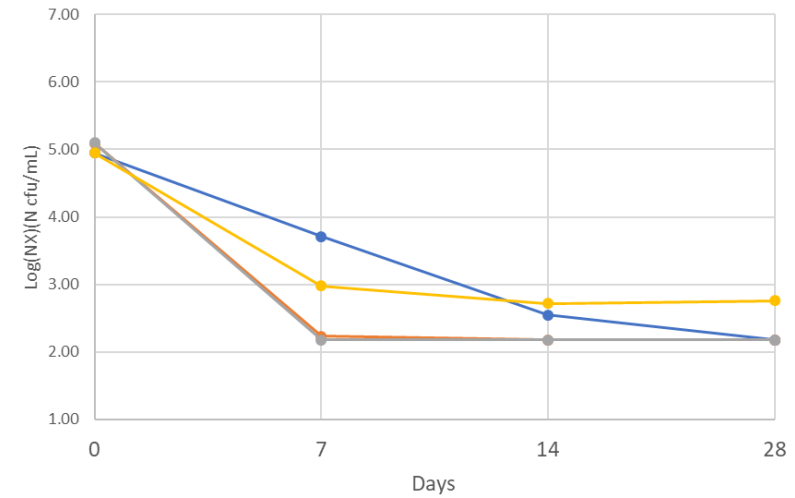
Escherichia Coli



Candida Albicans

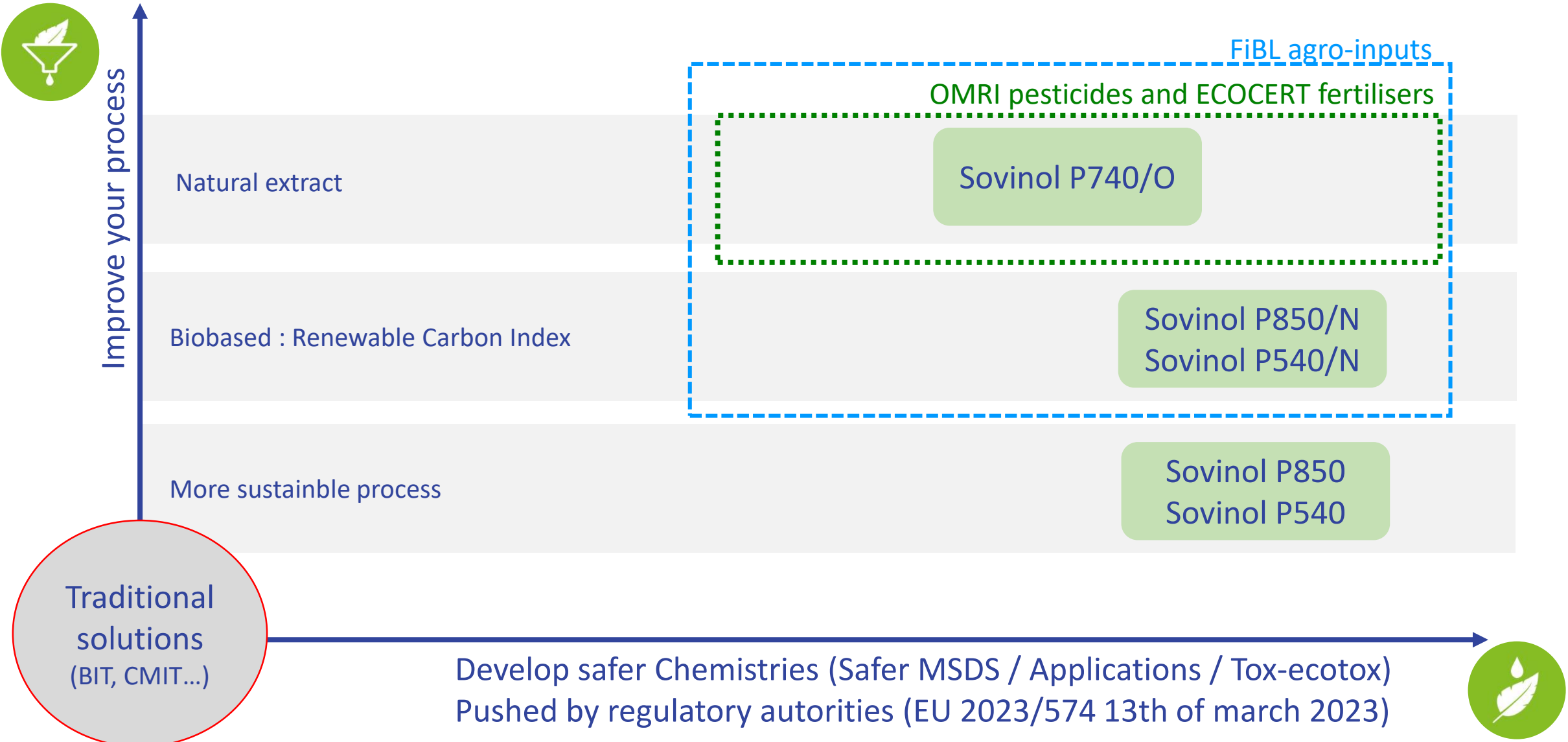


Aspergillus Brasiliensis

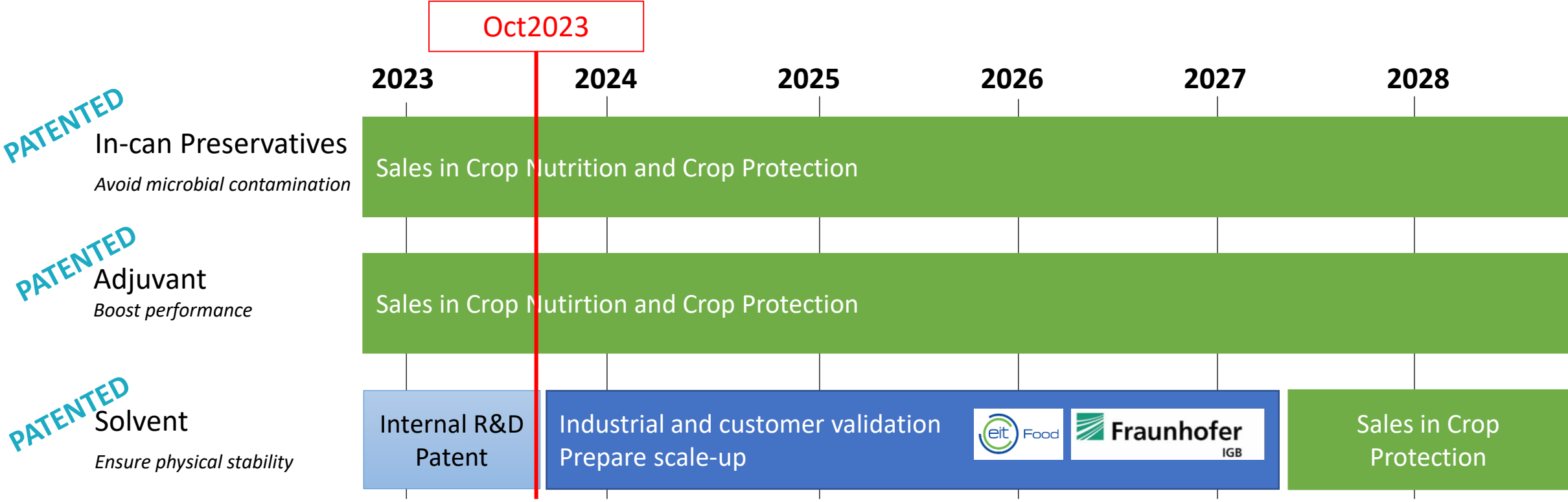


- Thickening Gum
- Biostimulant 1
- Biostimulant 2
- Biostimulant 3

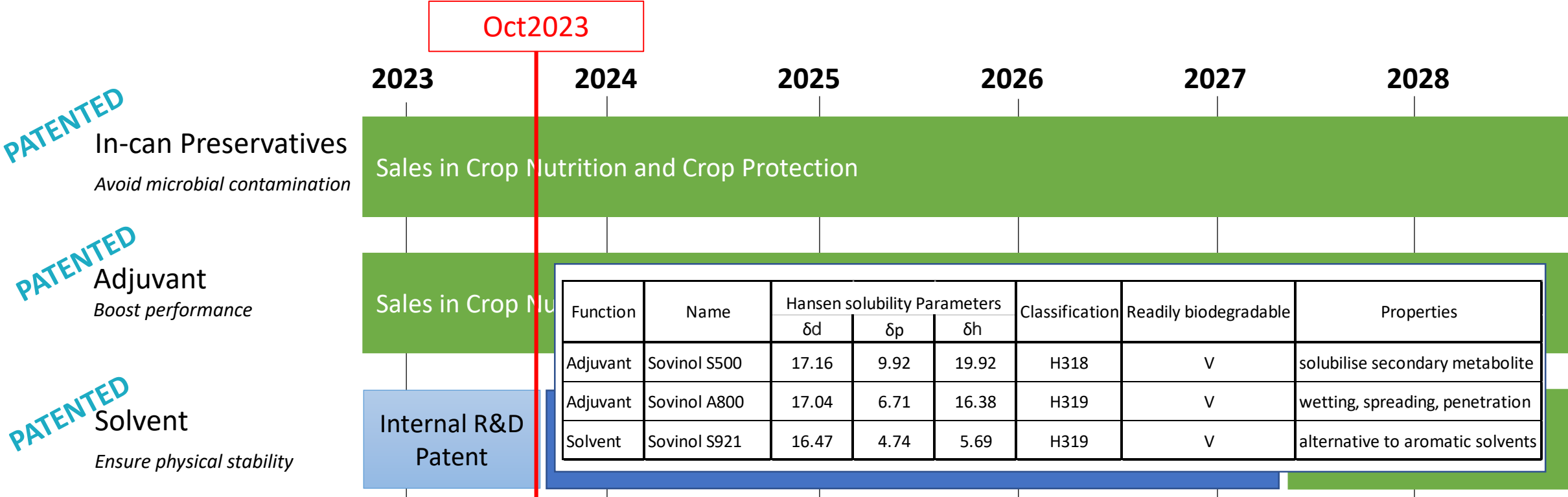
Case Study : In-can preservatives



Minagro development pipeline



Minagro development pipeline





MINAGRO SRL

Monnet Innovation Center
1348 Louvain-la-Neuve
Belgium



www.minagro.eu

arnold.demaere@minagro.eu

COMPANY OVERVIEW

- Minagro specializes in developing biobased ingredients for agrochemicals (4patents) providing an efficient and sustainable alternative to hazardous co-formulants.
- Founded in 2019 as an entity of the Minafin Group. Became a stand-alone company in Nov 2022 (lead investors: Invest BW & K&E, the holding of Globachem).

MARKET DRIVERS

- Improve the impact of our agricultural activities (Farm2Fork)
- Need biobased substitute to the petroleum economy (bioeconomy)
- Need a sustainable food and biomass production in EU (net zero carbon)

SOLUTION

- We offer biobased co-formulants for (bio)pesticides and (bio)fertilisers
- Minagro provides the agrochemical industry with a seamless and sustainable alternative to hazardous co-formulants.
- We assist farmers and the bioeconomy by enhancing the performance and sustainability of agricultural production in EU