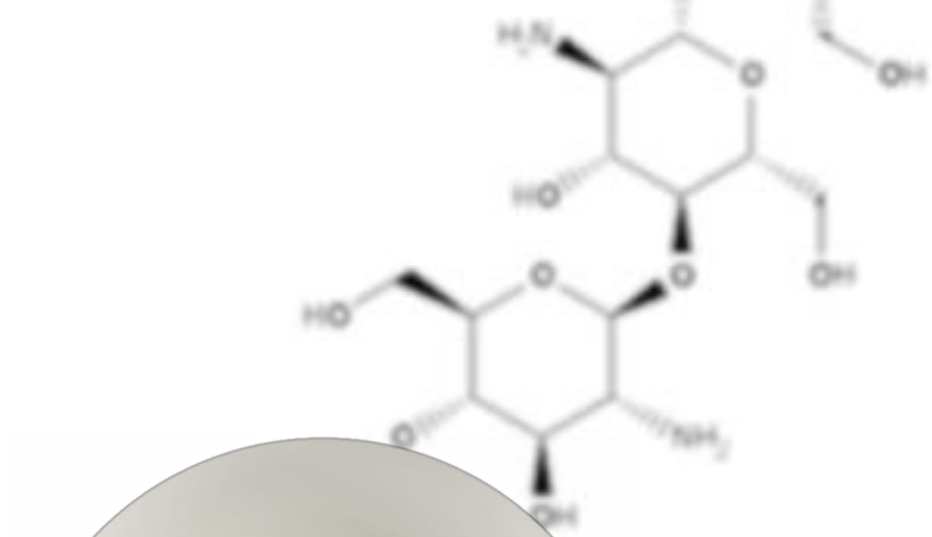
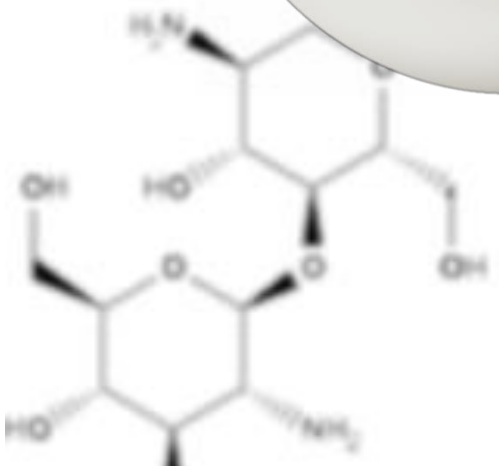
Novochizol

First-in-class polysaccharide material sciences





Plant protection

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Tel +41 76 370 73 25
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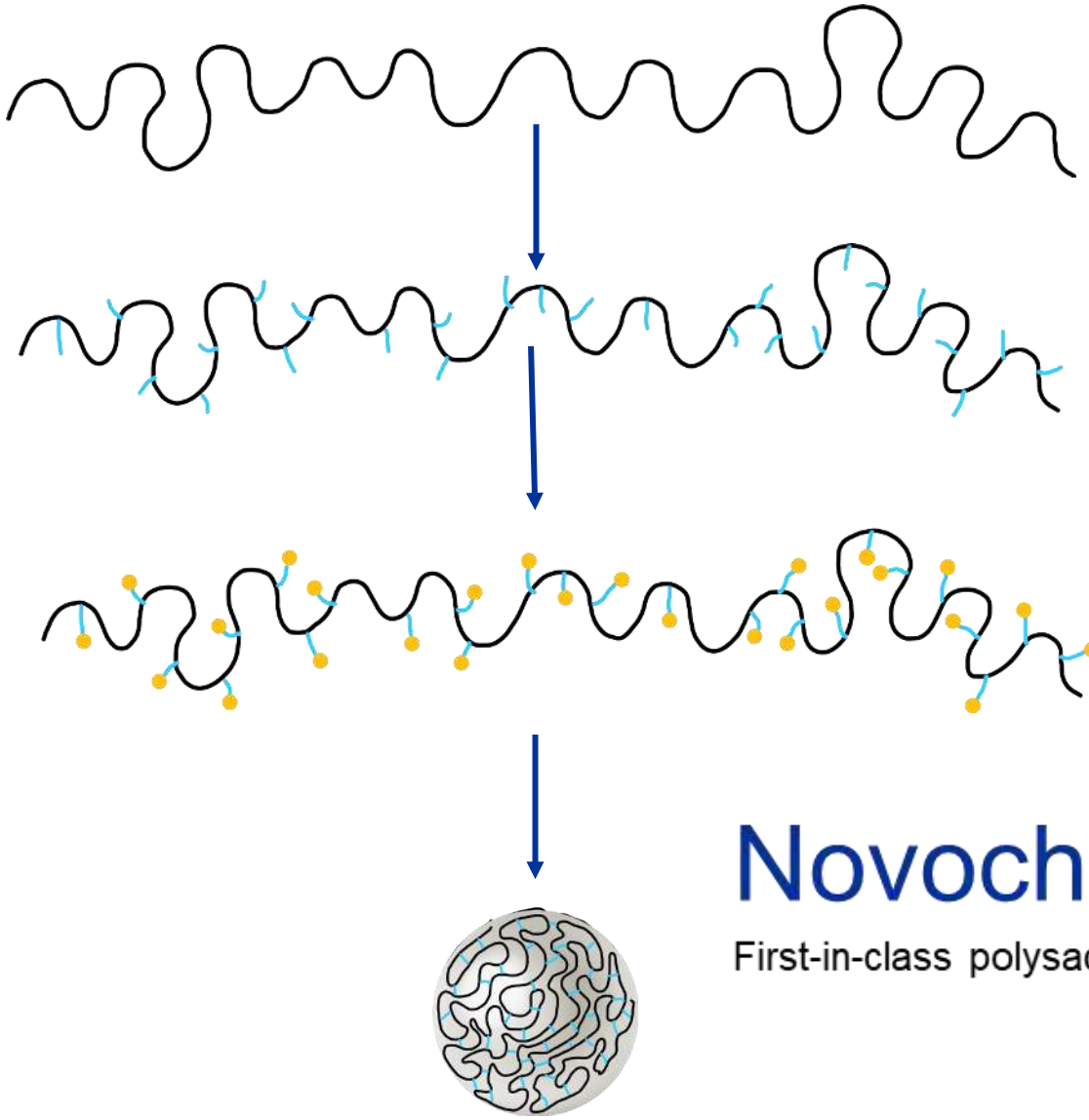
Novochizol ™: cross-linked monomolecular chitosan

Chitosan

Cross-linking agent

Activation

Intramolecular cross-linking

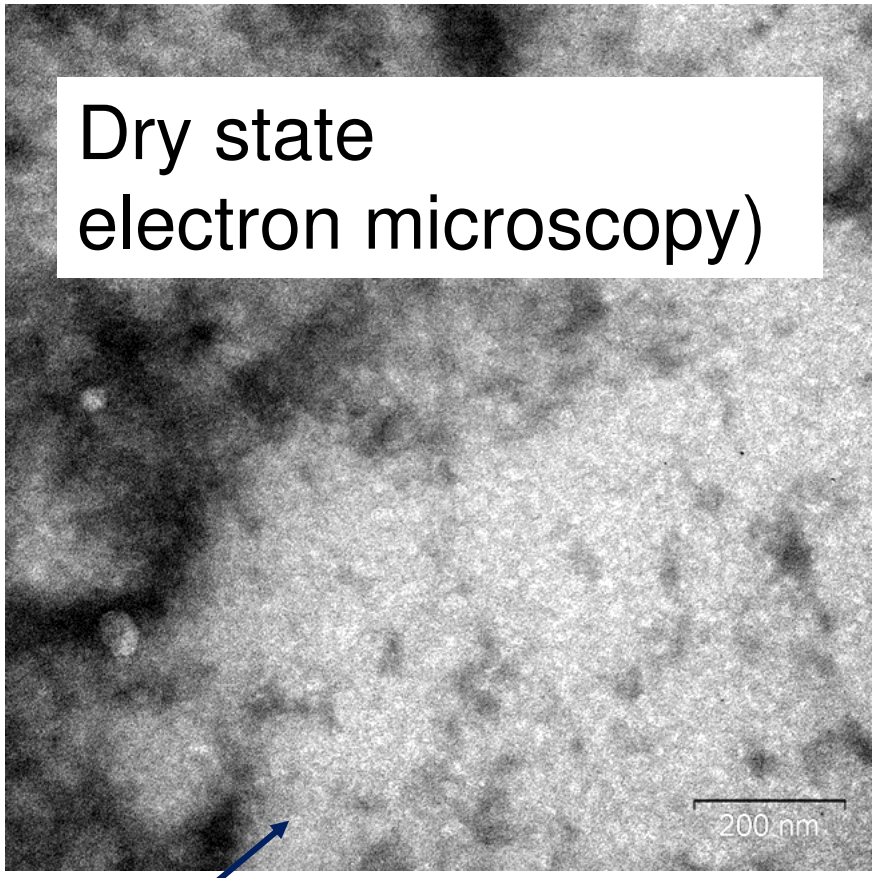


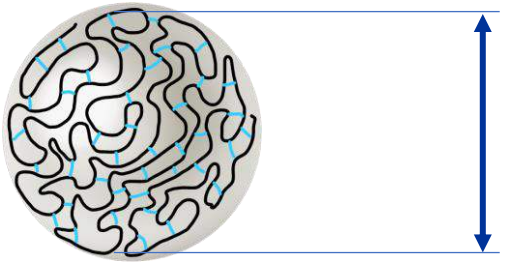
90%+ yield
robust
reproducible
scalable

Novochizol

First-in-class polysaccharide material sciences

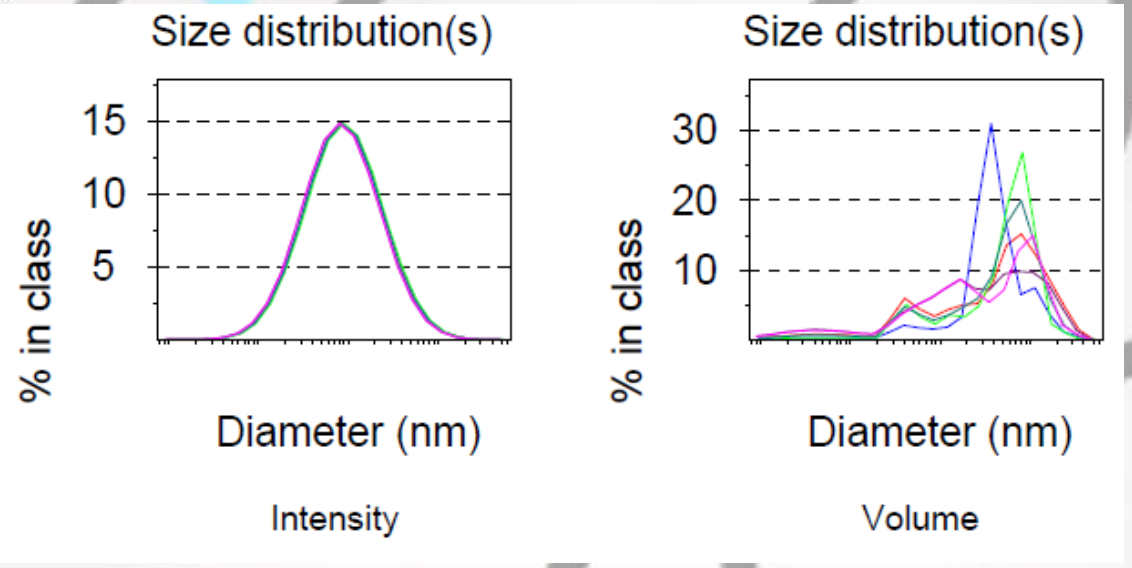
Novochizol™: “nanoparticle” size





20 nm

In solution (DLS)



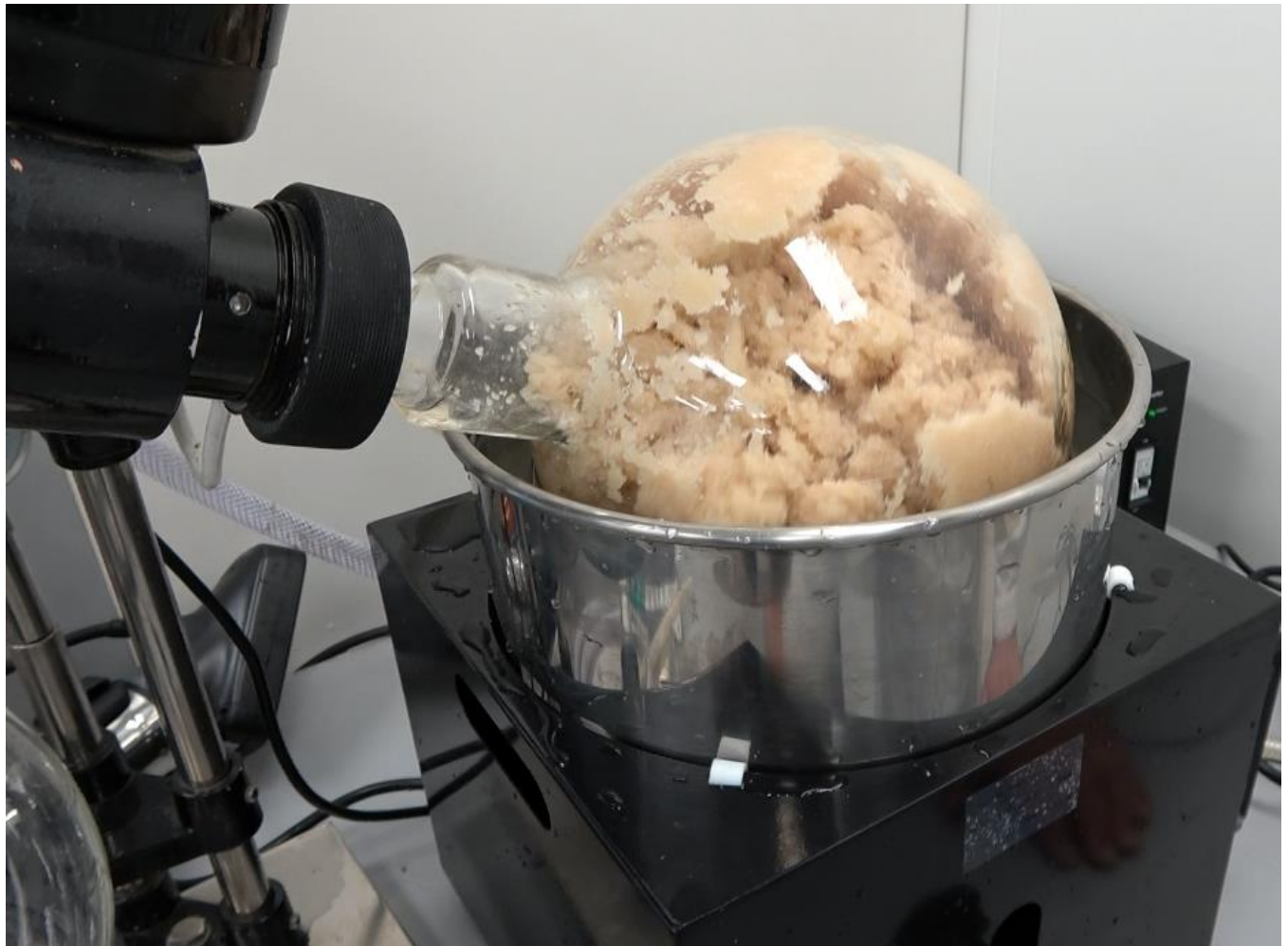
Cumulants mean (Z Ave) 820.7

820 nm

Novochizol where others make grams, we make kilograms

Standard methods of chitosan NP production require high dilutions

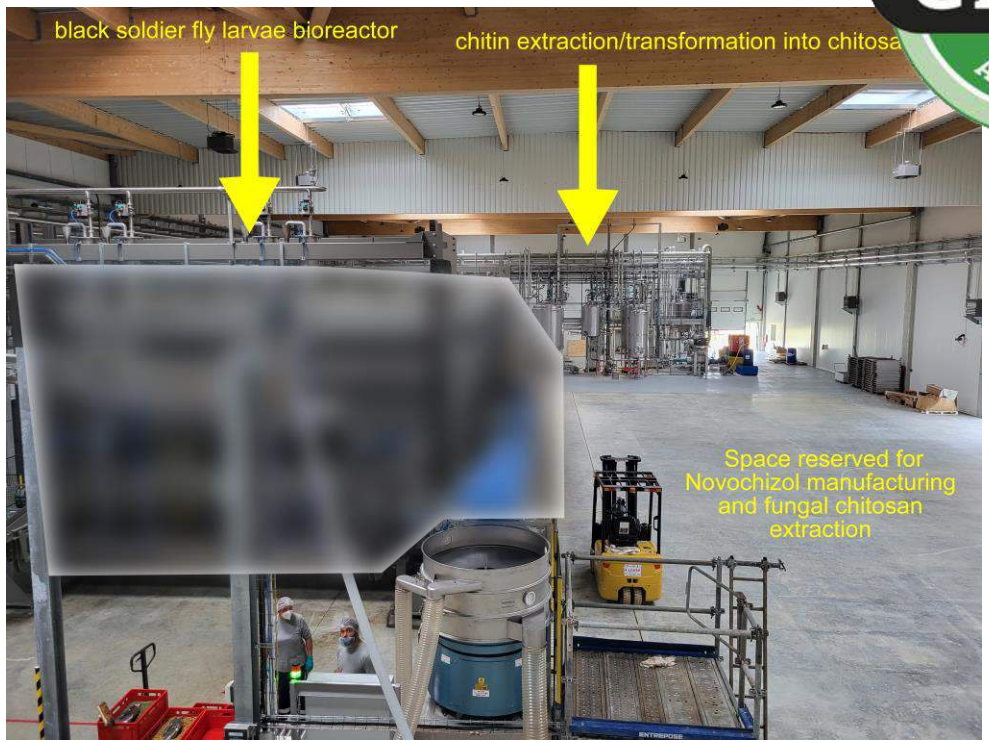
Novochizol synthesis occurs in a quasi-crystalline state



450 grams chitosan transformed into 450 grams Novochizol in a 2 liter vessel

NOVOCHIZOL – ALPHA CHITIN JOINT VENTURE

- new technologies to grow chitin
- new technologies to make chitosans
- bio-sourcing and full traceability
- green chemistry
- guaranteed batch-to-batch reproducibility
- lower cost



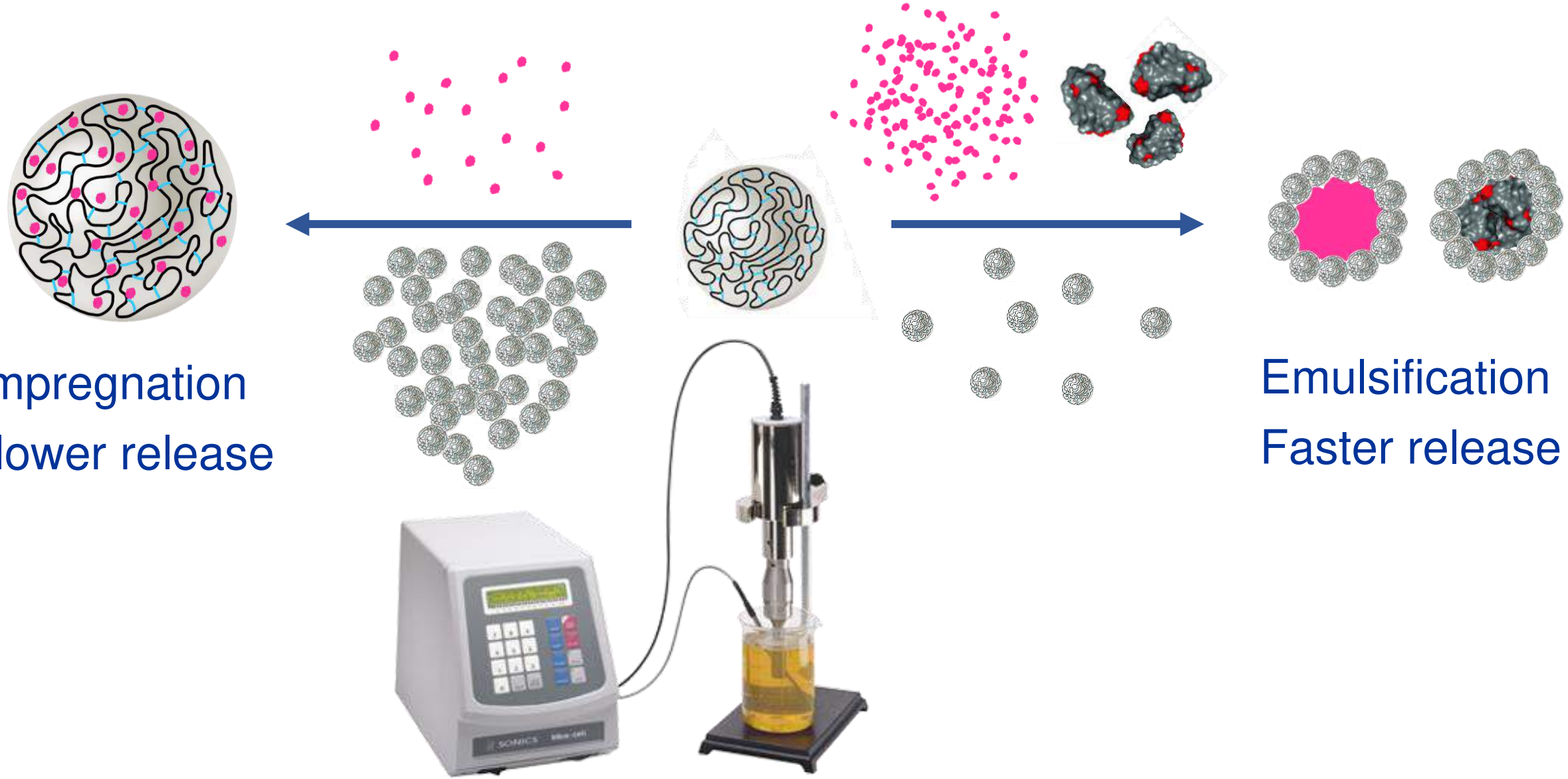
250 tons chitosan + 55 tons Novochizol per year

FROM CHITOSAN TO NOVOCHIZOL™

Solubility	only in acids	under all conditions (suspension)
Viscosity	high	low
Biodegradability	fast	slow
Chemical stability	low	high
Physical stability	fragile	robust

THE GAME CHANGER: NOVOCHIZOL™ formulations of:
small molecules, peptides, nucleic acids, proteins, viruses and microorganisms

Novochizol ™ formulation technology



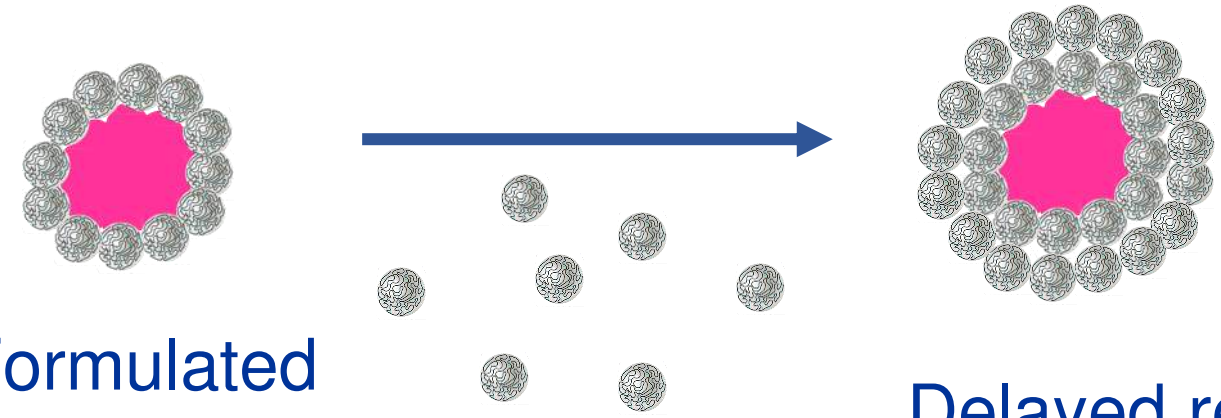
Impregnation

Slower release

Emulsification

Faster release

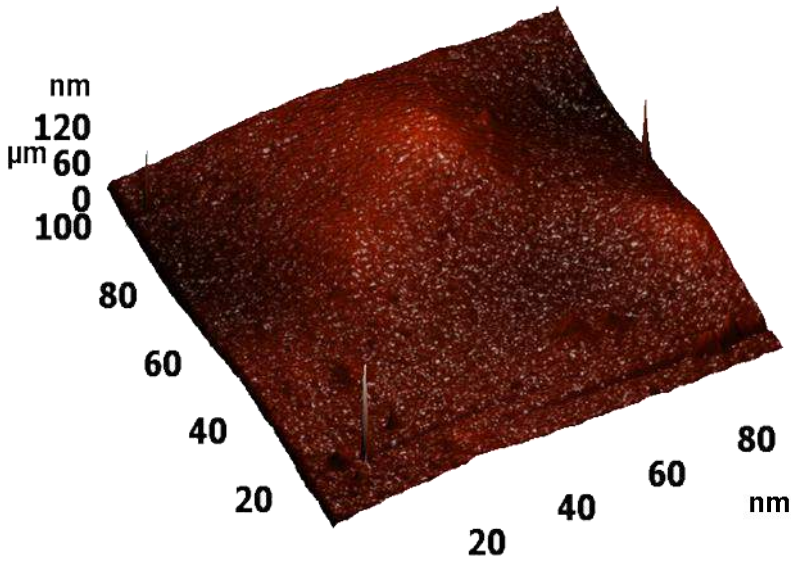
Novochizol ™ double formulations



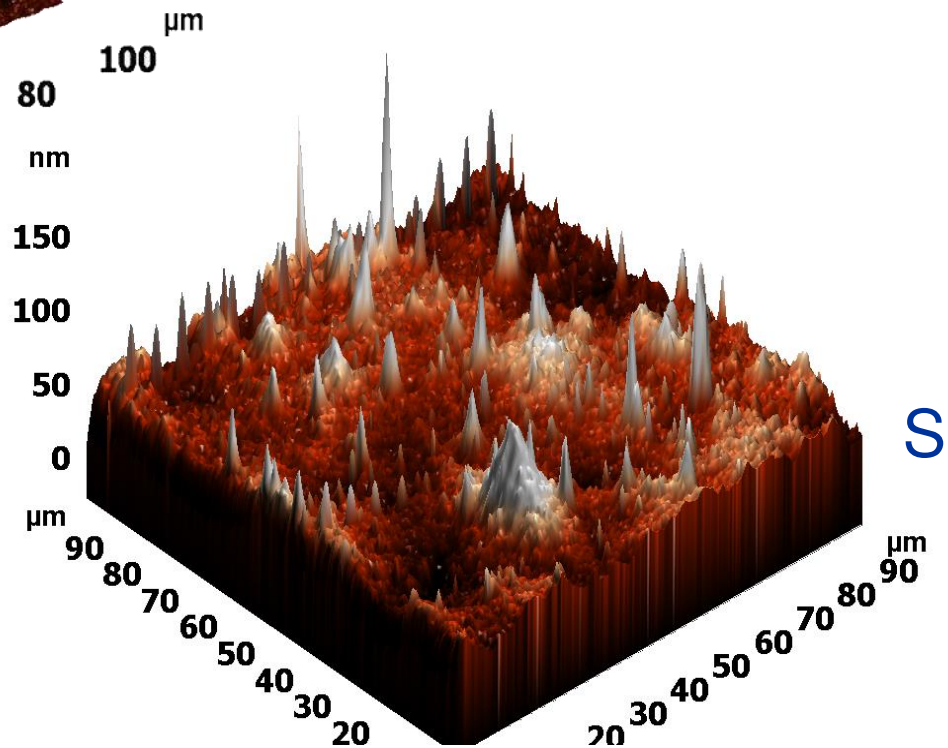
Formulated ingredient

Delayed release / synergy

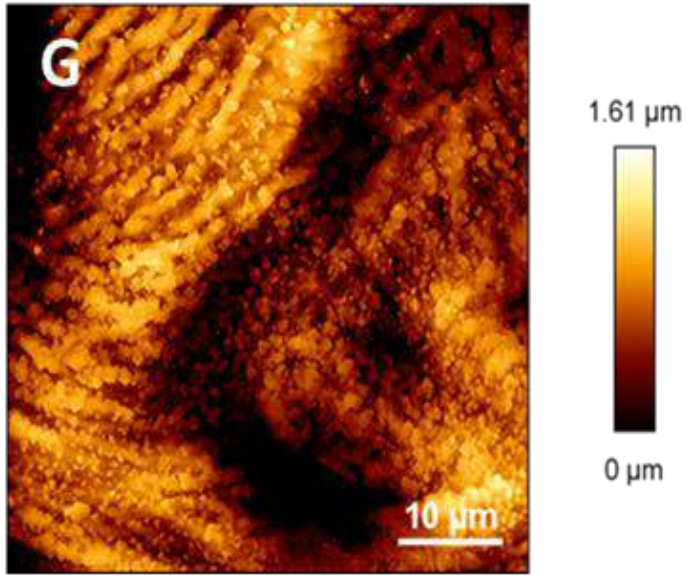
Novochizol™: better contact and adherence to plant tissue



Chitosan film



NOVOCHIZOL™ film



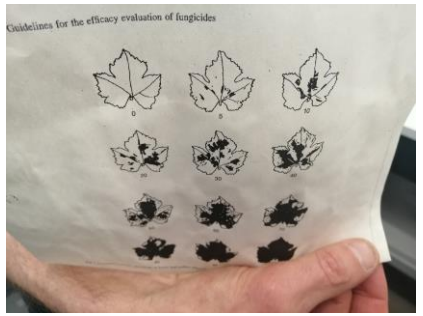
Surface of a grapevine leaf

Novochizol ™ intrinsic fungicide activity and behaviour

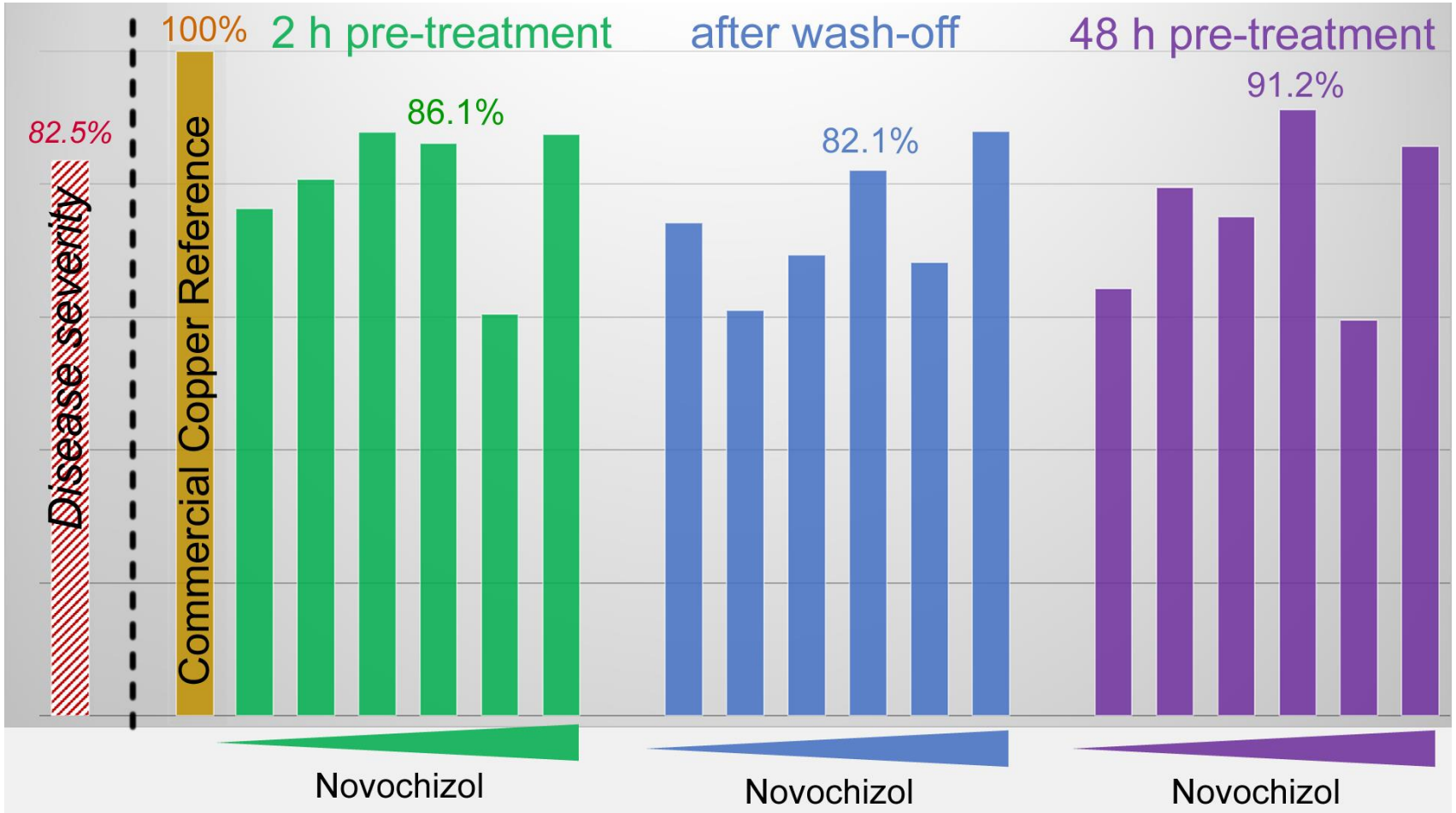
NOVOCHIZOL™- copper

then…

Plasmopara viticola



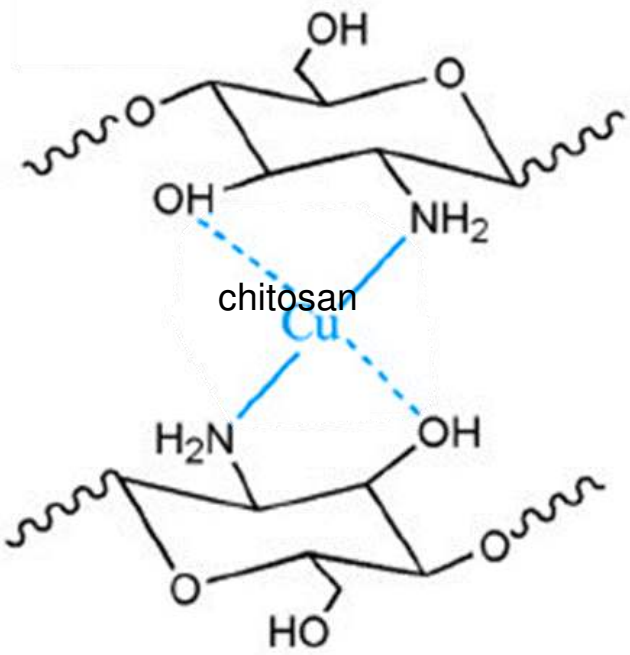
Made by FiBL



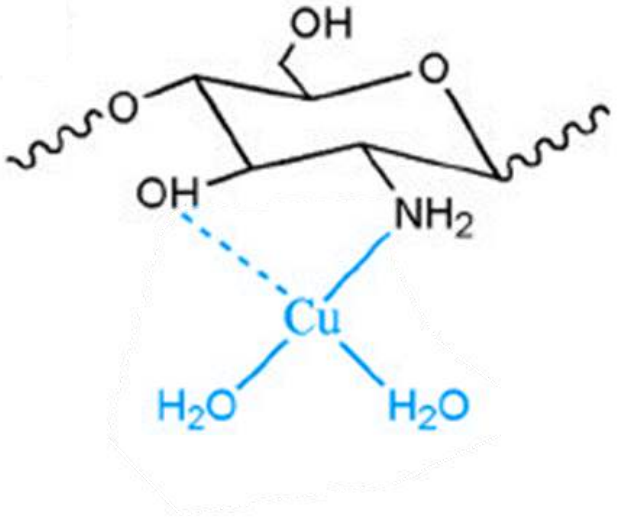
Novochizol ™ as a co-formulant of copper

Copper and chitosan: an old couple…

chitosan



chitosan



Estimated adsorption capacities:	
138.0 mg g^{-1}	276.0 mg g^{-1}

Novochizol ™ ?

Insoluble copper formulations

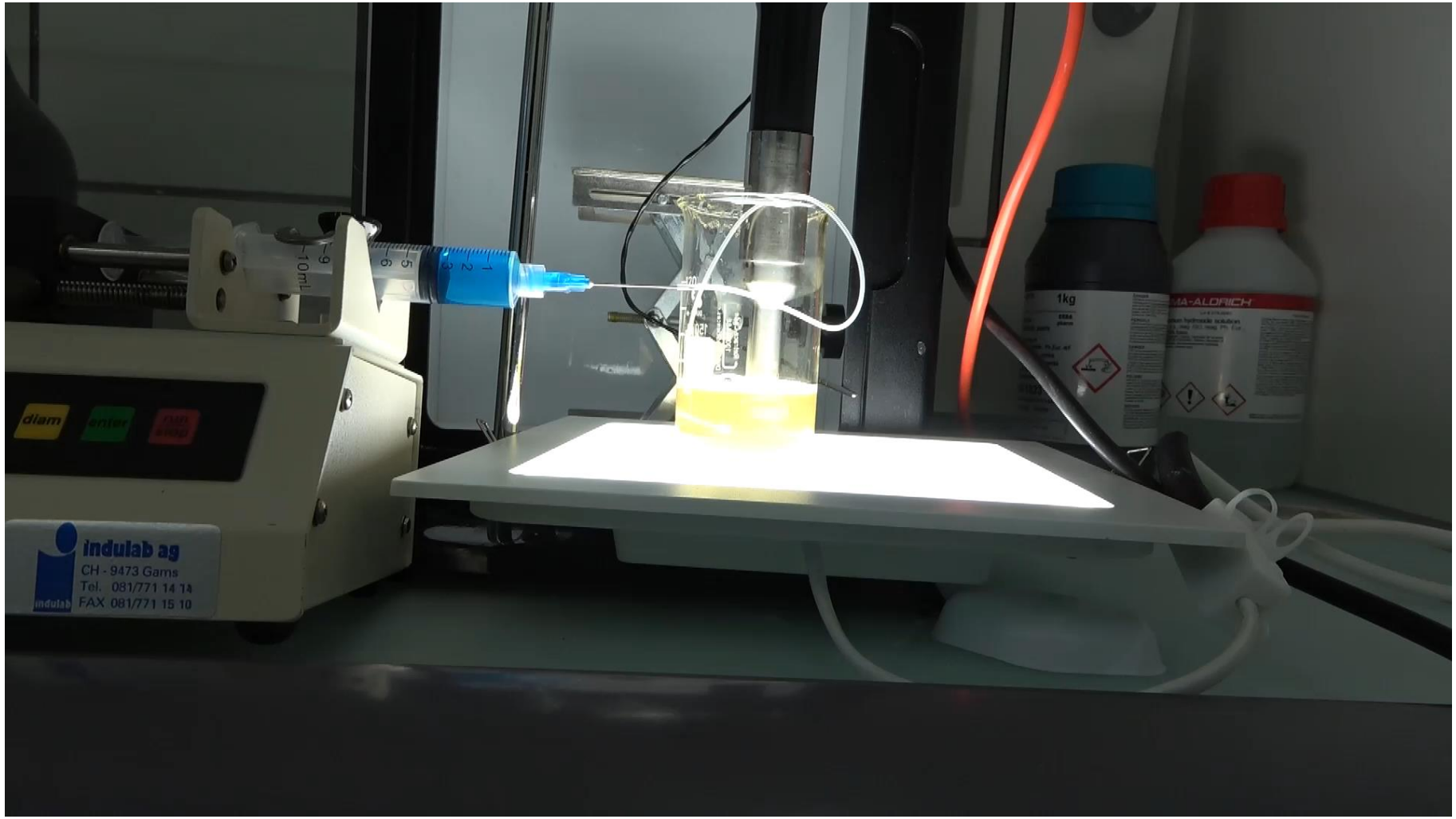
Sustained release of cupric ions

In the right range

Dose reduction

Formulation in practice: the case of copper sulfate

(1 % Novochizol, 200 mg Cu++ per g)



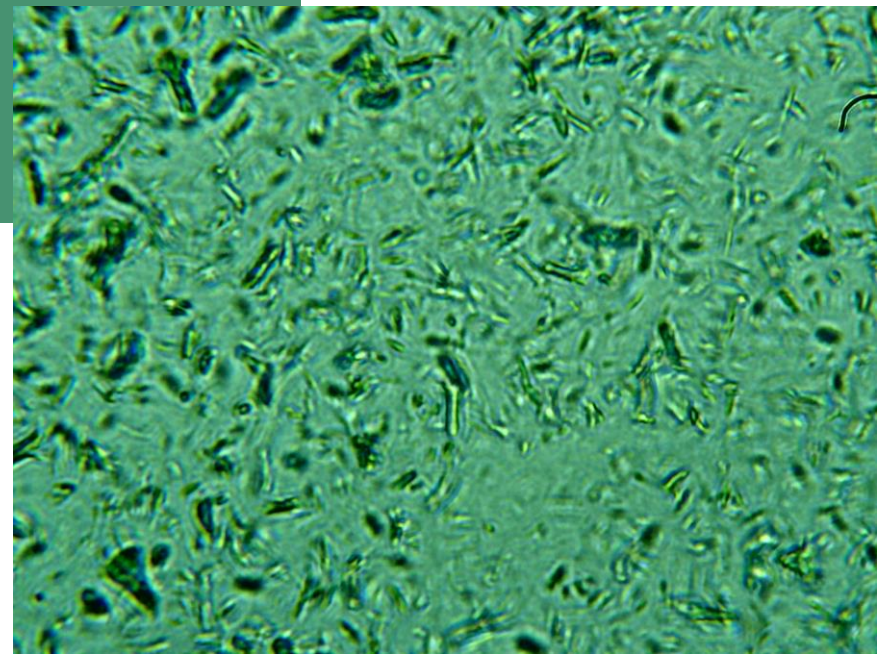
The case of copper sulfate (200 mg Cu++ per g chitosan or Novochizol)

After 24 hours

2% chitosan 2% Novochizol

Before (soluble)

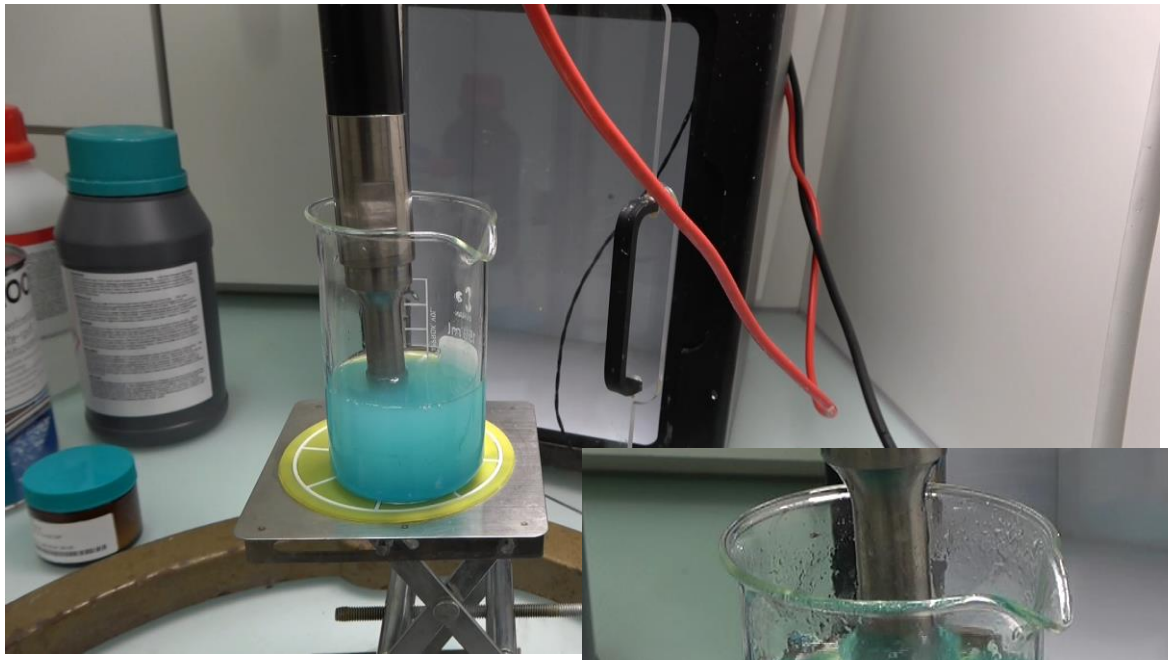
After (insoluble, particles of about 10-15 µm)

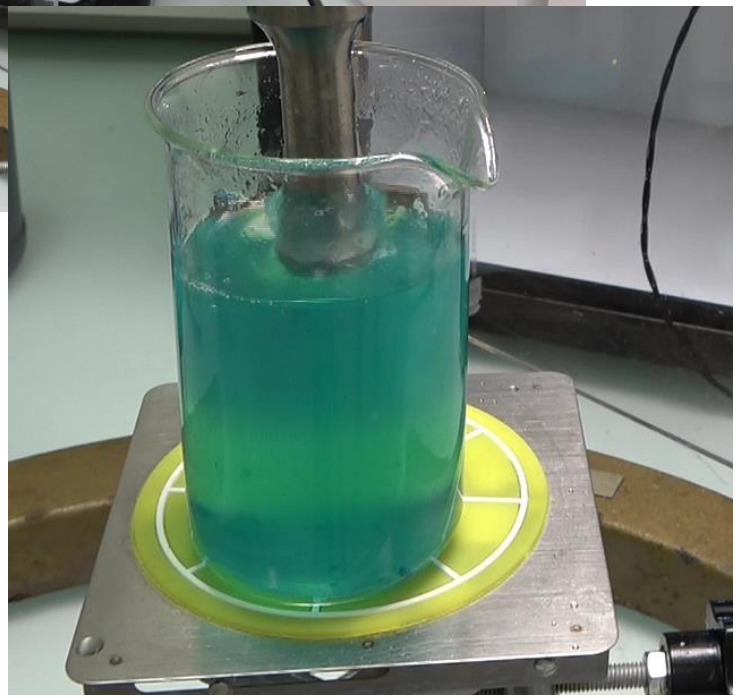


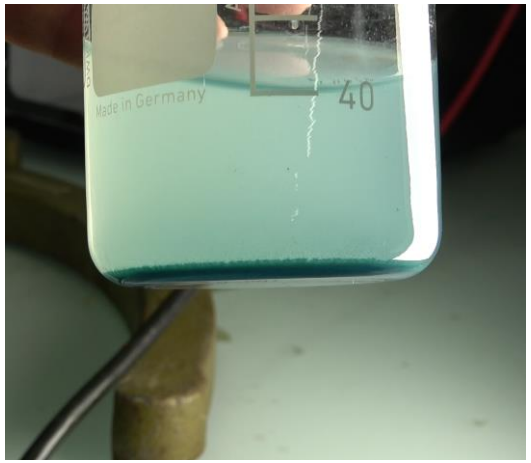
10 µm

The case of copper hydroxide

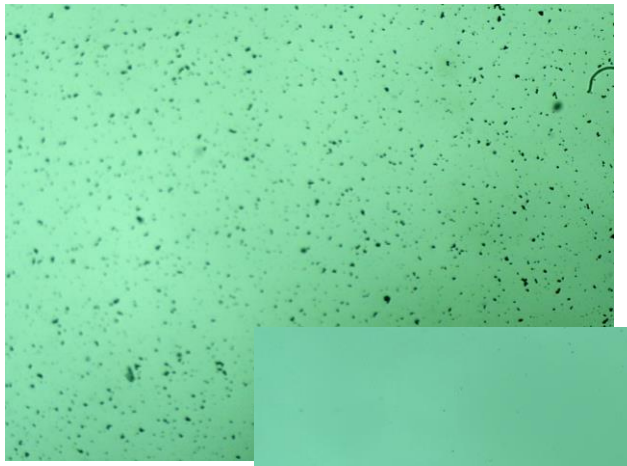
(1 % Novochizol, 200 mg Cu++ per g)





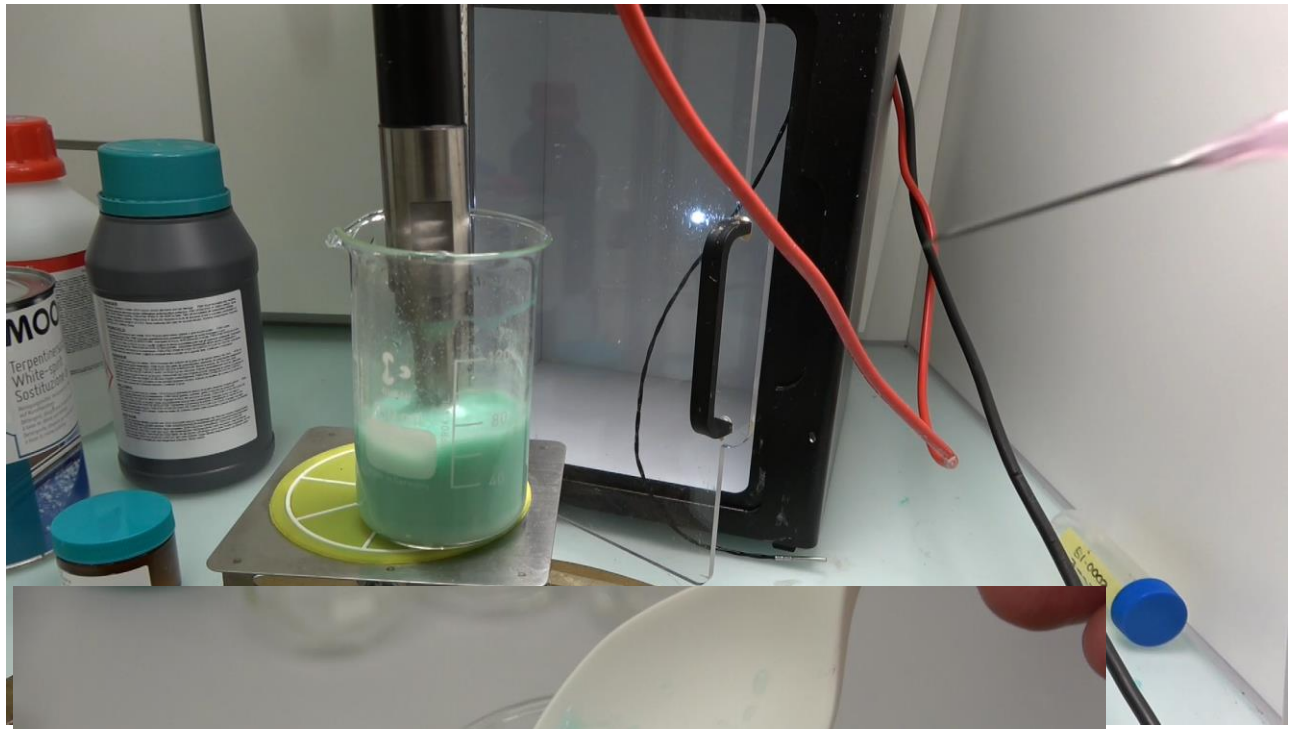


Before (insoluble powder)

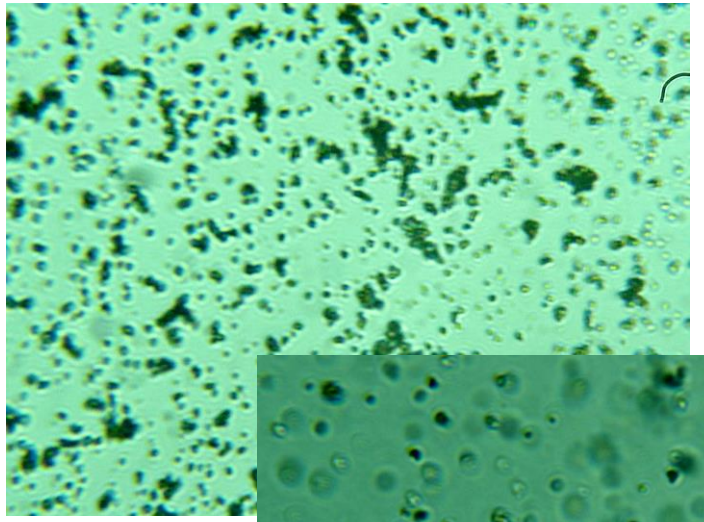


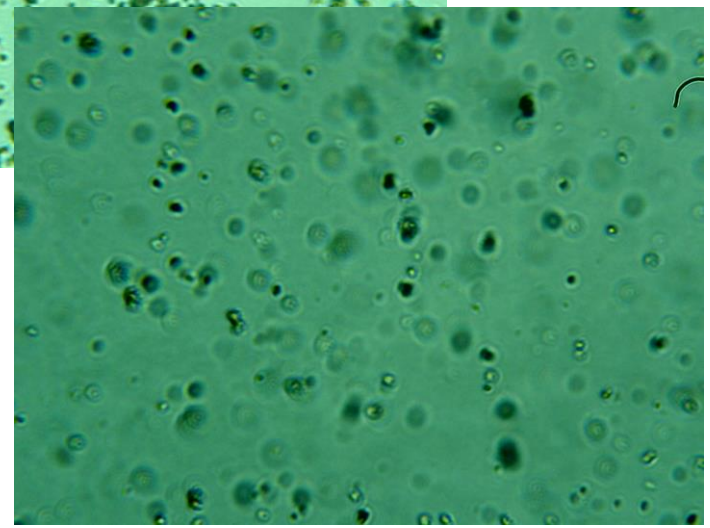
After («Soluble» suspension < 1 µm)

The case of copper trihydroxyl chloride (1 % Novochizol, 200 mg Cu++ per g)



Before (insoluble powder)

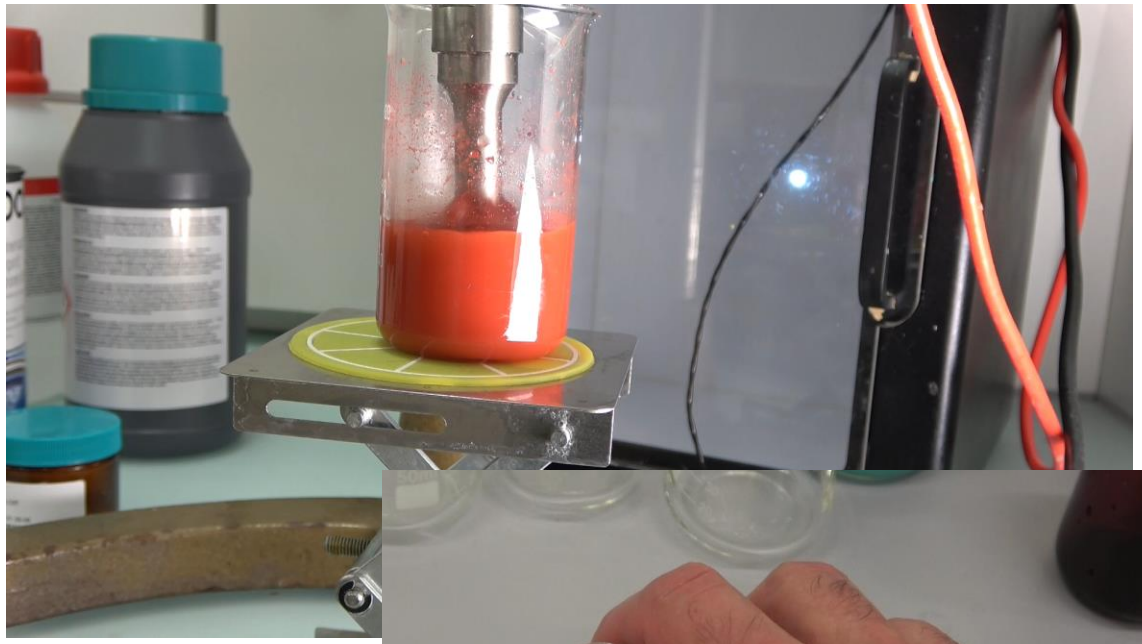




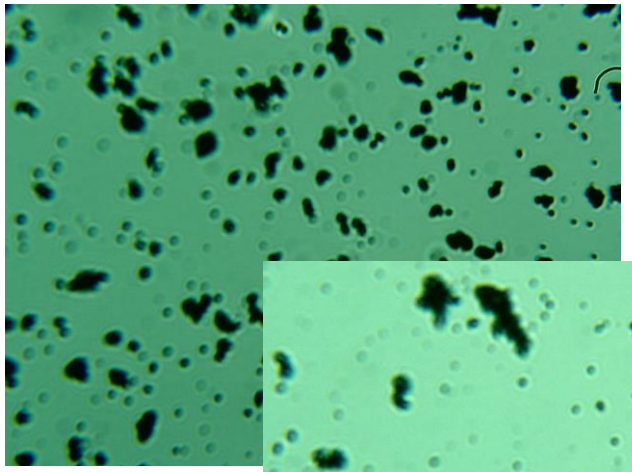
After («Soluble» suspension)

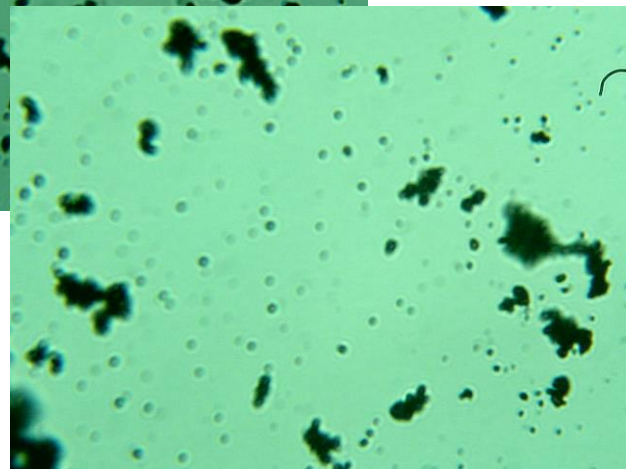
The case of copper (I) oxide

(1 % Novochizol, 200 mg Cu++ per g)



Insoluble





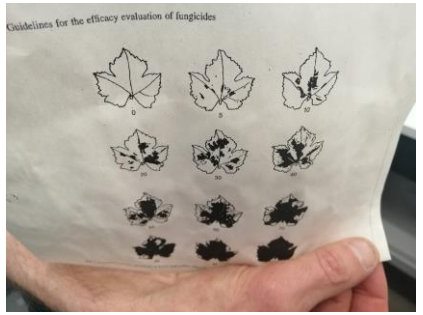
After («Soluble» suspension)

Novochizol ™ copper formulations: fungicide activity

NOVOCHIZOL™- copper

then…

Plasmopara viticola



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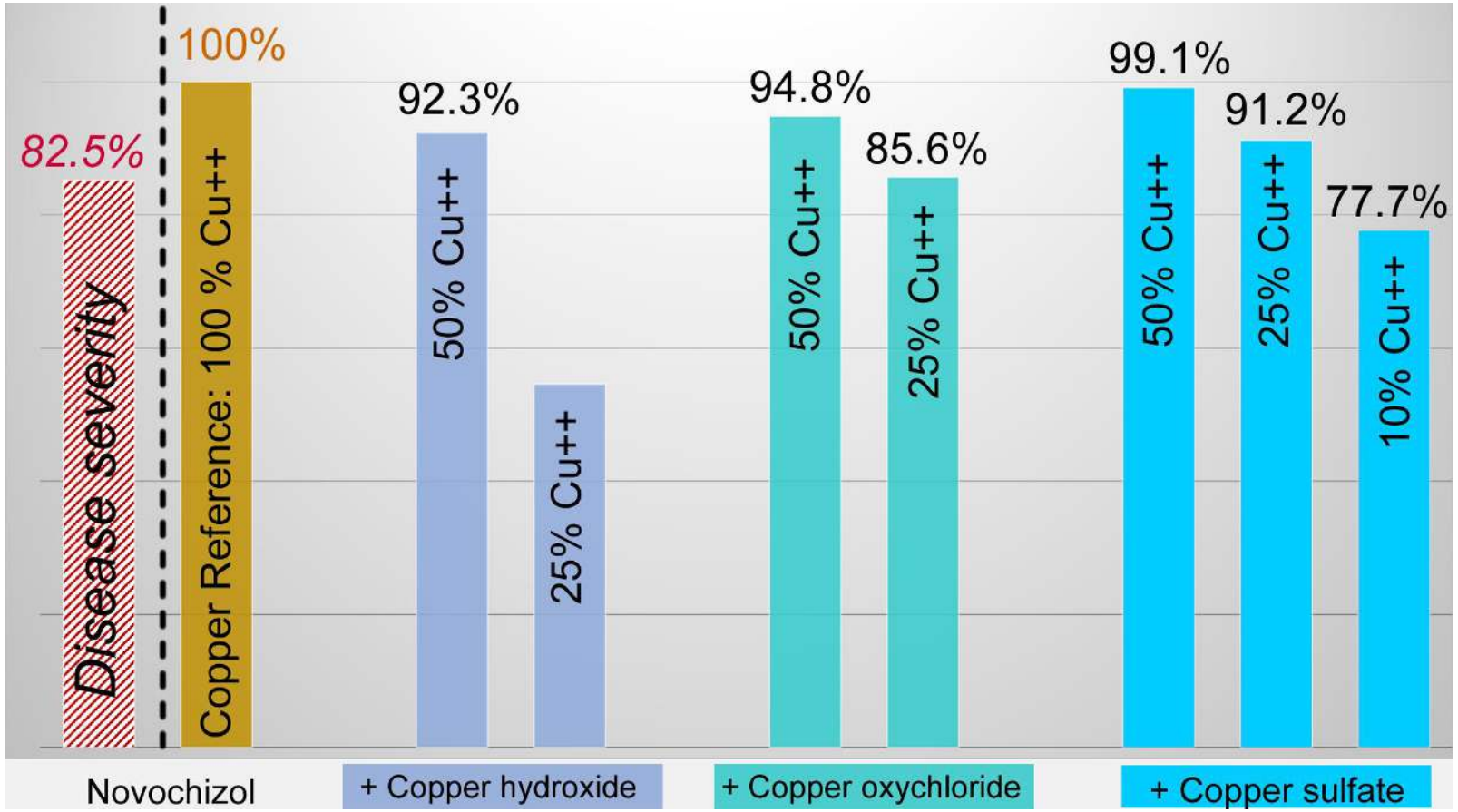
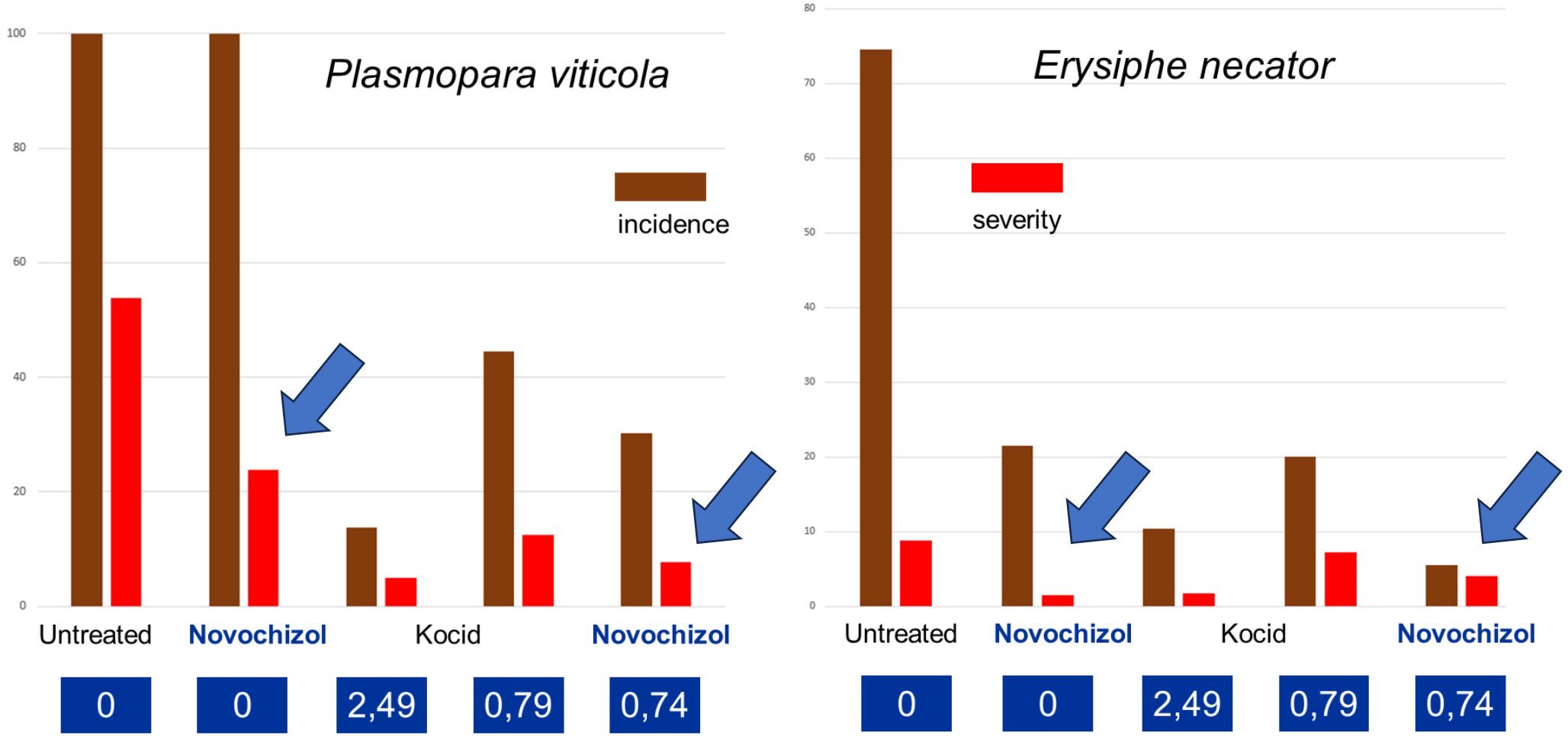


Novochizol™ as a biopesticide and co-formulant of copper

Field trials 2023

Made by FiBL



Seed treatment: Novochizol formulations of difenoconazole/metalaxyl-M

Spring wheat Seeds treated (5 days prior to germination) with:

1. Dividend Extreme ®, at the recommended concentration (0.5l/ton) - HIGH DM D
2. Novochizol™ formulation at the equivalent concentration - HIGH DM N
3. Dividend Extreme ®, at a 13.37-fold lower concentration dilution (0.037l/ton) - LOW DM D
4. Novochizol™ formulation at the equivalent concentration - LOW DM N

5. Novochizol Copper formulation (Novochizol 1%, Cu+2 7 mg/ml), 0.5l/ton

Germination chamber

Measure:

Degree of infection

Seedling development

Biomass

Seed treatment: Novochizol formulations of difenoconazole/metalaxyl-M

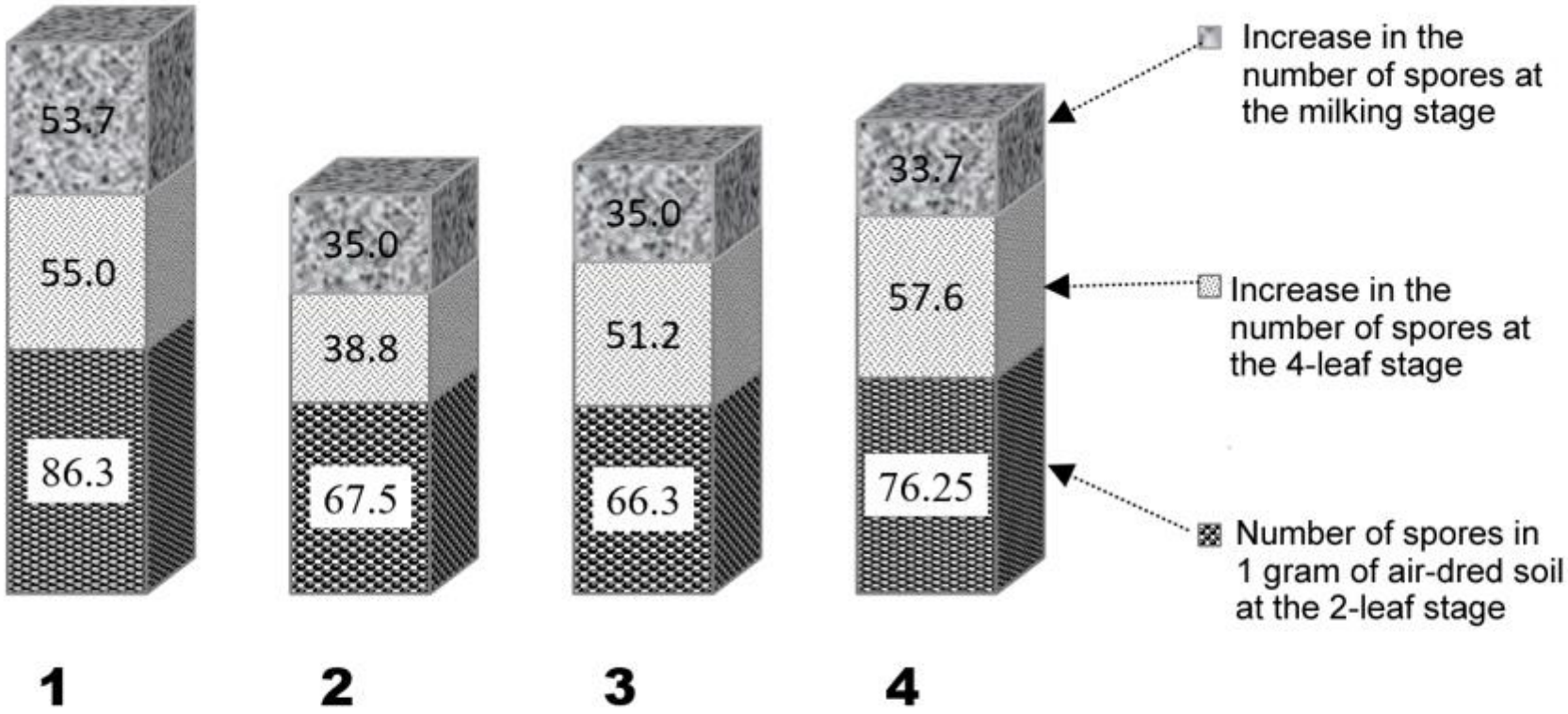
Biological efficacy	2. High DM D	3. Low DM D	4.Low DM N	5. High DM N	6. Copper N
Bipolaris sorokiniana Shoem. root rot	93.3%	46.7%	86.6%	40%	73.3%

Treatment with Novochizol formulations : no effect on alternariosis infections

Treatment with Novochizol formulations : 100% control of bacteriosis

Seed treatment: Novochizol formulations of difenoconazole/metalaxyl-M

Field trials



1 - Control; **2** - *Dividend* **3** - *Novochizol pesticide* **4** - *Novochizol copper*

Fig 1. Accumulation of *B. sorokiniana* spores (number per gram of air-dried soil, medium-power medium-loamy chernozem) in the upper root zone of spring soft wheat grown from seeds treated with *Novochizol pesticide* and *Dividend* formulations.

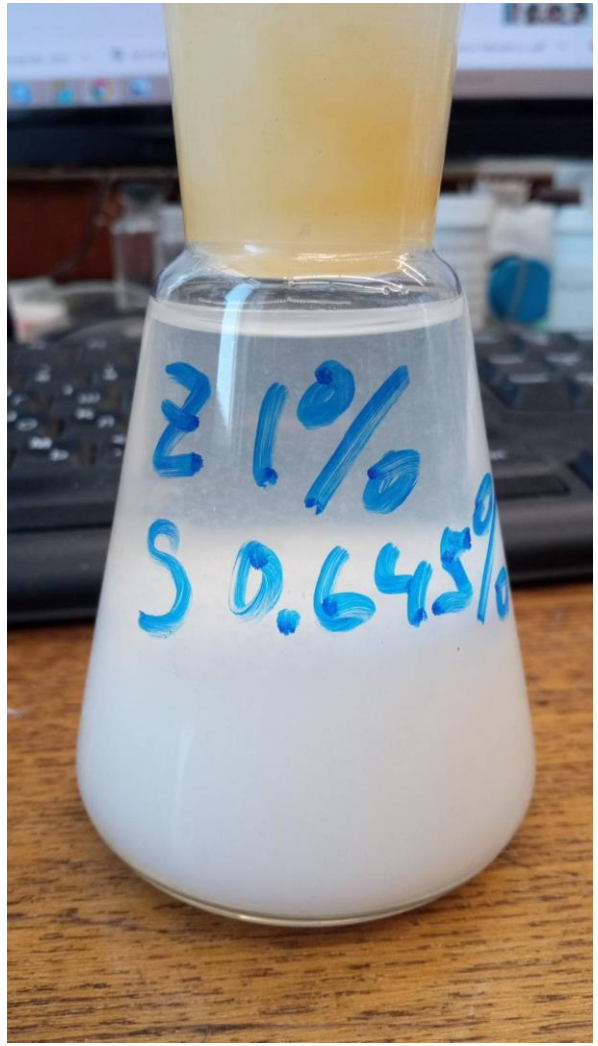
Seed treatment: Novochizol formulations of difenoconazole/metalaxyl-M

Field trials

Table 8. Effects of seed and foliar treatments on harvest

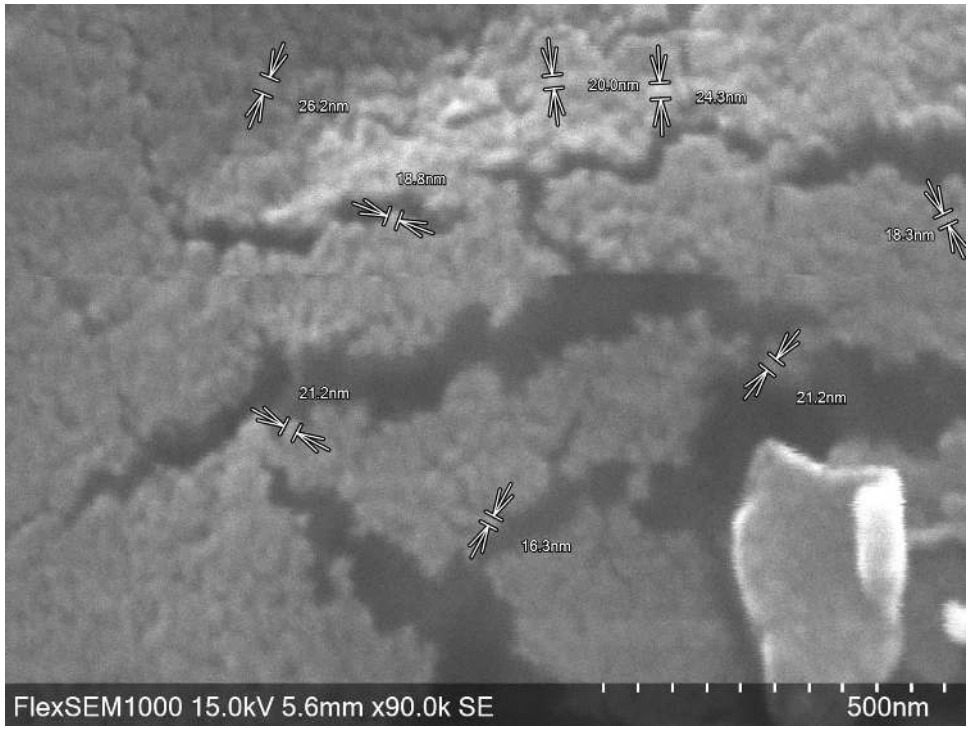
group	Treatments		Yield, ton/ha	Weight of 1000 seed, g
	foliar	seed		
1	No treatment	Control, no treatment	3.41	29.16
2		*Dividend*	3.57	29.61
3		*Novochizol pesticide*	3.75	29.45
4		*Novochizol copper*	3.44	28.88
5	*Novochizol copper leaf*	Control, no treatment	3.64	31.05
6		*Dividend*	3.83	30.88
7		*Novochizol pesticide*	3.75	31.44
8		*Novochizol copper*	3.53	30.19
9	*Fungicide + insecticide*	Control, no treatment	4.49	32.02
10		*Dividend*	4.40	32.35
11		*Novochizol pesticide*	4.43	33.37
12		*Novochizol copper*	4.38	32.38
HCP_{05}			0,11	0.31
Degree of freedom according to Snedekor, %, rendering in blocks			97,5	96.5

Novochizol formulations of elemental sulfur



Odorless, stable suspension

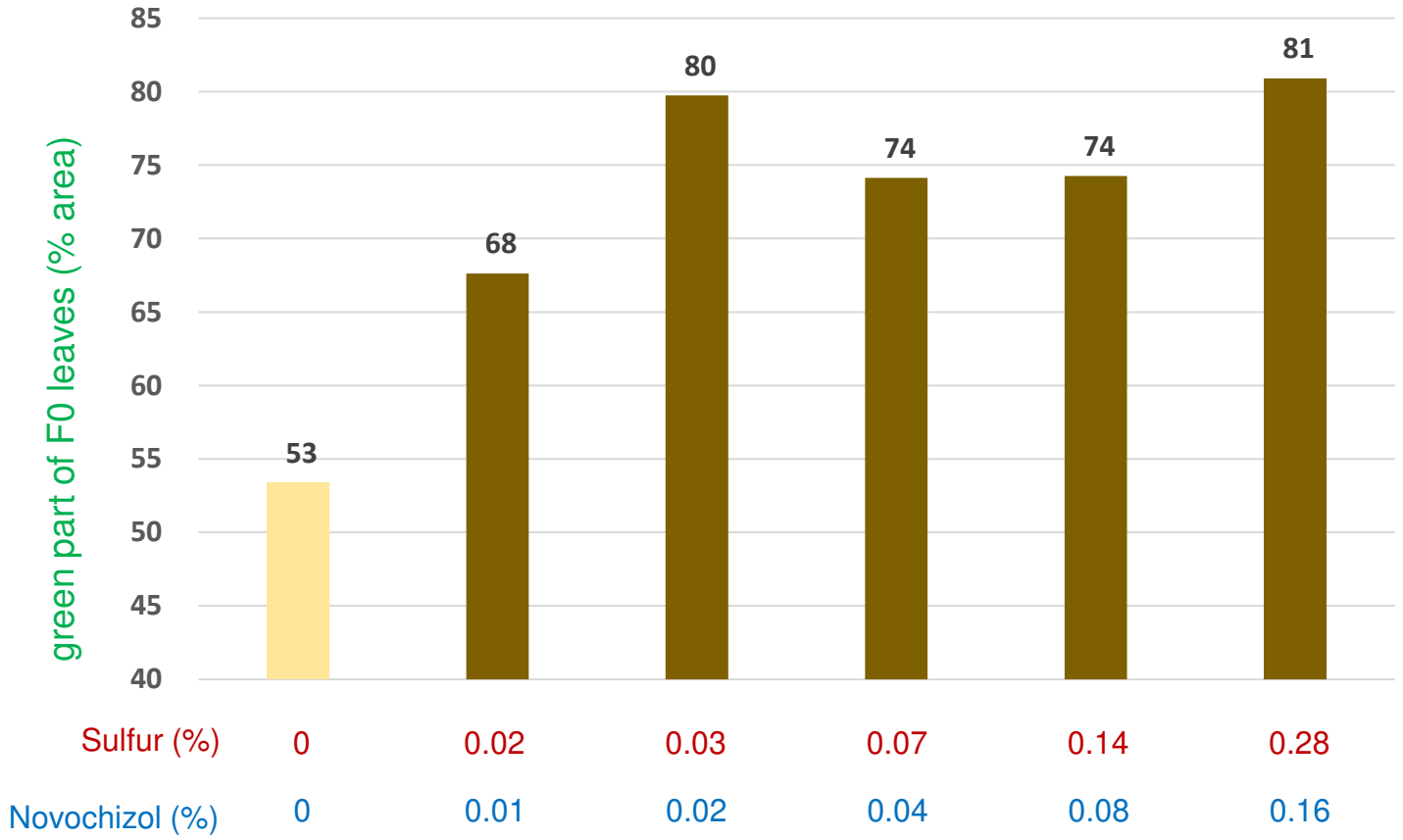
Very fine sulphur particles



Anti-fungal in vitro activity demonstrated

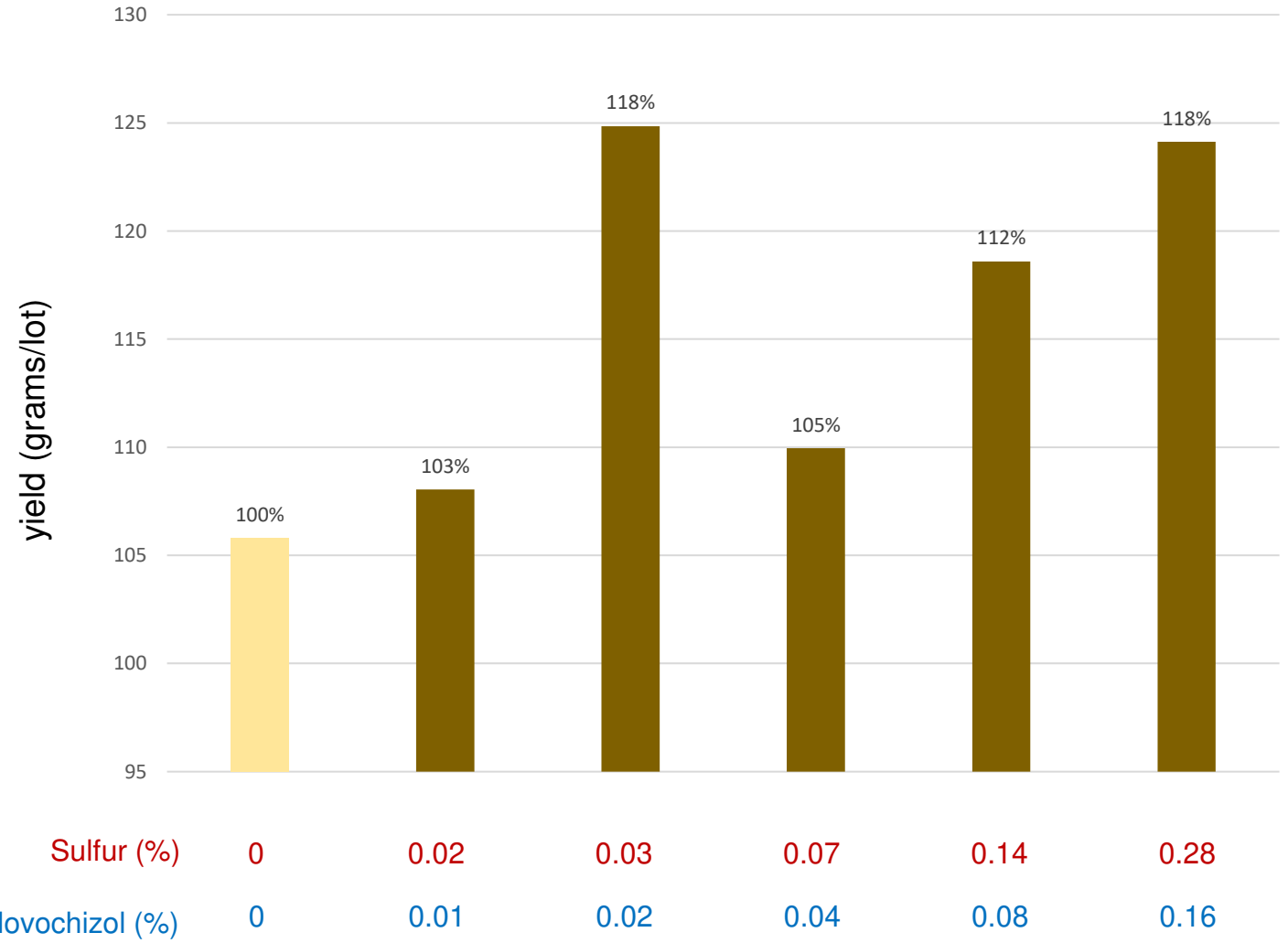
Foliar treatment of winter wheat: Novochizol Sulphur formulations: field trials

Disease protection (green part of F0 leaves, following brown rust infections and before ripening) of winter wheat (Montalbano cultivar) treated at the T2 and T3 stage, with a novel Novochizol sulfur formulation. 2022 growing season.



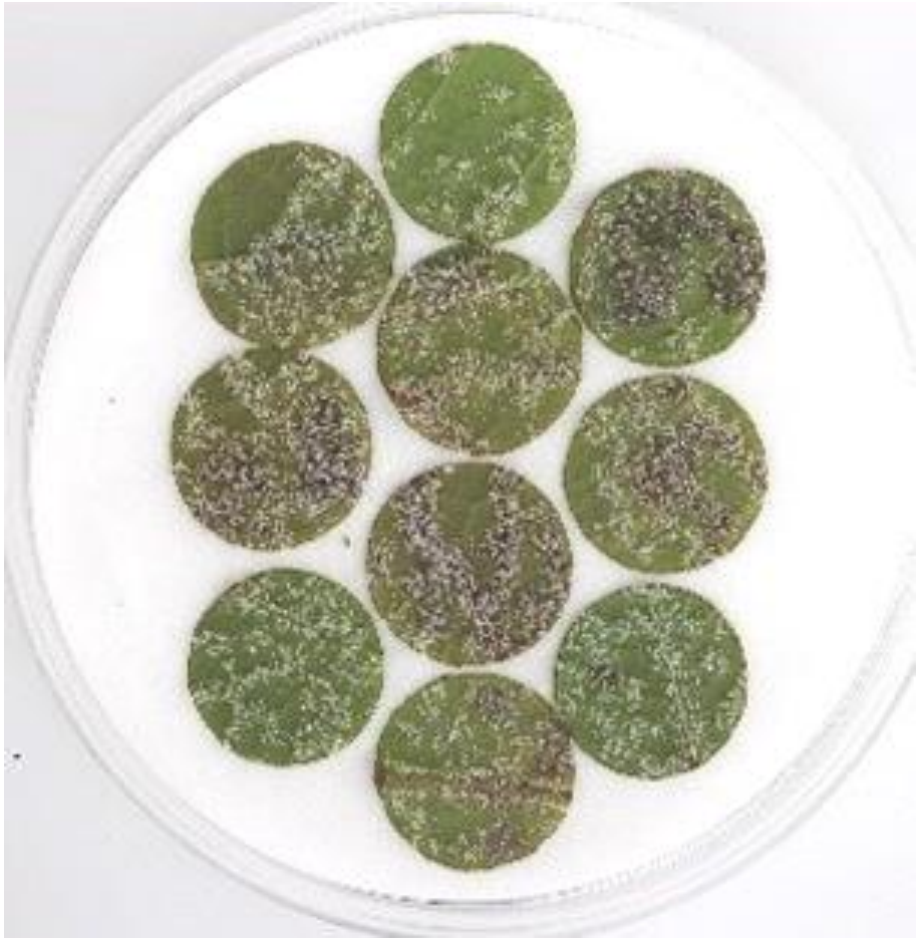
Foliar treatment of winter wheat: Novochizol Sulphur formulations: field trials

Yield of winter wheat (Montalbano cultivar) treated at the T2 and T3 stage, with a novel Novochizol sulfur formulation. 2022 growing season.



Novochizol grapevine cane extract* and copper formulations against *P. viticola*

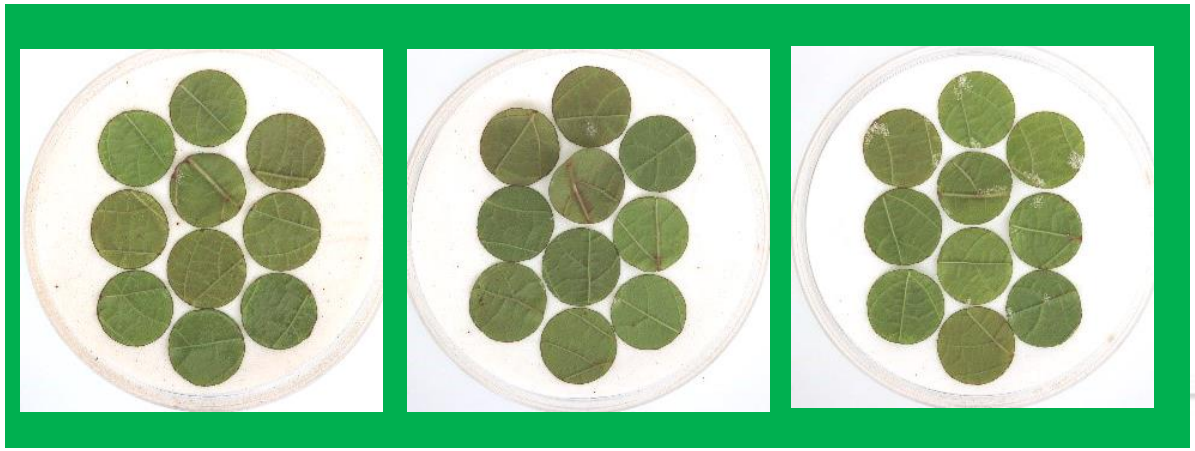
Agroscope



*Vitis vinifera Canes, a New Source of Antifungal Compounds against Plasmopara viticola, Erysiphe necator, and Botrytis cinerea. Sylvain Schnee et al. J. Agric. Food Chem. 2013, 61, 23, 5459–5467. https://doi.org/10.1021/jf4010252

Grapevine cane extract

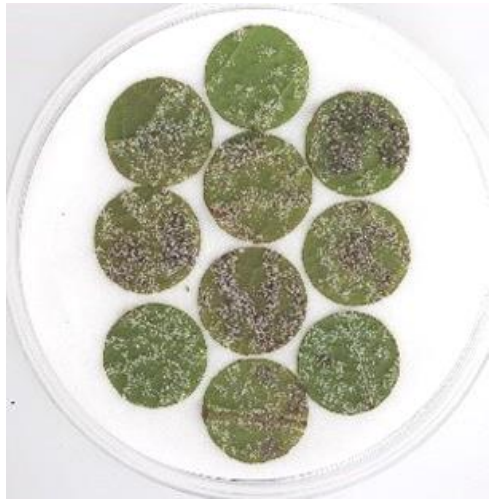
7.5 mg/ml 3,75 mg/ml 1.875 mg/ml



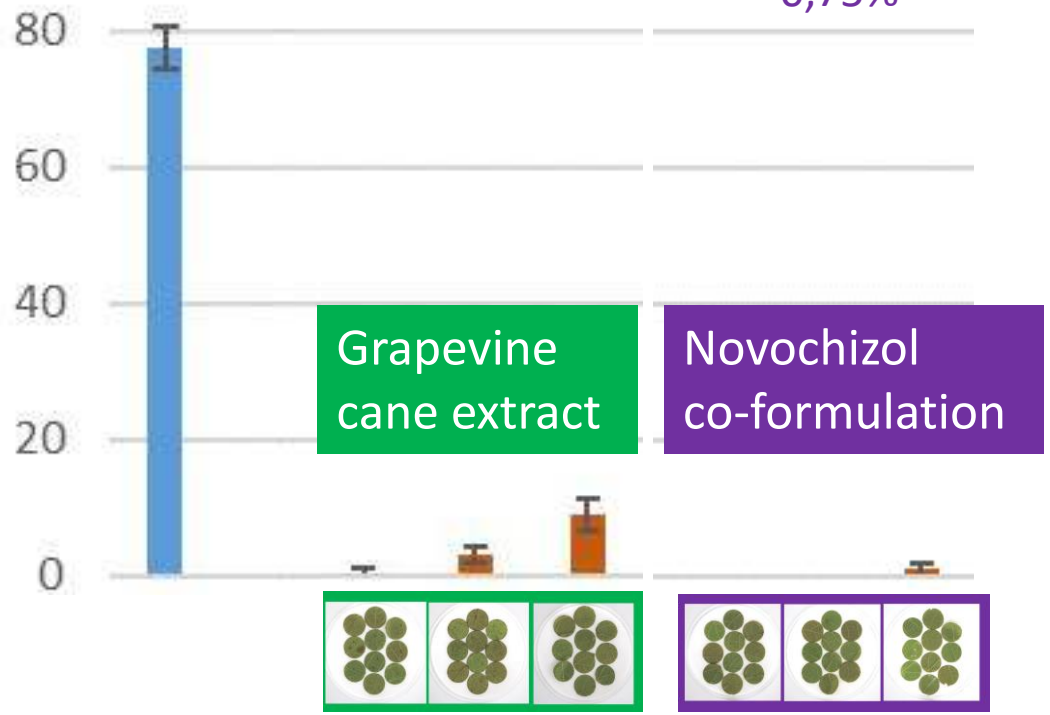
Grapevine cane extract Novochizol co-formulation

7.5 mg/ml 3,75 mg/ml 1.875 mg/ml

0,75% 0,375% 0,1875 %

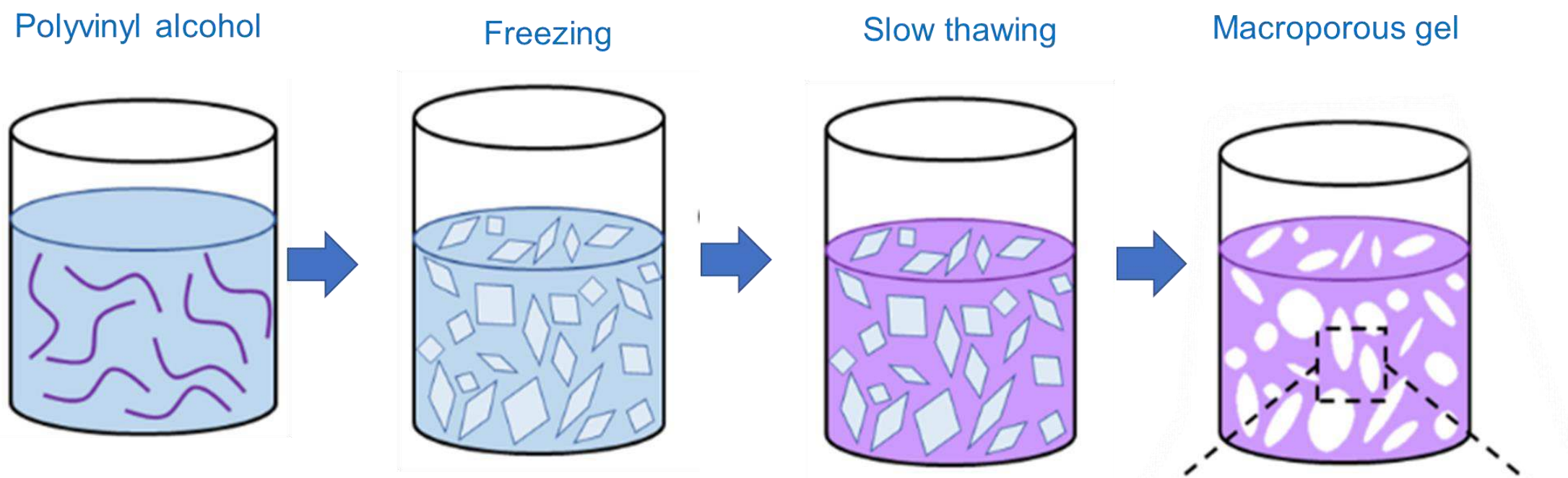


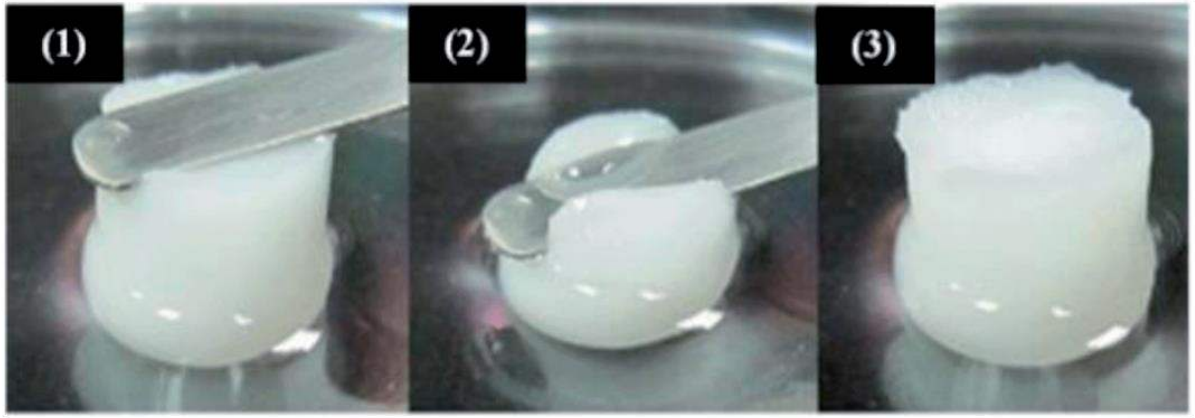
Water

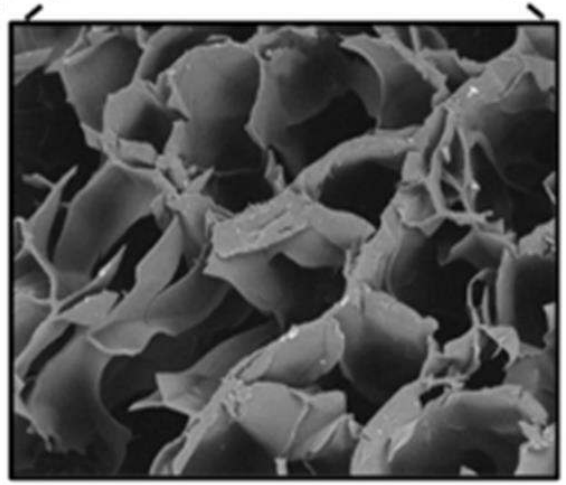


→ Synergy

Novochizol™ + polyvinyl alcohol cryogels for soil restoration







Novochizol™ + polyvinyl alcohol cryogels for soil restoration
One barrel solution

Fall

Spring

Novochizol™

Thank you for your attention

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