

Miguel Cachão
AVIPE



How to create value using CO₂ from wine fermentations and liquid effluents from wineries on microalgae production?



Funded by
the European Union

Erasmus+
Enriching lives, opening minds.

Higher education

erasmus+
PORTUGAL EDUCAÇÃO E FORMAÇÃO

www2.isep.ipp.pt/agrima

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Portuguese National Agency for Erasmus+, Education and Training (PNA). Neither the European Union nor the PNA can be held responsible for them.



Agri-food Waste Management for Sustainable bio-economy through Higher Education curricula and upskilling



Funded by
the European Union

Erasmus+
Enriching lives, opening minds.

Higher education

erasmus+
PORTUGAL EDUCAÇÃO E FORMAÇÃO

www2.isep.ipp.pt/agrima

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Portuguese National Agency for Erasmus+, Education and Training (PNA). Neither the European Union nor the PNA can be held responsible for them.

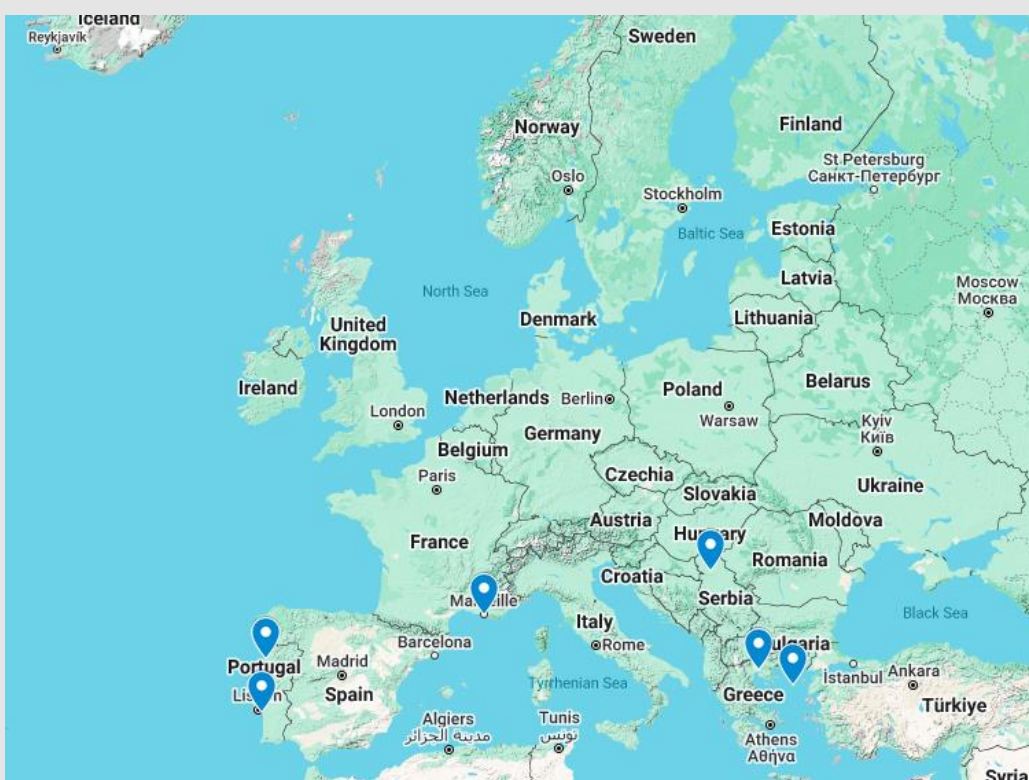
Goals

AGRIMA aims to foster universities' **capacity building** for the **green transition** through **innovative practices** and **higher education curricula updating** in **agri-food waste management** for the **circular bioeconomy**.

AGRIMA addresses:

- 1. Advancing pedagogical methods** for industrial agri-food waste valorisation **based on business-academia synergies**.
- 2. Integrating citizen science** in bio-economy-enhanced waste valorisation as a means of **civic engagement and environmental advocacy**.





Partners





redwine

HOW TO CREATE VALUE WITH CO₂ AND EFFLUENTS FROM WINE MAKING?

www.redwineproject.eu



Associação de Viticultores do Concelho de Palmela



D.O. SETÚBAL
D.O. PALMELA

5000Ha

350 farmers

> 300 training courses

> 500 sprayers inspected

> 200 investment projects to farmers

20 workshops/year with farmer



AGRIMA



Funded by
the European Union

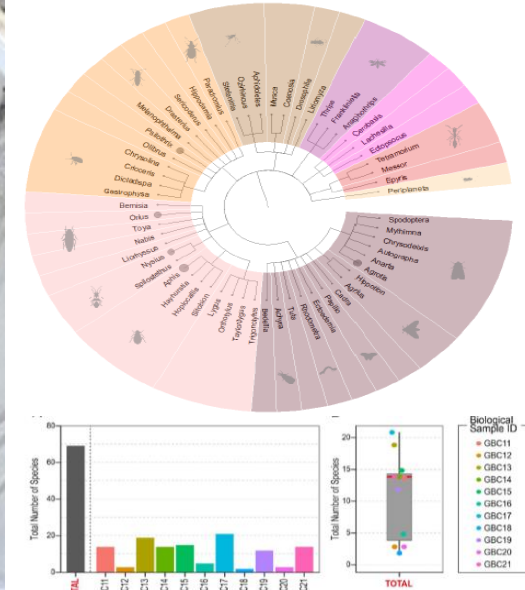


Associação de Viticultores do Concelho de Palmela

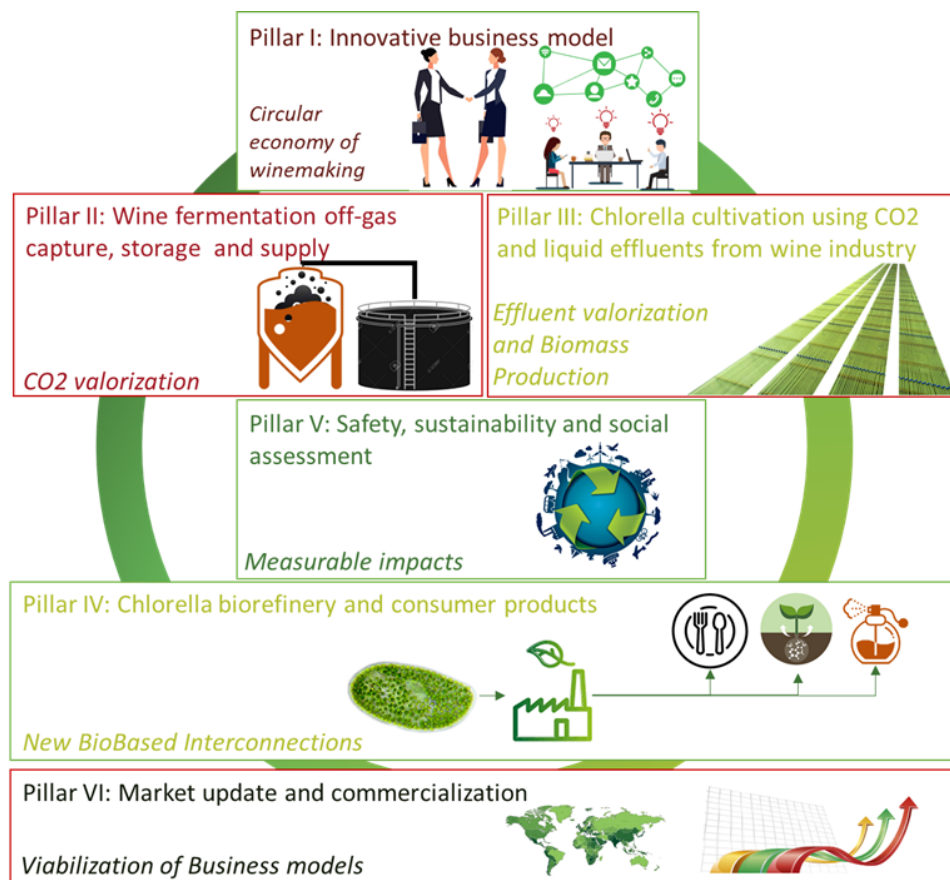


Bio-based Industries
Consortium

www2.isep.ipp.pt/agrima



Project and its consortium



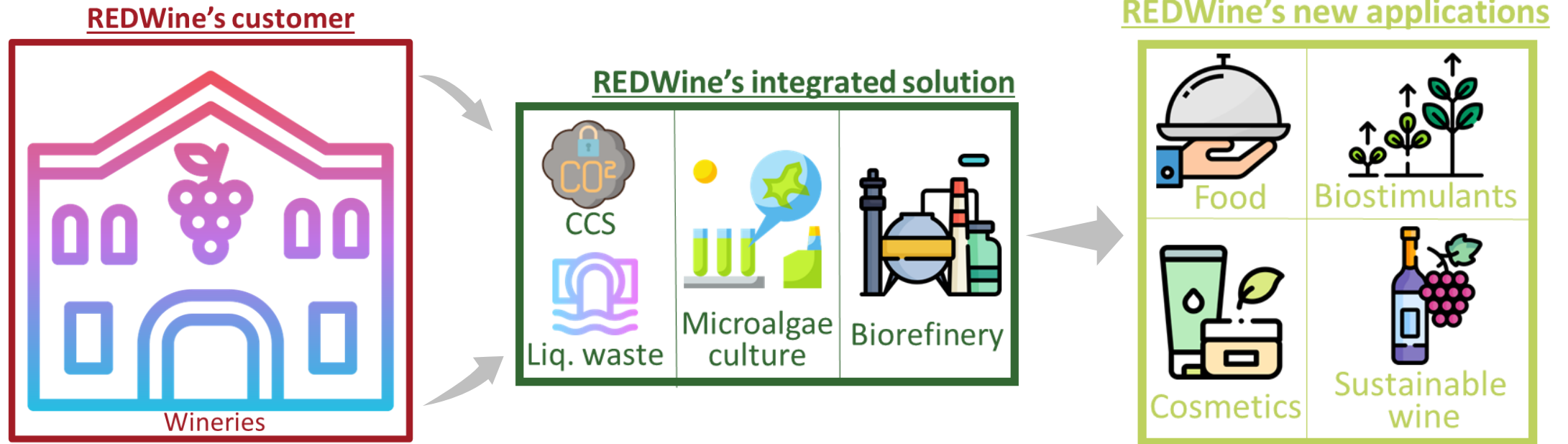
Total budget: 7 525 555 €

EU contribution: 5 676 744 €

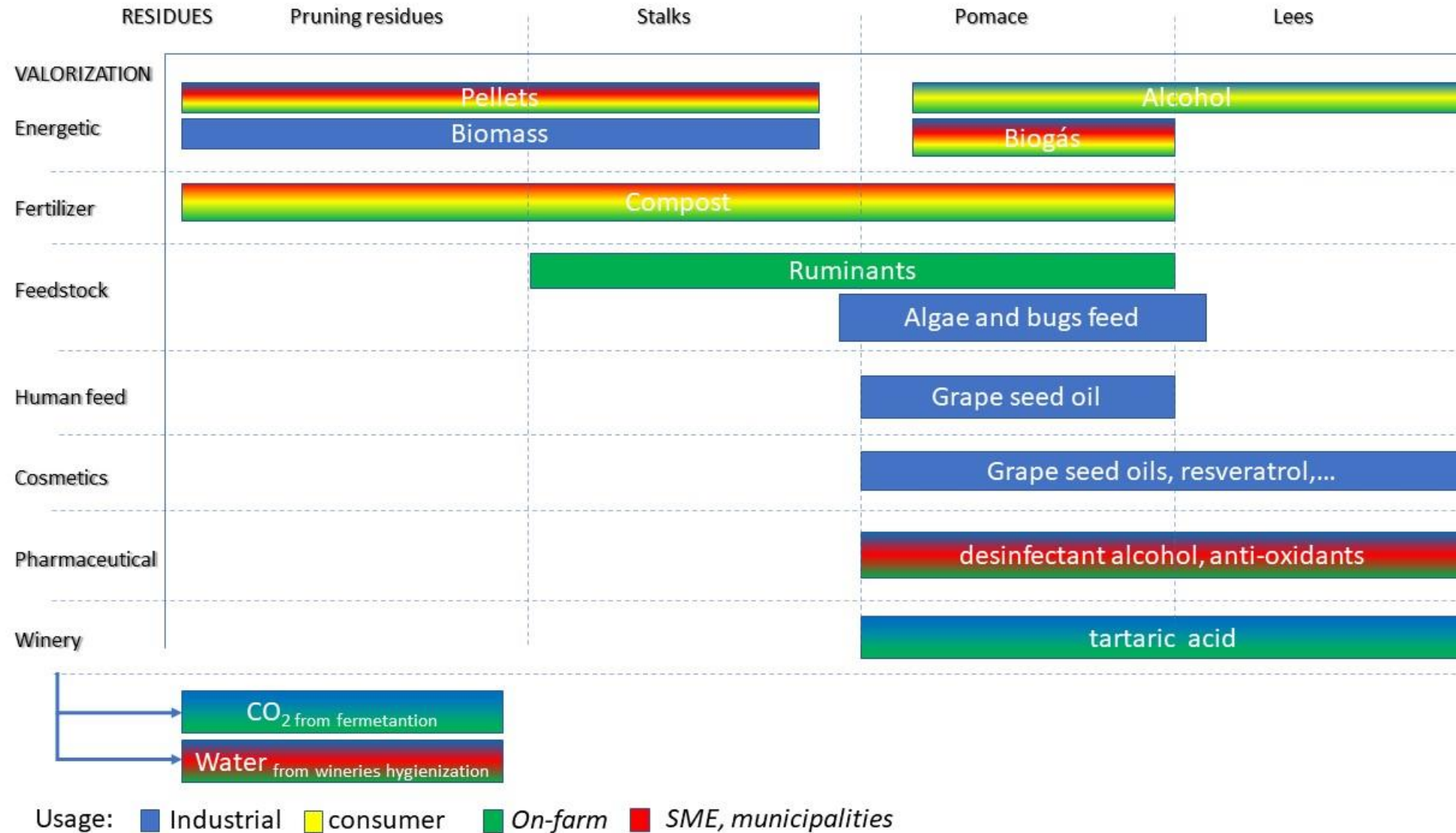
Proposition

Reduce wine industry carbon & water footprints

Incentivize the transition of the wine production industry to an innovative, circular and sustainable model that will increase and diversify revenues for its stakeholders.



The idea



Validation



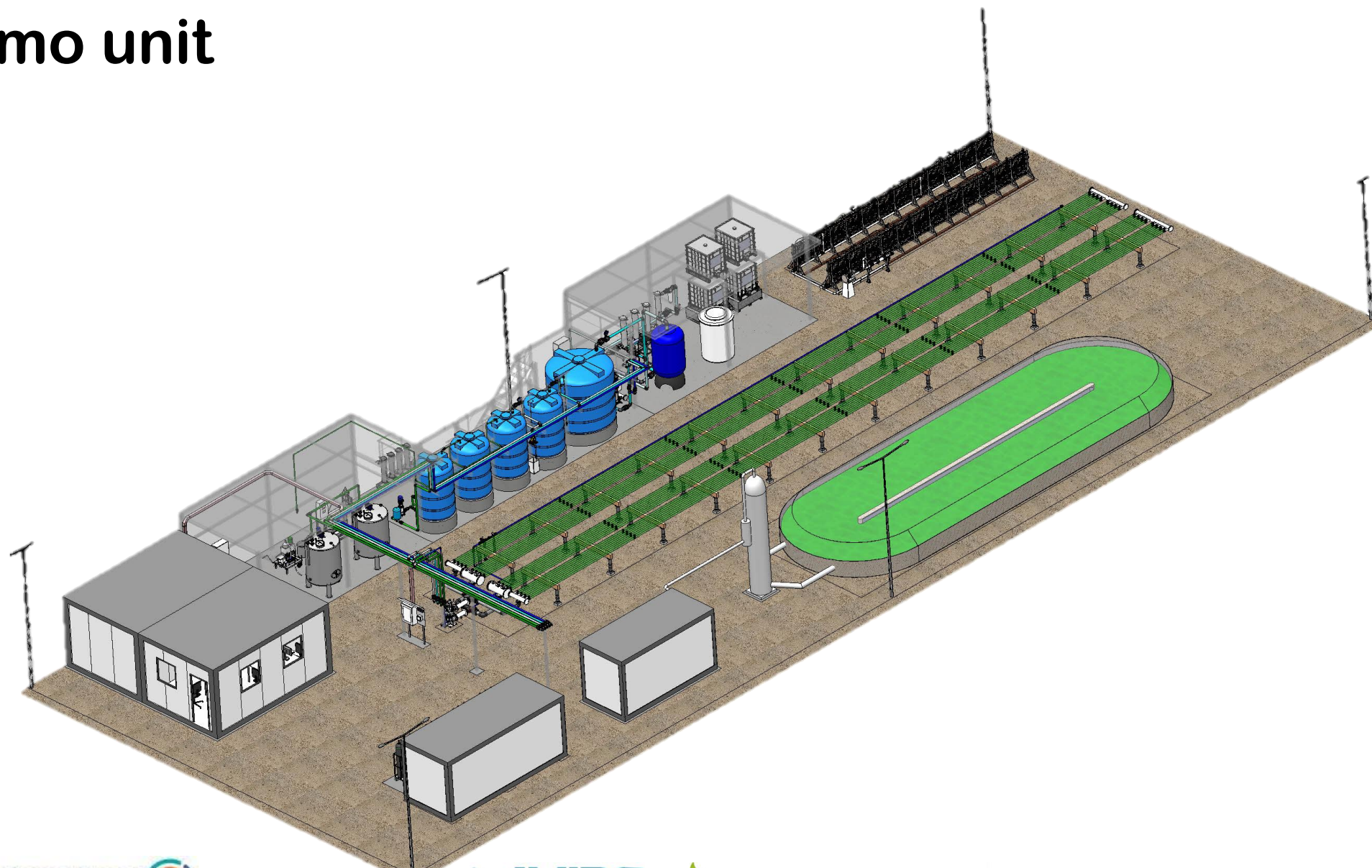
CO₂ capture and store

2 tons de CO₂ from 25 000l tank
28m³ of liquid effluents from the winery

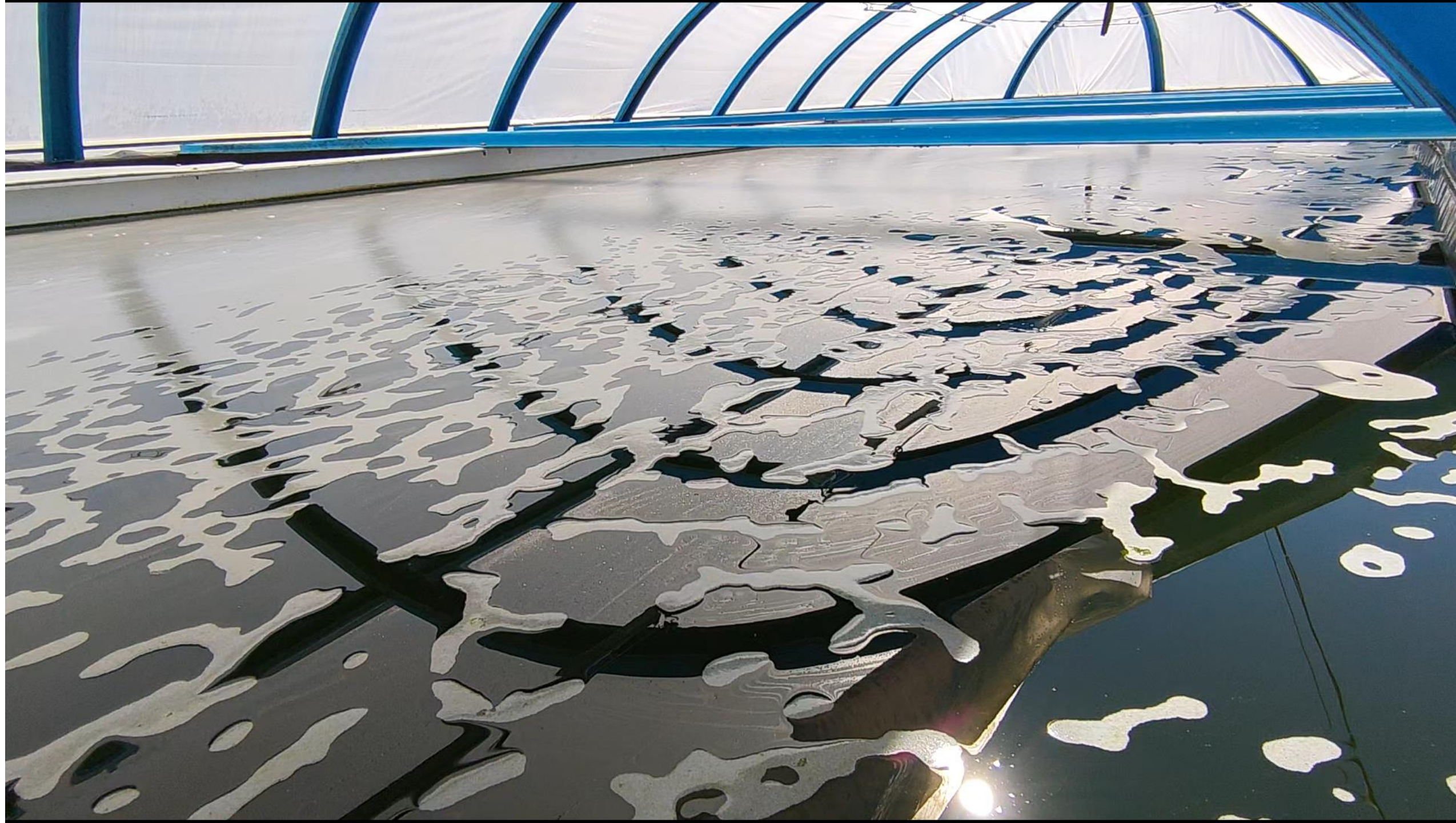
2 ton of *Chlorella vulgaris* biomass



Demo unit







Human food

Protein fraction 1 in "brioche"

Ingredients	Percentages
Water	22,00%
Wheat flour	49,20%
Sugar	10,8%
Canola Oil	7,90%
Egg-replacer + technical ingredients	5,40%
Fresh Yeast	1,70%
Flavor	1,20%
Salt	0,80%
Chlorella protein fraction 1	1,00%



Human food

Protein fraction 1 in "plant-based seafood"

Plant-based salmon slice recipe + 1% protein fraction 1.

Ingredients	Percentages
Water	87,60%
Canola Oil	6,14%
Salt	1,55%
Divers Fibers	1,72%
DHA rich microalgae oil	1,00%
Chlorella protein fraction 1	1,00%
Lemon juice	0,50%
Xanthan gum	0,43%
Astaxanthin powder	0,05%



Trials in vineyards

- Sunburn
- Biofungicide
- N enhance in grapes and must
- Impact in flowering and fruit set



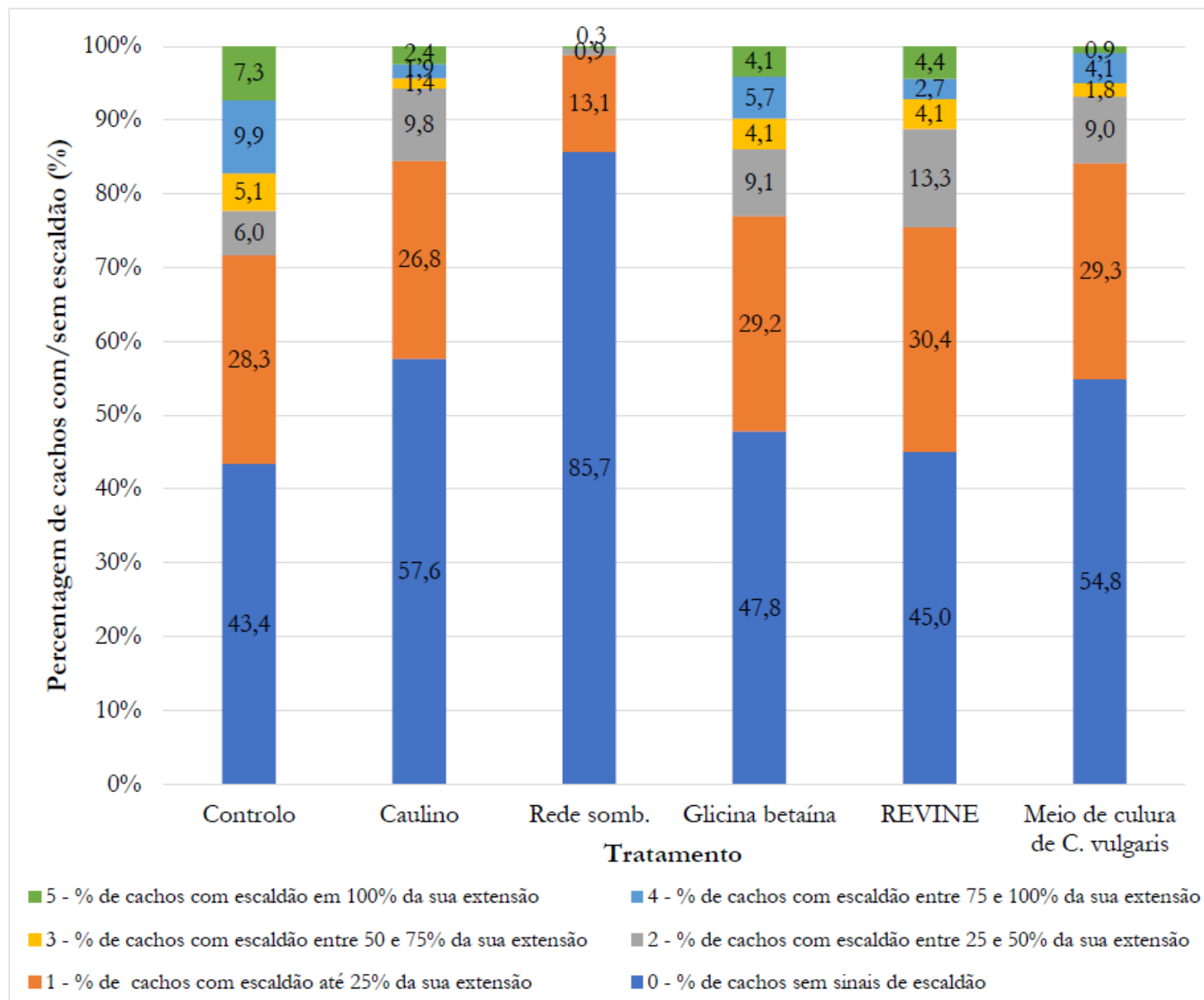
Rua/Estrada e Castelo sem Rega							
Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira
	Rede	7	Chorella	7		Glicina	9
Revine	Rede		Chorella		Controlo	6	Glicina
Revine	9	Crop Forcing	Desfolha	10	Controlo		Chorella
		7	Desfolha	9		8	Crop Forcing
	Crop Forcing				Glicina	9	Chorella
					Glicina		Desfolha
	Chorella	4	Caulino	3	Revine	6	Desfolha
	Chorella		Caulino		Rede		Caulino
Controlo				Revine	5	Rede	
Controlo	8	Desfolha		Revine		Controlo	9
			Revine			Revine	5
Glicina	5	Desfolha	3	Revine	4		Crop Forcing
Glicina		Caulino		Controlo	6		Crop Forcing
Rede	7	Caulino	4	Controlo	5	Glicina	10
Rede		Revine		Glicina	10	Crop Forcing	7
Crop Forcing	8	Revine	8	Glicina	10	Caulino	7
Crop Forcing		Controlo		Rede	10	Caulino	9
Chorella	6	Controlo		Rede	9	Desfolha	8
Chorella				Crop Forcing	8	Desfolha	8
				Crop Forcing	6	Rede	10
Desfolha				Chorella	8	Glicina	6
Desfolha	5	Glicina	9	Chorella		Rede	10
Caulino	11	Glicina	9	Chorella		Rede	10
Caulino				Desfolha	4	Revine	9
				Desfolha		Revine	
Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira	Cabeceira
Linha 2	Linha 4	Linha 5	Linha 7	Linha 8	Linha 10	Linha 11	Linha 16

Rua/Estrada - Herdade do Espirra

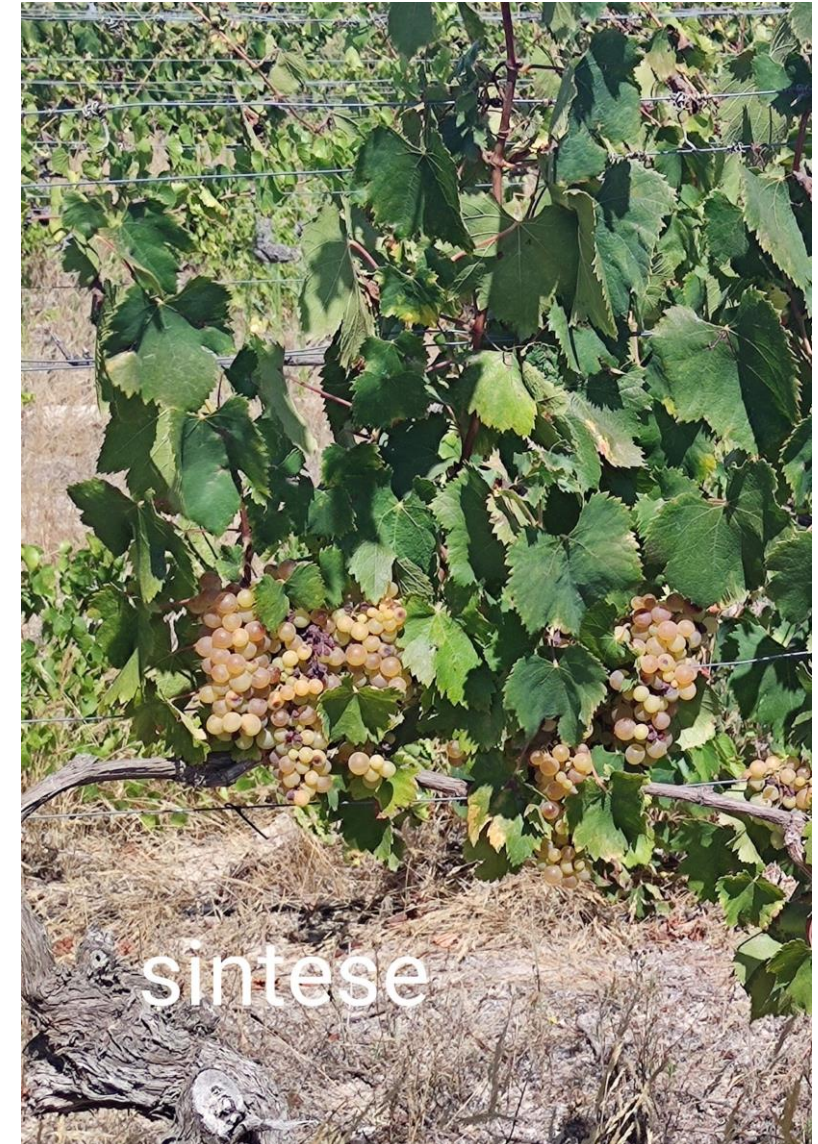
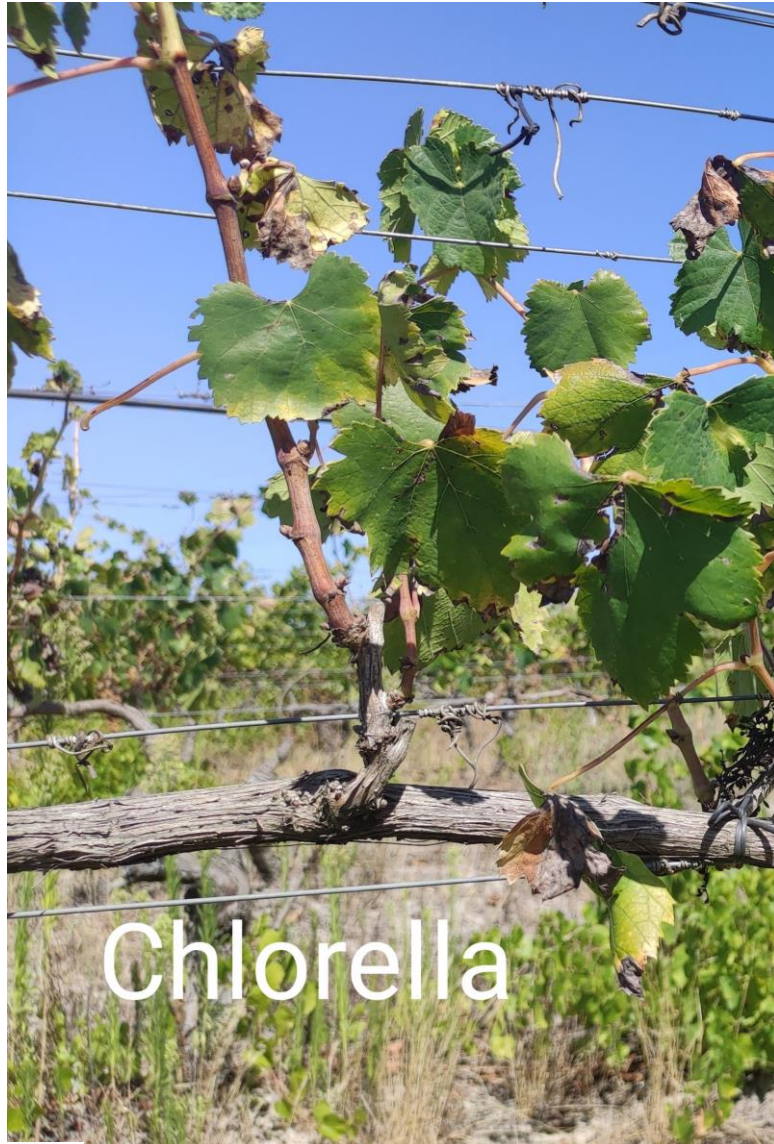
Trials in vineyards

• Sunburn

- Biofungicide
- N enhance in grapes and must
- Impact in flowering and fruit set



Biofungicide



Biofungicide



Biofungicide



Biofungicide



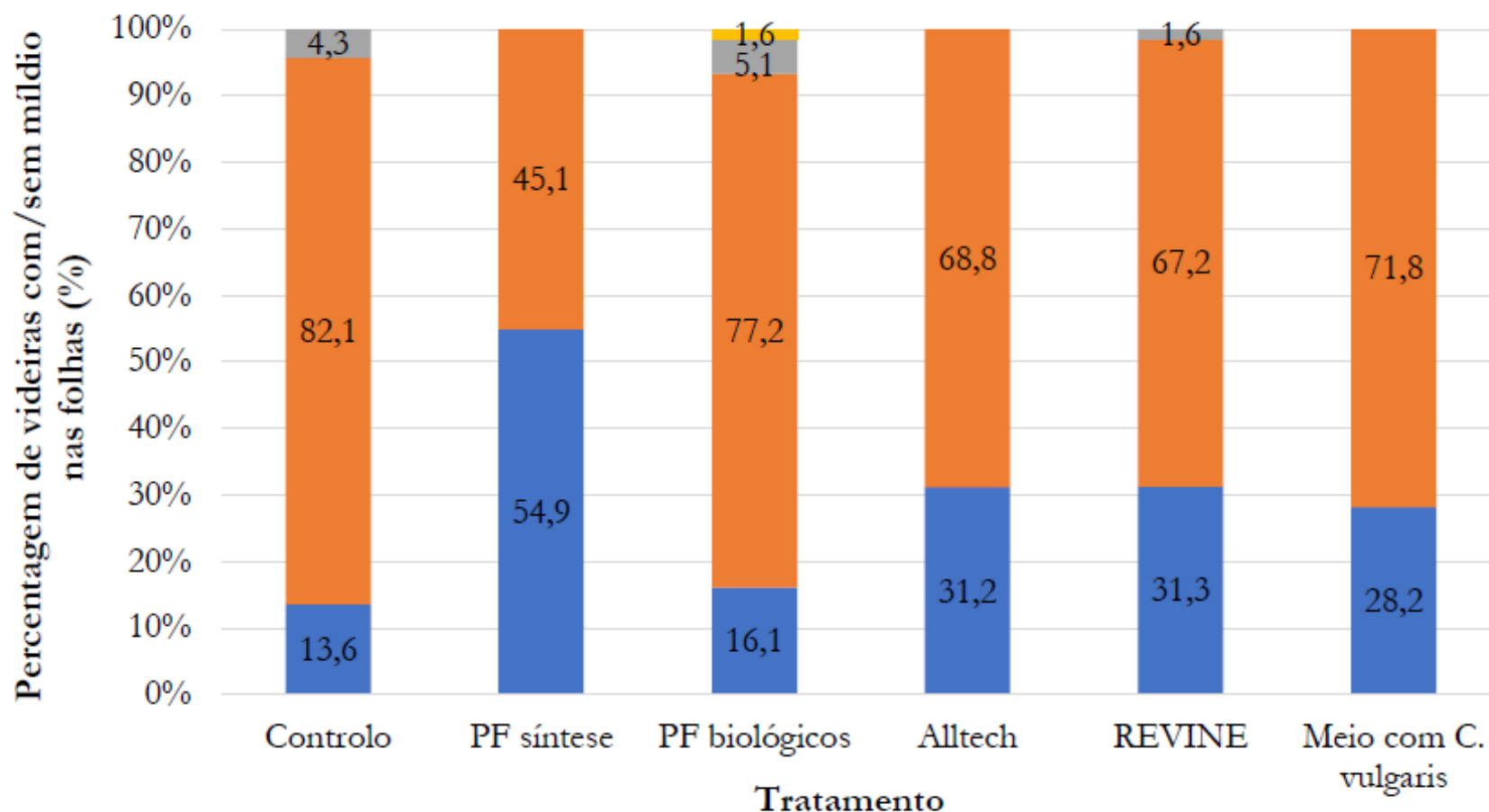
Ch

b

sintese

Trials in vineyards

- Sunburn
- **Biofungicide**
- N enhance in grapes and must
- Impact in flowering and fruit set



■ 4 - % de videiras infetadas em 100% da superfície das folhas

■ 3 - % de videiras infetadas até 75% da superfície das folhas

■ 2 - % de videiras infetadas até 50% da superfície das folhas

■ 1 - % de videiras infetadas até 25% da superfície das folhas

■ 0 - % de videiras com ausência de mildio nas folhas

Quantidade	Densidade	T (°C)	Densidade (20°C)	A. Provável (%)	A. Provável Refrac. (%)	Acidez Total (g/L)	pH	Amonia (mg/L)	PAN (mg/L)	Azoto (mg/L)
AQUEOS BIOMASS L9	1082	25,0	1084	10,9	11,0	8,63	3,11	79,00	53,40	118,18
CONTROLO L9	1087	25,0	1089	11,7	11,8	8,10	3,12	14,00	63,40	74,88
DISRUPTED L9	1079	25,0	1081	10,4	10,6	8,85	3,08	37,00	76,00	106,34
PELLET (M4) L9	1090	25,0	1092	12,2	12,3	7,58	3,20	22,00	79,10	97,14
P.COMERCIAL L9	1094	25,0	1096	12,8	12,9	7,65	3,19	25,00	89,70	110,20
AQUEOS BIOMASS L11	1086	23,0	1088	12,0	11,8	7,58	3,21	9,00	54,80	62,18
CONTROLO L11	1105	24,0	1107	14,5	14,4	7,35	3,16	21,00	100,30	117,52
DISRUPTED L11	1085	24,0	1087	11,9	11,8	8,33	3,17	17,00	65,20	79,14
PELLET (M4) L11	1102	24,0	1104	14,0	14,1	7,50	3,24	23,00	101,40	120,26
P.COMERCIAL L11	1100	24,4	1102	14,2	14,1	7,80	3,19	29,00	93,00	116,78
AQUEOS BIOMASS L13	1102	21,0	1103	13,9	14,1	7,13	3,25	27,00	106,60	128,74
CONTROLO L13	1100	24,0	1102	13,8	14,0	7,05	3,26	25,00	96,90	117,40
DISRUPTED L13	1099	24,0	1101	13,6	13,8	6,90	3,23	19,00	87,20	102,78
PELLET (M4) L13	1097	24,0	1099	13,3	13,5	7,43	3,22	28,00	100,90	123,86
P.COMERCIAL L13	1095	23,0	1097	12,9	13,1	7,35	3,23	22,00	87,70	105,74

Trials in vineyards

- Sunburn
- Biofungicide

• N enhance in grapes and must

- Impact in flowering and fruit set



Biostimulants

- Chlorella biomass
- Chlorella disrupted biomass
- Solid fraction

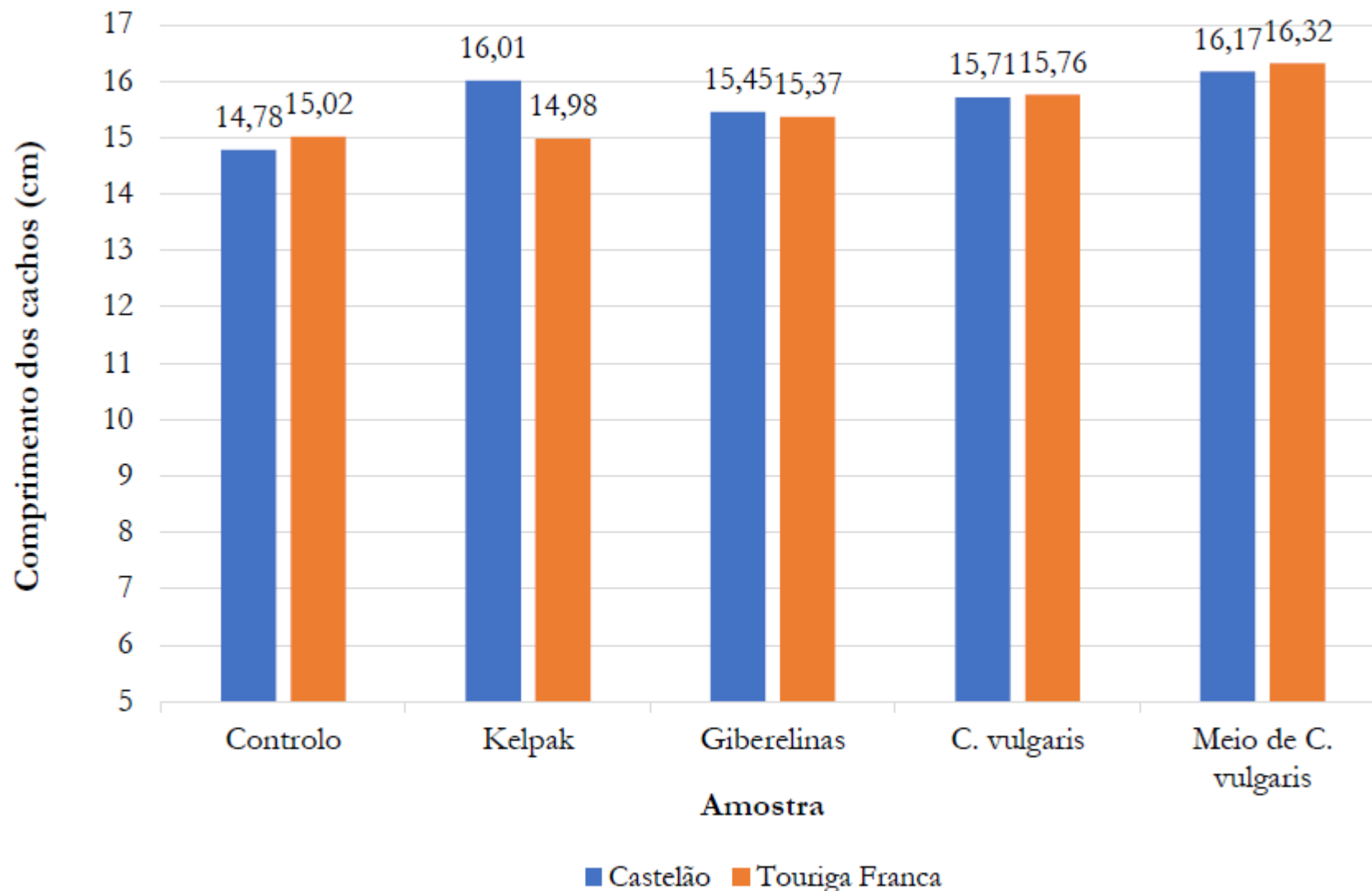
Trials in vineyards

Sunburn

Biofungicide

N enhance in grapes and must

**Impact in
size of the
cluster**



EcoWine production



- Effect in alcoholic fermentation
- Clarification
- Chitosan
- Bubble wine?
- Dry ice

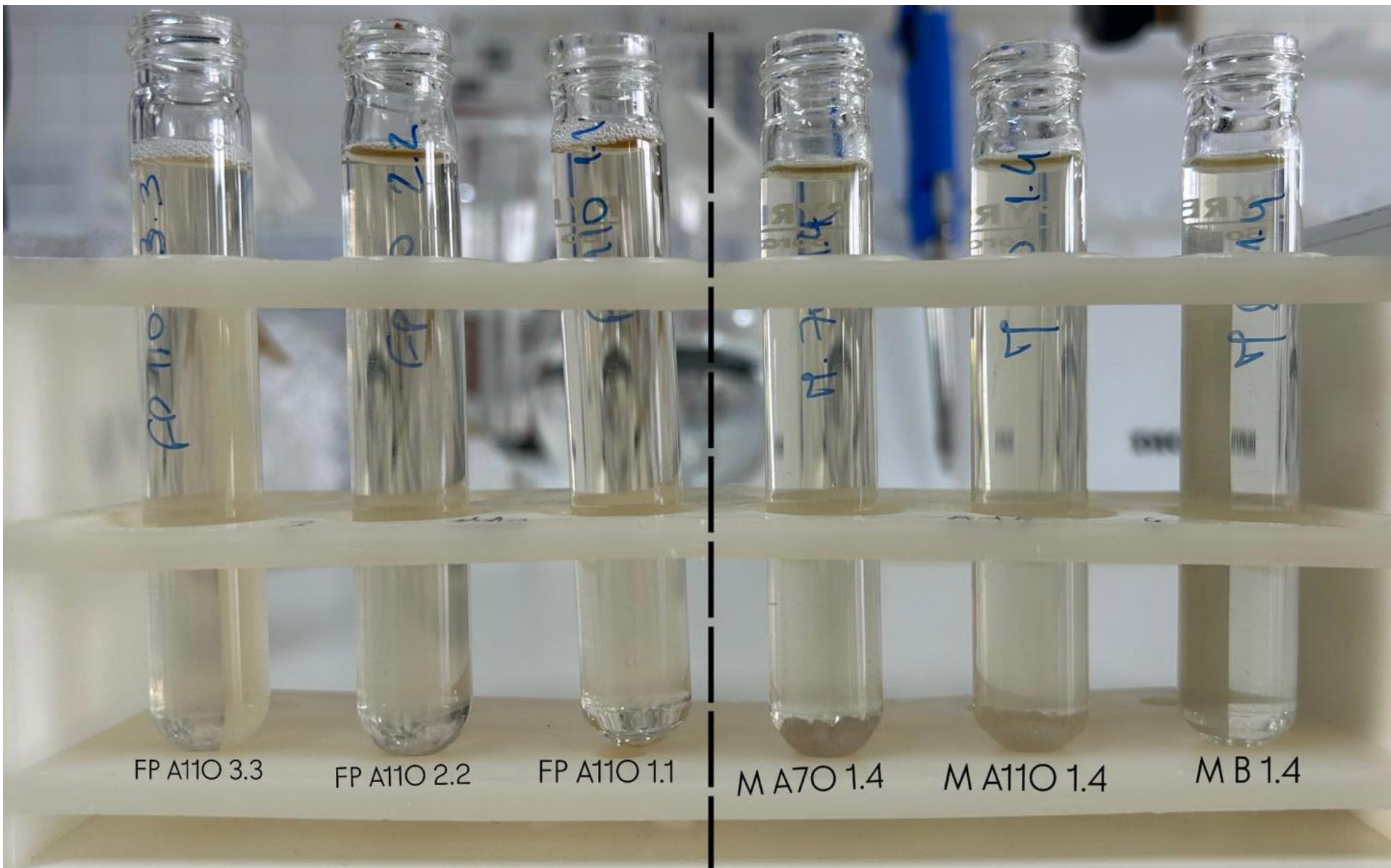
Clarification?



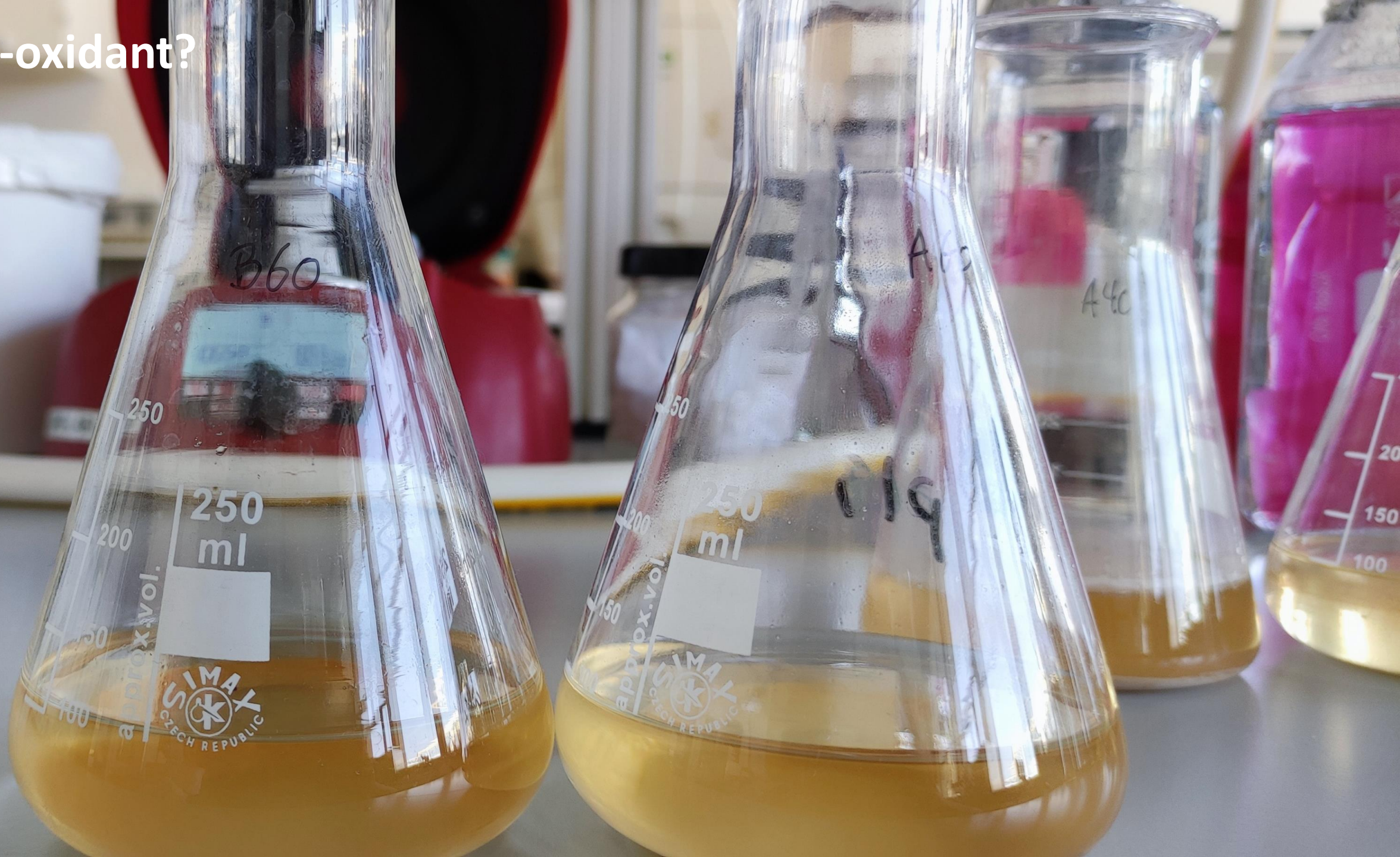


REDwine

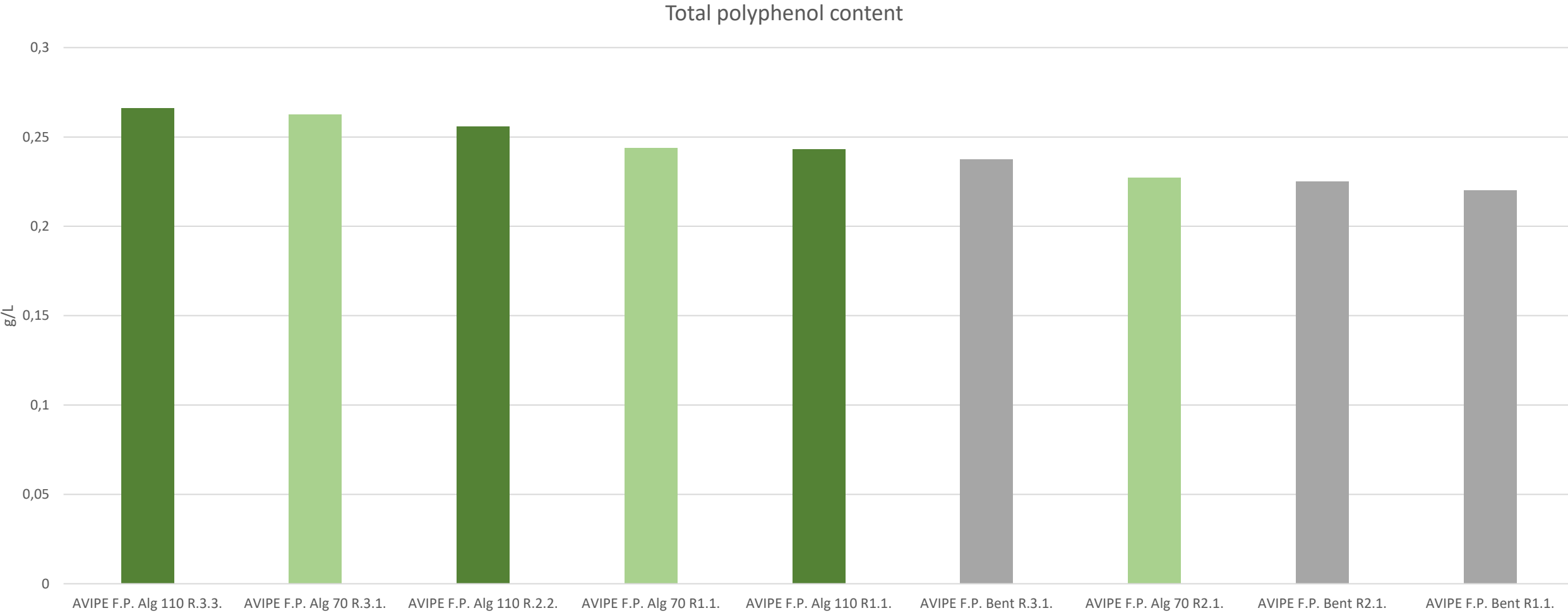
Protein estabilization?



Anti-oxidant?



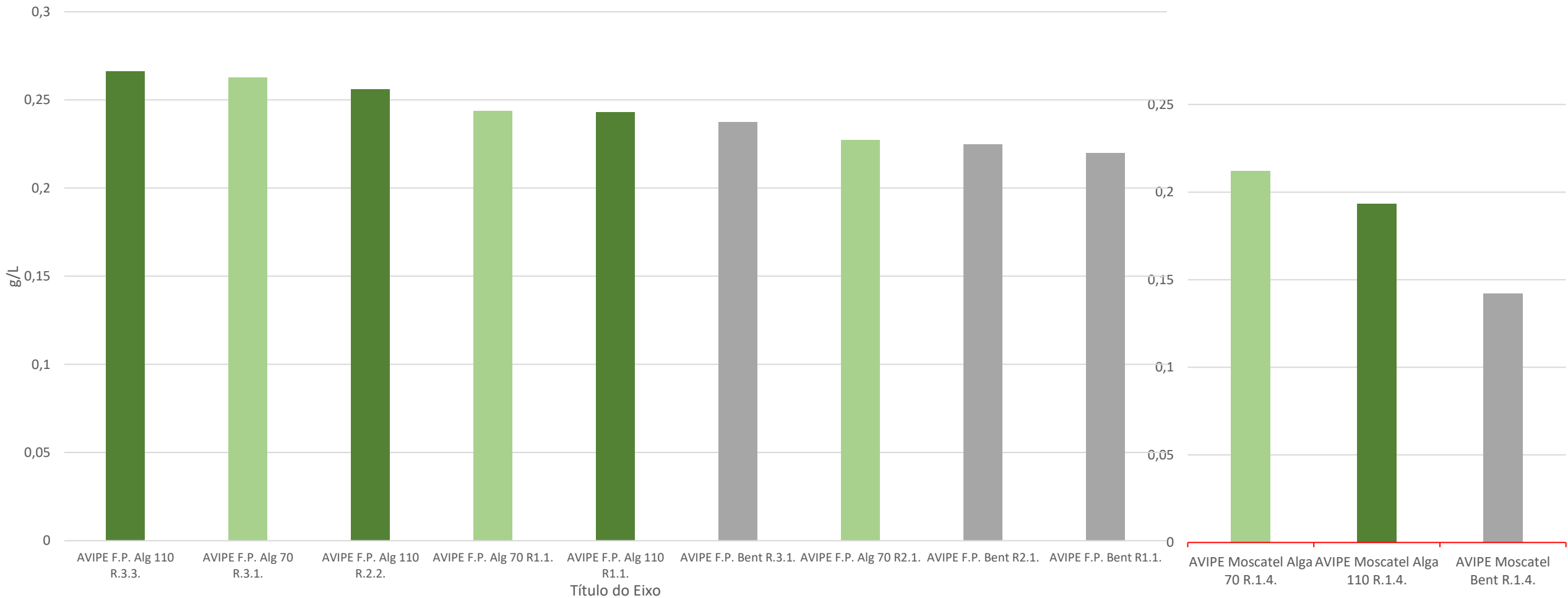
Anti-oxidant?



Anti-oxidant?

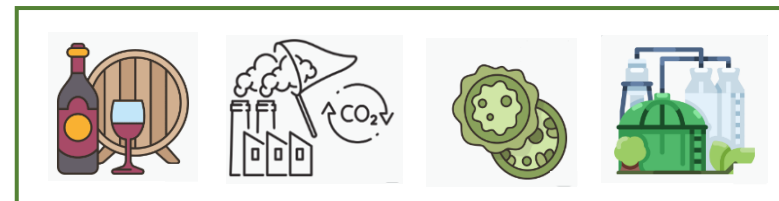


Total polyphenol content

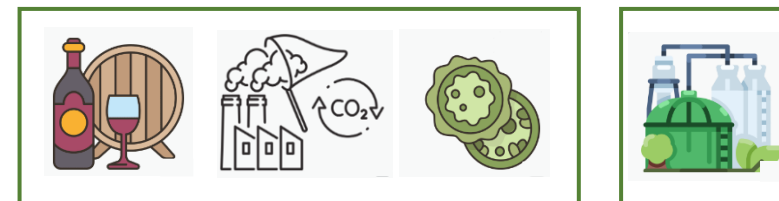


Conclusions

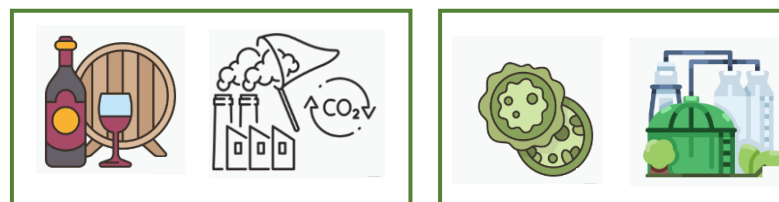
1. Winery Implementing Integrated REDWine Solution



2. Centralised Biorefinery



3. Centralised Microalgae Production & Biorefinery (Bio-hub)



Example:

6Ml winery spends 1,6 ton of CO2 on bottling stage with costs up to 11 400€



Take a minute to evaluate our lecture!

AGRIMA / WP2 - Innovation in
teaching and learning: waste
valorisation



Also available here:

<https://forms.office.com/e/9RbHaZfiMG>



Funded by
the European Union

Erasmus+

Enriching lives, opening minds.

Higher education

erasmus+
PORTUGAL EDUCAÇÃO E FORMAÇÃO

www2.isep.ipp.pt/agrima

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Portuguese National Agency for Erasmus+, Education and Training (PNA). Neither the European Union nor the PNA can be held responsible for them.