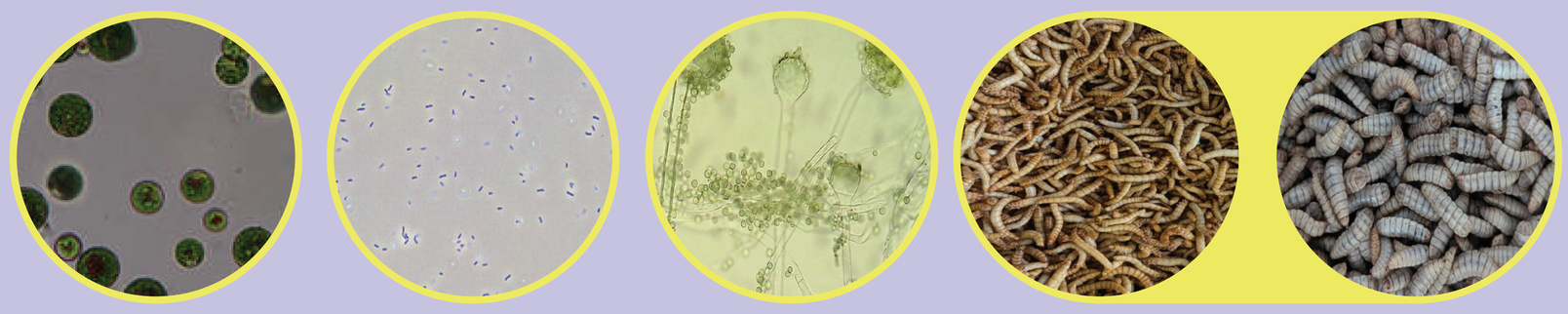
ADVANCED EXTRACTION TECHNIQUES FOR SINGLE-CELL AND INSECT PROTEINS: ULTRASOUND AND HIGH-SHEAR HOMOGENIZATION

Carlota Peral-Diez, Silvia Quintela-Antolinez, Thomas Dietrich
TECNALIA, Basque Research and Technology Alliance (BRTA), Parque Tecnológico de Álava, Leonardo Da Vinci, 11, 01510 Miñano – Araba, Spain

Introduction

InnoProtein tackles the urgent need for new and sustainable protein sources with high nutritional quality, healthy and functional properties for food, feed, and non-food biobased applications with a circular and zero waste approach.

Single-cell $ Insect



Haematococcus — **Microalgae**
Methylotrophic — **Bacteria**
Aspergillus oryzae — **Fungal**
Tenebrio molitor, *Hermetia illucens* — **Insect**

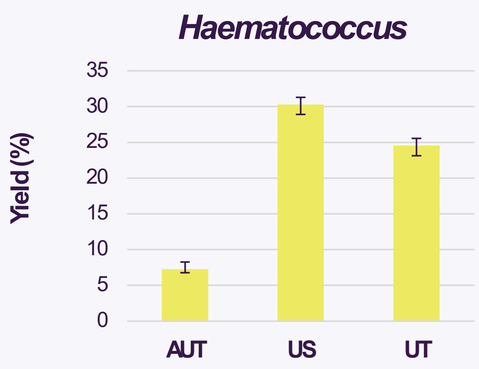
Methodology

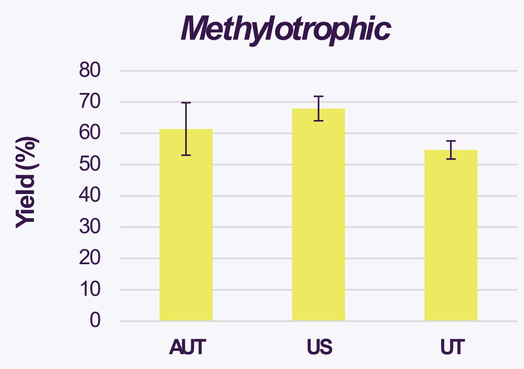
- AT Autolysis
- US Ultrasound
- UT High-shear homogenization

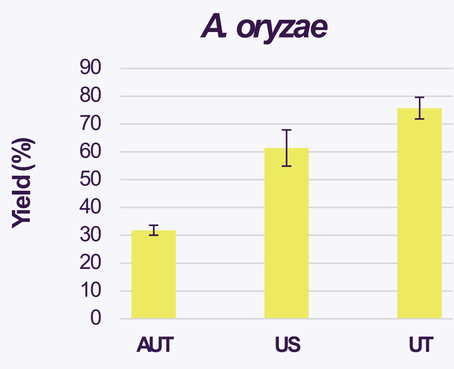
Protein extraction

		MA	BA	FU	IN	
					TM	HI
		Pre-treatment				
2x saline wash (0.9% NaCl)		√	-	-	-	-
Defatted		-	-	-	√	√
		Extraction				
AUT (MA, BA & FU) / CTRL (IN)	pH	10	10	9	10	10
	Ratio	1:10	1:10	1:10	1:10	1:10
	Temperature (ºC)	Room	Room	Room	Room	Room
	Stirring	Continuous	Continuous	Continuous	Continuo us	Continuo us
	Time (min)	120	120	60	60	60
US	pH	12	13	10	10	10
	Ratio	1:20	1:20	1:20	1:20	1:20
	Temperature (ºC)	< 40	< 40	< 40	< 40	< 40
	Frecuency (KHz)	20	20	20	20	20
	Amplitude (%)	60	60	60	60	60
	Time (min)	30	30	30	30	30
UT	pH	12	13	11	10	10
	Ratio	1:20	1:20	1:20	1:20	1:20
	Temperature (ºC)	10	10	10	10	10
	Speed (rpm)	8,000	8,000	8,000	8,000	8,000
	Time (min)	30	30	30	30	30

Results

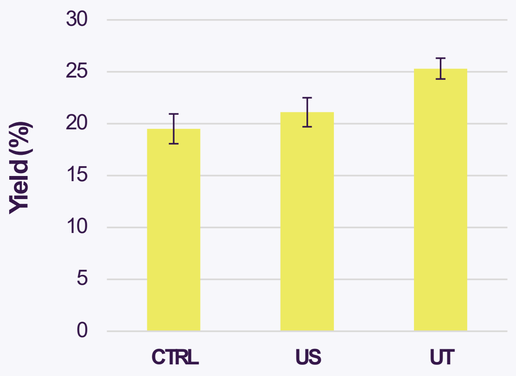


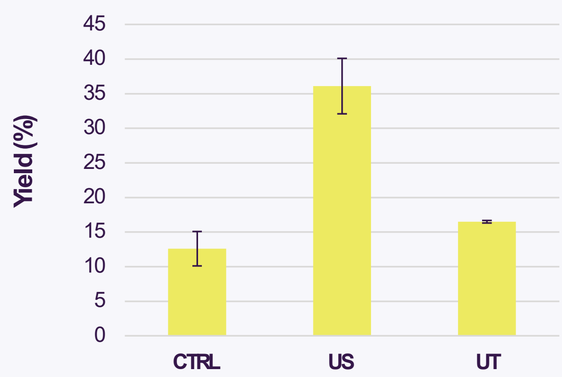




Conclusion

Ultrasound-assisted (US) technology consistently enhances protein extraction across all microbial and insect sources. However, high-shear mixing (UT) yielded superior results and represents the most viable option for industrial scale-up due to its greater scalability





inno protein
Co-funded by the European Union
Bio-based Industries Consortium
Circular Bio-based Europe Joint Undertaking