

## Asistencia a cursos/seminarios/workshops relacionados con la temática del Proyecto AGROALNEXT\_2022

<b>Lugar</b>	Palacio de Congresos Valencia
<b>Fecha</b>	6-8 Noviembre 2023
<b>Lugar</b>	Valencia
<b>Proyecto:</b>	SENSWINE
<b>Código proyecto</b>	AGROALNEXT_2022/021
<b>Grupo de investigación</b>	 

### INFORME DE LA ACTIVIDAD:

Durante los días del 6 al 8 de Noviembre, la Dra Amparo Querol y Lainy Ramírez-Aroca, asistieron al 37th EFFOST International Conference, donde presentaron en un póster con los resultados del proyecto SENSWINE (AGROALNEXT\_2022/021).

### Development of intelligent and predictive sensors for rapid wine quality monitoring

Lainy Ramírez-Aroca, Romain Minebois, Vicente Ferreira, Amparo Querol

### Evidencia de la actividad:

**P2.2.083**

2. New food product development from risk assessment to technical food

Lary Ramiro Araco

## Development of intelligent and predictive sensors for rapid wine quality monitoring

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**GENERALITAT VALENCIANA**  
Conselleria d'Innovació, Universitats, Ciència i Societat Digital

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### Introduction

The wine industry has undergone a significant revolution in recent years but still faces new challenges to improve the sector's competitiveness.

Demand for wine with high aromatic complexity and better sensory profile

Increase in yields to double change

Change in pH and grape characteristics

Aroma development (more average efficient processes)

The monitoring of wine quality along the entire elaboration process is a complex. In this aspect, it is proposed the intelligent and predictive sensors for the rapid monitoring of fermentative by-products (e.g. organic acids, aromas, ethanol) influencing wine quality during grape must fermentation, combining low-cost hardware sensors with predictive models of yeast metabolism could be a solution. Our first objective is the physiological and metabolic characterization of yeasts of industrial interest through laboratory-scale fermentations and determination of quality factors using different nitrogen additions.

### Materials and Methods

#### Study strains

IONYS: *S. cerevisiae*  
 QALSS: Most widely used commercial yeast  
 SAUVY: Thiol production (*S. cerevisiae*)  
 Vallata Evolution: *S. cerevisiae* x *S. uvarum*  
 DPI and DPI+: Thiol production. Yeast developed in the laboratory (*S. cerevisiae* x *S. kudryzsevi*)

#### Fermentation conditions

**Synthetic must (SM):**  
 - Glucose (Fructose) 210 g/L  
 - YAN 150 mg/L  
 - Thiol precursors 40 µg/L  
 - 18 °C, 220 rpm, 200 mL  
 - 7 sampling times

**Homemade supplementation at 1/3 of fermentation:**  
 - Organic nitrogen 40 g/L (Amino acids) or  
 - Inorganic nitrogen 30 g/L (NH<sub>4</sub>Cl)

**Conditions:** Control, Amino acids and Nitrogen

**Compounds analysed:**  
 HPLC - Non-volatiles compounds  
 GC-MS - Polyfunctional mercaptans (Thiols)

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### Results

#### Fermentations

Supplementation of 1/3 of the fermentation with inorganic nitrogen allows fermentation to finish earlier compared to the control and the addition of organic nitrogen. Furthermore, the kinetics of some yeasts change with supplementation.

#### Polyfunctional mercaptans (Thiols)

The yeast **IONYS** produces maximum levels of 3-mercaptohexanol and 3-mercaptoethyl acetate. DPI has exceptionally high levels of 4-mercapto-4-methyl-2-pentanone - which in this aromatic context is of major sensory importance - and discrete levels of 3-mercaptohexanol and 3-mercaptoethyl acetate. DPI+ has very high levels of 3-mercaptoethyl acetate and 3-mercaptohexanol. Vallata Evolution is the least active followed by SAUVY. QALSS gives the most distinct aroma, because it has low levels of 4-mercapto-4-methyl-2-pentanone and medium-high levels of 3-mercaptoethyl acetate and 3-mercaptohexanol.

#### Alcohols and acids

IONYS and Vallata Evolution strains produce more glycerol, while ethanol production increases between 0.2 - 1% (v/v) in all strains. Regarding the acids produced during fermentation, the differences in some strains are significant, whereby the Vallata Evolution strain stands out for the higher production of acetic acid and succinic acid in the control condition. DPI and DPI+ strains show high production of acetic acid and lactic acid with the addition of nitrogen, in all strains, lactic acid production increases with the addition of inorganic nitrogen.

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### Conclusion

- The addition of nitrogen reduces the fermentation time and improves the production of non-volatile compounds.
- The stationary phase is reached earlier with the addition of inorganic nitrogen, but less fermentation aroma are produced.
- Supplementation with organic nitrogen (amino acids) produces high levels of polyfunctional mercaptans.
- Although SAUVY is commercialized as a higher thiol producer, IONYS and the two hybrids (*S. cerevisiae* x *S. kudryzsevi*) - DPI and DPI+ developed in the IATA-lab, are the higher thiol producers.

### Acknowledgments

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### References

Ferrer V, Ouellet M, Pérez-Través L, Herrero JM, Gullón JM, Ferrerite V, Querol A. Generation of intra- and interspecific *Saccharomyces* hybrids with improved oenological and aromatic properties. *Microb Biotechnol*. 2022 Aug;14(8):2246-2260. doi:10.1111/1751-7717.14606.

Mateo-Vicario I, Zapata J, Cacho J, Ferrerite V. Analysis, occurrence, and potential sensory significance of five polyfunctional mercaptans in white wines. *J Agric Food Chem*. 2019 Sep;22(8):1810-1847. doi:10.1021/acs.jafc.9b0954.

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La Dra. Querol fue invitada a dar una conferencia el 6 en EFFoST, se incluye la evidencia



Y para que conste a los efectos oportunos

Firma del IP1.