

## Development of a system to remove TCA from cork stoppers using adsorbents and biosorbents

### Summary

The manufacture of stoppers is currently the application with the highest added value for cork as a raw material with 98% of the Catalan cork sector's revenue coming from the manufacture of corks for still wines and sparkling wines. The industry has a turnover of almost €230 million, has an export level of around 50% and employs more than 1200 people.

Given that it is a high-quality product, the challenge is to remove sensory deviations in order to comply with requirements of the wineries and stave off the threat of alternative stoppers. These alternative stoppers have consolidated their position in the market, mainly due to the controversy generated around the presence of haloanisoles (like TCA) and other volatile compounds which may be present in the cork and affect the bouquet of the wine. This has forced the cork sector to implement technologies for the detection and/or removal of these aromatic compounds.

There are currently systems to remove aromas in the market, but they are mainly aimed at cork granules, not bottle corks, given that they are 'aggressive' elimination systems that may affect the cellular structure of the material.

The proposed system is based on the use of adsorbents and biosorbents with the aim of retaining the aromas extracted in the various cork production stages.

The innovation developed in the project has an impact on productivity and sustainability levels both territorially and in the winemaking and cork industries in general.

### Objectives

The objective of the project was to develop an innovative system to remove aromas from cork stoppers based on a combination of various adsorbent and biosorbent materials. Achieving this objective helps to improve the competitiveness of cork companies, foster the use of natural and renewable products such as cork stoppers and address the competition from alternative stoppers by reducing the problem of aromas associated with corks.

### Description of the actions carried out in the project

ACTION 1. Assessment of the effectiveness of different adsorbents and biosorbents.

ACTION 2. Selection of cork production processes where the removal system will be applied. One process for each company.

ACTION 3. Design and manufacture of the removal system. This action depends on the materials selected in action 1 and the processes selected in action 2.

ACTION 4. Monitoring of the removal system and assessment of the best conditions for the removal of volatile compounds from cork samples. Creation of an operational protocol for the prototype. ACTION 5. Dissemination of the results.

### Final results and practical recommendations

The end result of the project is two aroma removal systems, one for the natural cork stopper manufacturing process and the other for the agglomerated cork stopper manufacturing process with two discs for sparkling wine in liquid and steam conditions.

A mixture of natural biosorbents was obtained that captures 50-95% of haloanisoles under laboratory conditions. This capture system is based on adsorbent compounds with a greater affinity for aromas than cork, enabling an increase in their removal without supposing major changes to the systems currently used by the companies.

The following practical recommendations may be drawn from the project:

- Recovered activated carbons are a good option for the removal of defective aromatic compounds present in corks.
- The selected materials can be applied in both aqueous and dry environments.
- The materials have a shelf life of more than six months.
- Application of these compounds in company extraction systems improves their efficiency.

### Conclusions

The following conclusions may be drawn from the project:

- There is significant potential for removing unwanted aromas in corks by using biosorbents at different points in the production process, adapted to the needs of each company.
- It is worth exploring the design of biosorbent containment prototypes to solve the challenge of biosorbent containment without limiting their adsorption properties.

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**Subject area(s) of application**

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|-------------------------------------|---|
| <input type="checkbox"/>            | Agricultural production system                                |
| <input type="checkbox"/>            | Agricultural practice   |
| <input type="checkbox"/>            | Agricultural equipment and machinery                          |
| <input type="checkbox"/>            | Livestock farming and animal welfare                          |
| <input type="checkbox"/>            | Vegetable production and horticulture                         |
| <input type="checkbox"/>            | Landscape / Territorial management                            |
| <input type="checkbox"/>            | Pest and disease control                                      |
| <input type="checkbox"/>            | Fertilisation and nutrient management                         |
| <input type="checkbox"/>            | Soil management   |
| <input type="checkbox"/>            | Genetic resources   |
| <input type="checkbox"/>            | Forestry  |
| <input type="checkbox"/>            | Water management  |
| <input type="checkbox"/>            | Climate and Climate Change                                    |
| <input type="checkbox"/>            | Energy management   |
| <input checked="" type="checkbox"/> | Waste and by-product management                               |
| <input type="checkbox"/>            | Biodiversity and environmental management                     |
| <input checked="" type="checkbox"/> | Food quality/processing and nutrition                         |
| <input checked="" type="checkbox"/> | Supply chain, marketing and consumption                       |
| <input type="checkbox"/>            | Competitiveness and agricultural and forestry diversification |
| <input type="checkbox"/>            | General   |

**Geographical area(s) of application**

PROVINCE(S)	REGION(S)
Girona	Baix Empordà and Gironès

**Dissemination of the project (publications, seminars, multimedia, etc.)**

The project has been disseminated mainly through the coordinating body (Catalan Cork Institute Foundation) and the following actions have been carried out, among others:

1. Web portal of the participating companies and the research centre:  
<https://www.icsuro.com/projectes/sistema-deliminacio-dhaloanisols-tca-i-altres-aromes-defectuosos/>
2. Dissemination on @ICSuro social media (Twitter, LinkedIn and Facebook)
3. ICSuro article and newsletter: <https://www.icsuro.com/la-bioabsorcio-daromes-suro/>

4. Writing of a scientific article titled "Simultaneous determination of eleven off-flavors in wine and cork stoppers by SPME-GC-MSMS" which is pending publication.
5. Writing of a scientific article titled "Assessment of diffuse uptake rates of haloanisoles, MIB and geosmin and determination of them in ambient air using thermal desorption gas chromatography coupled to mass spectrometry" which is pending publication.

### Project website

<https://www.icsuro.com/projectes/sistema-delimitacio-dhaloanisols-tca-i-altres-aromes-defectuosos/>

### More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): June 2018	Total budget: €140,980.00
Completion date (month-year): September 2020	DARP funding: €57,615.60
Current status: Executed	EU funding: €43,464.40
	Own funding: €39,900.00

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*Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1868/2017, of 20 June, announcing the call for the grant.*



Generalitat de Catalunya  
Departament d'Agricultura,  
Ramaderia, Pesca i Alimentació



Fons Europeu Agrícola  
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