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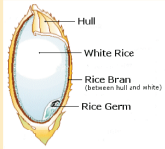
### Objective

The aim of our project is to biotechnologically produce xylanase in order to provide the whole Spanish bakery industry. Our process is designed to be part of a Catalan rice company, because the raw material is a lignocellulosic waste produced by this kind of industries. For our calculations and process design we used the software SuperPro Designer.

### The highlights of our process

#### Rice bran

- It is an agricultural waste
- $2.5 \cdot 10^4$  tons are produced every year
- 124 tons a year are needed to provide the Spanish market
- It is the process's main raw material
- It's available with the only cost of transportation



#### Solid-state Fermentation

- Fermentation on a solid moist support
- Rice bran is used as microorganism growth support and as carbon source
- Rotary drum reactor is the optimal equipment for this kind of operation



- The reactor rotates periodically in order to ensure a correct energy and material transport

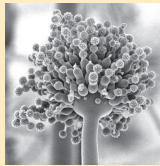
#### Bread

- Xylanase increases the dough strength and makes it more elastic, as a result bread gets a larger volume and improved dough stability
- It is known that 120 FXU is the optimal dosage for each flour kilogram and flour makes for 75% of bread's mass
- In Spain  $2 \cdot 10^6$  bread tones are consumed every year. So 30.6 kg of xylanase are needed to cover this demand.



#### Aspergillus niger

- It is a common aerobic filamentous fungus with a duplication time of 3.26 hours
- The DFR-5 collection strain is used
- It is a natural xylanase producer
- It is considered a GRAS organism by the FDA



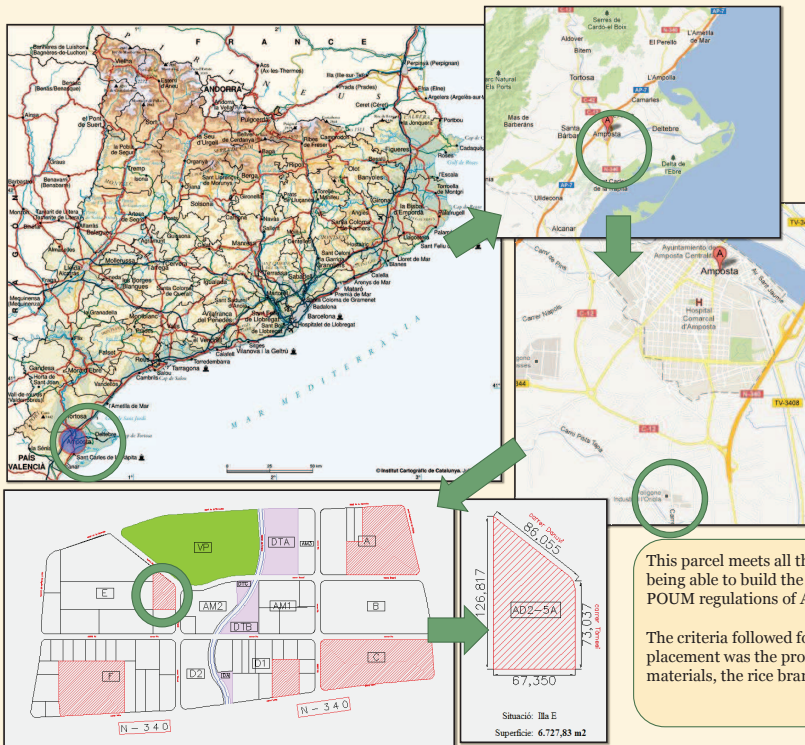
#### Xylanase

- Endo-1,4- $\beta$ -xylanase EC.3.2.1.8
- It is an extracellular enzyme produced by *A. Niger*
- It hydrolyzes the linear polysaccharide xylan, the main component of hemicellulose, into xylose
- Its specific activity is 5850 FXU/mg (Fungal Xylanase Units)



### Location

Our production plant is placed in the industrial area of Oriola, which belongs to the town of Amposta. The parcel is 6727 m<sup>2</sup> with a 60% of allowed occupancy. The industrial area of Oriola is placed in the intersection between "l'Eix de l'Ebre" and the National Road N-340, through which you can connect directly with AP-7. This is a very suitable emplacement due to its closeness to a capital city like is Amposta and its well communicated situation. Another reason to set up the plant in Amposta is the fact that our mother company is settled in this same town.



This parcel meets all the requirements for being able to build the plant following the POUM regulations of Amposta.

The criteria followed for the election of the placement was the proximity of the raw materials, the rice bran.

### Layout

The plant has been designed to meet the needs of the process and to accommodate the staff who works on it. A previous study regarding organization criteria was done in order to ensure a correct approach. Considerations such as the width of the corridors, the space between equipment, the size of the storage room and facilities needed for the operators to work in the plant, were taken.



- Storage
- Upstream
- Bioreactor
- Downstream
- Staff only area
- Common area
- 1 Production area
- 2 Repository
- 3 Engine room
- 4 Quality control lab
- 5 Maintenance
- 6 Loading dock
- 7 Locker room
- 8 Dining room
- 9 Offices