

PRELIMINARY RESULTS ON PRETREATMENT ON MACROPHYTE WETLAND BIOMASSES TO OBTAIN SECOND GENERATION ETHANOL

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This research in progress is studying new potential wetland plants irrigated with wastewater to obtain second generation ethanol, which could be an interesting opportunity of the reuse of poor quality waters and the development of the marginal areas.

The agronomic activities took place in two Italian University experimental fields, one in the north (Veneto Region) and one in the south (Sicily Region). The following 19 species were considered: *Acorus calamus* L., *Arundo donax* L., *Canna indica* L., *Carex elata* All., *Cyperus longus* L., *Cyperus papyrus* L., *Glyceria maxima* (Hartm.) Holmb., *Iris pseudacorus* L., *Juncus effusus* L., *Lythrum salicaria* L., *Miscanthus x Giganteus* Greef et Deu., *Phalaris arundinacea* L., *Phragmites australis* (Trin.) Cav., *Scirpus sylvaticus* L., *Sorghum bicolor* (L.) Moench *Symphytum officinale asperrimum* L., *Thalia dealbata* Fraser ex Roscoe, *Typha latifolia* L., *Vetiveria zizanioides* (L.) Nash. After the harvest dried samples of both location have been sent to the ENEA laboratory, which characterized each specie in terms of elements (C, N,S and O) and fiber (hemicellulose, cellulose and lignin) in order to find the best potential ethanol producers. The laboratory also carried out a three-step chemical pretreatment to solubilize most of hemicellulose and make the biomass more accessible to following enzymatic reactions and solubilize most of the lignin. First the biomasses were treated with hot diluted acid (H₂SO₄ 2%, T=80°C, t=24h), secondly with diluted NaOH (1%) at 40°C for 24h, finally concentrated H₂O₂ was added until the 1% concentration at t=25°C for 24h. After the chemical pretreatment until the 90% of cellulose was recovered and the 80% of lignin was solubilised. This pretreated material was then hydrolysed with a mix of commercial enzymes (Celluclast 1.5L and Novozym 188) for 72h and afterwards fermented for 24h by means of strain of *Saccharomyces cerevisiae* isolated in the ENEA laboratories. In the end for each studied plant the theoretical ethanol productivity percentage was calculated.