J Biotechnol Biomater 2015, 5:2
http://dx.doi.org/10.4172/2155-9597.C1.014

OMICS International
conferenceseries.com

9th Biotechnology Congress

August 31-September 02, 2015 Orlando,Florida, USA

Bioecomaterials from Spanish agri-residues

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The research groups presenting this work are carrying out research on the transformation of agri residues into biomaterials for several applications in biomedicine like design of scaffolds for tissue engineering supports for enzymatic processes, materials with textural properties capable to slow desorption of drugs, etc. Several industries collaborate in this approach, since using residues with proper design can decrease the use of raw materials which are expensive and not renewable. Also, the use of residues *in situ* avoids the need for transportation, this lowering energy expenditure. Results obtained up till now with residues from beer, rice and sunflower oil production are included in this summary, regarding several projects supporting this research.

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Callus induction, regeneration and *agrobacterium*-mediated transformation of *Wolffia arrhiza* to obtain plant-producer of therapeutic proteins

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Vaccines creation based on transgenic plants may be considered as a groundbreaking technology in modern vaccinology with the advantages as compared to bacterial and yeast systems such as the lack of common human and animal pathogens and high level expression of heterologous proteins. To date the development of tissue culture systems in duckweeds is limited to species of the genus *Lemna* and *Spirodella*. Yet more promising target for biopharming is *Wolffia arrhiza* as an object for submerged cultivation in a fermenter. We have developed a two-step procedure of callus induction in *Wolffia*. At the first stage cluster structures are induced in the presence of 2,4-D and BA during 16 weeks. At the second stage BA in the medium for callus induction is replaced by PCL over a period of 4 weeks. The created protocols for callus induction and regeneration allow achieving not only the high efficiency at each stage but also proceeding to the development of a protocol for *Wolffia arrhiza* stable transformation. The most efficient transgenesis and selection of the transgenic lines occur in the presence of hygromycin B. The successful transformation requires the presence both of 2,4-D and BA in the cultivation medium within 15 days. As a result of investigations 84 transgenic lines of *Wolffia* harboring both reporter [gfp (1 lines) and gus(3 lines)] and target [desulfatohirudin-1 (46 lines) and granulocyte colony-stimulating factor (34 lines)] genes were obtained. Integration of heterologous DNA was proved by molecular-biological analyzes (PCR and Southern blot analyzes). Expression of recombinant protein was confirmed by Western blot assay and ELISA.

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