Investigation of sodium lignosulfonate on lipid production by yeast *Rhodosporidium toruloides* growing on crude glycerol and xylose in batch and fed-batch cultures

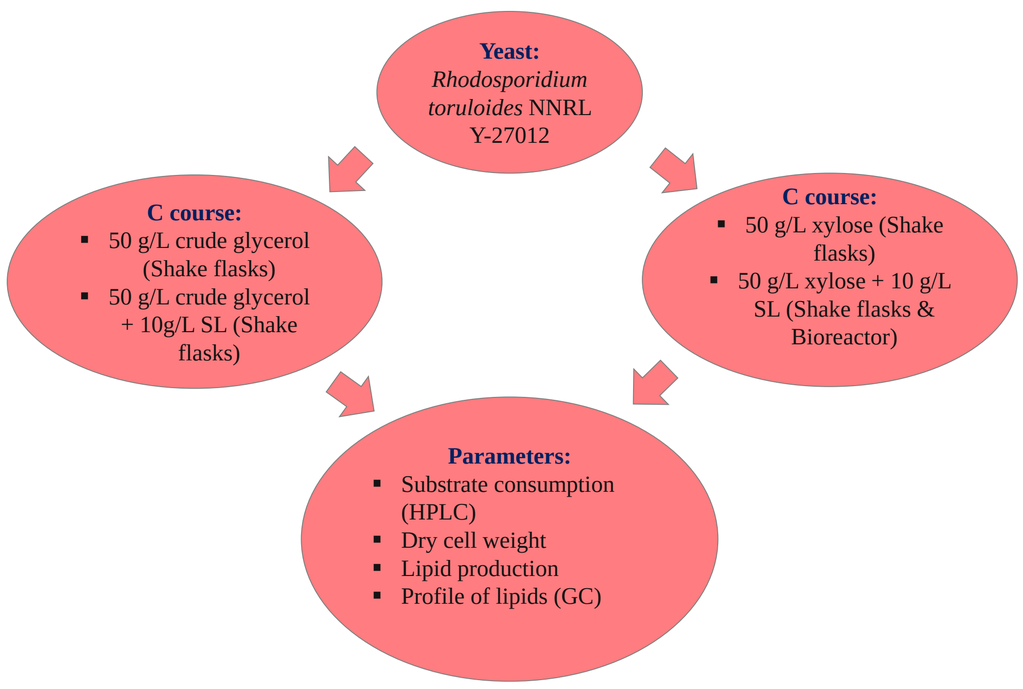
Savvoula Michou, Eleni–Stavroula Vastaroucha and Seraphim Papanikolaou

Agricultural University of Athens, Department of Food Science and Human Nutrition , Laboratory of Food Microbiology & Biotechnology, Athens Greece

Abstract:

Yeast lipids present increasing interest as alternative non-food feedstocks for biodiesel production, therefore, this study was focused on enhancing lipid production by the strain of yeast *Rhodosporidium toruloides* NRRL Y-27012. Fermentations were carried out using 50 g/L of different carbon sources. Xylose-based media was used because it mimics the principal waste-stream originated from paper production facilities (*viz*. the spent-sulfite liquor) and crude glycerol, the main by-product of the industrial production of biodiesel. The effect of sodium lignosulfonate (SL), a paper industry by-product, on cell growth and lipid production by the yeast cultivated on xylose-based media was explored. The oleaginous yeast was shake-flask cultured under nitrogen-limited conditions using xylose and SL with concentration of 10 g/L. Fermentation of the strain NRRL Y-27012 was further carried out in a fed-batch bioreactor with SL addition.

Materials and Methods



Results:

Maximum lipid production of 5.30 g/L by the strain NRRL Y-27012 was obtained after the addition of 10 g/L SL while in the fermentation without SL the value of lipids was lower (2.21 g/L). In fed-batch bioreactor experiments carried out with the strain NRRL Y-27012, lipid production of 17.0 g/L (corresponding to 29.7 g/L dry biomass) was achieved. The yield of lipid produced per unit of xylose consumed was approx. 0.19 g/g. When the strain NRRL Y-27012 was cultured in crude glycerol-based media the produced intracellular lipid was up to 8.23 g/L, while the addition of 10 g/L SL did not have a significant effect (8.78 g/L). The composition of the produced lipids was analyzed using gas chromatography (GC), and revealed increased concentrations of oleic acid.

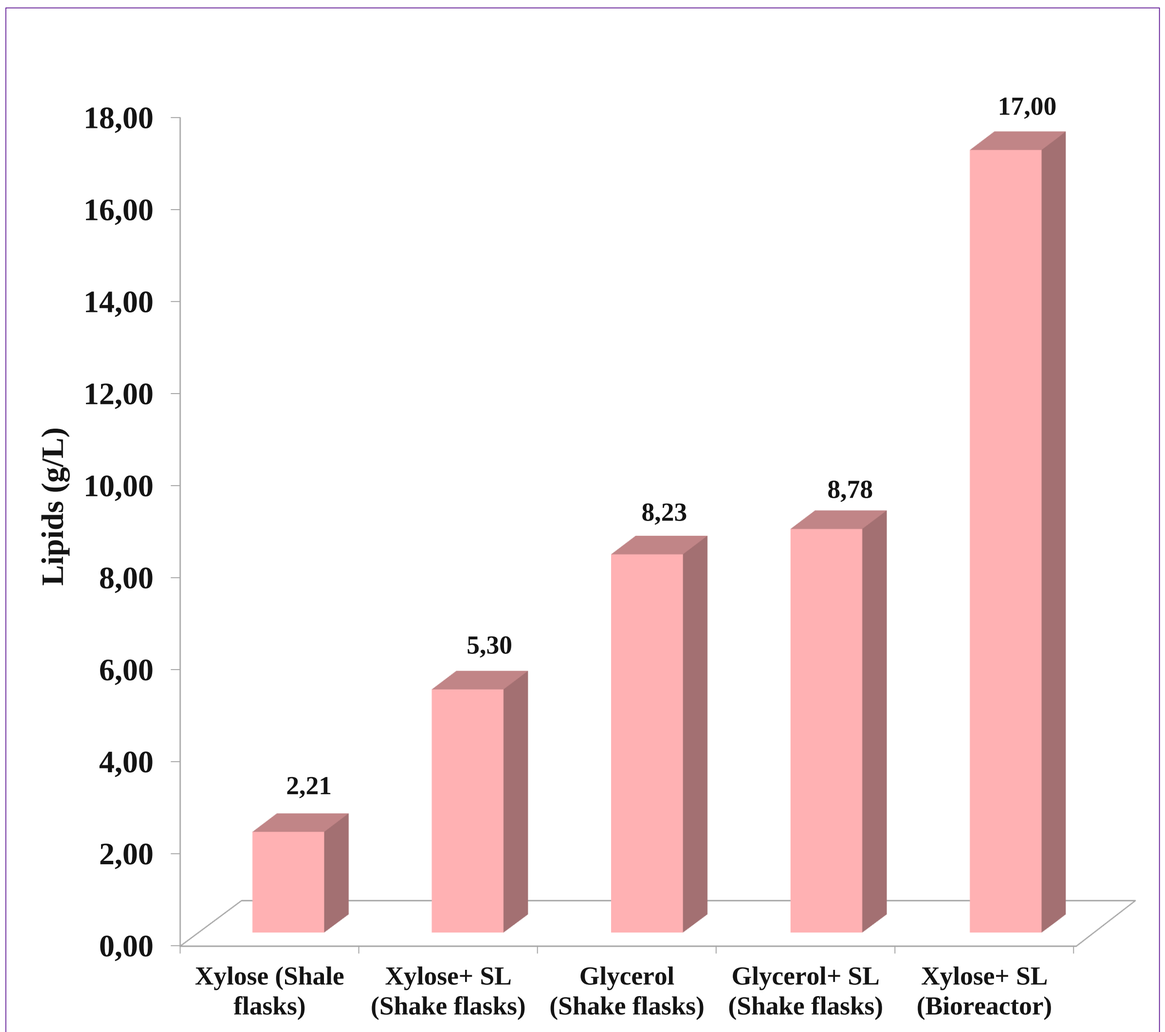


Figure: Maximum values of microbial lipid (g/L) production by oleaginous yeast *Rhodosporidium toruloides NRRL Y-27012* growing on several substrates.

Discussion/ Conclusions:

The findings in this study showed that the yeast can produce high amount of lipids rich in oleic acid, constituting perfect materials amenable to be converted into "2nd generation" biodiesel using low cost substrates.

Bibliography

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