

Process for the production of lipids from biomass including at least one polysaccharide comprising:

- subjecting said biomass to hydrolysis to obtain a mixture comprising a first solid phase and a first aqueous phase;
- preparing an inoculum comprising at least one oleaginous microorganism in a first fermentation device to obtain a first fermentation broth;
- feeding said first aqueous phase and said first fermentation broth to a second fermentation device to obtain a second fermentation broth;
- subjecting at least a portion of said second fermentation broth to microfiltration to obtain a first retentate and a first permeate;
- feeding said first retentate to said second fermentation device;
- subjecting said first permeate to a purification treatment to obtain a second permeate and a second retentate;
- feeding said second retentate to said second fermentation device;
- at the end of said fermentation, subjecting said second fermentation broth to separation to obtain an aqueous suspension of oleaginous cellular biomass comprising lipids and a second aqueous phase. The lipids thus obtained can advantageously be used in the production of biofuels.