

Figure 1.- Complete configuration (C) for the extrusion of barley straw in the twin-screw extruder. Inputs, outputs, screw profile and reaction and neutralization zones are shown. T: transport effect, M: mixing effect; S: shearing effect.

Figure 2.- Filtered configuration (F) for the extrusion of barley straw in the twin-screw extruder. Inputs, outputs, screw profile and reaction and neutralization zones are shown. T: transport effect, M: mixing effect; S: shearing effect.

Figure 3.- Enzymatic hydrolysis yields in % of theoretical glucan (A) and xylan (B) at 24 and 48h on BS extrudates produced in different configurations and R levels. C = complete extrudates; F = filtered extrudates; 6, 8 and 10 - g NaOH/100g dry BS

Figure 4.- Ethanol yield (in % of theoretical) at 48, 72 and 96h of incubation, on filtered extrudate at 8% R, submitted to LSSF at 2.5, 15 and 20% (w/v) solids loading

Figure 5.- Ethanol production (in g/l) at 48, 72 and 96h of incubation of filtered extrudate at 8% R, submitted to LSSF at 2.5, 15 and 20% (w/v) solids loading

Figure 6.- Mass balance of 1 kg of barley straw (BS) pretreated by alkaline extrusion plus neutralization and subsequent LSSF to ethanol