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Yeast biofilm development and rheological properties development on turbulent flow regimes

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In food processing lines or in complex equipment, microorganisms are exposed to varying hydrodynamic conditions caused by the flow of liquid food and biofilms grown under a wide distribution of hydrodynamic strengths. Using industrially relevant strains of yeasts, it was demonstrated that biofilms formed on stainless steel at Reynolds (Re) numbers ranging from 294,000 to 1.2×106. These growth phases transform adherent blastospores to well-defined cellular communities encased in an extracellular matrix and biofilm formation increases when increasing Re number and time. *In situ* rheological behavior of yeast biofilms growing on stainless steel under turbulent flow was also investigated. The species used (*R. mucilaginosa, C. krusei, C. kefyr and C. tropicalis*) were isolated from a clarified apple juice industry. The flow conditions impacted biofilm composition over time with a predominance of *C. krusei* under static and turbulent flow. Structural variations occurred with a tighter appearance under dynamic flow. Under turbulent flow there was an increase of 112 µm in biofilm thickness and cell morphology was governed by hyphal structures and rounded cells. Yeast biofilms were determined to be viscoelastic materials with a predominantly solid-like behavior and rheological values were not significantly affected by the flow conditions or the growth time. At large deformations their weak structure collapsed beyond a critical strain. The present work could represent a starting point for developing *in situ* measurements of yeast rheology and contribute to a thin body of knowledge about fungal biofilm formation.

Biography

Jorge Enrique Lozano has completed his PhD in Chemical Engineering in 1988. He is a full Professor in Food Engineering and a Member of the National Science and Technology Council of Argentina. He published more than 80 papers in reputed journals, two books and several chapters on food science and technology. He also serves as an Editorial Board Member of the *Journal of Food Process Engineering* (since 1998) and the *Food Engineering Reviews* (Since 2008).

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