



RHEOLOGIC STUDY OF PLANT CELL SUSPENSION CULTURE

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Introduction. Plant cell culture represents an important production platform for secondary metabolites and recombinant proteins with therapeutic properties (1). The presence of agglomerates, the complex morphology and the need to reach high density cell results in a non-Newtonian behavior of these cultures. The knowledge of cell culture rheology contributes to set up the best mass transfer and mixing conditions for these cultures. In this work we studied the rheological behavior of *Azadirachta indica* (Neem), *Thevetia peruviana* (Adelfa amarilla) and *Borojoa patinoi* (Borojó) suspensions to predict mixing conditions in shake flasks.

Methodology. The three plant species were cultivated in shake flasks and samples were analyzed at different cell concentrations (X) in Brookfield RV rheometer with a controlled shear rate test from 0 to 300 s⁻¹. Rheograms were made and the parameters for Casson and Power Law models were determined. Finally, the Phase numbers (Ph) of shake flasks were calculated (2).

Results.

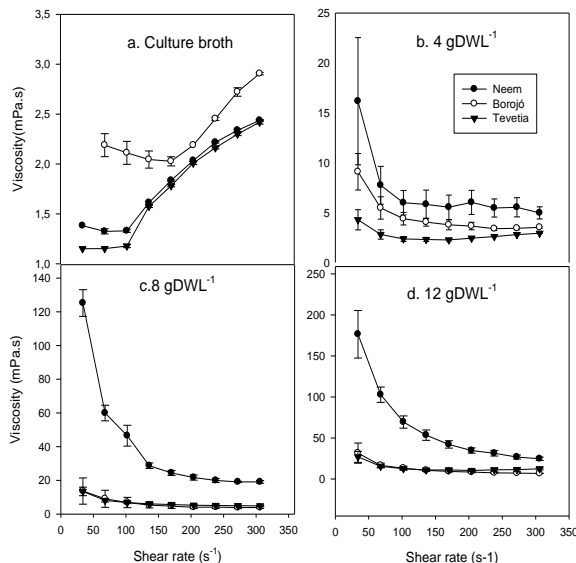


Figure 1. Apparent viscosity (mPa.s) vs. shear rate (s⁻¹) for *A. indica*, *B. patinoi* and *T. Peruviana*

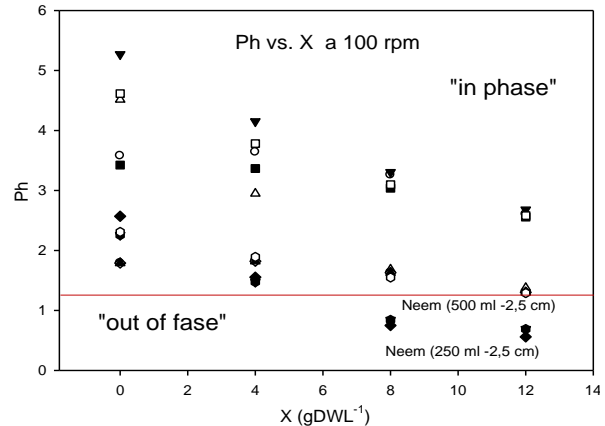


Figure 2. Ph number vs. Cell concentration (g DWL⁻¹) for *A. indica*, *B. patinoi* and *T. peruviana*. 100 rpm and 5 cm and 2.5 cm shaker diameters.

“Out phase phenomenon” which occurs at phase numbers below 1.26, was found for *A. indica* culture conditions, meaning that the liquid cannot follow the shaking movement and remains on the flask base with little motion, reducing mass transfer (3).

Conclusions. The three plant species present a pseudo-plastic behavior and dilatant broth. At high cell concentrations a bigger distance to the Newtonian behavior is seen, the suspension consistency, the initial flow resistance and the plastic viscosity are similar between Borojó and Adelfa, being Neem notably different due to its tendency to form agglomerates. “Out of phase” state is found in Neem cultures at cell concentration higher than 8 g DW L⁻¹ with shaking diameters of 2.5 and 5 cm.

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