Abstract

Performance of a mechanical demucilaging machine developed at CENICAFE, Colombia was evaluated. Theoretical models to estimate power consumption and average shear rate applied by rotating bars during the demucilaging of depulped coffee beans (Colombia and Caturra varieties) using a prototype developed at CENICAFE (called MRM-CENICAFE B model) were derived from the flow motion analysis of rotating disks in an infinite medium (depulped coffee beans-mucilage suspensions). The fundamental approach proposed by Karman (1921) to simplify the Navier-Stokes equations was used. At high average shear rate values applied by the MRM-CENICAFE B, suspensions behave like a Newtonian fluid, due to the tendency for alignment of coffee beans with the tangential direction of the flow field. Therefore, theoretical analysis was performed assuming the suspensions to be a Newtonian fluid. An apparent viscosity for suspensions at the second Newtonian plateau was used for predicting power and average shear rate. Good agreement between theoretical and experimental values of power and average shear rate were noted.

Rheological behavior of depulped coffee beans-mucilage suspensions (Colombia and Caturra) in the range of concentration 32 to 44% (v/v) and shear rate 0 to 100 s^{-1} at two different content of ripe coffee cherries (RCC), 75 and 100% and two postharvest conditions (PC), depulped and parchment, was evaluated. Concentration, followed by the PC, has the highest effect on the consistency index (K_{rms}) and flow behavior index (n_{rms}). No significant effect of RCC and variety on K_{rms} and n_{rms} was observed. In the experimental range considered, Mooney's model adapted for non-Newtonian fluids fitted well the experimental data of relative viscosity and concentration at different shear rates.