

ABSTRACT

An Aloe vera gel filleting machine was designed and developed. The filleting process comprised of manual trimming and feeding the leaves facing tip side to a set of rollers, where the removal of gel fillet, upper and lower rind takes place simultaneously through a pair of filleting blades. Optimization of machine and leaf parameters for efficient gel filleting was performed by artificial neural network and genetic algorithms modelling. The optimum values of independent variables *viz.*, blade angle, roller speed, leaf length, leaf width at base and leaf thickness at tip side were 4°, 63 rpm, 368 mm, 94 mm and 14 mm, respectively.

Desiccant dehumidified air drying characteristics of Aloe vera gel were investigated at temperature range of 40 to 70 °C, relative humidity range of 15 to 30% and air velocity range of 0.5 to 2.0 m.s⁻¹. Response surface methodology was applied to optimize the drying process. The optimized process parameters were temperature: 54 °C, relative humidity: 18% and air velocity: 1.7 m.s⁻¹. Three mathematical models namely, Newton, Page and Henderson-Pabis were evaluated in the kinetics research and the Page model was fitting well to the drying data. The quality parameters of Aloe vera gel powder mainly aloin content and colour were evaluated. The aloin content was found acceptable in all experiments. The specific energy consumption during the drying process was also calculated.

The equilibrium moisture content of desiccant dehumidified air dried Aloe vera gel powder was measured for adsorption at 25, 32 and 39 °C. The experimental data of sorption were fitted into four standard models namely, GAB, Smith, Oswin and Peleg. Results showed that the GAB model was more appropriate for predicting the equilibrium moisture content of Aloe vera gel powder. The net isosteric heat of sorption ranged from 2.23 to 22.16 kJ.mol⁻¹.

The shelf-life of Aloe vera gel powder packed in three different packaging materials *viz.*, laminated aluminum foil (AF), biaxially oriented polypropylene (BOPP) and polypropylene (PP) under accelerated storage condition (38±1°C, 90% RH) was calculated to be 34, 43 and 51 days, respectively. The total colour difference was increased from 4.64 to 22.73 in PP, 1.97 to 19.62 in AF and 7.95 to 25.37 in BOPP.

Key words: Aloe vera; Aloin; Desiccant dehumidified air drying; Gel filleting machine; Moisture sorption; Rehydration; Shelf-life