516d Optimum Technology for Separating Biomaterials from Extracts

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Extracts derived from biomaterials contain a substantial concentration of small, deformable or gelatinous particles that are difficult and costly to separate to the extent necessary in a large-scale operation. Moreover, the commonly low expression of therapeutic proteins in transgenic plants implies processing of solids suspensions at high volumetric rates (40 gpm or higher), yet inefficient separations cannot be tolerated. Micron-sized particles, like cell bodies and plant starch, as well as accompanying colloids formed by naturally occurring oils, must be removed before purification by ultrafiltration or column chromatography because they would foul the membrane or adsorbent and interfere with molecular separations. Bioprocessing has historically relied on centrifugal sedimentation, precoat filtration using vacuum or pressure, and pressure filtration at smaller scale using disposable elements for complete removal of these problem-causing impurities. Centrifugation at high g-force with long residence times can significantly clarify extracts, but the capital expense incurred by such machines and the additional equipment to polish lights and deliquor heavies becomes substantial. Filter aids and disposable filters can achieve complete separation in a single step, but the expense of using such materials can upset the cost-of-goods model, even for valuable biopharmaceutical products. This study compares the performance and cost of these three conventional clarification technologies applied to bio-extracts and also examines crossflow membrane microfiltration as an alternative. Extracts of transgenic corn and rice form the basis for comparison. Guidelines for selecting an optimum clarification technology or combination are developed.