Research on recovery of thuringiensin by micellar-enhanced ultrafiltration

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ABSTRACT

Thuringiensin has a wide host spectrum affecting dipteran, lepidopteran, coleopteran, and some other insects. Recently, many efforts have been devoted to the research and development of thuringiensin for using as a commercial insecticide. Due to its low concentration in fermentation broth and small molecular size, recovering of thuringiensin is very challenging problem. In this study, a surfactant cetylpyridinium chloride (CPC) was used to form micelle with thuringiensin, which increased the overall molecu lar size of CPC system including the adsorbed thuringiensin. Accordingly an ultrafiltration step could be adopted to recover the majority of thuringiensin in the broth. At the same time, the surface tension of broth contain CPC will be change depend on the surfactant concentration and twice achieve the critical micelle concentration; At consider the effect of surfactant on analyzing thuringiensin with HPLC method was cleared by a supplementary photodiode array scanning, which showed only a 0.5 minute delay of retention time. The another test result showed that the broth change the pH up and decreasing the ionic strength will be increase this micellar-enhanced ultrafiltration (MEUF) recovery rate; Finally, a novel processing scheme was developed which included two steps in series of micellar formation with CPC and ultrafiltration. Up to 94.6% of thuringiensin was recovered in the final retentate. The recovered solution had a high solid content, which was fed directly to a spray drying. Bioassay results of the product formulation showed that the control activity in insects was the same as the fermentation broth. In conclusion, the proposed MEUF process is effective in recovering thuringiensin. The process was economic in energy consumption, mild, and efficient; and thus, it has a good potential for industrial application.

Keywords : thuringiensin ; micellar-enhanced ultrafiltration ; critical

Table of Contents