Improved cultivation of gdhA derivative Pasteurella multocida B:2 for high density of viable cells through in situ ammonium removal using cation-exchange resin for use as animal vaccine

ABSTRACT

Pasteurella multocida serotype B:2 is the causative agent of hemorrhagic septicemia, a fatal disease of cattle and buffaloes. A live attenuated vaccine, *gdhA* derivative *P. multocida* B:2 mutant, was created to defeat the disease. During the cultivation of *P. multocida* B:2 mutant, substantial amount of ammonium was accumulated in the culture, which greatly inhibited the growth of this bacterium. The feasibility of using integrated cultivation with *in situ* removal of ammonium by cation-exchange resin for the improvement of growth and viability of *P. multocida* cells was investigated. The ability of various cation-exchange resins, which include Amberlite IRC86, Amberlite IR120 H, and Dowex DRG8 H, to selectively adsorbed ammonium was first investigated using sorption isotherm experiments. Amberlite IRC86 has the highest ability for ammonium adsorption. The incorporation of 10 g/L of Amberlite IRC86 resin into the shake flask culture (100 mL) of *P. multocida* B:2 mutant, improved the final viable cell concentration (7.2×10^{10} cfu/mL) by about 13-fold compared to that obtained in cultivation without resin (5.5×10^{9} cfu/mL). In cultivation with Amberlite IRC86 resin, approximately 41% of the ammonium accumulated in the culture was removed.

Keyword: gdhA derivative *Pasteurella multocida* B:2; Cell viability; Removal; Ammonium; Cation-exchange resin