使用不同方法分離或純化 GABA

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摘要

γ-胺基丁酸 (γ-aminobutyric acid, GABA) 具有許多生理功能，其合成方法可以簡單分為化學法與生物合成法；相較於生產，分離及純化等問題鮮少被研究與討論，因此本報告從前處理及純化技術探討不同方法之優劣，了解何種技術或技術組合最具經濟效益。去除蛋白質：高速離心後進行超過濾 (Ultrafiltration, UF, MWCO, 4,500,000 Da)，大分子蛋白質從1.45降至0.58 g/100 mL，降低64%，GABA純度僅從3.32%提升至6.20%，回收率88.6%。此外，使用UF (MWCO, 5000 Da) 後再進行兩次不連續的滲濾 (Discontinuous diafiltration, DD) GABA回收率可從82.1%提升至97.1%，提升15%；純度從71.72%降至67.21%，降低4.51%；總固形物含量從控制組發酵液5.86%降至1.83%，降低68.4%大分子蛋白質。水提醇沉法蛋白質分離效率90.41%，去除60-70%蛋白質，回收率95.14%。脫色處理：樹脂DA201-CII以5 Bed volume (BV) 樣品在3 BV/h流速下脫色率可90.6%，GABA回收率92.5%；樹脂S-8以200 mL在2 mL/min流速下脫色率92.14%，GABA回收率90.58%；高速離心的GABA基質上清液加入4 g活性碳在80℃下作用20 min，GABA回收率及純度皆下降，降為87.73%及49.52%，分別降低12.27%及4.37%。電透析CJ-MA-3及CJ-MC-3組去鹽率、GABA回收率佳，分別為99.3%及97.0%；電解液Na_2SO_4 GABA回收率97%，去鹽率約99%。GABA經過Na_2SO_4電解液CJ-MA-3、CJ-MC-3組電解其能量耗損約44.3 kWh/t，總能量耗損 ＜500 kWh/t，純度99%。陽離子交換樹脂DOWEX 50WX2以HCl 37 mM (控制NaCl < 1.5 M) 得GABA回收率91.2%並去除約98% Glu且無麩胺酸脫羧酶殘留，GABA純度 ＞99%。離子交換樹脂Amberlite 200C樣品在2.0 BV在1.0 BV/h流速作用後以去離子水脫洗GABA，酒精沉澱後得GABA結晶，純度達99.1%。綜合上述可採取絮凝法合併水提醇沉法來去除蛋白質；而樹脂脫色法較活性碳脫色法佳。在純化技術不論是電透析還是離子交換法都有好的GABA回收率及純度，考量其經濟效益則可選擇電透析作為作去鹽並分離GABA及其他胺基酸的主要技術。

文獻整理

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