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## 鸭空肠液中消化酶粗提纯方法的比较研究

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## A Comparison of Methods for Purifying Digestive Enzymes in Jejunal Fluid of Ducks

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- 摘要
- 参考文献
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**摘要** 本试验旨在比较硫酸铵沉淀-透析-冻干-脱脂法与低温浓缩-透析-冻干-脱脂法制备鸭空肠液消化酶粉剂的差异。采用两样本完全随机设计,将8 L鸭空肠液随机分成2组,每组4个重复,每个重复1 L肠液。第1组采用硫酸铵沉淀-透析-冻干法,第2组采用低温浓缩-透析-冻干法,分别制备消化酶粉剂,然后对2组制备的粉剂进行脱脂,比较脱脂前和脱脂后2种方法制备消化酶粉剂的消化酶活性与回收率、总蛋白浓度与回收率及化学成分含量的差异。结果表明:1)低温浓缩-透析-冻干法制备的消化酶粉剂中淀粉酶、胰蛋白酶、糜蛋白酶的活性比硫酸铵沉淀-透析-冻干法分别高34.8%、27.9%和12.1% ( $P < 0.05$ );相应地,3种消化酶回收率及总蛋白回收率比硫酸铵沉淀-透析-冻干法分别高34.8%、35.2%、15.3%和12.6% ( $P < 0.05$ );粗蛋白质及粗灰分含量显著低于硫酸铵沉淀-透析-冻干法 ( $P < 0.05$ ),而粗脂肪含量差异不显著 ( $P > 0.05$ )。2)经脱脂处理后,低温浓缩-透析-冻干-脱脂法制备的消化酶粉剂中淀粉酶、胰蛋白酶活性比硫酸铵沉淀-透析-冻干-脱脂法分别高11.5%和7.9% ( $P < 0.05$ ),而糜蛋白酶活性差异不显著 ( $P > 0.05$ );淀粉酶和胰蛋白酶回收率比硫酸铵沉淀-透析-冻干法分别高39.4%和43.9% ( $P < 0.05$ ),而糜蛋白酶回收率差异不显著 ( $P > 0.05$ );总蛋白回收率显著高于硫酸铵沉淀-透析-冻干-脱脂法 ( $P < 0.05$ ),而总蛋白浓度差异不显著 ( $P > 0.05$ );粗蛋白质及粗灰分含量显著低于硫酸铵沉淀-透析-冻干-脱脂法 ( $P < 0.05$ ),而粗脂肪含量差异不显著 ( $P > 0.05$ )。由此可知,从纯化过程的全程看,低温浓缩-透析-冻干-脱脂法中淀粉酶、胰蛋白酶活性和回收率均显著高于硫酸铵沉淀-透析-冻干-脱脂法。

**关键词:** 北京鸭 空肠液 消化酶 纯化

**Abstract:** This experiment was conducted to compare the difference between  $(\text{NH}_4)_2\text{SO}_4$ -dialysis-freeze dried-defat (ADFDD) method used and concentration-dialysis-freeze dried-defat (CDFDD) method to purify the digestive enzymes of jejunal fluid of ducks. A two-sample completely randomized design was adopted. Eight liters of duck jejunal fluid were divided into 2 groups with 4 replicates per group, and each replicate contained 1 L jejunal fluid. The 2 groups of jejunal fluid were randomly selected to be treated with  $(\text{NH}_4)_2\text{SO}_4$ -dialysis-freeze dried (ADFD) method or concentration-dialysis-freeze dried (CDFD) method to prepare the digestive enzyme dry powder. Then, the methods of ADFDD and CDFDD were established by defatting the dry powder, respectively. The activities and recovery rates of digestive enzymes, total protein concentration and chemical composition content of digestive enzymes dry power prepared by the methods of ADFD and CDFD, or the methods of ADFDD and CDFDD were compared. The results showed as follows: 1) the activities of amylase, trypsin and chymotrypsin of dry power prepared by CDFD method were 34.8%, 27.9%, and 12.1%, which were significantly greater than those of dry power prepared by ADFD method ( $P < 0.05$ ), respectively; the recovery rates of amylase, trypsin, chymotrypsin and total protein by CDFD method were 34.8%, 35.2%, 15.3% and 12.6%, which were significantly greater than those by ADFD method ( $P < 0.05$ ); the concentrations of crude protein and crude ash in dry power prepared by CDFD method were significantly lower than those of dry power prepared by ADFD method ( $P < 0.05$ ), but no significant difference was observed in the concentration of ether extract ( $P > 0.05$ ). 2) After ethanol defatted, the activities of amylase and trypsin of dry power prepared by CDFDD method were 11.5% and 7.9%, which were significantly greater than those of dry power purified by ADFDD method ( $P < 0.05$ ), but no significant difference was observed in the chymotrypsin activity ( $P > 0.05$ ); the recovery rates and the activities of amylase and trypsin in CDFDD method were 39.4% and 43.9%, which were greater than those by ADFDD method ( $P < 0.05$ ), but no significant difference was observed in the recovery rate of the chymotrypsin activity ( $P > 0.05$ ); the recovery rate of total protein by

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ADFDD method was significantly greater than that by ADFDD method ( $P < 0.05$ ), but no significant difference was observed in the concentration of total protein in dry power prepared by these two methods ( $P > 0.05$ ); the concentrations of crude protein and crude ash in dry power prepared by CDFDD method were significantly lower than those in dry power prepared by ADFDD method ( $P < 0.05$ ), but no significant difference was observed in the concentration of ether extract ( $P > 0.05$ ). From the entire purification process, the activities of amylase and trypsin and their recovery rates by dry power purified by CDFDD method are greater than those of ADFDD method.

Keywords: [Beijing duck](#), [jejunal fluid](#), [digestive enzymes](#), [purification](#)

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