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## 液态复合酶制剂对肉鸭生长性能及钙、磷代谢的影响

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## Effects of Liquid Compound Enzyme Preparation on Growth Performance and Calcium and Phosphorus Metabolism of Meat Ducks

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**摘要** 本试验旨在研究不同营养水平饲料中添加液态复合酶制剂对肉鸭生长性能及胫骨和血清钙(Ca)、磷(P)代谢的影响。选择640只1日龄樱桃谷肉公鸭,随机分为5个处理,分别为正对照(PC)组、负对照1(NC1)组[在PC组基础上降低334.40kJ/kg代谢能(ME)、2.00%可消化氨基酸(DAA)、0.15%有效磷(AP)和0.10%钙(Ca)]、负对照2(NC2)组(在PC组基础上降低418.00 kJ/kg ME、2.50% DAA、0.20% AP和0.15% Ca)以及在NC1和NC2组中分别添加液态复合酶制剂(0.2 mL/kg)的加酶(NC1+E、NC2+E)组,其中PC、NC1和NC1+E组为10个重复,NC2和NC2+E组为5个重复,每个重复16只鸭。试验分前期(1~21日龄)和后期(22~35日龄)2个阶段饲养。结果表明:1)与PC组相比,NC1组肉鸭各期生长性能及胫骨粗灰分(Ash)、Ca和P含量极显著降低( $P<0.01$ ),1~35日龄死亡率极显著提高( $P<0.01$ ),7和21日龄血清Ca含量及35日龄血清P含量极显著降低( $P<0.01$ ),35日龄血清碱性磷酸酶(ALP)活性极显著提高( $P<0.01$ );2)与PC组相比,NC2组肉鸭各期生长性能及胫骨Ash、Ca和P含量进一步极显著降低( $P<0.01$ ),7和21日龄血清Ca含量和21日龄血清P含量极显著降低( $P<0.01$ );与NC1组相比,NC2组肉鸭各期生长性能及胫骨Ash、Ca和P含量、21日龄血清P含量以及ALP活性均极显著降低( $P<0.01$ );3)与NC1和NC2组相比,NC1+E和NC2+E组肉鸭体重(BW)、体增重(BWG)和采食量(FI)均极显著提高( $P<0.01$ ),NC1+E组胫骨Ash、Ca和P含量极显著提高( $P<0.01$ );NC1+E和NC2+E组死亡率极显著降低( $P<0.01$ )。以上结果提示,以植酸酶和非淀粉多糖酶为主的液态复合酶制剂可明显缓解饲料低营养水平,尤其是AP水平降低对肉鸭生长性能及Ca、P代谢造成的不利影响。

**关键词:** 复合酶 肉鸭 生长性能 钙、磷代谢

**Abstract:** This study was conducted to investigate the effects of liquid compound enzyme preparation on the growth performance, serum and bone calcium and phosphorus metabolism of meat ducks supplementation in different nutrient level diets. A total of 640 one-day-old male Cherry Valley ducks were randomly allocated into 5 treatments, the treatments included: positive control (PC) group, negative control 1 (NC1) group [decreased 334.40 kJ/kg metabolic energy (ME), 2.00% digestible amino acid (DAA), 0.15% available phosphorous (AP) and 0.10% calcium (Ca) on the basis of PC group], negative control 2 (NC2) group (decreased 418 kJ/kg ME, 2.50% DAA, 0.20% AP and 0.15% Ca on the basis of PC group), and NC1+E and NC2+E groups which supplemented with 0.2 mL/kg liquid compound enzyme preparation on the basis of NC1 and NC2 group. PC, NC1 and NC1+E groups contained 10 replicates, NC2 and NC2+E groups contained 5 replicates, and each replicate contained 16 ducks. The study included two periods: starter (1 to 21 days of age) and later (22 to 35 days of age). The results showed as follows: 1) compared with PC group, the growth performance and the contents of ash, P and Ca in tibia in NC1 group were significantly decreased in all periods ( $P<0.01$ ), the mortality at 1 to 35 days of age was significantly increased ( $P<0.01$ ), the serum Ca content at 7 and 21 days of age and serum P content at 35 days of age were significantly decreased ( $P<0.01$ ), and the serum ALP activity at 35 days of age was significantly increased ( $P<0.01$ ). 2) Compared with PC group, the growth performance and the contents of ash, P and Ca in tibia in NC2 group were significantly decreased in all periods ( $P<0.01$ ), the serum Ca content at 7 and 21 days of age and serum P content at 21 days of age were significantly decreased ( $P<0.01$ ); compared with NC1 group, the growth performance, the contents of ash, phosphorous (P) and Ca in tibia, serum P content and alkaline phosphatase (ALP) activity at 21

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days were significantly decreased ( $P<0.01$ ). 3) NC1 and NC2 groups, the body weight, body weight gain and feed intake in NC1+E and NC2+E groups was significantly increased ( $P<0.01$ ), the contents of ash, P and Ca in tibia in NC1+E group were significantly increased ( $P<0.01$ ); and the mortality in NC1+E and NC2+E groups was significantly decreased ( $P<0.01$ ). These results indicate that the liquid compound enzyme preparation containing non-starch polysaccharides enzyme and phytase can alleviate the negative effects caused by the low nutrient level, especially the negative effects on growth performance, calcium and phosphorus metabolism caused by the reduction of AP level.

Keywords: [compound enzyme](#), [meat ducks](#), [growth performance](#), [calcium and phosphorus metabolism](#)

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