

基于奶牛饲料氮和磷摄入量的粪尿氮和磷排出量估算

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Estimation of Excretion of Nitrogen and Phosphorus with Manure from Dairy Cow Based on Ingestion of N and P with Feeds

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摘要

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摘要 通过监测规模化奶牛场夏、冬两季奶牛氮、磷摄入量与排出量,分析两者之间的相关性,建立估算模型,以估算夏、冬两季奶牛场氮、磷排放量。结果表明,冬、夏两季每头成年奶牛每日粪、尿平均排出量分别为31.14和13.90 kg。泌乳牛夏、冬两季通过粪、尿排出的氮、磷总量分别为270.71和66.67 g·d⁻¹,比干乳牛分别高16.4%和19.2%,比育成牛分别高150.7%和174.0%。不同生理阶段奶牛每日通过饲料摄入的氮、磷总量差异显著($P<0.05$),从高到低依次为泌乳牛、干乳牛和育成牛。每日通过粪、尿排出的氮、磷总量差异也达显著水平($P<0.05$),而且奶牛通过粪、尿排出的氮、磷占氮、磷摄入量的50%以上;夏、冬两季奶牛粪、尿、奶中氮、磷排出量与通过饲料摄入的氮、磷含量呈显著正相关关系,可利用拟合的回归方程建立基于奶牛饲料氮、磷摄入量的粪、尿中氮、磷排出量的估算模型,该模型可为奶牛场粪便管理及污染防治等工作提供参考。

关键词: 氮 磷 摄入量 排出量 奶牛 估算模型

Abstract: Through monitoring of ingestion and excretion of nitrogen and phosphorus by dairy cows of an on-scale dairy farm in summer and winter, analysis was done of relationship between the ingestion and excretion and a model was established for estimation of discharge of N and P from the farm in summer and winter. Results show that in water and summer, averagely, an adult dairy cow excretes 31.14 and 13.90 kg·d⁻¹ of feces per day, respectively, and a lactating cow excretes 270.71 g·d⁻¹ N and 66.67 g·d⁻¹ P with feces and urine, 16.4% and 19.2% more than a dry cow does, and 150.7% and 174.0% more than a heifer does, respectively. Daily ingestion of nitrogen and phosphorus with fodder of a dairy cow daily varies sharply from cow to cow different in physiological stage ($P<0.05$), displaying an order of lactating cow > drying cow > heifer. Daily excretion of nitrogen and phosphorus with feces and urine from a cow daily also varies sharply from cow to cow different in physiological stage ($P<0.05$). The cows excrete with feces and urine more than 50% of the nitrogen and phosphorus ingested. Positive relationship was found of N and P ingestions with fodder with and N and P excretions with feces, urine and milk in summer and winter. A model can hence be built up by fitting with a regression equation for estimation of N and P excretions with feces and urine based on N and P ingestions with fodder. The model may provide references for feces management and pollution prevention in dairy farms.

Keywords: nitrogen and phosphorus ingested amount excreted amount dairy cow estimation model

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