

The Phosphorus Availability of Feed Phosphates in Broilers

by

STEVEN GEORGE PAYNE

BScAgric, University of Stellenbosch

Thesis submitted in partial fulfilment
of the requirements for the Degree

MASTERS OF SCIENCE IN AGRICULTURE

in the

Department of Animal Sciences

Faculty of Agricultural and Forestry Sciences

University of Stellenbosch

Stellenbosch

-April 2005-

Abstract

Broiler diets are supplemented with feed phosphates to ensure that adequate available phosphorus is provided in the diet to meet the bird's requirements. These feed phosphates make a considerable contribution to the total available phosphorus in the diet and small differences in their availability may have significant effects on whether the bird's requirements are met or not. The variation in availability of phosphorus between feed phosphates belonging to different classes and between feed phosphates of the same generic class is well documented. This variation can partially be attributed to differences in the physical and chemical composition of the relevant sources, but the reported differences may also be the result of differences in the evaluation method employed in the determination of these values. Three experiments were conducted to investigate variations to the balance technique in an attempt to develop a practical, standardised method for the determination of phosphorus availability. The advantage of wheat gluten as the protein source in the basal diet and higher available phosphorus inclusion levels in the test diets were investigated. The phosphorus availability of the feed phosphates tested was shown to be lower than previously reported and differed from experiment to experiment. The availability of phosphorus from a given source was shown to be not only an inherent property of the particular phosphate alone, but an experimentally determined value reflecting the absorption and utilization of the phosphorus under the conditions of the trial. This poses the challenge of developing an effective availability system that incorporates the dietary, physiological and environmental factors that may influence the potential availability of a particular phosphate source.

Samevatting

Braaikuiken rantsoene is met voerfosfate gesupplementeer om te verseker dat voldoende beskikbare fosfaat voorsien word om aan die behoeftes van die braaikuiken te voldoen. Hierdie voerfosfate maak 'n groot bydrae tot die totale beskikbare fosfaat in die dieet. Klein verskille in die beskikbaarheid van die fosfor van hierdie fosfate kan 'n noemenswaardige effek hê op die voldoening aan die braaikuiken se behoeftes, al dan nie. Die variasie wat bestaan in die fosforbeskikbaarheid van voerfosfate van verskillende klasse en tussen voerfosfate van dieselfde generiese klas is goed gedokumenteer. Hierdie variasie kan gedeeltelik aan die fisiese en chemiese verskille tussen die fosfate toegeskryf word, maar die gerapporteerde verskille mag ook die gevolg wees van die spesifieke ontledingsmetode wat gebruik is. Drie proewe is uitgevoer om verskille in die balansmetode te ondersoek in 'n poging om 'n praktiese en gestandaardiseerde metode vir die bepaling van fosforbeskikbaarheid te ontwikkel. Die voordeel van koring gluten as die proteïenbron in die basale dieet en hoër beskikbare fosfor insluitingsvlakke in die proefrantsoene is ondersoek. Die fosforbeskikbaarheid van die voerfosfate wat getoets is was almal laer as wat voorheen gerapporteer is en het ook van eksperiment tot eksperiment verskil. Die resultate het getoon dat die fosforbeskikbaarheid van 'n voerfosfaat nie alleenlik 'n produk van die fosfaat per se is nie, maar ook 'n eksperimenteel bepaalde waarde is wat die absorpsie en benutting van die fosfor onder die spesifieke omstandighede van die proef reflekteer. Die uitdaging is dus om 'n effektiewe beskikbaarheidsstelsel te ontwikkel wat die voedings-, fisiologiese en omgewingsfaktore wat die potensiële beskikbaarheid van 'n spesifieke fosfaatbron beïnvloed, inkorporeer.