

# Project Summary

## Whole grain feeding for chicken meat production

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### Introduction

Whole grain feed (WGF) promotes the proventricular secretion of pepsin and hydrochloric acid, which reduces gizzard pH and enhances pepsin activity and, therefore, chicken meat productivity.

WGF studies in meat chickens experience multiple difficulties as the increase in relative gizzard weights generated by whole grain inclusion is unpredictable, and inert dietary markers cannot be incorporated into the whole grain.

As such, a WGF project was conducted that comprised of five individual studies, which focused on the effects of whole grain on feed conversion efficiency, energy utilisation, gut integrity and phytase interactions in meat chicken production.

Whole wheat was incorporated into rations at 4.5, 9.0 and 18.0%, either pre- or post-pelleting, and was compared to a ground-grain control diet, as well as the effects of pre- and post-pellet inclusion of grain. Alternately, diets based on wheat-sorghum with 12.5% barley, with and without 1000 FTU/kg of phytase, was offered to meat chickens.

### Key findings

- WGF consistently improved energy utilisation and feed conversion ratio in some instances.
- Diets containing 172 g/kg ground grain, 256 g/kg pre-pellet WG, 172 g/kg post-pellet WG generated the optimal feed conversion ratio, and a diet containing 384 g/kg pre-pellet WG and 216 g/kg ground grain generated the optimal ME:GE ratio.
- Phytase improved feed conversion ratio, AME, ME:GE ratios and AMEn in diets containing whole barley, but this was not the case in conventional, ground-grain diets. In general, dietary phytate degradation by exogenous phytases is enhanced by WGF.

- WGF reduced the incidence of dilated proventriculi from 8.4 to 0.7% in and from 4.76% to zero, demonstrating WG inclusion enhances gut integrity.
- Relative gizzard contents are significantly correlated with FCR, AME, ME:GE ratios, N retention and AMEn; whereas, relative gizzard weights were not significantly correlated with FCR and N retention. Therefore, relative gizzard contents may be a more indicative WGF parameter than relative gizzard weights.

### Implications and recommendations

Future WGF evaluations should exclude observations where there is minimal gizzard contents, as this is probably a euthanasia-induced consequence of contractions emptying the gizzard

These evaluations should also include the following parameters, growth performance, energy utilisation, relative gizzard weights, gizzard contents, gizzard pH, pancreas weights, incidence of dilated proventriculi, excreta moisture, water intake, starch, nitrogen and fat digestibility, and proximal jejunal digesta viscosity.

Further research is required to assess the efficacy of pre-pellet whole wheat inclusions in the starter phase, and the subsequent gradual adaption of birds to post-pellet whole wheat diets in the grower phase.



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## Publications

Truong HH, Moss AF, Liu SY, Selle PH (2017) Pre- and post-pellet whole grain inclusions enhance feed conversion efficiency, energy utilisation and gut integrity in broiler chickens offered wheat-based diets. *Animal Feed Science and Technology* 224, 115-123.

<https://doi.org/10.1016/j.anifeedsci.2016.12.001>

Moss AF, Chrystal PV, Truong HH, Liu SY, Selle PH (2017) Effects of phytase inclusions in diets containing ground wheat or 12.5% whole wheat (pre- and post-pellet) and phytase and protease additions, individually and in combination, to diets containing 12.5% pre-pellet whole wheat on the performance of broiler chickens. *Animal Feed Science and Technology* 234, 139-150.

<https://doi.org/10.1016/j.anifeedsci.2017.09.007>

Moss AF, Sydenham CJ, Truong HH, Liu SY, Selle PH (2017) The interactions of exogenous phytase with whole grain feeding and effects of barley as the whole grain component in broiler diets based on wheat, sorghum and wheat-sorghum blends. *Animal Feed Science and Technology* 217, 1-12.

<https://doi.org/10.1016/j.anifeedsci.2017.02.013>

Moss AF, Chrystal PV, Truong HH, Selle PH, Liu SY (2017) Evaluation of ground grain versus pre- and post-pellet whole grain additions to poultry diets via a response surface design. *British Poultry Science* 58, 718-728.

<https://doi.org/10.1080/00071668.2017.1370698>

Moss AF, Truong HH, Liu SY, Selle PH (2018) Inclusion levels and modes of whole grain incorporation into wheat-based rations differentially influence the performance of broiler chickens. *British Poultry Science* 59, 110-120.

<https://doi.org/10.1080/00071668.2017.1400658>

## Contact

### **Dr Peter H Selle, Adjunct Associate Professor**

Poultry Research Foundation, Camden Campus,  
The University of Sydney, Camden NSW

+61 2 9351 1697

0419 442 780

[peter.selle@sydney.edu.au](mailto:peter.selle@sydney.edu.au)

### **Amy Moss, PhD Candidate**

Sydney School of Veterinary Science

The University of Sydney

+61 490 147 735

[amy.moss@sydney.edu.au](mailto:amy.moss@sydney.edu.au)

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