



UNIVERSITI PUTRA MALAYSIA

**EFFECT OF PHYTATE PHOSPHORUS ON THE UTILISATION OF
RICE BRAN IN BROILER CHICKENS)**

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**EFFECT OF PHYTATE PHOSPHORUS ON THE UTILISATION OF RICE
BRAN IN BROILER CHICKENS**

BY

MD ASADUZZAMAN UKIL

**Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor
of Philosophy in the Faculty of Agriculture
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Dedication

To the memory of my late parents



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LIST OF ABBREVIATIONS

AA	Amino Acid
AAS	Atomic Absorption Spectrophotometer
ADF	Acid Detergent Fibre
ADL	Acid Detergent Lignin
AME	Apparent Metabolisable Energy
aP	Available Phosphorus
Ca	Calcium
CF	Crude Fibre
CP	Crude Protein
cm	Centimetre
Cr	Chromium
Cu	Copper
DFRB	De-fatted Rice Bran
DM	Dry Matter
d	Day
EE	Ether Extract
FCR	Feed Conversion Ratio
Fe	Iron
FFRB	Full Fatted Rice Bran



FM	Fishmeal
FTU	Unit of phytase
g	Gram
HPLC	High Pressure Liquid Chromatography
HU	Hemagglutinin Unit
IU	International Unit
k cal	Kilo Calorie
kg	Kilogram
MCP	Monocalcium phosphate
ME	Metabolisable Energy
Mg	Magnesium
mg	Milligram
ml	Mililitre
Mn	Manganese
NDF	Neutral Detergent Fibre
NFE	Nitrogen Free Extract
NRC	National Research Council
P	Phosphorus
PITC	Phenylisothyanate
pP	Phytate Phosphorus
PRP	Parboiled Rice Polish

RB	Rice Bran
rrf	Relative Response Factor
SBM	Soybean meal
Sd	Standard deviation
S.D.W	Sample Dry Weight
SE	Standard error
SEM	Standard Error of Means
sq	Square
tP	Total Phosphorus
TIU	Trypsin Inhibitor Unit
UPM	Universiti Putra Malaysia.
wt	Weight
Zn	Zinc
μl	Micro litre

Abstract of thesis submitted to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Doctor of Philosophy.

EFFECT OF PHYTATE PHOSPHORUS ON THE UTILISATION OF RICE BRAN IN BROILER CHICKENS

By

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November 1999

Chairman: Assoc. Prof. Abdul Razak Alimon, Ph. D.

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Rice bran (RB) is a by-product of rice milling industry and is produced in many parts of the world including Malaysia. It is a high energy source for both ruminant and nonruminant animals with a crude protein content of 12-13%. Its fibre content is about 7-16%. Rice bran is also rich in phytate phosphorus (pP) which is not easily available to poultry. This study examines the utilisation of pP by broiler chickens fed RB based diets at the finishing stage. The role of phytase enzyme and vitamin D₃ in improving the utilisation of pP was also examined.

Two growth trials were carried out with 21 day-old broiler chickens to determine the effects of replacing corn with RB on their performance. It was found that the performance of birds were adversely affected when RB was included at 45% level. The results obtained from these two studies suggest that RB can be included up to 35% in the diet of broiler chicken without any adverse effects on their performance.



The third experiment was carried out to investigate the effects of supplementing phytase and vitamin D₃ in a phosphorus (P) deficient corn-RB-soybean meal based diet. Birds fed P deficient diets supplemented with phytase or vitamin D₃ showed similar performance with those fed diets adequate in phosphorus. The bioavailability of calcium (Ca) and P was increased and P excretion decreased with supplemental phytase or vitamin D₃.

In the fourth experiment, two P deficient diets consisting of 18 and 20% protein were formulated and were supplemented with 0, 350, 700 and 1050 FTU of phytase. The birds showed similar performance regardless of protein and phytase levels. Higher mineralisation was noted in the toe and tibia ash contents with higher levels of supplemental phytase. Toe and tibia ash contents were not affected by varying levels of proteins. At the same time P excretion was reduced with higher levels of phytase.

In the last study, two diets, deficient in available P with 18 and 20% crude protein were formulated. Varying levels of calcium was used to obtain three Ca:total P (Ca:tP) ratios, 1.1:1, 1:1 and 0.9:1 and six diets were formulated. The diets were supplemented with 700 FTU of phytase. The narrower Ca:tP ratio (0.9:1) had adverse effect on the performance of birds and P utilisation. Phosphorus excretion was increased with Ca:tP ratio of 0.9:1. It was observed that Ca:tP ratio could be reduced from 1.1:1 to 1:1 without any deleterious effect on the performance of broiler chickens.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi syarat keperluan untuk Ijazah Doktor Falsafah.

**KESAN FOSFORUS PHYTATE KEATAS PENGGUNAAN DEDAK PADI
PADA AYAM PEDAGING**

Oleh

MD. ASADUZZAMAN UKIL

November 1999

Pengerusi: Prof. Madya Abdul Razak Alimon, Ph. D.

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Dedak padi adalah hasil sampingan daripada industri perkilangan beras yang dihasilkan di kebanyakan tempat di dunia termasuk Malaysia. Ia adalah sumber tenaga yang tinggi untuk haiwan ruminan dan bukan ruminan dengan kandungan protein kasar 12-13%. Kandungan serat ialah 7-16%. Dedak padi juga kaya dengan phytate fosforus, bentuk yang tidak mudah digunakan oleh ayam. Kajian ini menilai penggunaan phytate fosforus oleh ayam pedaging yang diberi makanan berasaskan dedak padi diperingkat penamat. Tindakan enzim phytase dan vitamin D₃ dalam meningkatkan penggunaan phytate fosforus juga dikaji.

Dua ujian pembesaran telah dilakukan ke atas ayam pedaging berumur 21 hari untuk melihat kesan penggantian jagung dengan dedak padi. Kesan sampingan dedak padi telah dilihat pada 45% aras rangsum. Keputusan kedua ujian ini menunjukkan bahawa dedak padi boleh di gunakan sehingga kearas 35% dalam rangsum ayam tanpa sebarang kesan sampingan keatas prestasi ayam.

