EVALUATION OF COMMERCIAL AMINO ACID MINERAL VITAMIN SUPPLEMENTS IN BROILERS FED MAIZE-SOYBEAN BASED DIETS.

By

NGOSA MATHEWS

A thesis submitted to the University of Zambia in partial fulfillment of the requirements for the award of the degree of Master of Science in Animal Nutrition.

The University of Zambia
LUSAKA
2010
DECLARATION

I, NGOSA MATHEWS, hereby declare that the thesis submitted for the award of the degree of Master of Science in Animal Nutrition by the University of Zambia is my own original work and has not previously been submitted to any other institution of higher education. I declare that all sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references.

Signed: -------------------------------

Date: -------------------------------
CERTIFICATE OF APPROVAL

This dissertation of NGOSA MATHEWS is approved as fulfilling part of the requirements for the award of the degree of Master of Science in Animal Nutrition by the University of Zambia.

Examiner's name and signature

Signed: _______________________________________ Date: ____________

Signed: _______________________________________ Date: ____________

Signed: _______________________________________ Date: ____________

Signed: _______________________________________ Date: ____________

Signed: _______________________________________ Date: ____________
ABSTRACT

Two experiments were conducted to investigate the efficacy of different nutritional supplements on productive performance of broilers. Parameters considered included growth rate, feed consumption, feed efficiency, mortality and the economic feasibility of using the commercial supplements. Supplements tested included Chick-A-min, Vita Flash Amino, Vitamino Trace Oral and Amino Vitasol (CM, VFA, VTO and AV) in maize-soybean diets under production. A deficient diet was employed in experiment 1 to determine the efficacy of the supplements in sustaining good performance. In both experiments, the treatment diets consisted of a Control and Diets supplemented with CM, VFA, VTO and AV.

Birds fed commercial supplements in the deficient diet had higher live weights, lower mortality, higher carcass and organ weights (expressed as % of live weight), high feed consumption and FCR (P≤0.05) compared with the control. Supplementation of a basal nutrient low diet was beneficial as it improved the overall performance of broilers and their livability.

On a standard diet, there were no significant differences in mortality among the supplements and the control. No significant differences in intake were observed among the supplements at 28 days of age, but supplements differed significantly from the control (P≤0.05). CM and AV showed better support for good growth and health than other supplements at 42 days of age. CM and AV had higher final weights for organs and carcass weights and were significantly different in terms of cost effectiveness with VFA, VTO and the control (P≤0.05).

The better performance of birds and net returns on CM and AV reveals the important influence of composition and quality of nutritional supplements on
broiler performance and profitability which parameters are essential to small scale broiler production.

The results of this study revealed that supplements of amino acids, minerals and vitamins had a positive effect on the live weight and feed utilisation efficiency in comparison to standard diets therefore the use of quality commercial amino acid-mineral-vitamin supplements on maize soybean diets should be encouraged to become a phenomenon for maintenance of normal growth and health in broiler chickens and ultimately improved profitability of the broiler business.
ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and appreciation to my supervisor Dr. F. Haazele for his positive attitude and guidance. I was almost discouraged at some point from completing this thesis but through his encouraging comments I have managed to successfully complete this study.

I also wish to thank Dr. M. Daura, the Head of the Department of Animal Science Department, for his useful observations and comments. Dr Simbaya needs to be commended for closely working with Dr. F. Haazele in giving me valuable advice that inspired me to work hard. I would be failing in my duty if I don’t mention the valuable assistance I got from the field station staff (Animal Science) without which the study would have been impossible.

My special acknowledgements go to Board Members and Members of Staff of the Poultry Association of Zambia for their willingness to allow me to pursue this study during which time my presence at work was highly needed.

Finally, I wish to thank the University of Zambia in particular the School of Agricultural Sciences for providing the necessary facilities needed to do this work.
DEDICATION

I would like to dedicate this study to my Wife for her patience and endurance during my long absence from home, my children Bupe, Nyakatola, Malama and my son Mathews Bwalya Ngosa Jnr, my nieces, Changu and Patuma, and my mother in law Marian Mazala for enduring my absence from home while working on this thesis. I dedicate it also to my late grandmother, Salome Mutunwa Kafwembela, for her words of wisdom which have made me who I am today.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td>i</td>
</tr>
<tr>
<td>CERTIFICATE OF APPROVAL</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>v</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS AND ACRONYMS</td>
<td>ix</td>
</tr>
</tbody>
</table>

CHAPTER 1

1.0 Introduction                                                       1
1.1 Background                                                         1
1.2 Statement of the problem                                            4
1.3 Main Objective                                                     4
1.4 Specific Objectives                                                 5
1.5 Research Justification                                             5

CHAPTER 2

2.0 Literature Review                                                  7
2.1 Need for nutrient supplements in poultry diets                      7
2.2 Requirements for amino acids                                       7
2.3 Vitamins                                                           8
2.3.1 Vitamin A                                                        9
2.3.2 Vitamin D 11
2.3.3 Vitamin E 14
2.3.4 Vitamin K 16
2.3.5 Vitamin $B_2$ (Riboflavin) 17
2.3.6 Vitamin $B_{12}$ 18
2.3.7 Pantothenic Acid 20
2.3.8 Pyridoxine 21
2.3.9 Folic Acid 22
2.3.10 Choline 23
2.3.11 Niacin 24
2.3.12 Biotin 25
2.4 Trace Minerals 26
2.4.1 Zinc 28
2.4.2 Manganese 30
2.4.3 Copper 32
2.4.4 Iodine 34
2.4.5 Iron 35
2.5 Protein 36

CHAPTER 3 41

3.0 Materials and Methods 41
3.1 Vitamino Trace Oral 41
3.2 Amino Vitasol 42
3.3 Chick-A-min 42
3.4 Vita Flash Amino 43
3.5 Location of Experiments 44
3.5.1 Experiment 1 45
3.5.2 Birds 45
3.5.3 Housing 45
3.5.4 Diets 45
3.5.5 Allotment of Treatments and Experimental Design
3.5.6 Feeding
3.5.7 General Management
3.5.8 Chemical Analysis
3.5.9 Data Collection
3.5.10 Statistical Analysis
3.6 Experiment 2
3.6.1 Birds
3.6.2 Housing
3.6.3 Diets
3.6.4 Allotment of Treatments and Experimental Design
3.6.5 Feeding
3.6.6 General Management
3.6.7 Chemical Analysis
3.6.8 Data Collection
3.6.9 Statistical Analysis
3.6.10 Cost Analysis

CHAPTER 4

4.0 Results and Discussions
4.1 Experiment 1
4.1.1 Feed Intake
4.1.2 Live weights
4.1.3 Feed Conversion Ratio
4.1.4 Mortality
4.1.5 Carcass weight and Organ weights
4.1.5.1 Carcass weights
4.1.5.2 Organ weights
4.2 Experiment 2
4.2.1 Feed Intake
4.2.2 Live weights 64
4.2.3 Feed Conversion Ratio 66
4.2.4 Mortality 66
4.2.5 Carcass weight and Organ weights 68
4.2.5.1 Carcass weights 69
4.2.5.2 Organ weights 70
4.2.6 Cost Analysis 71

CHAPTER 5 74

5.0 Conclusion and Recommendations 74

CHAPTER 6 76

6.0 References 76

Appendix 91
List of Tables

Table 1. Nutrient requirements of broilers as percentage or milligrams or units Per Kilogram diet. 39
Table 2. Comparative composition of different supplements 43
Table 3. Composition and nutrient content of the trace mineral and vitamin deficient diet 46
Table 4. Composition and nutrient content of standard diets 50
Table 5. Feed Intake, Live weight, feed Conversion Ratio and mortality of broilers fed a trace mineral and vitamin deficient diet to 28 days of age. 57
Table 6. Carcass and organ weights of broilers fed a trace mineral and vitamin deficient diet to 28 days of age 60
Table 7. Feed Intake, Live weight, feed Conversion Ratio and Mortality of broilers fed standard diets supplemented trace mineral and vitamin to 28 days of age. 62
Table 8. Feed Intake, Live weight, feed Conversion Ratio and Mortality of broilers fed standard diets supplemented trace mineral and vitamins to 42 days of age. 62
Table 9. Carcass weight, organ weight and cost analysis of broilers fed standard diets supplemented trace mineral and vitamins to 28 days of age. 68
Table 10. Carcass weight, organ weight and cost analysis of broiler fed standard diets supplemented trace minerals and vitamins to 42 days of age. 68
List of Figures

Figure1. Diagramatic presentation of the role of vitamin A (Retinol) in the visual Cycle 10
Figure2. Metabolic pathway showing production of hormonally active Form of vitamin D 13
Figure3. Pantothenic Acid chemical structure 20
Figure4. Choline Chemical structure 23
ABBREVIATIONS AND ACRONYMS

AV – Amino Vitasol
AMV – Amino Mineral Vitamins
AOAC  - Official Methods of Analysis of the Association of Official Analytical Chemists.
BV – Biological Value
CBP – Calcium Binding Protein
CM – Chick-A-min
CRD – Complete Randomised Design
EAA – Essential Amino Acids
FBD – Finisher Basal Diet
FCR – Feed Conversion Ratio
FLKS - Fatty Liver and Kidney Syndrome
IBD – Infectious Bursal Disease
MSD – Maize-Soybean Diet
NRC – National Research Council
NSP – Non Starch Polsaccharides
PAZ – Poultry Association of Zambia
PP – Pyridoxal Phosphate
RBC – Red Blood Cells
SBD – Starter Basal Diet
SBM – Soybean Meal
TD – Tibia Dyschondroplasia
VFA – Vita Flash Amino
VTO – Vitamino Trace Oral
WSP – Wetable Soluble Powder