

**Quality Variation of Selected Imported Ration  
Ingredients**

**By**

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Thesis submitted to the University of Sri Jayewardenepura as a partial fulfillment of the requirement for the award of the Master of Science in Food Science and Technology.

## Declaration

The work described in this thesis was carried out by me under the supervision of Dr. R.A.U.J. Marapana and a report of this has not been submitted in whole or part to any university or any other institution for another Degree.

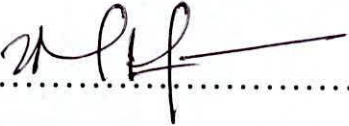
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## Declaration

I certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation



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Dr. R.A.U.J. Marapana

Date: 10.12.2015

## TABLE OF CONTENTS

	<b>Page</b>
List of Tables	vi
Acknowledgement	vii
Abstract	viii
<b>CHAPTER 1 : INTRODUCTION</b>	<b>1</b>
<b>CHAPTER 2 : LITERATURE REVIEW</b>	<b>2</b>
2.1 Components of Poultry Diets	2
2.2 Energy	3
2.2.1 Energy Terminology	3
2.3 Proteins and Amino acids	5
2.3.1 Variations in Requirements	6
2.4 Fat	6
2.5 Minerals	7
2.6 Vitamins	8
2.7 Water	9
2.8 Other nutrients and additives	9
2.9 Raw Materials	10
2.10 Soya Bean Meal	10
2.10.1 Description	10
2.10.2 Distribution	11
2.10.3 Nutritional attributes	11
2.10.4 Potential constraints	12

2.10.5 Poultry	13
2.11 Fish Meal	13
2.11.1 Description	13
2.11.2 Distribution	14
2.11.3 Nutritional attributes	14
2.11.4 Potential constraints	14
2.11.5 Poultry	15
2.12 Wheat (general)	15
2.12.1 Description	15
2.12.2 Distribution	16
2.12.3 Nutritional attributes	16
2.12.4 Potential constraints	17
2.12.5 Poultry	17
2.13 Palm Oil	18
2.13.1 Description	18
2.13.2 Distribution	19
2.13.3 Quality Control	19
<b>CHAPTER 3 : MATERIALS AND METHODS</b>	<b>22</b>
3.1 Methodology	22
3.1.1 Study Location	22
3.1.1.2 Selection of Raw Materials	22
3.1.2 Sampling methods	24
3.1.2.2 Preparing the sample	24
3.1.2.3 Tested Parameters	24

3.2 Proximate Analysis	25
3.2.1 Determination of Moisture	25
3.2.1.1 Procedure	25
3.2.2 Determination of Crude Protein	26
3.2.2.1 Apparatus/ Equipment	26
3.2.2.2 Reagents	26
3.2.2.3 Procedure	27
3.2.3 Determination of Crude Fat	28
3.2.3.1 Apparatus/ Equipment	28
3.2.3.2 Reagents	29
3.2.3.3 Procedure	29
3.2.4 Determination of Crude Fibre	30
3.2.4.1 Apparatus/ Equipment	30
3.2.4.2 Reagents	30
3.2.4.3 Procedure	31
3.2.5 Determination of Ash	32
3.2.5.1 Apparatus/ Equipment	32
3.2.5.2 Procedure	33
3.2.6 Determination of Calcium	33
3.2.6.1 Reagents	34
3.2.6.2 Procedure	34
3.2.7 Determination of Phosphorous	36
3.2.7.1 Apparatus/ Equipment	36
3.2.7.2 Reagents	36

3.2.7.3 Procedure	36
3.2.8 Determination of Sugar and Starch	37
3.2.8.1 Apparatus/ Equipment	37
3.2.8.2 Reagents	37
3.2.8.3 Procedure	38
3.2.9 Determination of Soluble Protein in SBM	40
3.2.9.1 Reagents	40
3.2.9.2 Procedure	40
3.2.10 Determination of Salt	41
3.2.10.1 Reagents	41
3.2.10.2 Procedure	42
3.2.11 Determination of Pepsin Digestibility	42
3.2.11.1 Apparatus/ Equipment	43
3.2.11.2 Reagents	43
3.2.11.3 Procedure	43
3.2.12 Determination of Iodine Value	44
3.2.12.1 Apparatus/ Equipment	44
3.2.12.2 Reagents	45
3.2.12.3 Procedure	45
3.2.13 Determination of Free Fatty Acids	46
3.2.13.1 Reagents	46
3.2.13.2 Procedure	46
3.2.14 Determination of Peroxide Value	47
3.2.14.1 Apparatus/ Equipment	47

3.2.14.2 Reagents	47
3.2.14.3 Procedure	48
3.2.15 Determination of Impurities	48
3.2.15.1 Apparatus/ Equipment	48
3.2.15.2 Reagents	49
3.2.15.3 Procedure	49
3.2.16 Determination of Unsap Value	49
3.2.16.1 Apparatus/ Equipment	50
3.2.16.2 Reagents	50
3.2.16.3 Procedure	50
3.3 Statistical Data Analysis	52
<b>CHAPTER 4 : RESULTS AND DISCUSSION</b>	<b>53</b>
4.1 Soya Bean Meal	53
4.2 Fish Meal	55
4.3 Wheat Flour	58
4.4 Palm Oil	60
<b>CHAPTER 5 : CONCLUSION</b>	<b>62</b>
<b>REFERENCES</b>	<b>63</b>
<b>APPENDICES</b>	<b>I - LVII</b>



## **List of Tables**

Table. 4.1 : Proximate composition of Soya Bean Meal	53
Table. 4.2 : Proximate composition of Fish Meal	55
Table. 4.3 : Proximate composition of Wheat Flour	58
Table. 4.4 : Quality of Palm Oil	60

## **ACKNOWLEDGEMENTS**

Firstly, I make this an opportunity to express my sincere appreciation and gratitude to my supervisor, Dr. R.A.U.J. Marapana, Senior Lecturer, Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura for his invaluable guidance throughout my research.

Further I wish to express my thanks to the management of Ceylon Grain Elevators PLC, Colombo for providing me chemicals, consumables and instrumental facilities for my research. Special thanks go to all the lecturers and the staff members of Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura for all the support provided throughout the two years as a post-graduate student.

I am very grateful to my parents, friends and my colleagues who gave me the necessary encouragement and support whenever required.

## **Quality variation of selected imported ration ingredients**

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### **ABSTRACT**

Imported and local raw materials are used in animal feeds. Their quality is very important to produce a quality final product. By knowing the nutrient contents of raw materials, producers can identify the deficient nutrients that need to be supplemented. Poultry diets are composed primarily of a mixture of several feedstuffs such as cereal grains, soybean meal, animal by-product meals, fats, and vitamin and mineral premixes.

In this study, concentrate feedstuffs were selected. Concentrates are the feedstuffs which contain less than 18% crude fibre and more than 60% Total Digestible nutrients. The concentrates are further classified as energy rich concentrates which contain more than 20% crude protein, and energy rich concentrates which have less than 20% crude protein. There are two main categories in energy rich concentrates; they are carbohydrates and lipids (oils and fats). As the carbohydrate source wheat was selected and as the lipid source palm oil was selected. Wheat was analyzed from three different countries; India, Australia and USA, representing Asian, Oceania, and North American regions respectively. Palm oil used for analysis, was imported from two countries; Malaysia and Indonesia, and both of them were from East Asian region.

From protein rich concentrates, soya bean meal was selected as the vegetable protein source while the fish meal was selected as the animal protein source. Soya bean meal was analyzed from three different countries; Brazil, USA, and India, representing South American, North American, and Asian regions respectively. Fish meal also was

analyzed from three different countries; Denmark, Chili, and Maldives, representing European, South American, and Asian continents respectively.

Proximate analysis (Moisture, protein, fat fibre, ash, silica) was carried out for Soya bean meal, Fish meal, and Wheat. Starch and sugar contents were determined in wheat, and the soluble protein levels were determined in soya bean meal. Calcium, phosphorous, salt and pepsin digestibility values were obtained in fish meal. Palm oil was analyzed for general quality parameters of oil; namely, Impurity, Iodine value, Peroxide value, FFA, and Unsaponifiable matter. For every parameter mentioned above, mean value of the replicate values were obtained. Metabolizable energy was calculated by prediction equations described by Janssen (1989).

Results were statistically analyzed using Minitab 17 software. In order to find out significant differences between data from different countries, One-way ANOVA test was applied (at  $\alpha = 0.05$ ). Grouping was done using the Fisher LSD Method and 95% Confidence. According to the statistical analysis, there were significant differences present in the some quality parameters assessed between the countries from different regions as well as between the countries within the same region. This can be due to the biochemical and physical changes that occur during the development and processing stages of the feedstuff and on geochemical differences in the soil where the plants were grown. Variations in different regions may occur due to several reasons. Genetics, growing conditions, storage conditions and processes cause variations in composition and nutritional quality.

## **CHAPTER 1**

### **INTRODUCTION**

Animal feed means any simple or compounded product intended to supply wholly or partly the nutritional requirements of animal or poultry and which on being fed to them contribute to their maintenance, growth and productive and includes feed additives.

Animal feed plays an important part in the food chain and has implications for the composition and quality of the livestock products (milk, meat and eggs) that people consume. Livestock production is growing rapidly worldwide, which is interpreted to be the result of the increasing demand for animal products. Overall, there has been a rise in the production of livestock products and this is expected to continue in the future. Specially, the poultry industry worldwide has seen significant developments in recent decades, following the increase in consumption of chicken by the population. In this scenario, the improvement in nutrition, genetics, health and management have allowed the continued development of this activity. However, to adequately meet the nutritional requirements, it is necessary to use diets that maximize the utilization of nutrients

Imported and local raw materials are used in animal feeds. Their quality is very important to produce a quality final product. By knowing the nutrient contents of raw materials, producers can identify the deficient nutrients that need to be supplemented. A firm understanding of categories of feeds and their role in feeding animals will make identifying alternatives easier. The diversity of foods and sub products used in feed formulation for poultry indicate the necessity of understanding their nutritional values, aiming its better utilization. The accuracy of the values of chemical composition, energy and digestibility of nutrients is essential to reducing costs and improving productivity.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Components of Poultry Diets

Poultry diets are composed primarily of a mixture of several feedstuffs such as cereal grains, soybean meal, animal by-product meals, fats, and vitamin and mineral premixes. These feedstuffs, together with water, provide the energy and nutrients that are essential for the bird's growth, reproduction, and health, namely proteins and amino acids, carbohydrates, fats, minerals, and vitamins. (Alvarenga *et al.*, 2013). The energy necessary for maintaining the bird's general metabolism and for producing meat and eggs is provided by the energy-yielding dietary components, primarily carbohydrates and fats, but also protein.

Poultry convert feed into food products quickly, efficiently, and with relatively low environmental impact compared with other livestock. (Speedy,2003). The high rate of productivity of poultry results in relatively high nutrient needs. Poultry require the presence of at least 38 dietary nutrients in appropriate concentrations and balance (NRC, 1994). Criteria used to determine the requirement for a given nutrient include growth, feed efficiency, egg production, prevention of deficiency symptoms, and quality of poultry product. These requirements assume the nutrients are in a highly bioavailable form, and they do not include a margin of safety. Consequently, adjustments should be made based on bioavailability of nutrients in various feedstuffs.

A margin of safety should be added based on the length of time the diet will be stored before feeding, changes in rates of feed intake due to environmental temperature or dietary energy content, genetic strain, husbandry conditions (especially the level of sanitation), and the presence of stressors (such as diseases or mycotoxins)

Poultry diets also can include certain constituents not classified as nutrients, such as xanthophylls (that pigment and impart desired color to poultry products), the unidentified growth factors claimed to be in some natural ingredients, and antimicrobial agents (benefits of which may include improvement of growth and efficiency of feed utilization). Each of these components of poultry diets is considered in the following sections.

## **2.2 Energy**

Energy is not a nutrient but a property of energy-yielding nutrients when they are oxidized during metabolism. The energy value of a feed ingredient or of a diet can be expressed in several ways. Thus, a description is presented below of terminology associated with dietary energy values, including units of measure (digestible energy, metabolizable energy, etc.). The energy requirements of poultry and the energy content of feedstuffs are expressed in kilocalories (1 kcal equals 4.1868 kilojoules).

### **2.2.1 Energy Terminology**

Energy terms for feedstuffs are defined and discussed in detail in *Nutrient Requirements of Poultry* (NRC, 1994).