The Response of Broiler Chick's to Treated Dietary Hyacinth Bean (*Lablab purpureus*) seeds

By

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DEDICATION

This work is dedicated to my

Parents

Brothers

Teachers
And friends
ACKNOWLEDGEMENT

My faithful thanks to Allah who gave me health and strength throughout this study.

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ABSTRACT

An experiment was conducted to study the response of broiler chicks to treated Hyacinth bean (*Lablab purpureus*) seeds as a protein supplement.

One hundred and sixty un-sexed one-day old broiler chicks Ross (308) were used. Four experimental diets were formulated to meet the nutrient requirements of broiler chicks according to NRC (1994). Diet (A) was the control diet with 0% Hyacinth bean seeds and there were other three diets, each containing 15% Hyacinth bean seeds with different treatment. Diet (B), soaked seed + enzyme; the seeds were soaked in water for 24 hours then boiled for 15 minutes and multi enzyme was added: (Bergazym P) contains Endo-1,4-B-Xylanase, Endo Pentoanase, protease and amylase. Diet (C): (The seeds were soaked in water for 24 hours then boiled for 15 minutes. Diet (D): The seeds were roasted in electric oven for 15 minutes at 100 °C. All diets were approximately isocaloric and isonitrogenous.

Chicks were divided into four groups (40 birds/treatment) with four replicates of 10 birds/replicate in a Complete Randomize Design. The experiment continued for six weeks. Feed and water were provided *ad libitum*. Feed intake, weight gain and feed conversion ratio were weekly reported. Final body weight, hot carcass weight and dressing percentage were obtained.

The results of the experiment indicated that treated Hyacinth bean seeds significantly (p<0.05) affected the final body weight and feed conversion ratio of broiler chicks. In birds fed soaked Hyacinth bean seeds (diet C) the final body weight increased and better feed conversion ratio were observed while the other two treatments had significantly (p<0.05) lower body weight and feed conversion ratio. Treatment had no significant (p>0.05) effect on overall feed intake and dressing percentage.
خلاصة الأطروحة

تم تصميم هذه التجربة لدراسة استجابة الوجبات اللاحم للعوامل المختلفة لذور اللوبيا

عفن واستخدامه كمصدر للبروتين.

تم استخدام 160 كوكبة لحم عمر يوم غير مجنس من سلالة روس (308) لتكوين

أربعة علائق حسب توصية المجلس القومي للأبحاث (1994) لتنفيذ الاحتياجات الغذائية للوجبات

اللحم.

والمية (أ) علائق ضاغطة وتحتوي على صفر % من بذور اللوبيا عفنة وثلاثة علائق أخرى

تحتوي كل منها على 15% من بذور اللوبيا عفنة معان بعمليات مختلفة، العلائق (ب) معاملة

بالمغلفة ومغلفة ومضمنة الزيتية (ج) معاملة بالمغلفة ومغلفة والعليقة (د) معاملة

بالحرارة. وكانت العلائق متساوية تقريباً في مستوى البروتين والطاقة.

تم توزيع الانتاكات عشوائياً لأربع عواملات 40 طائر / معاملة مع 4 مكررات، 10 طيور /

مكرر باستخدام النظام العشوي الكامل.

استمرت التجربة لمدة 6 أسابيع قدمت خلالها الوجبات والطعام بصورة حرة و تم خلالها

قياس استهلاك العلف الأسبوعي، الوزن المكتسب الأسبوعي، معدل التحول الغذائي الأسبوعي

بالإضافة للوزن الحي النهائي ووزن الذبيحة ونسبة التصافي.

أوضحت النتائج أن المجموعة (ج) المعاملة بالمغلفة والمغلفة لذور اللوبيا تتأثر معنوً (0.05)

على الوزن الحي النهائي ومعدل التحول الغذائي حيث أوضحت النتائج زيادة في الوزن الحي النهائي

ومعدل التحول الغذائي للكوكبة المجموعة (ج) مقارنة بالمجموعتين (ب) و (د) واللتين اعتقل

وزن مكتسب أسبوعي واقل معدل تحول غذائي بينما أوضحت النتائج بأنه لا توجد فرق معنوية

(0.05) في معدل استهلاك العلف الكلي ونسبة التصافي.

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CHAPTER ONE
INTRODUCTION

Legume seeds are used for poultry feeding. Legumes often referred to as pulse crops are members of the *leguminosae* family. They produce seeds that can be fed for man and animals. The major grain legumes produced in most countries are Soya beans, field beans, lupins, peanuts, lentils and peas.

In tropical areas, there are numbers of other species that are grown for food. Most grain legumes are produced specially for human food. In general, legumes seeds are low in some amino acids. Most grain legumes seed contain anti-nutritive factors (ANFs). Ruminants are usually less sensitive for these deleterious factors than poultry (Cheeke, 1998).

Since early studies on the nutritional value of the proteins in legumes, it has been known that dry beans contain heat-labile toxic factors with protease (trypsin) inhibitors and lectins of most significance (Van der Poel, 1990).

Hyacinth bean combines a great number of qualities that can be used successfully under various conditions. Its first advantage is its adaptability to drought resistant. It is also able to grow in adverse range of environmental conditions world wide. (Andrea and Pablo, 1999).

The bean is classified by the National Academy of Science (NAS) as potential source of the protein that has not been explored yet. Studies on nutrient composition showed that the bean is a good source of protein, carbohydrate and energy (Pursoglove, 1968; Duke, 1983; Deka and Sarkar, 1990; Salimath and Aranathan, 1982).

Major limitation to the uses of legumes in the animal diets is the presence of anti-nutritional factors. (Schaaffausen (1963b).
The seeds of lablab contain anti-nutritional factors such as tannins, phytate and trypsin inhibitors. Activity of these compounds could be reduced by processing methods such as removing the seed coat, soaking and cooking (Lambourne and Wood 1985, Deka and Sarkar, 1990). It was suggested that more research is needed to reduce the anti-nutritional factors present in lablab like heamagglutinins and the toxic substances (Deka and Sarkar 1990). There have been little studies on the use of seeds as poultry feed.

More recently it has been reported that feeding 15% raw Hyacinth bean seeds to broiler chick's result in negative performance (Gasim and Abdel Ati, 2007).

Therefore the objective of present study was to evaluate the different treatment of Hyacinth bean seeds as a source of protein on broiler chick's diet.
2-1 Origin and distribution:

Hyacinth bean (*Lablab purpureus*) is, probably, of Asian origin and has been cultivated in India since earliest time. *Var Lignosus* is found wild in some area in India the crop was taken to Africa. It has since been distributed to many tropical countries and has become naturalized in some areas. (Purseglove, 1984).

*Lablab* is thought to be indigenous to India, South East Asia or Africa now it has been cultivated and distributed throughout the tropics and subtropics. It is most popular in India, south East Asia, Egypt and the Sudan (Evans, 2002).

The wild forms of *lablab* are believed to have originated in India (Deka and Sarkar, 1990). They were introduced into Africa from south East Asia during the eighth century (Kay, 1979). Presently, *lablab* is common in Africa, extending from Cameroon to Swaziland and Zimbabwe, through Sudan, Ethiopia, Uganda Kenya and Tanzania (Skerman et al, 1991).

2-2 Uses of Hyacinth bean:

The young pods and tender beans are popular vegetable in India and also used elsewhere in the tropics for this purpose. The ripe and dried seeds are consumed as a split pulse in India.

The beans are also sported, soaked in water, shelled boiled and smashed into a paste, which is fried with spices, etc. The haulms either green or as hay or silage, are used as livestock fodder and the dried seeds are also fed to livestock. The growing crops is also grazed and has the valuable property of remaining green in the dry season. It is also grown as a green
manure and cover crops, It is the green manure which is grown in rotation with cotton and sorghum in the Sudan Gezira. It is the last crop in the rotation, after which the land is bare fallowed for a season (Purseglove, 1984). Lablab is main fodder crop in Kenya, Zimbabwe, Botswana and the Sudan. Organic matter digestibility declines over time (61.3% in younger plant to 48.3% in older ones). Milk production from lablab was usually higher than from other grasses (Evans, 2002).

Lablab has also been known for its use as a green manure, adding organic matter as well as N and minerals to the soil. In land destined for immediate agricultural use, as for sugarcane, the green mass is disked harrowed before it produces ripe seed. If the land does not have to be used the same year the plant are left to grow and are used as pasture in the dry season (Schaaffausen, 1963a). Lablab is protect the soil and acts as a natural weed control without any detrimental effects on the coffee bushes or fruit trees (Schaaffausen, 1963a). Lablab seeds are traditionally used as a soup ingredient and therapeutic purposes such as curing dropsy, relieving diarrhea and as a tonic to the viscera (Li, 1973).

2-3 Common names of Hyacinth bean:

Rongai Dolichos, Lablab Bean (Australia), Poor man Bean, Tonga Bean (England), Labia (the Sudan), Batao (Philippines), Hyacinth Bean (Brazil), Frijol Jacinto (Colombia), Quiquaquia, Caroata chwata (Venezuela), Protode de Egypt (Argentina), Dolique Lablab, Dolique d’Egypte (France), Fiwi Bean (Zambia), Chicarros, Frijol Caballo (Puerto Rico), Gallinita (Mexico), Frijol de Adorno (El Salvador), Wal (India) (Skerman et al 1988).
2-4 Description:

Hyacinth bean is the summer growing annual or short-lived perennial fodder legume sown for grazing and conservation in tropical environments with summer's rainfall. It is vigorously trailing, twining herbaceous plant, resistant to disease and insect attack (Milford and Minson, 1968; Cameron, 1988). Lablab is climbing or erect annual or short lived perennial. It grows up 1 meter (3.2ft) high with longer stems in climbing types (up to 6 meters or 20ft). The leaves are pubescent, trifoliolate, 1-6 in long and 1.5-14 cm wide. Flowers are purple or white, 4-20cm long and 1.2-1.6 cm in diameter on peduncles that are 2-40 cm long (Evans, 2002). Pods vary in shape and in colour, flated, 5cm in long by 1.5 cm wide the dorsal side of the leaf is smooth with the underside being hairy. Of the two hundred types of lablab recognized, only two cultivars, Rongai and High worth are valuable commercially (Murphy and Colucci, 1999). Additionally, three subspecies have been identified: *ssp purpureus*, *ssp benhalensis* and *ssp uncinatus*.

2-5 Chemical analysis:

It was reported that the seeds of Hyacinth bean contain: 11.6% Moisture, 24.75% Crude protein, 8.33 Ether extract, 3.21 crude fiber, 3.77 Ash and 59.72 Nitrogen Free Extract (Arinathan et al, 2003).

Some of the leaves had been lost in making the hay. Luck (1965b) reported 25 to 26 percent crude protein in the leaf of lablab. The levels of crude protein reported by Karachi, (1997) were 25% for leaves and 11.88% for stems. Evans, (2002) reported a range between 12.7-14.1 crude proteins for whole plant.

Aganga and Autlwetse (2000) reported a CP content of 16.4% for whole plant lablab hay. Magdi (2007) reported that crude protein in
processed lablab seeds (soaked, cooked, roasted) is (25.6, 25-43, 24.56) respectively.

2-6 Environmental conditions:

Hyacinth bean is a legume well suited to most tropical environment and it is adaptable to a wide range of rainfall, temperature and altitude. It is reported that it is well grown under warm, humid conditions at temperature ranging from 18 to 30°C and is fairly tolerant to high temperature (Hendrickson and Minson, 1985b; Schaffausen 1963 a b, Kay 1979; Cameron, 1988). Below 20°C the plant will have reduced growth; leaves being to drop at minus 2 °C but the plant survive frost for a limited period (Kay 1979; Mayer et al 1986).

Lablab is drought, hardy and has been grown in arid, semi arid and humid regions with rainfalls between 200 and 2500mm (Cameron, 1988). It needs rainfall or irrigation (minimum of 10 to 20mm) during germination and early establishment, although once established it is extremely resistant to drought (Mayer et al, 1986; Schaffausen 1963 a b). Being hardy plant, lablab can be found throughout the tropics and subtropics; ranging from 30° south to 30° north latitude. It is normally grown from sea level up to elevations of between 1800and 2100 meters (Cameron 1988; Hendricksen and Minson 1985b; Mayer et al 1986).

2-7 Anti nutritional factors:

A major limitation to the use of legumes in animal diets is the presence of anti-nutritional factors. Most grain legumes contain anti-nutritive factors (ANF, s). Ruminant are usually less sensitive to these deleterious factors than the swine and poultry (Cheeke, 1998).

The anti-nutritive factors level of this bean has been studied by many authors. Trypsin inhibitors activity level ranged from 11.8 to 29.0 TIA gm
Tannin content of untreated lablab bean has been reported to be high (Deka and Sarkar, 1990; Shastry and John 1991). Phytic acid level varied from 100.0 to 313.4 mg/100gm (Deka and Sarkar, 1990; Al Othman, 1999). In order to utilize bean effectively as human food, it is essential to inactivate or remove these anti-nutritional factors. Generally, adequate heat, processing inactivates the trypsin and chemotrypsin (Dipitro and Liner, 1989; Othman et al, 2002). Since early studies on the nutritional value of proteins, it has been known that dry beans contain heat-labile toxic factors with protease (trypsin) inhibitors and lectins of most significance (Vander Poel, 1990).

Schaaffausen (1963b) reported that the leaves of lablab do not contain tannins, making them a good feed for monogastric animals. The seeds contain anti-nutritive factors such as tannins, phytate and trypsin inhibitors. Activities of these compounds could be reduced by processing methods such as removing the seed coat, soaking and cooking (Lambourne and Wood, 1985; Deka and Sarkar, 1990).

For proper nutritional assessment of anti-nutritive factors like haemagglutinins and other toxic substances in lablab seeds, more research is required. (Deka and Sarkar, 1990).

It has been known that proteins in raw legumes have a low nutritive value due to some anti-nutritional factors which hinder the effective breakdown and utilization of their stored protein by monogastrics (Ani and Okeke, 2003; Etuk, 2001; Balogun et al, 2001).

According to Bawa et al (2003a), Akinmutimi (2003) and Ani and Okeke, (2003) legumes seed have certain anti-nutritional factors such as phytic acid, trypsin inhibitors, haemagglutinin and cyanogenic glucosides.
which may remain logged in the body of birds for long time and impart negative effects on performance later on in their productive life.

Certain anti-nutritional factors such as goitrogens and tannin present in grain legume seeds which are not easily destroyed by heat (Bawa et al, 2003b) and by enzymes (Otome, 1999), may remain logged in the body of the birds or carried in the bloodstream for a long time. Other anti-nutritional factors such as cyanogenic glucosides, alkaloids and goitrogens implicated in liver serosis and therefore impair nutrient utilization and productive performance.

According to Mc Donald et al (1995), trypsin inhibitors are partly responsible for the growth retardation influence of raw legume seed meal. (Arinathan et al, 2003) reported that total free phenolics 0.26%, Tannins 0.40%, Hydrogen cyanide (mg/100g) 0.46.

**2-8Amino acids:**

Dietary protein and amino acid content has more of an indirect effect and feed intake than any direct effect growth can be very sensitive to daily amino acid intake and changes in feed intake may reflect only changes in production rather than being a primary response to protein (Boorman, 1979). In general lablab seeds are low in some amino acids. (Baldi and Salamini, 1973) reported sulphur-containing amino acids (methionine and cystine).

Amino acids composition in lablab (mg/g) according to (Chau et al, 1998): Aspartic acid 115, Threonine 38.3, Serine 53.9, Glutamic acid 159, Proline 42.2, Glycin 40.6, Alanine 43.4, Valine 53.5, Methionine 12.5, Cystine 13, Isoleucine 41.4, Leucine 77.2, Tyrosine 36.6, Phenylalanine 51.5, Histidine 28.2, Lysine 63.1, Arginine 55.9, Total EAA 415.
2-9 Vitamins and minerals:

With its deep tap root, Hyacinth Bean is not only drought resistant, but is able to bring minerals, otherwise not available for annual crops, from the depths to the top soil (Schaaffausen, 1963a).

Vitamins and minerals function primarily as cofactors of metabolism, while macro minerals such as calcium, phosphorus and magnesium also serve as structural components of the body.

Mineral composition of lablab seeds (mg/100g seed flour) according to (Arinathan et al 2003): Sodium 55.15, Potassium 2438.54, Calcium 520, Magnesium 620, Phosphorus 268, Iron 7.90, Copper 1.58, Zinc 2.14, Manganese 4.54.

2-10 Toxicity:

Many leguminosae plants are toxic to animals consumption of certain species within the genus *Lathyrus*, may result in the condition known as (Lathyrism). The former is characterized by bone deformation and weakness in connective tissues. The later is characterized by retardation of sexual development and increasing paralysis which may prove fatal if the larynx is affected (Mc Donald, 2002).

A sole ration of lablab caused a "feedy" flavor in milk, similar to that from clovers and Lucerne. Pasteurization and /or homogenization rendered milk acceptable. A case of bloat in cattle eating a sole diet of lablab was reported by (Hamilton and Ruth, 1969).

2-11 Effect of processing:

Cooking improves the nutritive value and brings the value close to that of meat and milk products by destroying most of the anti-nutritional factors such as trypsin inhibitors, haemogglutinins, lectins, phytic acid, goitrogen etc which cause poor growth and other poor results obtained
when raw legume seed diets are fed to monogastric (Kaankuka et al 2000; Amaefule and Obioha, 2001; Bawa et al, 2003a).

However for how long should Hyacinth Bean seeds be cooked before it can be properly utilized by chicken has not been determined. This is important because over cooking or under cooking can result into some problems of utilization by poultry birds. (Omeje, 1999) reported that cooking of legume seed for about 30 min results in the destruction of their anti-nutritional factors such as trypsin inhibitors, haemagglutinins, phytic acid, lectins and goitrogen and hence improved their nutrient availability for better performance in poultry.

Agbede and Aletor (2001) reported that broiler chicks fed boiled *Lablab purpureus* beans performed better than those fed the raw lablab beans diets.

Reports by Esonu (2001) and Amaefule and Obioha (2001) indicate that feeding raw legumes in broilers starter diets have a negative effect on the attainment of slaughter weight at the finisher stage. They reported that the broilers fed raw legume diets at the starter phase had significantly lower (p<0.05) body weight at 8 weeks than those fed cooked legume seeds. This was irrespective of the type of legume seed used.

Heat stable compounds in cereals and legumes such tannins and hydrates are easily removed after germination (Reddy et al, 1985) and fermentation (Osman, 2004).

The properties of protein that determine their uses in foods are collectively called functional properties denoting those physicochemical properties of food proteins that determine their behavior in foods during processing, storage and consumption. These properties and the manner in which protein interacts with other components, directly and indirectly affect
processing application, food quality and acceptance water binding, solubility, swelling, viscosity gelation and surface activity and important properties, determining usefulness and final product quality in a food system (Kinsella, et al., 1985).

In order to utilize bean effectively as food or feed it is essential to inactivate or remove these anti nutritional generally, adequate heat processing inactivates the trypsin and chymotrypsin (Dipitero and Liener, 1989; Osman et al, 2002). Heat stable compounds in cereal and legumes such as tannins and hydrates are easily removed after germination (Reddy et al, 1985).and fermentation (Osman, 2004).

A better understanding of the effect of different traditional processing methods on nutritive value, may lead to a wider use of this legumes in food industry.

2-12 Comparison with other legumes:

In general, tropical legumes tend to be higher in crude lignin and protein and lower in cell wall than tropical grasses (Vansoest 1994). With an average crude protein of 17% on the dry matter, lablab is slightly above average when compared to other tropical legumes and has considerably more protein than tropical grasses (Norton, 1982). The average 28% crude fiber in dry matter of lablab ranks less than the majority of the tropical legumes and grasses (Norton, 1982). In term of dry matter digestibility lablab ranks well compared to both tropical grasses and legumes (Minson and Wilson 1980). In additional to ranking well in terms of crude protein, crude fiber and dry matter digestibility lablab makes a better recovery after grazing and demonstrates less susceptibility to disease and insect pests as compared to other tropical legumes and grasses. It is colder tolerant growing much later in colder seasons than many other tropical legumes. In arid
environments lablab stays greener during drought periods than conventional crops (Luck 1965b; Philpotts 1969); When compared to 43 other tropical forage legumes in Trinidad, lablab was given an excellent production rating based on observations of the dry matter yield, adaptability, persistency, resistance to drought, pests, and diseases. It is suggested, however, that the production rating may change according to soil types. This warrants further investigation in other areas (Harricharan et al. 1988).

2-13 **Hyacinth beans in animal production:**

Soyabean and groundnut meals, which are the major sources of vegetable protein for poultry rations, have become very expensive. There is therefore the need to search for alternative vegetable proteins that will be cheaper, nutritionally adequate as replacement for these expensive meals so as to reduce production cost of meat and eggs. Among these alternative vegetable proteins is Hyacinth bean. Most farmers would prefer to feed raw Hyacinth Bean seeds to their chickens in order to eliminate the cost. This has not been a case because it has been known that proteins in raw legumes have a low nutritive value due to some anti-nutritional factors, which hinder the effective breakdown and utilization for their stored protein by monogastrics (Ani and Okeke, 2003; Etuke, 2001). Processing improves the nutritive value by destroying most of anti-nutritional factors.

With improving standards of human nutrition in all countries, there is certain to be increasing demand for protective foods, such as milk, meat and eggs. This demand cannot possibly meet unless animal fodders with high protein content are available, with also the necessary energy foods to preserve a correct protein/carbohydrate ratio. Until recent times, sufficient concentrated high-protein feeds based on linseed, groundnut and cottonseed were available to meet the needs of those types of animals demanding a
high-protein ration. Now the world supply of these feeds tends to decrease because of diversion to other purposes, especially direct human consumption. At the same time the demand for them as livestock feed increases rapidly. Because of the need to conserve the usual protein concentrates for the non-ruminant animals (pigs and poultry). It is further desirable to meet the protein requirements of ruminants by the use of legumes and their associate species.

Many conventional diets in the tropics for ruminants are poor quality roughages typified by high NDF, low nitrogen and slow fermentation rates. This poor dietary combination leads to decreased intake, weight loss, increase susceptibility to health risks and reduced reproductive performance. Including herbaceous legumes in these feeds regimes help to rectify some of the problems associated with low protein and high fiber diet (Murphy and Colucci, 1999). In a study where lablab was used as a supplement to oat hay, average daily gain in sheep fed the supplement was almost double than that of sheep fed solely the basal diet (Umunna et al, 1995). Lablab is a main fodder crop in Kenya, Zimbabwe, Botswana and the Sudan. Organic matter digestibility declines over time (61.3% in younger plants to 48.3% in older ones). Milk production from feeding lablab was usually higher than those feeding grasses. A feedy flavour in milk is reported with lablab feed. (Evans, 2002).
CHAPTER THREE
MATERIAL AND METHODS

3-1 Experimental site and duration:

The experiment was conducted in the premises of the Faculty of Animal Production, University of Khartoum during the period from 12 December 2006 to 27 January 2007. Temperature ranged (22.7 - 34.3°C) maximum, (11.3 - 24.7°C) minimum. Relative humidity during the period of study (20-40%) according to records of Ministry of Aviation.

3-2 Housing and equipments:

The experiment was carried out in an open-sided deep litter poultry house with concrete floor and corrugated iron roof. The house long axis was situated in an east-west direction and was constructed from iron posts and wire netting. It was divided into 16 pens (1 sqM each). The house was cleaned and disinfected then each pen was provided with clean disinfected feeders and drinkers. Light was provided 24 hours in the form of natural light supplemented with an artificial light in the evening using 60 watt bulbs.

3-3 Experimental birds:

One hundred and sixty unsexed broiler chicks (Ross308) one day old were weighed and randomly divided into sixteen pens of 10 chicks/pen as replicate with four replicates in each treatment. The experimental diets were randomly distributed among the pens.

3-4 Treatment of Hyacinth bean seeds:

Hyacinth bean seeds were divided into three treated groups (soaked, roasted, soaked+ enzyme). The Hyacinth bean seeds was soaked in water for 24 hours then boiled for 15 minutes. Excess water was drained off and the beans were dried and grind. Sample was analyzed for their chemical content.
Roasting was carried out by using electric oven with controlled temperature for 15 minutes at 100°C. Sample were analyzed for the proximate analysis. For enzyme we used soaked boiled method and then enzyme was added. Bergazym P contains Endo-1, 4-B-Xylanase, Endo Pentosanase, protease and amylase Unites) and the dosage used is (25g/100g). Table (1) shows the analysis of processed lablab.

3-5 Experimental diets:

Three experimental diets were formulated with the similar level of processed Hyacinth bean (15%). Diet A control with 0% Hyacinth bean, diet (B) contain 15% soaked Hyacinth bean plus enzyme. Diet (C) contains 15% soaked Hyacinth bean and diet D contained 15% roasted Hyacinth bean. Table (2) shows the experimental diet composition. The diets were formulated to meet the nutrient requirement of broiler chicks according to the National Research Council (NRC, 1994). Table (4) shows determined experimental diets and table (3) shows calculated experimental diets.

3-6 Data collection:

Feed intake, body weight gain, feed conversion ratio (FCR) were determined weekly during the experimental period. Five birds per replicate were randomly selected labeled and weighed individually at the end of the experimental period (6 weeks). The birds were slaughtered and the internal organs were removed. Carcass weights were measured to obtain the dressing percentage.

3-7 Chemical analyses:

Chemical analyses of the rations was done according to procedure of (AOAC 1982).
3-8 Statistical analysis:

Complete randomized design was used in the experiment. Data obtained from the experiment was subjected to analysis of variance according to Steel and Torrie (1980), using SPSS computer program. Duncan's multiple tests were also used according (Gomes and Gomes, 1984).
Table (1) chemical analysis (%) of treated Hyacinth bean seeds:

<table>
<thead>
<tr>
<th>compounds</th>
<th>Soaked</th>
<th>Roasted</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM</td>
<td>93.05</td>
<td>95.98</td>
</tr>
<tr>
<td>EE</td>
<td>1.27</td>
<td>1.46</td>
</tr>
<tr>
<td>CP</td>
<td>22.7</td>
<td>19.6</td>
</tr>
<tr>
<td>CF</td>
<td>8.81</td>
<td>9.07</td>
</tr>
<tr>
<td>Ash</td>
<td>7.37</td>
<td>6.31</td>
</tr>
<tr>
<td>NFE</td>
<td>52.9</td>
<td>59.54</td>
</tr>
</tbody>
</table>

ME (kcal/kg) for soaked and roasted lablab seeds is 2568 and 2639 respectively.
ME calculated according to equation of Lodhi et al (1970).
Table (2) ingredient composition (%) of experimental diets as fed:

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Diet*</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Sorghum</td>
<td>64.6</td>
<td>55.1</td>
<td>55.1</td>
<td>55.1</td>
</tr>
<tr>
<td>GNM</td>
<td>17</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>SSM</td>
<td>11</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Lablab</td>
<td>-</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Concentrate **</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Dicalcium</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Na Cl</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Premix ***</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Lysine</td>
<td>0.05</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>0.1</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Oil</td>
<td>0.03</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>methionin</td>
<td>-</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* (A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.

**Super concentrate contain(%): CP 40, lysine 10, meyhionine 3, methionine+cystine 3.3, Ca 10, available phosphorus 6.40, CF 1.44, C Fat 3.90, ME 1750 Kcal/kg, crude minerals 39.30

***Vitamin composition per kg of diet: vit A = 200,000 IU, vit D3 = 70,000 IU, B1 = 50 mg, B2 = 120 mg, B12 = 180 mg, iodine 550 mg, selenium 8 mg, cobalt 9 mg, iron 580 mg, molybdenum 20 mg.
Table (3) calculated experimental diets on dry matter basis:

<table>
<thead>
<tr>
<th>compounds</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>C P%</td>
<td>22.5</td>
<td>22.5</td>
<td>22.5</td>
<td>22.5</td>
</tr>
<tr>
<td>M E(kcal/kg)</td>
<td>3100.8</td>
<td>3100</td>
<td>3100</td>
<td>3100</td>
</tr>
<tr>
<td>Lysine%</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Methionine%</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Ca%</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
Table (4) determined chemical analysis of experimental diets on dry matter basis:

<table>
<thead>
<tr>
<th>compounds</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM</td>
<td>96.5</td>
<td>96.2</td>
<td>96.1</td>
<td>96.4</td>
</tr>
<tr>
<td>EE</td>
<td>5.2</td>
<td>5.9</td>
<td>4.2</td>
<td>3.7</td>
</tr>
<tr>
<td>CP</td>
<td>21</td>
<td>20.7</td>
<td>23.8</td>
<td>22</td>
</tr>
<tr>
<td>CF</td>
<td>11.5</td>
<td>19.4</td>
<td>13.9</td>
<td>12.7</td>
</tr>
<tr>
<td>ASH</td>
<td>7.5</td>
<td>6.5</td>
<td>6.4</td>
<td>7.3</td>
</tr>
<tr>
<td>NFE</td>
<td>51.3</td>
<td>43.8</td>
<td>47.7</td>
<td>50.7</td>
</tr>
</tbody>
</table>

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
CHAPTER FOUR
RESULTS AND DISCUSSION

The results of chemical composition of treated Hyacinth bean seeds (soaked and roasted) were shown in table (1). The results indicated that roasted Hyacinth bean seeds contain lower CP and Ash compared to soaked while it contained higher calculated ME, CF and EE than soaked seeds. The findings agreed with that obtained by Osman (2007) and (Arinathan et al, 2003).

(Figure 1 and appendix 1) show the data of weekly feed intake of broiler chicks received different treatment of Hyacinth bean seeds. The results showed that no significant difference between treatment in week 1, 5, 6 and total feed intake, since the diets were isocaloric, the birds were expected to consume similar feed (Scott et al, 1984). Table (5) shows the total feed intake of bird during the experimental period. In week 2 group (C) (bird fed soaked seeds) significantly consumed (P<0.05) highest feed while control group (A) and (D) (birds fed roasted seeds) consumed similar feed in week 2. In week 3 group (D) (birds fed roasted seeds) significantly consumed (P<0.05) lowest feed while control group (A) and (C) (bird fed soaked seeds) consumed similar feed and in week 4 control group (A) significantly consumed (P<0.05) higher feed than other groups while group (B) (birds fed soaked seeds with enzyme supplementation) and (C) (bird fed soaked seeds) consumed similar feed. The present finding are similar to those reported by Agbede and Aletor (2001) and Ayanwale and Ayanwale (2007).
Figure. (1): Effect of treated Hyacinth bean seeds on broilers feed intake

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
Figure (2) and appendix (2) and table (5) show the data of weekly weight gain of broiler chicks fed differently treated Hyacinth bean seeds. Treatments had no significant effect between each groups in weight gain in week 1. control group (A) and group (C) (bird fed soaked seeds) significantly gained (p<0.05) higher weight in week 2, 4, 5, 6 and total weight gain and in week 3 control group (A) gained significant (p>0.05) higher while group (B) (birds fed soaked seeds with enzyme supplementation) and (D) (birds fed roasted seeds) gained similar weight in week 3.

The low final body weight observed in this study in group (B) (birds receiving soaked seeds with enzyme supplementation) and (D) (birds fed roasted seeds) could be due to low efficiency of feed utilization of diets containing roasted lablab seeds may also be due to the presence of anti-nutritional factors which may still remain in the beans (phytic acid and tannin content of lablab seeds are highly resistant to heat) according to (Bawa et al, 2003a).

This finding also agreed with (Bawa et al, 2003b) and (Omej, 1999) who reported that certain anti-nutritional factors such as goitrogens and tannin present in grain legume seeds which are not easily destroyed by heat and by enzyme.
Figure. (2): Effect of treated Hyacinth bean seeds on broilers weight gain
(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
Figure (3) and appendix (3) shows the data of weekly feed conversion ratio of each groups and table (5) shows the overall feed conversion ratio.

No significant difference between all groups in week 1, 3 and 4. But in week 2 feed conversion ratio significantly (p>0.05) affected by dietary treatment the best feed conversion ratio was observed in group(C) (bird fed soaked seeds) while control group (A) and (B) (birds fed soaked seeds with enzyme supplementation) are similar FCR. In week 5, 6 and total, feed conversion ratio significantly (p>0.05) affected by dietary treatment the best FCR was observed in control group (A) and (C) (bird fed soaked seeds) and group (D) showed the lowest feed conversion ratio in week 5.

The effect of dietary treatment on final body weight, hot carcass weight and dressing percentage of broilers was shown in table (5).

Treatment significantly (p<0.05) affected the final body weight (table 6) group (A) (birds received control diet) and (C) (birds fed soaked seeds) showed similar weight, whereas the birds fed diet (B) (soaked lablab seeds supplemented with enzyme) and (D) (roasted lablab seeds) significantly showed (p<0.05) lower body weight and this may be due to nutrient availability and utilization of soaked beans and this agreed with Ayanwale and Ayanwale (2007) who reported that broilers fed raw and roasted *Afzelia Africana* seed meal has significantly (p<0.05) reduced daily feed intake and daily weight gain as compared to control.

The result of the performance of the birds agrees with the Ogundipe et al (2003) And Agbede and Altor (2001) who reported that broiler chicks fed boiled *Dolichos Lablab* bean performed better than those fed the raw lablab diet. Omeje(1999) reported that cooking of legumes seed for about 30minites result in the destruction of their anti-nutritional factors such as...
trypsin inhibitors, haemagglutinins, phytic acid, lectins and goitrogen and hence improve their nutrient availability for better performance in poultry.
Table (5): Effect of feeding treated Hyacinth bean seeds of overall performance of broiler chicks (gm/bird).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total feed intake</td>
<td>3296&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2970.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3262&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2946.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>110.9</td>
</tr>
<tr>
<td>Final body weight</td>
<td>1684.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1264.8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1680.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1341&lt;sup&gt;b&lt;/sup&gt;</td>
<td>58.9</td>
</tr>
<tr>
<td>Total feed conversion ratio</td>
<td>1.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.11</td>
</tr>
</tbody>
</table>

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.

1-means with the same superscript are not significant different (p>0.05).
2-SE= standard error of means.
Table (6) average live weight, hot carcass weight and dressing percentage (%) of broilers fed diets containing treated Hyacinth bean seeds during 0-6 weeks. (gm/bird).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Diets</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live weight</td>
<td></td>
<td>1684.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1264.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1680.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1341&lt;sup&gt;b&lt;/sup&gt;</td>
<td>58.9</td>
</tr>
<tr>
<td>Hot weight</td>
<td></td>
<td>1114.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>818.04&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1097.05&lt;sup&gt;a&lt;/sup&gt;</td>
<td>859.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>41</td>
</tr>
<tr>
<td>Dressing</td>
<td></td>
<td>66.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>64.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>65.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>64.07&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.7</td>
</tr>
</tbody>
</table>

1-means with the same superscript are not significant different (p>0.05).
2-SE= standard error of means.

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
Figure. (3): Effect of treated Hyacinth bean seeds on broilers feed conversion ratio
(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked
Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

• The result of present study demonstrated that soaked Hyacinth bean seeds can be fed as a source of protein to broiler chicks and it may decrease the levels of anti-nutritional factors present in raw Hyacinth bean seeds and enhanced feed intake, body weight, feed conversion ratio.

• It seemed that the roasted seeds may contain some anti-nutritional factors which can not be destroyed and or removed by heat treatment.

• Enzyme supplementation in the present condition has no beneficial effect in improving the nutritional value of Hyacinth bean. This observation is also supported by many reports in the literature.

• It is recommended that soaked Hyacinth bean seeds can be used in broiler ration at level of 15% and gave positive response in broiler performance.
REFERENCES


**Appendix (1)**

Effect of feeding treated Hyacinth bean seeds of weekly feed intake of broiler chicks (g/bird).

<table>
<thead>
<tr>
<th>Weeks</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>205.8</td>
<td>145.3</td>
<td>169.3</td>
<td>161.8</td>
<td>19.2</td>
</tr>
<tr>
<td>2</td>
<td>242.3</td>
<td>214.5</td>
<td>267.8</td>
<td>233.5</td>
<td>13.6</td>
</tr>
<tr>
<td>3</td>
<td>506.3</td>
<td>444</td>
<td>479.8</td>
<td>401.8</td>
<td>22.1</td>
</tr>
<tr>
<td>4</td>
<td>597</td>
<td>526.5</td>
<td>576.5</td>
<td>509.8</td>
<td>25.2</td>
</tr>
<tr>
<td>5</td>
<td>700.3</td>
<td>639</td>
<td>664.5</td>
<td>634.5</td>
<td>28.3</td>
</tr>
<tr>
<td>6</td>
<td>1044.5</td>
<td>1001.3</td>
<td>1104.3</td>
<td>1005.5</td>
<td>48.12</td>
</tr>
</tbody>
</table>

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.

1- Values are means of 4 replicates of 8 birds/ treatment.
2- means with the same superscript are not significant different (p>0.05).
3- SE= standard error of means.
Appendix (2)

Effect of feeding processed Hyacinth bean seeds on weekly weight gain of broiler chicks (g/bird).

<table>
<thead>
<tr>
<th>Week</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66.3\textsuperscript{a}</td>
<td>58.2\textsuperscript{a}</td>
<td>68.7\textsuperscript{a}</td>
<td>55.7\textsuperscript{a}</td>
<td>4.1</td>
</tr>
<tr>
<td>2</td>
<td>134.8\textsuperscript{a}</td>
<td>105.3\textsuperscript{b}</td>
<td>148.8\textsuperscript{a}</td>
<td>103.9\textsuperscript{b}</td>
<td>6.8</td>
</tr>
<tr>
<td>3</td>
<td>238.3\textsuperscript{a}</td>
<td>189.3\textsuperscript{b}</td>
<td>214.5\textsuperscript{ab}</td>
<td>175\textsuperscript{b}</td>
<td>13.2</td>
</tr>
<tr>
<td>4</td>
<td>299.5\textsuperscript{a}</td>
<td>237.5\textsuperscript{b}</td>
<td>318\textsuperscript{a}</td>
<td>249.8\textsuperscript{b}</td>
<td>14.8</td>
</tr>
<tr>
<td>5</td>
<td>382.3\textsuperscript{a}</td>
<td>269.5\textsuperscript{b}</td>
<td>341.8\textsuperscript{a}</td>
<td>285.3\textsuperscript{b}</td>
<td>15.5</td>
</tr>
<tr>
<td>6</td>
<td>525.8\textsuperscript{a}</td>
<td>367.8\textsuperscript{b}</td>
<td>552.3\textsuperscript{a}</td>
<td>434.5\textsuperscript{b}</td>
<td>24.03</td>
</tr>
</tbody>
</table>

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
1- Values are means of 4 replicates of 8 birds/treatment.
2-means with the same superscript are not significant different (p>0.05).
3-SE= standard error of means.
**Appendix (3)**

Effect of feeding processed Hyacinth bean seeds on weekly feed conversion ration of broiler chicks.

<table>
<thead>
<tr>
<th>Week</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>SE</th>
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(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.

1-means with the same superscript are not significant different (p>0.05).

2-SE= standard error of means.
Appendix (4)

Effect of treated Hyacinth bean seeds on broilers dressing percentage

(A) control-(B) soaked Hyacinth bean seeds with enzyme supplementation-(C) soaked Hyacinth bean seeds-(D) roasted Hyacinth bean seeds.
Appendix (5)

Metabolizable energy value for poultry

Metabolizable energy value for poultry ME (P) as calculated from equation of Lodhi et al.,(1970). Available carbohydrate in this equation assumed to be 80% of the found NEE value. The equation as follows

\[ ME\ (P) = 1.549 + 0.0102\ CP + 0.0275\ Oil + 0.0145\ NEE - 0.0034\ CF. \]
Appendix (6)

Data sheet of Bergazym P

Application: Bergazym P is a multi enzyme with a high content of pentosanase; EC. Registration no: 17 for piglets, fattening pigs, broiler chickens, turkey and layers.

Biological origin: Bergazym P is produced by trichoderma longibrachiatum, genetically not modified. The product is made of pure plant origin.

Enzyme activity: As lead enzyme activity Bergazym P contains Endo-1,4B-Xylanase, with 6000 in EPU/g (=Endo petosanase Unites).
Additionally Bergazym P has side activities as cellulose, alpha-amylase, protease and further hemicellulase.

Dosage proved: 1 Kg final feed 1000 kg final fed (Enzyme activity) (Bergazym P)

Minimum dosage 750 EPU 125 g.
Dosage recommendation 1500 EPU 250 g.

Formulation: Bergazym P is a brown, dust free and flowing product with wheat meal as a carrier. It is standardized to 6000 EPU/g.

Compatibility: Bergazym P can be combined with all other feed additives and veterinary pharmaceuticals in feed.

Safety aspects: Bergazym P is tolerated by all animals species contact with the product or inhalation of dust from the product should be avoided. In case of spillage or accidental contact with skin or eyes rinses by flowing water.

Ecology: Bergazym P is degraded rapidly thoroughly by microorganisms in the soil. Plants do not absorb it.

Shelf live: Bergazym P has stability for minimum 24 months under normal storage housing conditions in closed packing.

Packing: Multiply paper bag with PE- In linear, 25kg net; 20 kg net aluminum bag in carton.