Sudan University of Science and Technology

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Effect of Live Yeast in Comparison with Enzymes Commercial (Hamecozyme) as Growth Promoter in Broiler Chicks

أثر الخميرة الحية بالمقارنة مع الإنزيم التجاري(Hamecozyme) كمحفزات للنمو في الدجاج اللاحم

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الآية

بسم الله الرحمن الرحيم

قال تعالى:

(أَوَلَمْ يَرَوْا إِلَى الطَّيْرِ فَوْقَهُمْ صَافَّاتٍ وَيَقْبِضْنَ مَا يُمْسِكُهُنَّ إِلَّا الرَّحْمَنُ إِنَّهُ بِكُلِّ شَيْءٍ بَصِيرٌ).

صدق الله العظيم

سورة الملك الآية (19)

Dedication

To my loved mother, father, brothers and sisters

To my extended family

To all my teachers and friends with great regard and respect.

Acknowledgment

Firstly and lastly thanks to ALLAH who gave me persistence, and patience to complete this work. No words can adequately express my deep gratitude to my supervisor **Prof .Dr Mohamed Hassan Musa Tabidi** for generously providing and for patience, constant support, advices and insight was invaluable to me. He is always available not only for consultation but also to solve any difficulties. Then I wish to express grateful thanks to administration of Sudan University of Science and Technology, College of Agricultural Studies for allowing me to conduct my research and providing any assistance requested. Special thanks to my best friend Hidaya Adam Ali to help me in this research.

List of Contents

Title **Page No.**

List of Tables

Title **Page No.**

List of Figures

Title **Page No.**

Abstract

This experiment was conducted to study the effect of feeding broiler chicks on diets containing yeast Saccromyces Cerevisiae (Sc) in comparison with enzyme (Hamecozyme) as a natural feed additive in productive performance, carcass dressing percentage. The experimental design was used in this experiment Complete Randomized Design (CRD). Total number of 63 chicks at 7 days old, unsexed Aberecar strain broiler chick's approximately similar initial weights (120gm) randomly divided in to 3 experimental groups with 3 replicates each of 7 chicks. The first group (A) fed on basal diet without feed additive (control group), the second group (B) fed on basal diet with enzyme (Hamecozyme) and third group (C) fed on basal diet supplemented with live yeast (Sc) at level 0.3%.The basal diet was formulated to meet the nutrients requirement of broiler according to Department of Animal Production, College of Agricultural Studies, Sudan University of Science and Technology. The experimental diet duration was 5 weeks. Average weights gain, feed intake and FCR dressing percentage, non carcass component (liver, gizzard, and chemical analysis of blood samples serum parameters were use are criteria of response. Economics for each group was calculated at the end of experimental period. Results showed significant between groups in performance parameters, dressing percentage, non carcass component and chemical analysis of blood serum. The results indicated that the live yeast (Sc) supplemented groups has significantly ($P>0.05$) better body weight gain and feed conversion ratio than control group and enzyme (Hamecozyme) while the feed intake and carcass dressing percentage were not significantly affected by the dietary treatments. In experimental period generally was not recorded mortality rate through the experimental period. The live yeast 0.3% obtained the high total profit compared to other tested groups.

الملخص

أجريت هذه التجربة لدراسة اثر تغذية الدجاج اللاحم علي علائق تحتوي علي الخميرة الحية (*Saccharomyces cerevisiae*) كمحفز للنمو مقارنة بالإنزيم علي أداء الدجاج الإنتاجي. تم استخدام النظام العشوائي الكامل CRD في هذه التجربة حيث استخدام عدد 63 كتكوت لاحم من سلالة Arber في عمر7 أيام غير مجنسة، قسمت عشوائيات إلى3 مجاميع تجريبية متساوية تقريبا في الوزن الابتدائي وكل مجموعة بها 3 مكررات وبكل مكرر 7كتاكيت، تمت تغذية المجموعة الأولى Aعلي عليقة أساسية بدون أي إضافة (عليقة قياسية) وتمت إضافة الإنزيم للعليقة القياسية لتغذية المجموعة الثانية B، أما المجوعة الثالثة C فقد تمت تغذيتها على العليقة الأساسية مضافا إليها الخميرة الحية (Sc) بنسبة 0.3%

تم تكوين العليقة الأساسية وفقا للاحتياجات الغذائية للدجاج اللاحم طبقا لعليقة قسم الإنتاج الحيواني، كلية الدراسات الزراعية جامعة السودان للعلوم والتكنولوجيا . تمت التغذية على العلائق التجريبية لمدة 5 أسابيع، تمت المراقبة اللصيقة لصحة القطيع وتسجيل قياسات الأداء الإنتاجي (الوزن المكتسب/ العليقة المستهلكة/ معدل التحويل الغذائي) كما تم حساب نسبة التصافي للذبيحة في نهاية التجربة.

أثبتت النتائج المتحصل عليها أن مجموعات الكتاكيت المغذاة علي العلائق المضاف إليها الخميرة (Sc) كانت أفضل معنويا ($P>0.05$) في وزن الجسم المكتسب ومعدل التحويل الغذائي من المجموعات التي غذيت علي العليقة القياسية والعليقة المضاف إليها الإنزيم بينما لم يتأثر استهلاك العليقه ونسبه التصافي للذبيحة معنويا ($P>0.05$) بالمعاملات الغذائية المختلفة. كما أظهرت النتائج أن مجموعة الكتاكيت المغذاة علي عليقه تحتوي 0.3% خميرة حيه (Sc) هي الأعلى من حيث الوزن المكتسب من بين المجموعات التجريبية كما تحصلت على أعلى مردود اقتصادي مقارنة مع المجموعات التجريبية الأخرى.

CHAPTER ONE

INTRODUCTION

The general awareness created in Sudanese behavior made it quite imperative to develop news means of living which emphasized mainly on improving their nutritional plans and new pattern of consumption. This is quite evident in the increase need of poultry product as one of the protein sources.

The poultry feeding costs constitute about 70% of the total cost of poultry production because of that of the development of poultry industry depends upon the large extent on the availability of feedstuffs that are used or can be made suitable for use in poultry nutrition ((Ravindran *et al*.,1984).

Poultry industry is under increasing pressure to produce high quantity and quality product for consumer. In same time to minimize the used of antibacterial feed additives as antibiotics have been used worldwide for years as growth promoters to control and prevent pathogen bacteria in the gut mucosa so as to improve meat and egg production.

Since January 2006 the use of antibiotic as growth promoter is prohibited by the European Union (Eckhert, *et al*, 2010). Currently, many parts of world are experimenting alternative feed additives that may be used to elevate the problems associated with the withdrawal of antibiotic from feeds. In this view, the use of probiotic product as substitute for antibiotics in poultry production has become an area of great interests.

Probiotic was defined as a live microbial feed supplement that beneficially affects the host animal by improving its microbial intestinal

balance (Fuller, 1989). The microorganisms used in animal feed as probiotic are mainly bacterial strains of gram positive bacterial belonging to the type Lactobacillus, Enterococcus, Pediococcus and Bacillus. Some other probiotic are microscopic fungi such as strain of yeast belonging the saccharomyses cerevisiae species (Fuller, 1992; Guillot, 1998). Some probiotic microorganisms (Lactobacillus and Enterococcus) are normal residents in digestive tract while others (Bacillus, Pediococcus and Saccharomyces cerevisiae) are absent (Celik *et al*, 2001).

Saccharomyces cerevisiae (Sc), one of the most widely commercialized types of yeast, has long been fed to animals as natural growth promoters. Eckles and Williams (1925) first reported the use of Sc as growth promoter for ruminants. Beneficial effects of yeast products in ruminant are due to increase concentration of total and cellulytic ruminal bacteria (Wallace, 1994; New bold *et al*, 1995), which may increase availability of ME from diets, there by increasing production.

The effect of yeast products on production and their mode of action in poultry have been reported by (Hayat *et al*, 1993; Bradley and Savage, 1995, Stanley *et al*, 2004, and Zhang *et al*, 2005; Gao *et al*, 2008). However, there are many mechanisms may be responsible for effects of yeast culture (Sc) in poultry. Mannan_ oligosaccharides and 1,3\1,6 ?-glucan are components of the yeast cell wall that modulate immunity (Shashidhara and Devegowda, 2003), promoting growth of intestinal micro flora (Spring *et al*, 2000; Stanley *et al*, 2000) and increase growth (Parks *et al*, 2000). Yeast culture contains viable cells, cell walls components, metabolites, and media in which the yeast were grown (Miles and Bootwalla, 1991). In addition other have reported that yeast product improve digestions and absorption of nutrients (Bradley and Savage 1995, Shin *et al*, 2005, Gao *et al*, 2008) and intestinal lumen

health (Bradley *et al*, 1994). However an unambiguous application of probiotics in broiler nutrition is still far from being possible. This may be due to probiotics efficiency may depend on multifactor such as administration level, application method, overall diet, bird age, overall farm hygiene and environmental stress factors (Moutzouris *et al*, 2010). The objective behind this research to evaluate the effect of the enzyme in broiler chick in compare with live yeast to performance values of broiler chicks

- To evaluate carcass characteristics and blood constitute
- Economic effect of using enzyme in broiler diet as natural feed additives

CHAPTER TWO

LITERATURE REVIEW

2.1Defining Feed Additive

The diet of animals and humans contain a wide variety of additives. However, in poultry diets these additives are primarily included to improve the efficiency of the birds growth and\or laying capacity, prevent disease and improve feed utilization. Any additives used in feed must be approved for use and then used as directed with respect to inclusion levels and duration of feeding. They are also specific for the type and age of birds being fed. These guidelines are maintained by government committee (Product Safety and Integrity; Australian Government Department of Agriculture, Fisheries and Forestry), Most additives are used to improve physical diet characteristics, feed acceptability or bird health (*Leeson et al*., 2008).

2.2 Antibiotics

Antibiotics represent a group of chemicals compounds produced biologically by certain plants or microorganism, usually a fungus, which process bacteriostatic or bacteriocidal properties, some antibiotics are particularly effective against negative bacteria. Other antibiotic are most effective against positive bacteria, while some, termed board spectrum antibiotic are effective against a wide range of both gram positive and gram negative bacteria.

Certain chemotherapeutic agent such as arsenical and nitro furans have been found to possess bacteriostatic or bacteriocidal properties and at the

effective levels, are not toxic to chickens or other host animals (Parks *et al*, 2000).

The use of antibiotics as growth promoters in poultry diets was stared around 65 year ago, when the first indication of beneficial effects on production efficiency in poultry was reported by (Moore *et al*, 1946). By 1949, antibiotics had been approved for growth promotion (in sub-therapeutic levels, 5-10 ppm/ton) in experimental, and many different groups of antibacterial have subsequently been approved form on-farm use as growth promoter in many European countries and United State of America (Leesons and Summers, 2001; Nasir and Grasharon, 2006)

The term of antibiotic growth promoter is used to describe any medicine that destroys or inhibit bacteria and is administrated at a low sub therapeutic does.

2.2.1 Negative Impact for Antibiotics

Antibiotic use in animals, however, is a potential problem for human medicine because antibiotic resistant bacteria can pass through the food chain to people. As a result of increasing concerns over the transfer of resistance between different bacteria and between human and animals (Hashemi and Davoodi, 2010). The reduction of antibiotics in poultry feed is critical for human health due to the contaminations of meat products with antibiotics residues (Apajalahti *et al.,* 2004).

This because increases in microbial resistance to antibiotics and residues in chicken meat products can be harmful to consumers. The control of infections and enhancement of live performance through a non-antibiotic approach is thus urgently required. Consequently, several alternatives have been investigated to reduce or replace

antibiotics. Because of the general problem of increased resistance of bacteria and the decreasing acceptance of the consumers for Antibacterial Growth Promoters (AGPs), different substances, referred to as Natural Growth Promoters (NGPs), have been identified as effective and safe alternatives to AGPs (Fuller, 1989).

2.3 History Background of Probiotic

The concepts of probiotics have their inception in the works of IlyaMechnikov (also known as Elie Metchnikoff; 1845-1916). In addition to Mechnikov being awarded the Nobel Prize in 1908 for his work on phagocytosis, he may be considered the father of modern probiotics (Fuller, 1992). His studies regarding probiotics were based on the observations of Stamen Grigorov (1878-1945), a Bulgarian microbiologist, who documented the health benefits of Bulgarian yogurt as Lactobacillus bulgaricus,today known as Lactobacillus promoted the idea that yogurt and its bacterial constituents were essential ingredients contributing to the longevity seen in Bulgarian peasants. However, the production, consumption, and noted health qualities of yogurt were also well known to the peoples of the Middle East and Asia and predate these more modern observations by perhaps 5,000 yr. One influential episode highlighting its therapeutic use relates how Suleiman the Magnificent (1494-1566) sent a physician from his Turkish court to prescribe yogurt and successfully treat the severe diarrhea suffered by Francis I of France (1494-1547). Guarner *et al*. 2005) attributes the origin of the term "probiotika" to Werner Kollath who, as related by proposed the temi to designate "active substances that are essential for a healthy development of life.

2.3.1 Definition of Probiotics

Probiotics are defined as live microbial supplements which beneficially affect the host animal by improving some beneficial functions in its intestinal microbial balance (Fuller, 1989)agree with(Salminen *et al*., 1998). Over the years the word probiotic has been used in several different ways. It was originally used to describe substances produced by one protozoan which stimulated another (Lilly et al., 1965). but was later used to describe animal feed supplements which had a beneficial effect on the host animal by affecting its gut flora (Parker 1974). In its latter role it was defined as 'organisms and substances which contribute to intestinal microbial balance'. This definition is unsatisfactory because it is too imprecise; it would include antibiotics. I have revised the definition to read 'A live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance'. This revised definition emphasizes the importance of live cells as an essential component of an effective probiotic and removes the confusion created by the use of the word 'substances'.

2.3.2 Probiotics from the Greek

The Greek meaning of the word probiotic is for life . Which are viable live microorganisms when administered in adequate amounts confer a health benefit on the host (Fuller, 1989). Several lactococci, lactobacilli and bifidobacteria are held to be health benefiting bacteria but little is known about the probiotic mechanism of gut microbiota (Gibson and Fuller, 2000). Lactic acid bacteria or LAB constitute an integral part of the healthy gastrointestinal microceology and are involved in the host metabolism.

2.3.3 The Use of Probiotics

Today, probiotics are used as health supplements in food and feeds and they are replacing the use of antibiotic growth promoters or chemical supplements. Under the right conditions the claims made for probiotic preparations can be realized. In recent years, antibiotics have not been a major player in most poultry company programs. The use of antibiotics, including chlortetracycline as growth promoters to increase production performance and to decrease mortality, This because increases in microbial resistance to antibiotics and residues in chicken meat products can be harmful to consumers. The control of infections and enhancement of live performance through a non-antibiotic approach is thus urgently required .replace antibiotics because of the general problem of increased resistance of bacteria and the decreasing acceptance of the consumers for Antibacterial Growth Promoters (AGPs), different substances, referred to as Natural Growth Promoters (NGPs), have been identified as effective and safe alternatives to AGPs. At present, there is a large number of NGPs available in the market, including probiotics, prebiotics and immune modulators. They have been used in poultry management to enhance production perfatinances (Jin *et al*., 1997), to develop and stimulate the immune response and to reduce mortality .The use of probiotics has become widely accepted as a natural means to promote health for both humans and animals. The health promoting effect of probiotic in the gastrointestinal tract has been mainly associated with their capacity to stimulate the immune response and to inhibit the growth of pathogenic bacteria (Barnes *et al*., 1972).Substitution of conventional and prohibited AGPs with probiotics has received much attention in the recent years. One of the major reasons for increased interest in the use of probiotics is because they are natural alternatives to antibiotics for growth promotion in poultry.

2.3.4 Composition of Probiotics and Samples of Types of Problloaes

Probiotics can be presented to the animal in various ways. The type of preparation will depend on the sort of use intended. They can either be included in the pellet feed or produced in the foiiii of capsules, paste, powder or granules which can be used for dosing animals directly or through their food. The target species are cattle, sheep, goats, poultry, horses and domestic pets. Nearly all of the probiotics currently on the market contain lactobacilli and/or streptococci; a few contain bifidobacteria. Probiotic preparations may consist of single strains or may contain any number up to eight strains. The attraction of multiple-strain preparations is that they are active against a wider range of conditions and in a wider range of animal species .The species currently being used in probiotic preparations are L. bulgaricus, L. acidophilus, L. casei,L. helveticus, L. lactis, L. salivarius, L. plantarum, Streptococcus theimophilus, Enterococcus faecium,Ent.faecalis, BiJidobacterium spp. The two exceptions, L. bulgaricus and Strep.thermophilus,are yoghurt starter The choice of the other lactobacilli and streptococci may also have been influenced by the yoghurt health claims. Similarly in human flora rats reduced coliform counts, were obtained by feeding either acidified milk or pasteurized yoghurt (Fuller and Cole, unpublished data). However, the increased lactase activity of the gut, after ingestion of yoghurt, is dependent on microbial enzyme activity and requires the presence of live yoghurt organisms in the intestine. However, the situation is complicated by the finding that some of the strains of so-called Ent.faecium used as probiotics are not Ent. faecium but an unidentified strain of Enterococcus (Farrow, personal communication) and the strain which causes growth depression is not Ent. faecium but a new species called Ent. Hirae. It may be that the two similar organisms

are Some probiotics contain Bacillus subtilis as one of the components. However, it is difficult to see how this can be active in the gut; it is certainly not an intestinal organism and, since it is a strict aerobe, would not be able to grow or metabolize in the gut.

2.3.5 Probiotics - Properties

Probiotics have been suggested to have the following properties and functions:

adherence to host epithelial tissue, acid resistance and bile tolerance, elimination of pathogens or reduction in pathogenic adherence, production of acids, hydrogen peroxide and bacteriocins antagonistic to pathogen growth, safety, non pathogenic and non carcinogenic, and Improvement of intestinal microflora. However, the mode of action of probiotics still remains unclear. It has been proposed that probiotics could maintain the healthy intestinal microbiota through competitive exclusion and antagonistic action against pathogenic bacteria in the animal intestine (Fuller, 1989). The ability of lactic acid bacteria to inhibit the growth of various Gram- positive or Gram- negative bacteria is well known. This inhibition may be due to the production of organic acids such as lactic and acetic acid, hydrogen peroxide, bacteriocins, bacteriocin like substances and possibly biosurfactants, which are active against certain pathogens. On the other hand, several studies have suggested that adhesive probiotic bacteria could prevent the attachment of pathogens and stimulate their removal from the infected intestinal tract. These antagonistic properties could be very useful in probiotic products. Apart from this, successful probiotic bacteria should be able to survive gastric conditions and colonize the intestine, at least temporarily, by adhering to the intestinal epithelium. Such probiotic microorganisms appear to be

promising candidates for the treatment of intestinal disorders produced by abnoimal gut microflora and altered gut mucosal barrier functions (Salminen *et al*., 1998).

2.4 Origin of Name of Yeast

The word "yeast" comes from old English gist, gyst, and from the Indo-European root yes meaning "boil","foam", or "bubble". Yeast microbes are probably one of the earliest domesticated organisms. Archaeologists digging in egyptian ruins found early grinding stones and baking chambers for yeast-raised bread, as well as (Loureiro V, Malfeito-Ferreira M , 2003) a wing of 4,000-year-old bakeries and breweries (Fleet GH, Praphailong, 2001) In 1680, Dutch naturalist Anton van Leeuwenhoek first microscopically observed yeast, but at the time did not consider them to be living organisms, but rather globular structures, (Loureiro V, Malfeito-Ferreira, M (2003) In 1857, French microbiologist Louis Pasteur proved in the paper "*Memoiresur la fermentation alcoolique"* that alcoholic fermentation was conducted by living yeasts and not by a chemical catalyst. (Fleet GH, Praphailong 2001) Pasteur showed that by bubbling oxygen into the yeast broth, cell growth could be increased, but fermentation was inhibited- an observation later called the "Pasteur effect".

2.4.1 Define of Yeast

Yeasts are eukaryotic microorganisms classified in the kingdom fungi, with 1500 species currently described (Kurtzman and Fell. 2006). Yeast are unicellular, although some species with yeast forms may become multy cellular through the formation of strings of connected budding cells know as pseudohyphae, or false hyphae, as seen in most molds Yeast size can very greatly depending on the species, typically measuring 3-4 µm in

diameter, although some yeasts con reach over 40 µm, (Legras et al., 2007). Most yeasts reproduce asexually by mitosis, and many do so by an asymmetric division process called budding.

2.4.2 Benefit of the Yeast

Yeast, which is known as "Baker Yeast" is rich in crude protein (40_45%) and vitamin B complex. Yeast extracts have been widely reported as successful growth promoter in poultry industry (Savage and Zarrewska, 1996 and Spring, 2002). Containing minerals and amino acids, yeast offers many benefits. These indispensable elements for a healthy organism give yeast a crucial role in our diet and balance. For example, yeast and its derivatives are used in food supplements to complement our diet, ensure our. It is also used in other sectors such as animal foods or cosmetics. (Anderson *et al.* 2001)

2.4.3 The Use of Yeast

Commonly used probiotics include saccharomyces cerevisiae for enhancing the activity of beneficial microbes in the gastrointestinal tract, thus improving the digestibility of nutrients and production potential of the animals (Newbold *et al*. 1995), and Lactobacillus. For competitive exclusion of undesirable microorganisms from the intestine, thus improving the health of the animal.

There is a lot of variation in the performance of the same animal fed on different species of probaiotic, or even the same species of probiotic but different strains. (*Newbold et al*. 1995) observed that different strains of S. cervisiae had different effects on rumen bacteria in vitro and in sheep. The probiotics entering in gastrointestinal tract have to face certain environmental constraints, and different strains of probiotic cultures differ

in there sensitivity towards them. Some factors such as lysozyme, pancreatic enzymes, low Ph, organic acid and bile salts. Have been indented against which sensitivity of various cultures should be tested during selection for use as probiotics (Jin *et al*. 1997).

Celik *et al*. (2001) evaluated the effects of saccharomyces serevisiae and Falavomycin on broiler growth performance. Three experimental diets were used, 1/control diet no additives, 2/2 mg flavomycin /kg feed and 3/0.2% saccharomyce serevisiae/kg feed. The results indicated that birds receiving 0.2% saccharomyesserevisiae consumed significantly much feed during 37 days of experiment.

2.5 Enzymes

Addition of enzymes to feed may be a useful strategy to increase its digestibility. Dietry enzymes may supplement to animal's own digestive system enzymes or enable it to utilize the energy in complex carbohydrates which normally pass unchanged through the gastro intestinal tract (Atteh, 2001).

Some of enzymes that have been used over the past several years have potential for use in feed industry include celluloase protease (β-glucanase, xylanases and associated enzymes, phytases, proteases, lipases and glactosidases. Enzymes in feed the industry have mostly been used for poultry to neutralize the effects of the viscouse, non-starch-polysaccharides (NSP) in cereal such as barely, wheat, rye, and tritical. These anti-nutritive carbohydrates are undesirable, as they reduce digestion and absorption of all nutruents in the diet, especially fat and protein (Marquardt, 2005; Oslukosi *et al*, 2007).

Recently, conciderable interest has been shown in the use of phytase as feed additive, as it not only increase the availability of phosphate in plants but also reduce environmental pollution. The enzyme phytase can decrease the anti nutritional effects of phytate which binds 50-75% of the phosphotus in vegetable matter. phytase also appearse to interfere with the digestion and absorption of other minerals such as calcium (Juapere *et al*, 2005; Arabi, 2006).

Several other enzymes products are currently being evaluated in the feed industry, including protease to enhance protein digestion, lipase to enhance lipid digestion, β-galactosidases to neutralize certain anti-nutritive factors in non-cereal feedstuffs, and amylase to assist in the digestion of starch (Zanella *et al*, 1999; Cafe et al, 2002; Meng *et al*, 2005; Marquardt, 2005).

The exogenous enzyme addition appears to limit microbial growth in ileum, the product enzymatic break down may provide fermentable substrates to the cereal flora increases in volatile fatty acid (VFA) production and chaing in VFA profile serve to favor the beneficial organisms (Bifids bacteria, of example) and suppress population of deleterious organisms (Campylobacter, Salmonella, Colstridium) (Ravington, 2002). The combination of xylanase, amylase and protease enzymes have been shown to improve protein, amino acidsand energy utilization, improve performance, uniformity and impact microbial, population in bacteria manner in the upperand lower intestine. (Zanella *et al*, 1999, Cafe *et al*, 2002).

Enzymes are one of the many types of protein in biological systems. Their essential characteristic is to catalyze the rate of a reaction but is not themselves altered by it. They are involved in all anabolic and catabolic

pathways of digestion and metabolism. Enzymes tend to be very specific catalysts that act on one or, at most, a limited group of compounds known as substrates. Enzymes are not living organisms and are not concerned about viability or cross infection. They are stable at 80-85 degree centigrade for short time.

Another important feature of enzymes is that the rate of an enzyme catalyzed reaction increases with increasing substrate concentration, to the point where there is no further response and the enzyme is said to be saturated. Therefore, we need to match the amount of enzyme with the quantity of substrate (Acamovic and McCleary, 1996).

It is common practice to name enzymes by adding the suffix ase to the name of the principal substrate. For example, β-glucanase is an enzyme that splits β-glucans, and proteases break protein. We may also broadly categorize the digestive enzymes as endogenous or exogenous - referring to those produced by the animal and those administered from outside, respectively. For example, pancreatic lipase, which splits fat or lipid into glycerol and fatty acids, is an endogenous enzyme. Those enzymes added to feed as a supplement are exogenous (Classen, 1996).

2.5.1 Sources of Enzymes

Enzymes were used in the preparation of foods long before there was any awareness of enzymes as such, possibly as long ago as 10,000 years. The industrial exploitation of microbial enzymes in the Western world started 100 years ago with the patenting of a process for the production of alpha-amylase (Taka mine) from the fungus *Aspergillus oryzae*. Enzymes are produced in every living organism from the highest developed animals and plants to the simplest unicellular forms of life, as they are essential for metabolic process. Most of the enzymes currently

used in the food and beverage industry are from *Aspergillus*, but hemicellulases and cellulases are derived from *Trichoderma*. Recently, genes encoding for different enzymes, including phytases, ß-glucanases, and xylanases, have been cloned and expressed in different commercial systems (microorganisms and plants). It is possible to produce large amounts of cheap enzyme by continually selecting favorable microbes, growing them in advanced fermentation systems and by streamlining the extraction and purification of the enzyme (Wallis, 1996).

Microorganisms that generally involved in production of enzymes are; Bacteria (*Bacillus subtilis, Bacillus lentus, Bacillus amyloliquifaciens* and *Bacillus stearothermophils*), Fungus (*Triochoderma longibrachiatum, Asperigillus oryzae* and *Asperigillus niger*) and Yeast (*S. cerevisiae*)

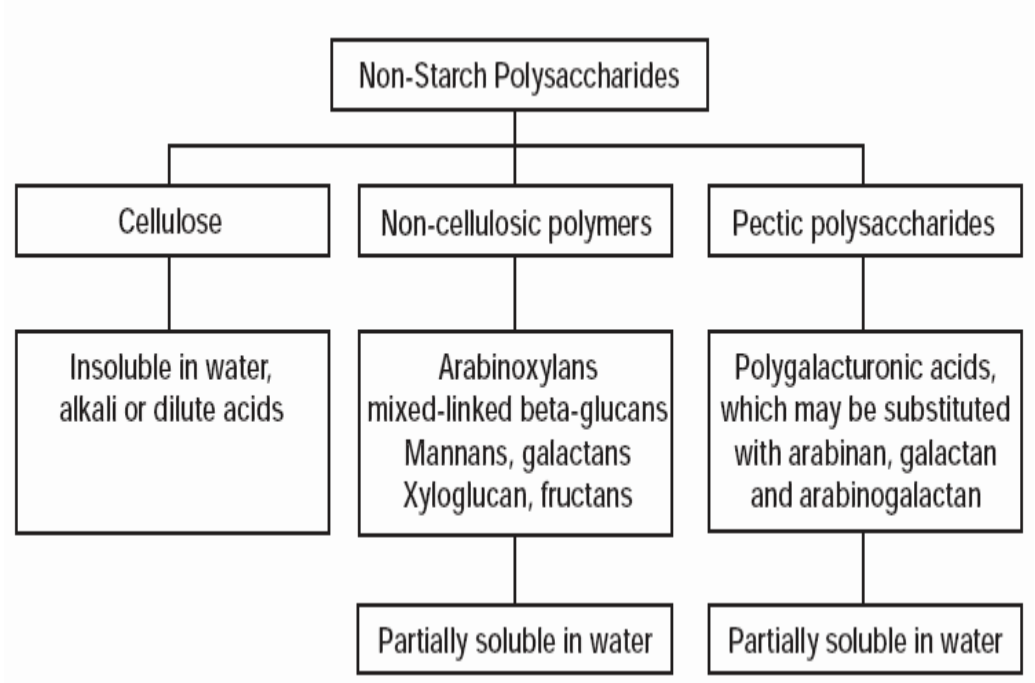
2.5.2 Enzymes in Poultry Nutrition

The use of enzymes in animal feed is of great importance. Consistent increase in the price of feed ingredients has been a major constraint in most of the developing countries. As a consequence cheaper and nonnconventional feed ingredients have to be used which contain higher percentage of Non-Starch Polysaccharides (soluble and insoluble/crude fibre) along with starch. Non Starch Polysaccharides (NSPs) are polymeric carbohydrates which differ in composition and structure from starch (Morgan *et al.*, 1995) and possess chemical cross linking among them therefore, are not well digested by poultry (Adams and Pough, 1993; Annison, 1993). A part of these NSPs is water-soluble which is notorious for forming a gel like viscous consistency in the intestinal tract (Ward, 1995) thus by reducing gut performance. Predominantly water soluble and viscous arabinoxylans, which belong to pentosan group, are

assumed to be the factor responsible. These pentosans also greatly increase the water intake by the birds, which lead to unmanageable litter problems caused by wet and sticky droppings. This deteriorates the hygienic conditions and carcass quality (Dunn, 1996).

The other hand, ß-glucans adversely affect all nutrients, especially protein and starch utilization and are known to give rise highly viscous conditions in the small intestine of the chicks (Hasselman and Aman, 1986).

Poultry do not produce enzymes for the hydrolysis of Non-Starch Polysaccharide present in the cell wall of the grains and they remain un-hydrolyzed. This results in low feed efficiency. Research work has suggested that the negative effects of NSPs can be overcome by dietary modifications including supplementation of diets with suitable exogenous enzyme preparations (Creswell, 1994). Enzymes break down the NSPs, decreases intestinal viscosity and eventually improve the digestibility of nutrients by improving gut performance.



2.5.3 Types of Enzyme Available for Poultry

Some of the enzymes that have been used over the past several years or have potential for use in the feed industry include cellulase (ß-glucanases), xylanases and associated enzymes, phytases, proteases, lipases, and galactosidases (Table 1). Enzymes in the feed industry have mostly been used for poultry to neutralize the effects of the viscous, nonstarch polysaccharides in cereals such as barley, wheat, rye, and triticale. These antinutritive carbohydrates are undesirable, as they reduce digestion and absorption of all nutrients in the diet, especially fat and protein. Recently, considerable interest has been shown in the use of phytase as a feed additive, as it not only increases the availability of phosphate in plants but also reduces environmental pollution. Several other enzyme products are currently being evaluated in the feed industry, including protease to enhance protein digestion, lipases to enhance lipid digestion, ß-galactosidases to neutralize certain antinutritive factors in noncereal feedstuffs, and amylase to assist in the digestion of starch in early-weaned animals.

2.5.4 Benefits of Enzymes

Benefits of using feed enzymes to poultry diets include; reduction in digesta viscosity, enhanced digestion and absorption of nutrients especially fat and protein, improved Apparent Metabolizable Energy (AME) value of the diet, increased feed intake, weight gain, and feed–gain ratio, reduced beak impaction and vent plugging, decreased size of gastrointestinal tract, altered population of microorganisms in gastrointestinal tract, reduced water intake, reduced water content of excreta, reduced production of ammonia from excreta, reduced output of excreta, including reduced N and P (Campbell *et al*. 1989; Jansson *et al*.

1990; Annison and Choct, 1991; Bedford *et al*. 1991; Benabdeljelil 1992; Jeroch and Dänicke 1993; Marquardt *et al*. 1994; Leeson and Proulx, 1994; Bedford, 1995; Choct *et al*. 1995; Classen *et al*. 1995; Dunn 1996; Esteve-Garcia *et al*, 1997; Ouhida *et al*, 2000; Gill, 2001; Odetallah, 2002; Gracia, *et al.*, 2003; Saleh, *et al.*, 2003; and Odetallah, *et. al.*, 2005).

CHAPTER THREE

MATERIAL AND METHODS

3.1 Duration

The experiment was conducted in Poultry Farm, College of Agriculture Studies, Sudan University of Science and Technology, during the period 35 days which the ambient temperature ranged between 16C to 28C.

3.2 Housing

The house is open system, East-West long axis , the house dimensions were length and width and height.9 seprate replicates of equal size $1m^2$ each were used wire net partitions, each replicates was provided with wood shaving litter and feeder and drinker to allow optimum consumption of feed and water were supplied ad labium. Heat lamps were used for the control of heating and lighting and had put in away to ensure adequate and uniform distribution of heat and light, light was open during the period of whole night ,to protect the chicks from cold.

Strict sanitation program were maintained in the house before and during the period of experiment.

3.3 Experimental birds

Sixty three unsexed commercial broiler chicks (Arborakers) were selected after week of adaptation period .Chicks were fed pre-starter diet for period adaptation.

Chicks were distributed randomly to three experimental diet (A, B and C,) in a completely randomized design, each treatment had three replicates of 7 birds each Chicks were vaccinated against infectious

bronchitis disease (IBD) and Newcastle disease at age of 7 days and 29 days Gamburo disease at age of 14 days and 20 days.

Chicks in all groups have been given water soluble multivitamin compounds during the first three days of age and 24&25&26 days of age and before and after vaccination avoid the stress.

3.4 Experimental diet

The chicks were fed a commercial broiler pre-starter for a week. In this experiment a bush has been installed in the Sudan University, College of Agricultural Studies. The chicks were fed on dietary treatment. The first group A fed on basal diet (control). The second group B fed on enzyme. The third group C fed on yeast 0.3%.

3.5 Parameters

Body weight and feed intake were recorded weekly and body weight gain and feed conversion ratio (FCR) were also calculated and mortality was recorded daily.

3.6 Carcass preparation

At the end of experiment, one bird from each replicate was randomly selected, individually weighted after an overnight fast except from water, slaughtered and allowed to bleed, they were scale and defeathered manually, washed and drained after evisceration the hot carcass was weight, the individual organs, liver, gizzard, abdominal fat and legs were separated weighted.

3.7 Panel test

The stored left of carcasses was slightly seasoned wrapped individually in aluminum foil and roasted at 190C^{o} for 70 minutes with average internal temperature of 88C^{o} and served warm.

Well trained panel test were used to color, tenderness, juiciness and flavor of meat on scale of (Appendix 2), the roasted room samples were served randomly to each judge at room temperature.

Water was provided to the panelist to rinse their mouth after lasting each sample.

Table 1: Chemical composition of Yeast

Energy	1,361 kJ (325 kcal)
Carbohydrates	41.22 g
Sugars	0 g
Dietary fiber	26.9 g
Fat	7.61 g
Protein	40.44 g
Vitamins	
Thiamine (B1)	(956%) 10.99 mg
Riboflavin (B2)	(333%) 4 mg
Niacin (B3)	(268%) 40.2 mg
Pantothenic acid (B5)	(270%) 13.5 mg
Vitamin B6	(115%) 1.5 mg
Folate (B9)	(585%) 2340 μg
Choline	(7%) 32 mg
Vitamin C	(0%) 0.3 mg
Minerals	
Calcium	(3%) 30 mg
Iron	(17%) 2.17 mg
Magnesium	(15%) 54 mg
Manganese	(15%) 0.312 mg
Phosphorus	(91%) 637 mg
Potassium	(20%) 955 mg
Sodium	(3%) 51 mg
Zinc	(84%) 7.94 mg
Other constituents	
Water	5.08 g

Table 2: Chemical composition of Enzyme

Composition	Units per gramme
PROTEASE	6
AMYLASE	8
Beta- GLUCANASE	150
XYLANASE	1.100

3.8 Statistical analysis

3.8.1 Blood sample

Blood was collected by vein of wing, plasma was separated and analyized for total protein and cholesterol and phosphors and calcium and SGOT and SGPT using kits.

Table 3: The ingredients percent composition of experimental diet

Ingredients%	A	B	C
Dura	64.14	64.14	64.14
Ground nut cake	14.00	14.00	14.00
Sesame cake	15.00	15.00	15.00
Concentrate	5.00	5.00	5.00
Ouster shell	0.487	0.487	0.487
Dicalcium	0.618	0.618	0.618
Salt	0.25	0.25	0.25
Methionine	0.159	0.159	0.159
Lysine	0.344	0.344	0.344
Enzyme	0	0.3	0
Yeast	0	0	0.3
Total	100	100	100

CHAPTER FOUR

RESULTS

4-1 Effect of feeding live yeast in comparison with enzymes on growth performance of broiler chicks

Results obtained showed no significant (P≥0.05) difference in the Performance (Final body weight, Body weight gain and Feed intake) of broiler chicks fed on all the experimental treatments. Data obtained for body weight gain showed that the chick fed on diet containing 0.3% yeast numerically heavy body weight while the group supplemented with enzyme showed numerically the low value in the body weight gain compared with yeast group. Feed intake also was similar between groups. However, there is no significant (P≥0.05) difference for feed conversion ratio (FCR) between all experimental s groups.

4-2 Value of non carcass components, commercial cuts and dressing percentage

Value of non carcass component of (Neck and Feet) of experimental chicks showed no significant (P≥0.05) different (Table5). But the abdominal fat, liver, gizzard intestinal, head and dressing Percentage results showed significant differences (P≤0.05) between groups.

Values of commercial cuts were illustrated in (Table6) the results recorded significant different (P≤0.05) in (Breast, Thigh and Drumstick) values.

4-3 Panel test

The subjective panel test meat attributes of tested groups (Table8) showed significant different ($P \leq 0.05$) between groups. The results showed that the addition of 0.3% yeast improved the flavor, color, and juiciness compared with the groups.

4-4 Chemical analysis of serum

The results of chemical analysis of blood samples collected from experimental chicks (Table7) revealed significant different ($P \leq 0.05$) in (cholesterol, uric acid, phosphorous, glucose, total glycerol, urea), tested groups. But the Albumin and Protein results showed no significant ($P \geq 0.05$) different between other groups.

Table 4: The Performance of Broiler Chicks on Diet Containing Yeast

Items	A	B	C	SE
Inatial weight(g)	176.19	176.38	176.9	
Final weight(g)	1940.7	1800.7	1923.3	107.38
Body weight gain (g)	1746.4	1633.3	1747.5	104.02
Feed intake(g)	3240	3047.2	3251	118.52
FCR	1.6854	1.6988	1.6791	0.0881
Mortality%	0.00	0.00	0.00	

Key:

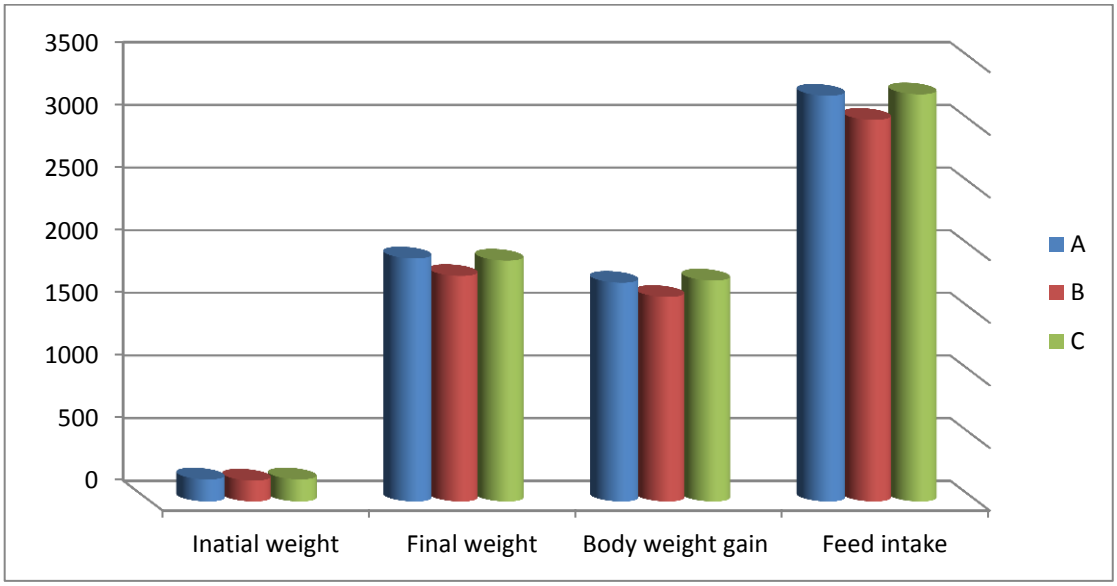
A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

SE=standard error

Figure 1: The Performance of Broiler Chicks on Diet Containing Yeast During Period (5) weeks



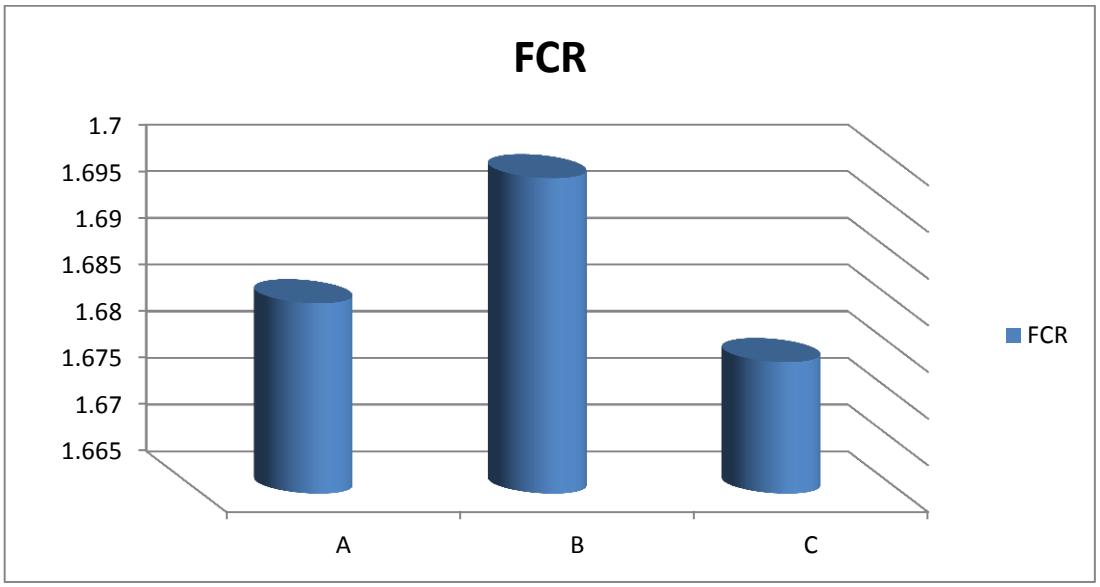
Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Figure 2: Effect of Feeding 0.3% Yeast on Feed Conversion Ratio during Period 5 weeks



Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Table 5: Effect of Feeding Broiler Chicks on Diet Containing 0.3% Yeast in comparison with Enzyme on non Carcass components

Items	A	B	C	SE
Dressing%	71.92	71.705	71.853	0.0252
Liver	3.4963	3.0117	2.3319	0.0204
Gizzard	2.005	2.2538	1.9279	0.0130
Abdominal fat	1.7448	1.2454	1.07	0.0101
Intesting	9.2644	8.5476	8.5442	7.158
Neck	4.5138	4.2738	4.5385	6.062
Head	2.7556	2.2638	1.1599	5.883
Feet	3.2594	3.5159	3.6739	5.907

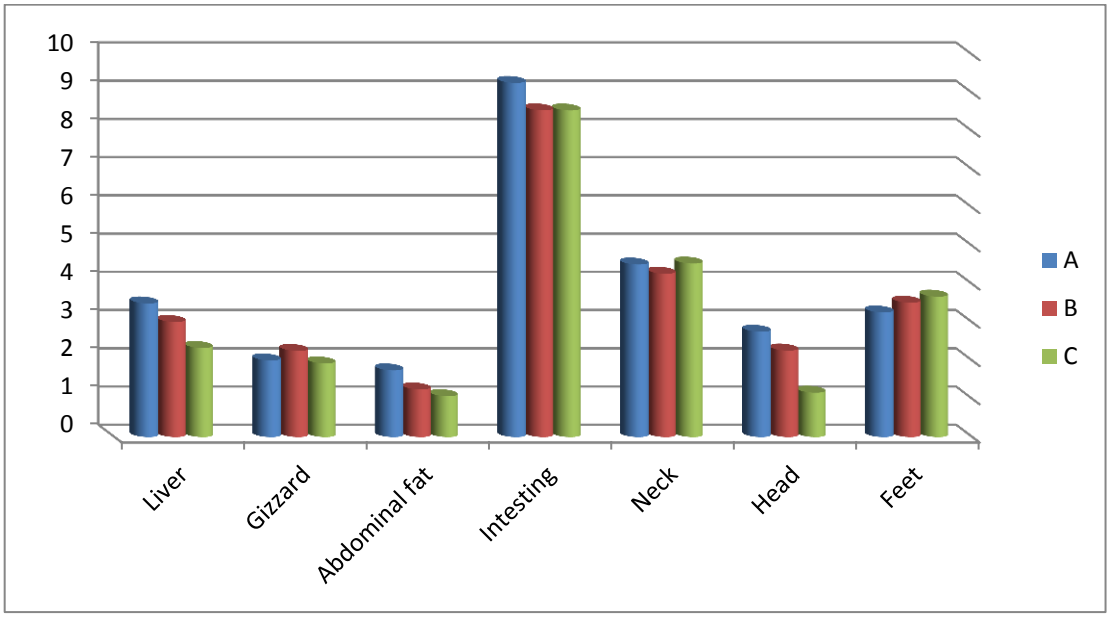
Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Figure 3: Effect of Feeding Broiler Chicks on Diet Containing 0.3% Yeast in Comparison with Enzyme



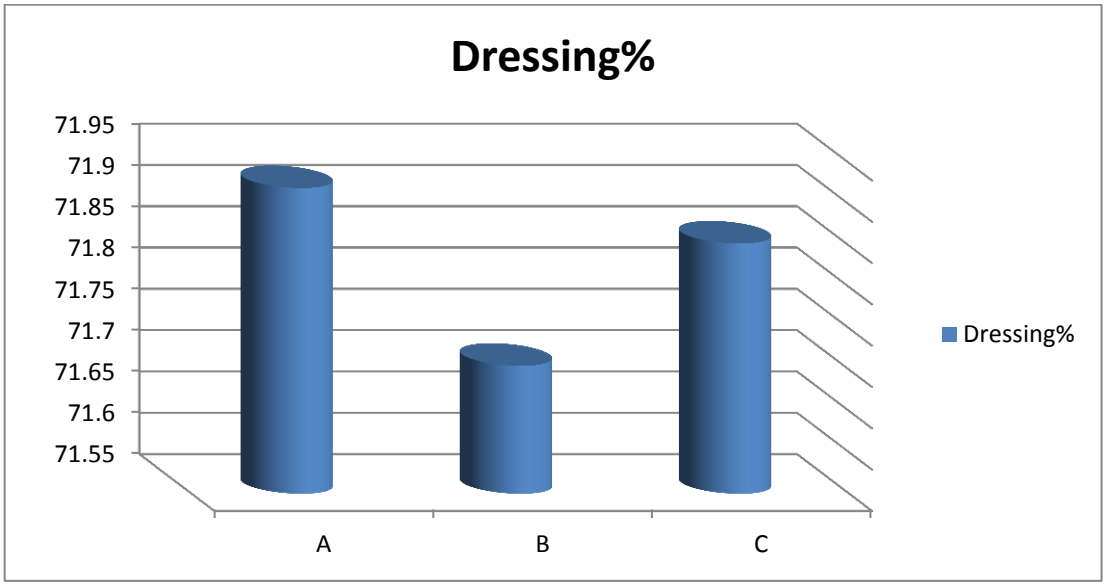
Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Figure 4: Effect of Feeding 0.3% Yeast in Comparison with Enzyme on Dressing Percentages



Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Table 6: Effect of 0.3% Yeast in Comparison with Enzyme on the Commercial Cuts Percentages of Broiler Chicks for 5 weeks

Items	A	B	C	SE
Breast%	37.67	43.451	43.972	0.0123
Thigh%	14.381	13.68	16.16	8.131
Drumstick%	6.1615	5.9608	5.4828	9.311

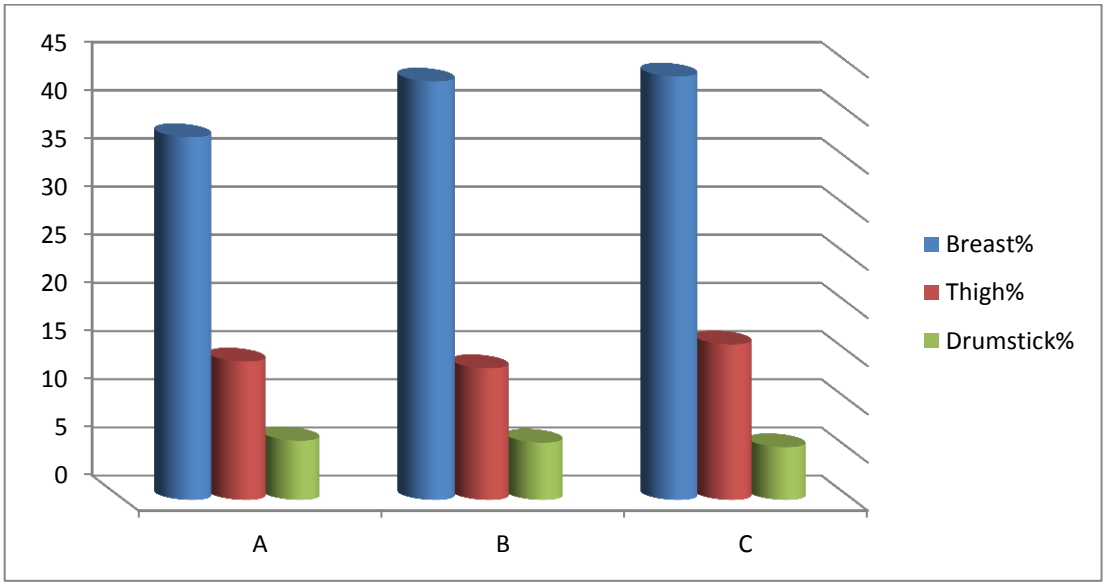
Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Figure 5: The Effect of Feeding 0.3% Yeast in Comparison with Enzyme on the Commercial Cuts Percentages of Broiler Chicks for 5 weeks



Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Table 7: Effect of Feeding Broiler Chicks on Diets Containing 0.3% Yeast on Comparison with Enzyme on Blood Serum Analysis

Items	**A**	**B**	**C**	**SE**
Cholesterol (mg)	93.28	75.827	73.14	9.813
Uric acid (mg)	6.44	5.1667	6.96	9.813
Phosphorous%	7.93	13.327	11.32	9.812
Glucose%	196.11	149.46	163.6	0.0479
Total glycerol %	63.63	41.657	56.06	9.813
Urea (mg/dl)	51.12	53.367	52	0.4715
Albumin	1.3400	1.3400	1.3200	8.165
Protein	2.800	2.750	2.826	0.0479

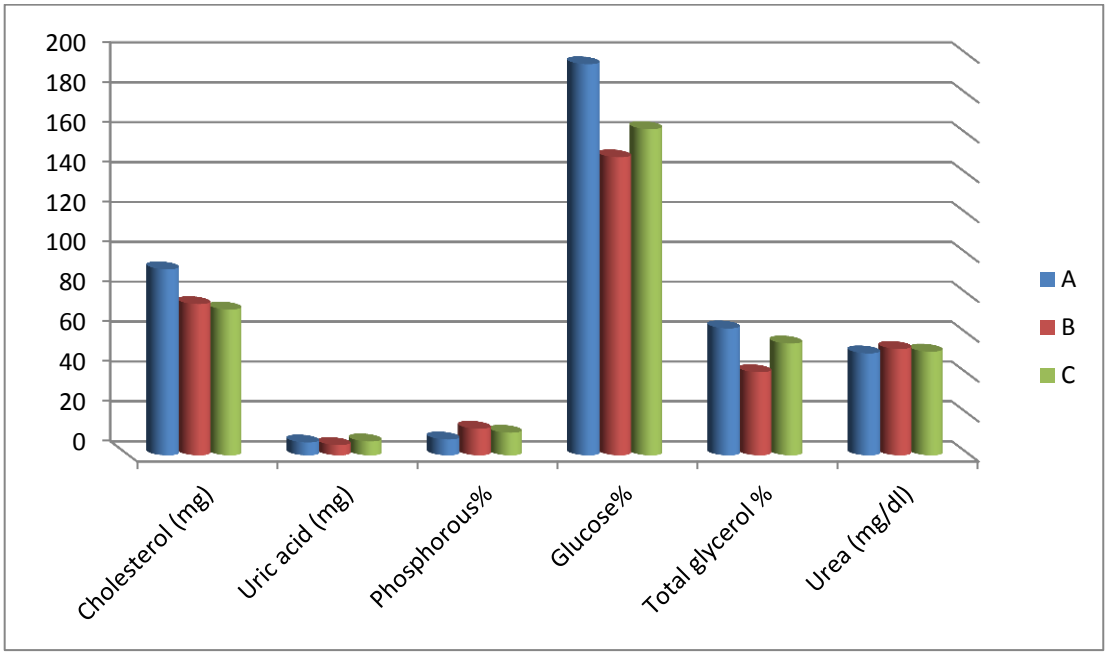
Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Figure 6: Effect of Feeding Broiler Chicks on Diets Containing 0.3% Yeast in Comparison with Enzyme on Blood Serum Analysis



Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Table 8: Effect of Feeding Broiler Chicks on Diets Containing 0.3% Yeast in Comparison with Enzyme on on Subjective Meat Attribute

Items	A	B	C	SE
Tenderness	6.6	6.2	6.3	0.0483
Flavor	5.5	5.8	6.4	0.0197
Color	5.2	5.2	6.5	0.0254
Juiciness	5.4	4.1	6.6	0.0374

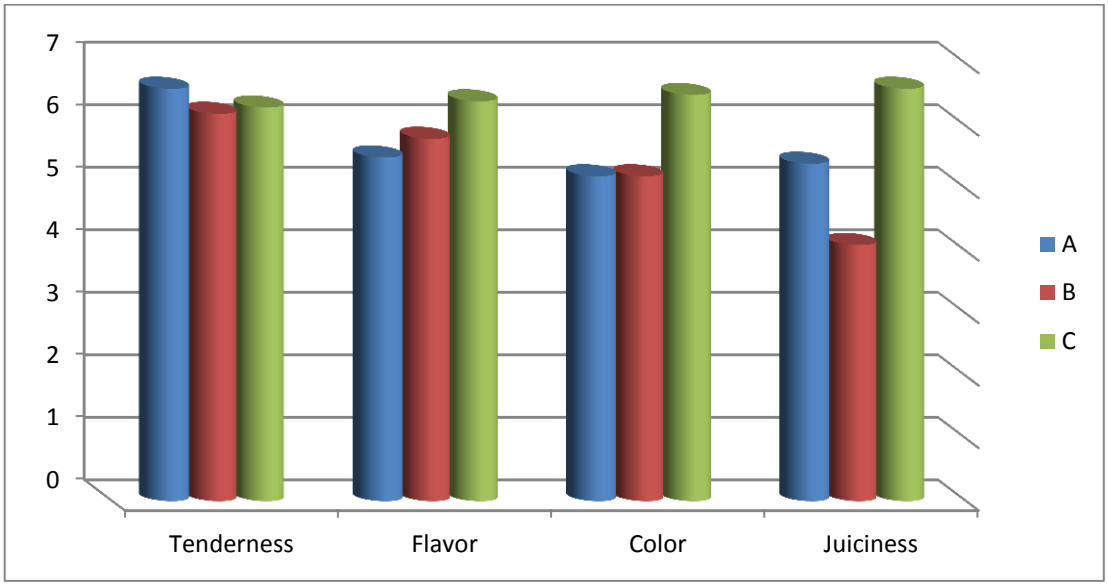
Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

Figure 7: Effect of Feeding Broiler Chicks on Diets Containing 0.3% Yeast in Comparison with Enzyme on Subjective Meat Attributes



Key:

A=control sample (without addition)

B= sample treated with enzyme

C=sample treated with 0.3% yeast

4-5 Economical appraisal

Total costs calculation according to December 2015, price kilogram of Bird calculated according to February 2016.

Table 9: The economic appraisal of dietary 0.3% yeast for broiler chicks

Items	A	B	C
Cost:			
Chicks	6	6	6
Feed	14.58	15.71	14.72
Management	3.5	3.5	3.5
Total costs	24.08	24.21	24.22
Revenues:			
Average weight carcass	1746.4	1633.3	1764.5
Price kg/bird	29	29	29
Total revenues	50.64	47.36	51.17
Total costs	24.08	25.21	24.22
Profit/chicks	26.56	22.15	26.95
Profitability ratio	1	0.83	1.01

CHAPTER FIVE

DISCUSSION

Feed additives play important role as growth promoter in poultry industry instead of antibiotic that have side effect for development of resistant from harmful microorganism tends the current outcry from consumer society and health sector (Cavazzoni *et al*., 1998).

Consequently there exists the need to replace antibiotics with probiotics.

Probiotic is a microbe organism use as additives to diet in order to improve the performance of beneficial microbs in the gut of animal or birds.

In the present study the yeast (saccharomyces cerevisiae) was used as feed additives as a natural alternative to antibiotics. The result showed that birds supplemented with yeast (SC) at level 0.3% had a significant different at ($P \geq 0.05$) in comparison with group consumed enzyme (20 g / ton) in body weight gain and feed conversion. No significant differences were observed among all treatment groups in Feed intake. However, within the treatment groups, yeast group (0.3%) consumed lower feed than other treatment groups control and enzyme. This result agrees with Mustafa, (2011) the results disagree with Zhang *et al*, (2005), and Abaza *et al*, (2008).

Many authors the refer that live yeast adding on feed increase feed intake in broiler chick , body weight gain and feed conversion ratio may be due to shape of yeast environmental condition and its content of digestive peptides, amino acids, polysaccharides, smell, flavor and other elements may be for other factors which make response had beneficial in field of

animal production mention by (Gao *et al*., 2008) many researcher like (Savage *et al*, 1985, Absza *et al*, 2008) recorded that yeast helpful to digestive and absorption nutrition materials throw improve health of intestinal wall from that make from that make the improve of nutrition values. The results of current study did on line with (Flemmhng *et al*., 2004, and Brummer *et al*., 2010).

Which they refer that adding of yeast in feed of broiler chicks they did appear significant deferent in body weight gain and feed conversion ratio. The result is not agree with many research in adding of yeast in feed of broiler chicks that due for yeast efficiency which depend for many factors for example the form of yeast adding for feed (dry active yeast, moister, life yeast and fermented yeast) also the percentage of yeast adding in feed method of adding on feed or water age of birds and level of biosecurity and environmental conditions as mention by (Patterson and Burkholder 2003, Stanly et al., 2004, Gao *et al*., 2008).

The experimental birds did not recorded any of mortality rate that may be due for highly biosecurity measures and content vaccination program against (ND+IB) done in hatchery by aerosol.

Adding of live yeast (Sc) powder to the feed of experimental birds participate to improved health condition throw of yeast to improve intestinal wall and soled of immunity system (Gao *et al* 2008) which is result on line with result of (Devegouda *et al*., 1997) that refer adding of yeast (Sc) to the feed of broiler chicks which participate to reduce mortality rate although (Flemming *et al*., 2004) which did not found any effect of using yeast (Sc) reduce mortality rate.

The result obtained by adding commercial enzyme (Hamicoenzyme) 20g/ton which recorded feedback less than live yeast (Sc) at level 0.3%.

The live yeast (Sc) was better than others treatment. In special way there is no residual in poultry production (meat), in compared with antibiotics.

Conclusion and Recommendations

Conclusion

Based on the results obtained it may be concluded that yeast at level of 0.3% improved the performance (Body weight gain, FCR), Add yeast improves the tenderness and juiciness of the meat. Yeast recorded no mortality rate, and increased percentage the breast, thigh and dressing percentage.

Recommendations

According to above conclusion the following recommendations could be drowning:

- More experiment needed to be run to investigate the effect of different levels of yeast supplementation in broiler diets.
- Add yeast 0.3% recorded better results compared with the rest of proportions.
- In the future we need to study the effect of adding yeast in poultry diets in the immunity.

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Appendices

Appendix (1)

Card used for judgment of subjective meat quality attributes.

Sensory evaluation card

Evaluation these sample for color, flavor, juiciness and tenderness. For each sample, use the appropriate scale to show your attitude by checking at the point that best describes your felling about the sample. If you have any question please ask. Thanks your cooperation.

Name: ……Date: ……

Tenderness	Flavor	Color	Juiciness
8-Extremely tender	8- Extremely intense	8-Extremely desirable	8-Extremely juicy
7-Very tender	7-Very intense	7-Very desirable	7-Very juicy
6-Moderately tender	6-Moderately intense	6-Moderately desirable	6-Moderately juicy
5-Slightly tender	5-Slightly intense	5-Slightly desirable	5-Slightly juicy
4-Slightly tough	4-Slightly bland	4-Slightly desirable	4-Slightly juicy
3-Moderately tough	3-Moderately bland	3-Moderately undesirable	3-Moderately dry
2-Very tough	2-Very bland	2-Very undesirable	2-Very dry
1-Extremely tough	1-Extremely bland	1-Extremely undesirable	1-Extremely dry

Serial	Sample Code	Tenderness	Flavor	Color	Juiciness	Comment

Appendix (2)

Distribution of chicks in the house

Appendix (3)

Experimental Site

Appendix (4)

Hamecozyme

Yeast