Sudan University of Science and Technology

College of Graduate Studies

Effect of Dietary Supplementation of Dry onion, Anise and Y.mos on Broiler Production Performance

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A dissertation Submitted in Partial Fulfillment of the Requirement for the Degree of M.Sc. in Tropical Animal Production

By:

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SUPERVISOR

Dr .ELfadil Ahmed Adam Fadul

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الايـــــــــــة

بسم الله الرحمن الرحيم

قال تعالى:

(ولحم طير مما يشتهون)

(صدق الله العظيم)

الاية (21) سورة الواقعة

DEDICATION

I dedicated this work to:

My wife and lovely children

My family (father, mother, brothers and sisters)

My friends

Acknowledgement

I would like to express my sincere gratitude to my supervisor Dr. ELfadil Ahmed Adam, Director of the Department of Poultry Science and Technology, Sudan University of Science and Technology, for his guidance, advice, utmost care and encouragement during the period of this study.

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Finally, I would like to express my gratitude to my friends for support and encouragement.

Abstract

This study was conducted to evaluate the effect of dietary supplementation of dry onion, anise and yeast (y.mos) as growth promoter on performance of broiler chicks. A total, 120 one-day old (Ross) broiler chicks were used in this study. The broilers were distributed in a completely randomized design into four treatments groups having 3 replications with 10 chicks per replicate. Two basal diets (starter and finisher) were formulated according to the nutrient requirements outlined by NRC (1994).The treatment groups were control (basal diet) without supplement (T1), basal diet + 0.1% dry onion (T2) , basal diet + 0.1% anise (T3) and basal diet + 0.1% yeast(y.mos) (T4). The experiment was extended for 42 days. The following parameters were evaluated: feed intake, weight gain, feed conversation ratio, body weight, internal organs (liver, spleen, pancreas, heart) , abdominal fat and dressed carcass weight. The statistical analysis indicated that birds fed dry onion supplemented diet had significantly (P<0.01) higher feed intake. Weight gain, final body weight. Spleen and proventriculus weight. followed by those fed anise, Y.mos finally the control group. On the other hand, feed conversion ratio (FCR) and mortality were not affected. Supplementing dry onion, anise and Y.mos were not affected heart and gizzard weight. On the other hand, liver weight was increased when supplementing anise in the broiler basal diets. compared to Y.mos , onion and the control.

However, abdominal fat weight was significantly ($P<0.01$) higher when the birds fed dry onion supplemented diet followed by those fed Y.mos, anise and the control treatment respectively.

The microbiological results revealed that none of the samples of the intestinal content was positive for Salmonella spp. for all treatment groups. While all were positive for E.coli. Lactobacillus colonies were detected when Y.mos and Anise were supplemented, the opposite was true when supplementing dry onion and the control treatment.

In conclusion, addition of dry onion, y.mos and anise in broiler diets was validated to have beneficial effects on most of the observed parameters compared to the control group, especially in onion fed broilers, hence it could be concluded that these feed additives can work as alternative growth promoters for antibiotics in broiler production.

مخلص البحث

اجريت هذه التجربة لتقيم اثر اضافة البصل المجفف ،الينسون والواى موس على الاداء الانتاجي للدجاج اللاحم. تم شراء (120) مائة وعشرين كتكوت عمر يوم تم من الهجين التجاري روس 308. تم توزيع الكتاكيت عشوائيا الي أربعة مجموعات بحيث تتكون كل مجموعة من ثلاثة مكررات يحتوي كل مكرر علي 10 كتاكيت. تم تكوين عليقتين اساسيتين (بادي وناهي) حسب الاحتياجات الغذائية للمجلس القومي للبحوث 1994. مجموعات التجربة كانت كالاتي : المجموعة الاولي تمت تغذيتها علي عليقة الاساس بدون اضافات وهي تمثل مجموعة التحكم ،المجموعة الثانية تمت تغذيتها علي عليقة الاساس+ 0.1% بصل مجفف ،المجموعة الثالثة تمت تغذيتها علي عليقة الاساس+0.1% ينسون بينما المجموعة الرابعة تمت تغذيتها علي عليقة الاساس + 0.1% واى موس .استمرت التجربة لفترة امتدت لاثنين وأربعين يوماً تم خلالها قياس الاتي :استهلاك العلف ،الوزن المكتسب ، معدل التحويل الغذائي والوزن النهائي بالاضافة لوزن بعض الاعضاء الداخلية (البنكرياس ، الكبد ، الطحال ، القانصة والدهن البطني) بالاضافة لوزن الذبيحة الصافي كما تم حساب نسبة النفوق . اشارت نتائج التحليل الاحصائي ان الطيور التي اعلفت علي البصل المجفف سجلت أعلي مستوي معنوية(P<0.01) في استهلاك العلف، الوزن المكتسيب ووزن جسم النهائي و الطحال ووزن القانصة تليها المجموعة التي اعلفت علي الينسون ثم (الخماىر) واخيراً مجموعة بالعليقة المقارنة(الكنترول) .

إضافة البصل المجفف او الينسون او الواي موس لم يكن لها تأثير معنوي علي وزن القلب والمعدة الغدية. من ناحية أخري فإن وزن الكبد كان أعلي معنوياً (P<0.01) عند إضافة الينسون في عليقة الاساس مقارنتاً بالخميرة والبصل الجاف و العليقة المقارنة ، بينما كان وزن دهن الاحشاء أعلي معنوياً (P<0.01) في الطيور التي أعلفت علي العليقة التي تحتوي علي البصل المجفف تليها التي أعلفت علي عليقة الخميرة ثم الينسون وأخيراً العليقة المقارنة (الكنترول) علي التوالي.

أوضحت نتائج الفحص المعملي لمحتويات الامعاءعدم وجود بكتريا السالمونيلا في جميع العينات ولكل المجموعات بينما كانت ايجابية لبكتيريا الايشريشيا كولي، ومن ناحية أخري فإن مستعمرات اللاكتوباسلس قد وجدت في محتويات الامعاء عند التغذية علي العلائق التي تحتوي علي الواي موس و الينسون والعكس صحيح عند التغذية علي العليقة التي احتوت البصل المجفف وعليقة التحكم.

من النتائج المتحصل عليها إن إضافة البصل المجفف الينسون و الخميرة لها أثر مهم علي معظم القياسات التي كانت تحت الدراسة مقارنتاً بمجموعة المقارنة ، وكان التأثير أكثر وضوحاً عند تغذية كتاكيت اللاحم بعليقة تحتوي علي البصل المجفف. وعلية فان الاضافات العلفية من الممكن إستخدامها كمحفزات نمو بدلاً عن المضادات الحيوية في إنتاج اللاحم.

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CHAPTER ONE

1.0 INTRODUCTION

Antibiotic as a feed additives have been banned in animal nutrition in many European countries (Anadon, 2006) due to the increased occurrence of pathogens resistant to therapeutic antibiotics used in both animals and humans. Therefore, searche for alternate products can aid in growth promotion, improved feed utilization and maintenance of gut health are taking place. Herbs and species and various plant extracts have received increasing attention as possible alternative growth promoter replacements(Revington, 2002; Huyghebaert, 2003). In limited research, the effect of some aromatic plants and their components on the performance have been studied, The addition of these substances to the feeds and water improved feed intake, feed conversion ratio and carcass yield (Turker, 2002; Alcicek et al., 2003). As an aromatic plant, anise (Pimpinella anisum L.) has been used as stimulating effect of digestion and antiparasitic (Cabuk et al., 2003), antibacterial (Singh et al., 2002), antifungal (Soliman and Badea, 2002) and antipyretic (Afifi et al., 1994) and could have some direct antiviral effects. Meanwhile, onion (Allium cepa) was used for treatment of some illness as herbal medicine (Ebesunun et al., 2007). This plant contain plenty organic sulphur compounds and very small amount of volatile oil compounds (Melvin et al., 2009). Numerous health benefits have been attributed to the vegetable, including antibacterial, antiviral, antiparasitic and antifungal properties (Lampe, 1999). Furthermore, Aji et al. (2011) reported the useful influence of onion bulbs on growth yield of broiler chickens. Available mannan-oligosaccharide has exhibited to enhance the bird growth parameters including feed intake and feed utilization (Hooge, 2004; Rosen, 2007 ; Nikpiran et al., 2013). However, bird growth responses to herbs and spices supplementation are still controversial. Therefore, this study aim to evaluate the effect of supplementing dry onion, anise and yeast(Y-mos) in broiler diet on performance, internal organs weight and gastro intestinal tract (GIT) bacterial population.

CHAPTER TWO

2.0/LITERATURE REVIEW

2.1/Antibiotics as Growth Promoter

Antibiotics are chemical substances derived initially from certain fungi, bacteria, and other organisms that can inhibit the growth of, and even destroy, harmful microorganisms (Davey, 2000). With the advances in medicinal chemistry, antibiotics can be produced synthetically. According to their origin-based classification, antibiotics can be categorized into natural, semi-synthetic, and synthetic (Edwards et al., 1975; Edwards et al., 1976). According to their effect on microorganisms, antibiotics might be classified into bacteriocidal, which kill bacteria, and bacteriostatic, which only inhibit bacterial growth (Hinton, 1988; Norcia et al., 1999). As antimicrobial growth promoters (AGP), antibiotics have been practiced in poultry feed for about 60 years. Early findings of beneficial effects of AGP were reported in poultry diets by Moore et al. (1946). European states followed to authorize antibiotics in the 1950s and 1960s (Jones and Ricke, 2003). Antibiotics have been added mainly during the growing period to protect poultry from pathogenic organisms, maintain health, promote growth, facilitate better feed efficiency, and improve meat quality. For instance, two of the more popular broad spectrum antibiotics utilized within the poultry industry, i.e. virginiamycin and bambermycins, have been reported to improve the growth and performance of broilers and turkeys (Waldroup et al., 1985; Salmon and Stevens, 1990). In a more recent study, Miles et al. (2006) showed that addition of virginiamycin to a corn-soybean meal diet stimulated improvement in total body weight and the number of absorptive cells per unit length in the intestine of male and female broiler chickens. In other studies, it has been reported by Engberg et al. (2000) that zinc bacitracin significantly reduced the number of coliform bacteria in the ileum and increased the activities of amylase and lipase in pancreas homogenates. Numerous studies have reported that growth enhancement properties of antibiotics are closely related to interactions with the microbes in the gut. Antibiotics can help control disease by selectively modifying and improving the gut microflora, reducing bacterial fermentation and preventing infectious diseases, and results in health status improvement. All these changes lead to an increase in nutrient availability for the animal, allowing enhanced feed efficiency and being able to achieve better growth performance (Dibner and Buttin, 2002; Hernández et al., 2006). Moreover, Donoghue and Venkitanarayanan (2008) showed that the use of antibiotic in poultry diets gives significant economical advantages as it facilitates better production efficiency, thus allowing consumer to purchase high quality poultry products at lower price

2.1.1The Ban of Antibiotics

In order to limit the spread and development of antibiotic resistant microflora, the authorisation of several antibiotics as growth promoters as feed additives has been withdrawn in European Union since 1997 (Dibner and Richards, 2005). The authorisation of these antibiotics as feed additives has been withdrawn because the contribution to bacterial resistance is of a significantly larger extent than from the benefit of these antibiotics for veterinary therapy (World Health Organization, 2003). It was surprisingly and unexpected, as these antimicrobials were not allowed to be used in the feed as a part of disease remedy (Aarestrup et al., 2001). The authorisation of these antimicrobials in the feed has been withdrawn to reduce potency of creating microflora that resistant to the drugs, which was also exhibited a potential hazard to public health (World Health Organization, 2003). The removal of AGPs authorisation resulted in substantial increase in infection in poultry (Knarreborg et al., 2002; Casewell et al., 2003). As a consequence, the poultry industry has needed to find alternatives to AGP in order to stem the spike in infection rates. These alternatives are required to be environmental friendly and safe for both animal and humans who consume animal products (Cabuk et al., 2006).

2.2 Alternatives to Antibiotics

Various types of feed additives have been evaluated under commercial conditions and in experimental trials with the objective to achieve improvements on growth performance and the best economic return (Bozkurt et al., 2009). Some of the alternatives that have been studied include herbs, spices and various plant extracts/essential oils, probiotics or direct fed microbials (An et al., 2008), prebiotics (Dahiya et al., 2006), synbiotics (Ghasemi et al., 2010), organic acids, and dietary enzymes (Cowieson et al., 2006; Dahiya et al., 2006). Combinations of two or more of these additives have been used in various trials in order to maximize the benefits from using them (Hofacre et al., 2003; Choi et al., 2010). Herbs, spices and various plant extracts/essential oils can be use as alternatives to replace antibiotics as they rich of photochemical (active compounds) that can be used to stimulate growth and health of the animals. In vitro studies showed that active compounds in herbs and spices have beneficial effects, such as antimicrobial, antifungal, antihelminthic, and anticoccidial properties (Tabak et al., 1999; Araújo and Leon, 2001; Tzakou et al., 2001; Lee et al., 2003b; Brr and Mahmoud, 2005; Fernandes et al., 2005; Mekala et al., 2006).in vivo showed that active compounds in these additives stimulated growth, improved feed efficiency, enhanced nutrient digestibility, lowered mortality, increased immunity, increased liveability, reduced cholesterol level, increased carcass yield and improved meat quality of poultry (Tabak et al., 1999; Lewis et al., 2003; Lewis et al., 2004; Alcicek et al., 2004; Hernández et al., 2004; Cross et al., 2007; Onimisi et al., 2007; Rizzo et al., 2008; Windisch et al., 2008; Rahmatnejad et al., 2009).

Probiotics or direct-fed microbials have been reported to have properties to replace AGP in feed. Probiotics are defined as monocultures or mixed cultures of live microorganisms; when consumed, they exert a beneficial influence on animal health by quantitative and qualitative effects on the intestinal microflora or even modification of the immune system (FAO/WHO, 2001; Reid, 2016). The products available on the market contain Bacilli, Saccharomyces, Streptococci, Lactobacilli, and Bifidobacteria varieties. Probiotics act by competitive exclusion, reduce gut pH, and produce bacteriocins and lysozyme (Grashorn, 2010). In available studies, it has been reported that probiotics improved feed intake, stimulated digestive enzymes, promoted gut performance, reduced population of feed borne pathogens, reduced bacterial metabolites, improved intestinal balance of microflora, improved gut health, and promoted body immune system (Mead, 2000; Simmering and Blaut, 2001;Schneitz, 2005; Johny et al., 2008;Awad et al., 2009; Feng et al., 2010).

Prebiotics are non-digestible feed ingredients, which have a beneficial effect on the host by selective stimulation of the growth and activity of one or a limited number of bacteria in the colon. This has a positive impact on animal health status (Roberfroid, 2007). A supplement can be classified as a prebiotic if it fulfils three criteria, i.e. it cannot be hydrolyzed or absorbed in the stomach or small intestine, it has to be for Bifidobacteria, and its fermentation should yield beneficial effects in the gastrointestinal tract (Manning and Gibson, 2004). Prebiotics are typically non-digestible compounds, mainly polysaccharides and oligosaccharides, reducing pH in the gut and thus inhibiting colonization of pathogenic microorganisms, stimulating immunity, and neutralizing toxins (Nabizade, 2012). The group of prebiotics comprises mannanoligosaccharides (MOS), glucans, fructooligosacharides (FOS), yeast cell walls (YCW), inulin, and chitooligosaccharides (COS). Compounds such as FOS, MOS, and β-glucan are called immunosaccharides (Song et al., 2014).Prebiotics were proposed to replace AGP as they had significant effects on growth promotion and health maintenance in poultry.Several studies have shown that prebiotics have significant effect to lower mortality caused by necrotic enteritis, improved body weight and feed consumption, stimulated better feed efficiency, improved apparent metabolizable energy (AME), and reduced the coliform bacteria in the gut (Acamovic and Brooker, 2005; Dahiya et al., 2006).

Patterson and Burkholder (2003) suggested that combinations of prebiotics and probiotics are known as synbiotics.

Organic acids can be used as alternatives to replace AGP as they promoted overall growth performance and health status of poultry. As weak acid, several organic acids significantly controlled microbial growth in the gut, lowered nutrients competition, reduced microbial metabolites, decreased sub-clinical infections, stimulated the growth of intestinal absorptive cells (villus and crypt), and stimulated secretion of digestive organs of broiler chickens (Roy et al., 2002; Dibner and Richards, 2004; Pelicano et al., 2005; Buhler et al., 2006; Viola and Vieira, 2007; Chotikatum et al., 2009; Józefiak et al., 2010).

Dietary enzymes have also been reported to have properties to replace AGP in poultry feed. It was reported that enzyme supplementation regulated nutrient supply, promoted growth performance, improved feed efficiency, improved nutrient digestibility and retention, developed digestive and capacities of the intestine, improved carcass yield, and improved meat quality (Zyla et al., 2000; Angel et al., 2006; Olukosi and Adeola, 2008; Choct, 2009).

2.2.1 Herbs and Spices as Alternatives to Antibiotics

After the ban on antibiotics, more herbs are used as feed additives for a better growth condition. Due to the wide variety of active components, different herbs and spices affect digestion processes differently. Most of them stimulate the secretion of saliva. Curcuma, cayenne pepper, ginger, anis, mint, onions, fenugreek, and cumin enhance the synthesis of bile acids in the liver and their excretion in bile, what beneficially effects the digestion and absorption of lipids. Most of the spices stimulate the function of pancreatic enzymes (lipases, amylases and proteases), some also increase the activity of digestive enzymes of gastric mucosa. Besides the effect on bile synthesis and enzyme activity, extracts from= herbs and spices accelerate the digestion and shorten the time of feed/food passage through the digestive tract (Frankic et al., 2009)

Studies showed that phytobiotic substances present in herbs and spices have antibacterial (Juven et al.,1994; Hammer et al., 1999), antifungal (Daouk et al., 1995; Hammer et al., 1999), antiparasitic (Anthony et al., 2005), antihelminthic (Chatterje et al., 1982), and anticoccidial (Giannenas et al., 2003) properties. In situ studies have demonstrated growth-promoting properties (Cross et al., 2007; Rizzo et al., 2008; Rahmatnejad et al., 2009) and showed beneficial effects of essential oils from several herbs and spices to lower pathogenic microbes in the GIT (Sokmen et al., 1999; Kamel, 2001; Cabuk et al., 2003). There is an evidence to suggest that herbs, spices and various plant extracts have broad properties to improve growth performance and health of poultry. It has been shown that in broiler chickens inclusion of essential oils in the diets stimulates feed intake (Durrani et al., 2006; Al-Kassie, 2009), body weight gain (Lewis et al., 2003; Durrani et al., 2006), feed efficiency (Tollba and Hassan, 2003), nutrient digestibility (Hernández et al., 2004; Jamroz et al., 2005), as well as appetite and digestion (Kamel, 2001; Alcicek et al., 2004; Zhang et al., 2005). Improvement in feed efficiency were also found in layer chickens (Akhtar et al., 2003), in Japanese quail (Denli et al., 2004).

The primary mode of action of phytochemicals as growth-promoter is attributed to the growth inhibition of harmful intestinal microflora in the GIT (Lopez et al., 2005; Islam et al., 2006) and by stimulating function of digestive organ, e.g. the pancreas and small intestine (Jang et al., 2004). Windisch and Kroismayr (2007) reported that reduction on the population of enteropathogens results in a more stabilized microflora that will indirectly stimulate functions of digestive organs and reduce microbe-host competition for nutrients. The mechanism by which the phytochemicals exert their antimicrobial activity consists of interactions with the microbial cell membranes of microorganisms by changing permeability for cations such as H+ and K+ (Cabuk et al., 2006). The antimicrobial compounds are quickly exerted by determining structural alterations of the cell envelope. Population of enteropathogen microbes which are known to less resistant to this antimicrobials activity will decreased, while many beneficial microbes, such as

Bifidobacterium spp. and Lactobacillus spp. are relatively resistant (Di Pasqua et al., 2007; Ouwehand et al., 2010). Several researches have studied the antimicrobiol effect of herbs and spices. These herbs and spices have antibacterial effect against Salmonella spp or E. coli and gram positive bacteria Staphylococcus spp. and Streptococcus spp. Active principles in herbal feed additives changes fatty acid composition which can affect surviving ability of microorganisms by increasing hydrophobicity. This confirms the fact that herbs and spices act as antimicrobial agents by changing the characteristics of cell membranes, and causing ion leakage, thus making microbes less virulent. Huyghebaert et al., 2011).Another mechanism of actions which proposed for active compounds in herbal products as growth promoters are related to their oxidation-resistant activity (Faix et al., 2009; Zhang et al., 2009) and improvement of the immune system (Emadi and Kermanshahi, 2007; Yarru et al., 2008; Najafi and Torki, 2010), thereby stimulating animal's growth.

2.2.1.1 Onion.

The onion (Allium cepa) belong the Allium genus. Allium is derived from the Greek word for garlic. Onion is a bulbous plant greatly tilled for thousands of years in majority countries of the world. It originated in the Near East and Central Asia (Ebesunun et al., 2007). This plant contain plenty organic sulphur compounds such as Spropylcycteine sulfoxides, S-methyl-cysteine sulfoxide, Trans-S-(1propenyl) cysteine sulfoxide, and cycloallicin, flavinoids, phenolic acids, sterols including cholesterol, bsitosterol, saponins stigma sterol, sugars and very small amount of volatile oil compounds (Melvinet al., 2009). Numerous health benefits have been attributed to the vegetable, including antibacterial, antiviral, antiparasitic and antifungal properties. In addition, onions have antihypertensive, hypoglycemic, antithrombotic, antioxidant antihyperlipidemic, and anti inflammatory property (Lampe, 1999). Furthermore, Aji et al. (2011) reported the useful influence of onion bulbs on growth yield of broiler chickens

2.2.1.2 Anise.

Anise (Pimpinella anisum L.), a member of the Apiaceae family is an annual aromatic herb belonging to the Apiaceae family. It is cultivated mainly in southern Europe and Southeast Asia. Anise fruits, or the so-called seeds, are usable parts of the plant (Al-Beitawi et al.,2009). They contain 2-6% of essential oils, phenolic acids, eugenol, estragole, and trans-anethole, which is a powerful phytoestrogen (Christaki et al., 2012). Anise has been used over the years for its antioxidant (Gulcin et al., 2003), antimicrobial (Al-Kassie 2008), antibacterial (Tabanca et al., 2003), antipyretic (Afifi et al.,1994), and antifungal (Soliman and Badea 2002) properties. Also, essential oil from anise seeds can stimulate immunity (Yazdi et al.,2014), as well as a digestion and milk secretion (galactagogue) (Frankičet al.,2009). Anise has also been shown to have anti-cancer (Kadan et al., 2012), antioxidative, antihemolytic, anti-inflammatory (Iyer et al., 2013), antihyperglycemic, hypolipidemic (Rajeshwari et al., 2011), cytoprotective, as well as anti-ulcer (Al Mofleh et al., 2007) and anti-osteoporosis characteristics (Hassan and Saed 2011).

2.2.1.3 Yeast (Y-mos).

Mannan-oligosaccharides originated from the mannose blocks that exist in the yeast cell wall as it is mostly non-digestible carbohydrates (Saccharomyces cerevisiaeis). The cell wall consists of up to 25–30% of cell dry weight. The Saccharomyces cerevisiae is known yeast in the brewery and bakery industries. The MOS product which is a derivative of the yeast is used in animal nutrition. Saccharomyces cerevisiae cell wall involves both α-glucans and manna –proteins (Kogan and Kocher, 2000). The host enzymes or the intestinal bacteria enzymes cannot break these bonds apart and as a result carbohydrates (MOS) have no direct nutritive value, but it has benefits in keeping the gut health It can be theorized from the several scientific research work that although mannan-as a derivate from yeast (Saccharomyces cerevisiae) is attributed to production and processing technologies, it might have different chemical formation and biological efficiency as reported by Spring (1999).

2.3 Effect of Supplementing dry onion on broiler performance

The herbal products and spicy have been used in animal feed as digestion stimulants and growth promoters (Frankic et al., 2009). The broiler chickens fed diet with 3% onion bulbs had a greater bodyweight gain (Goodarzi et al., 2014). Aji et al. (2011) also reported that body weight gain in chicks fed diets with garlic and onion was higher than control. It has been appeared that inclusion of onion into broiler diets did not have adverse effects on feed intake (Goodarzi et al., 2013). In another study, there was no significant effect on feed intake during starter and grower phases with slight increase in bodyweight gain. An et al. (2015), these results are consistent with the result from Aji et al. (2011) who found no significant difference in the carcass yield obtained from broilers fed garlic and onion. The weight of carcass, abdominal fat, liver and pancreas relative to the live weight at slaughter except for abdominal fat, carcass yield and relative organs weight were not markedly affected by dietary treatments. These results are agreeing with those reported by Aji et al. (2011) and Goodarziet al.(2013). In another experiment, carcass and organ characteristics of broilers fed diets containing garlic and onion were not affected by experimental treatments (Gbengaet al., 2009).

Spices and their extracts have lipotropic effects. Some of the active components in spices affect lipid metabolism through fatty acid transportation. This can increase the lipid utilization and decrease abdominal fat (Cross and et al, 2007).

2.4 Effect of supplementing anise on broiler performance.

Broiler fed on the basel diet supplemented with 0.5%,and 0.75% of anise seeds /kg diet showed significant (p<0.o5) higher body weight by about 8.1 and 7.1% when compared with control .while chicks fed on Basel diets supplemented by 0.25,1.0 and 1.25g/kg diet showed not significant (p<0.05) higher by about o.4,3.5 and 0.2% when compared with control .supplement anise seed 1.5g /kg diet recorded not significant(p<0.05) reduction in body weight by about 2.8% when compared with control. The highest body weight and body weight gain were recorded in broiler fed on diet supplemented by 0.5gAnise seed and followed by fed 0.75% anise

Anise seed supplementation had not significant (p<0.05) affect on feed conversion ratio of broiler chicks (Soltan et al.,2008).

El-Ghammary et al (2002) and Hassan et al. (2004) mentioned that, the increase in live body weight and body weight gain may be due to the different active ingredients, particularly anethole and eugenol in anise which have digestive stimulating effects. Al-Kassie (2008) reported that feeding 1% of anise to Arbor Acer broiler chicks resulted in improvement on average daily body weight gain to feeding 0.5% of anise, stated that highest feed intake was at anise 1% group as compared to control group. The feed intake significantly ($P<0.05$) tended to increase with the increasing level of anise seeds powder in the diets of broiler as compared to control diet. The highest feed intake was significantly ($P<0.05$) produced by the birds fed with the highest level of anise seeds powder diet (1%). This improvement in feed intake for the diet with 1% anise seeds powder may be attributed to the appetizing effect of active ingredient, such as anethol in anise, the improvement in feed conversion ratio could be related to anise which have digestive stimulating effect (Cabuk et al., 2003). In addition, Hamodi and Al-Khalani (2011) mentioned that supplementation of anise seed at 6 kg/ton in broiler chick Cobb diet significantly ($P<0.05$) increased the feed consumption as compared with control diet. Anise seeds stimulate digestion, particularly the digestion of protein, fat and cellulose (Jamroz and Kamel, 2002). the improvement effects of using anise seeds in broiler diet might be due to the improvement of apparent whole tract and ileal digestibility of the nutrients (Hernandez et al., 2004), increasing the effects of pancreatic lipase and amylase secretion (Ramakrishna et al., 2003). The positive effect of anise seeds powder in broiler diets on the final body weight, body weight gain and feed conversion ratio can be explained by the fact that, anise have medical properties such as antimicrobial (Tabanca et al., 2003) and anti-fungal effect which improved the overall productive performance of broiler chicks (Soliman and Badea, 2002)

2.5 Effect of supplementing yeast(Y.mos) on broiler performance.

The weekly body weight, feed intake and feed conversion ratio of the experimental broiler chicks fed on diets supplemented with different levels of commercial yeast(y.mos) showed that there were no significant ($P>0.05$) difference between all treatment groups (Abdelbasit et al., 2017) . The overall main effect of Y-MOS yeast was to increase weight gain when compared to control group. This corporate with the findings of(Mohamed and Mukhtar 2016) who reported that addition of Y-MOS improved the performance of broiler chickens, but the differences among treatment groups were not significant. MOS supplementation to broiler diets had no significant effect on carcass traits. MOS supplementation did not affect empty gizzard weight of birds Bozkurt (2012). Also Abdel Raheem and Abd-Allah (2011) reported that addition of bio mos in poultry diets increase feed intake. Abdelimohsin (2016) reported that supplementing Y-Mos in broiler diet showed no significant differences in feed intake, overall weight gain, among the tested group, and the overall feed conversion ratio (Tibyan et al., 2017), internal organ weights and proportions, as percentages of carcass weight, were not influenced (Abdelbasit et al., 2017). The addition of Y-MOS yeast up to 2% in broiler diets had no significant effect on performance and carcass yields of broiler chicks. However, a higher dose of Y-MOS significantly influences the chemical and physical analysis of the meat. . Abdelbasit et al., 2017). In another study by (Jahanian and Ashnagar, 2015) found that MOS supplementation to laying hens feed under bacterial infection could improve their productive performance probably through modification in the gut's bacterial populations and improving nutrient digestibility. The use of MOS in broiler diets had shown to positively Impacts the performance criteria (Rosen, 2007; Fritts and Waldroup, 2003).The range of dietary inclusion of the MOS averaged from 0.5 to 5 g /kg diet. The dose-response of MOS in different research work had showed the best dosage of MOS for optimal growth is around 2 g /kg diet as reported by Tucker et al. (2003). Iji et al. (2001) studied the influences of different doses of MOS (0, 1, 3 and 5 g /kg diet) on the structure and function of the intestine of poultry birds within the starter period (21-day). Results proved that poultry birds gave a high response with the increases with MOS addition from 1 to 21 d compared with the 21-42 d period (Tucker et al., 2003). Nikpiran et al. (2014) reported that adding the MOS to the diets on poultry improved the growth performance values by enhancing the feed intake and stimulating the growth hormone and insulin release.

2.6 Effect of supplementing dry onion, anise and y.mos on gastro-intestinal tract (GIT) microbial population.

There is elevating evidence confirming that the composition of micro flora in the gastro intestinal tract in an adult healthy host remains statistically stable (Williams et al., 2001;White et al., 2002; Castillo et al., 2008).The MOS supplementation was indeed accompanied with increasing beneficial flora, especially lactobacilli(Rekiel et al., 2007). The beneficial impacts of MOS on the development gut microflora were also illustrated by Kocher et al. (2005) and Yang et al. (2008).The addition of MOS constantly elevates the caecal beneficial populations like Bifidobacterium and Lactobacillus spp. (Sadeghi et al., 2013).Decreasing the pathogenic bacteria and the increasing the beneficial bacteria could be belonged to the receptor sites competition and producing volatile fatty acids by bacteriocins along with IgA antibodies by the host immune system Kim et al.(2009).

Onion has antibacterial and antifungal properties. It has been reported that onion extract was very effective against Grampositive bacteria, dermatophyte fungi and growth and production of aflatoxin by Aspergillus (Zohri et al., 1995). In addition to the inhibitory effects against pathogenic bacteria, it has been shown that onion stimulates the growth of beneficial microorganisms. Onions contain Fructooligosaccharides(FOS) that belong to prebiotic components. The components are non-digestible substances that are fermented in the body by bifidobacteria. These compounds help to health maintaining of digestive system and colon (Gibson, 1998).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Experimental site and duration:

_This study was carried out at the Poultry Farm of the College of Animal Production Science and Technology, Sudan University of Science and Technology during the period from 14 novmber 2018 to 3rd January 2019.

3.2: Experimental House.

The experiment was conducted in an open sided poultry house (8x3m) The long axis of the house extended east-west facing the wind direction for efficient ventilation , the sides of house were covered by nylon sheet during the brooding period. The house was divided into 12 experimental units (replicates) of equal size (1x1 m) .The pen and equipment were cleaned and disinfected before the arrival of birds and then fresh wood shaving as litter was spreaded on the floor (7cm) depth .Each replicates was provided with one tubular feeder and one fountain plastic drinker. 24 hours day light was provided. Feed and water were provided adlibitum consumption during whole experimental period.

3.3 Experimental birds.

A total of (120) one day old unsexed broiler chicks (Ross) purchased from Ommat Company were used Chicks were kept for one week before the commencement of the experiment as an adaptation period, during which a pre- starter diet that contained 21% CP and 3000ME/kcal/kg. was birds were divided into four treatments group and each replicate with three replicates contain 10 birds each.

Chicks were vaccinated against infectious bronchitis (IB) and New Castle disease (ND) at day 7. At day 14 they were vaccinated against disease (IBD), Gumboro and the second doses of (ND) administered at day 21 and 28 respectively.

3.4 Experimental diets.

3.4.1 Preparation of feed addition.

Fresh onion bulbs were purchased from the local market they were peeled, chopped to slices sun dried for two days, dry onion and anise seeds were ground into powdery form. Yeast (Y.mos) (commercial prebiotic) was purchased from purchased from the local market. yeast(Y-MOS) is a commercial product extracted from natural yeast compound of β-glucanase18% and mannanoligosaccharides 27% produced by the Nutrex Ltd in Belgium.

3.4.2 Diets formulation

Two iso-caloric, iso-nitrogenous starter and finisher basal diets were formulated according to the requirement for broiler chicks as outlined by National Research Council (NRC, 1994).

Experiential diets were basal diet which serve as control without addition (T1). Anise, dry onion and Y.mos were supplemented at the rate of 0.1% in the basal diets to serve as (T2), (T3) and (T4) respectively. Composition and calculated analysis of the starter and finisher diets are presented in table (1).

3.5 Broiler performance parameter:-

3.5.1 Body weight

Live body weight was measured at the beginning of the experiment, and then it was repeated on weekly basis at the end of each week at the same time.

3.5.2 Body Weight gain

Body weight gain was calculated by subtraction live body weight at the beginning of each week from live body weight at the end of the same week.

3.5.3 Feed intake.

Feed intake was calculated for each treatment on weekly basis by subtracting the weight of remained feed at end of week from the weight of feed given at the beginning of the same week,

3.5.4 Feed conversion ratio.

Feed conversion ratio (FCR) was calculated on weekly basis using the following equation: Feed conversion ratio (FCR) = feed consumed (g)/Weight gain (g)

3.5.5 Mortality Rate.

Mortality was recorded when occurred.

3.5.6 Internal organs weight:

At the end of the experiment (42 days), birds were weighed and fasted overnight (except for water). Two birds (male and female) from each replicate were randomly selected and slaughtered without stunning, then scalded, manually plucked, washed and allowed to drain on wooden table. Evisceration was performed by a ventral cut and visceral as well as thoracic organs were removed. Liver, Heart, Gizzard weight and abdominal fat were isolated and individually weighted.

3.6 Gastro intestinal tract GIT bacterial population.

After evisceration the ileum and cecal contents were gently collected for microbial study.

3.6.1 Total E. coli count (TEC)

In order to determine the TEC, each sample was taken in a sterile test tube and diluted with 10 ml of 0.1% peptone water. Another tube containing 9 ml of 0.1% peptone water was taken and 1 ml diluted sample from the first test tube was added and mixed well and repeated it from the first to last tube. Finally 1 ml was discarded from last tube. One hundred μl of the diluted sample from 10 fold dilution was then inoculated into two MacConkey agar (Hi-Media, India) plates and spread with a sterile glass spreader. Then, the plates were then kept in an incubator at 37°C for 24 to 48 h. Following incubation, agar plates exhibiting colonies were counted. The average number of colonies was multiplied by the dilution factor to obtain the total E. coli count. The total E. coli count was calculated according to the ISO (1995). The results of the total bacterial count were expressed as the number of colony forming units per gram (CFU/gm) of samples.

3.6.2 Total Salmonella count (TSC)

The procedures of sampling, dilution and streaking for the determination of TSC were similar to those followed in TEC. Only in case of TSC, xylose lysine deoxycholate (XLD) agar (Hi-Media, India) was used. The calculation for TSC was similar to that of total viable count.

3.6.3 Total Lactobacillus count (TLC)

The procedures of sampling, dilution and streaking for the determination of TLC were also similar to those followed in TEC. Only in case of TLC, Man, Rogosa and Sharpe (MRS) agar (HiMedia, India) was used. The calculation for TLC was similar to that of total viable count.

3.7 Statistical Analysis:

The data generated from the experiment were subjected to analysis of variance (one-way-ANOVA) and the mean were tested for significance by least significant (LSD) using the statistical package of social science (SPSS) computer program.

Table (1): Composition and Calculated chemical Analysis of the Experimental Starter and Finisher Diets:

Ingredient		Starter%			Finisher%	
Sorghum		65			74	
Wheat bran		3.5			2	
GNC		25			17.5	
Super con.		5			5	
Lysine		0.2			0.2	
Salt		0.2			0.2	
Methionine		0.1			0.1	
Lime stone		1			1	
Calculated Analysis						
ME/kcal/kg	CP%	CF%	Lysine$	Methionine%	Ca%	P%
Starter. 3121	21.56	4.7	1.4	.5	1	.43
Finisher.3164.2	19.66	3.98	1.1	.39	1	.6

Super concentrate provided: CP 35%, Fat2.00, Na 2.70, Ca 3.0,Pav. 4.6, Vit. B1,

CHAPTER FOUR

4.0 RESULTS

4.1 Effect of supplementing dry onion, Anise and Y.mos on weekly body weight.

Body weight is presented in table (2).

Feeding dry onion showed no significant differences in weekly body weight between all treatment groups during the first week of the experiment. On the other hand, highly significant differences (P< 0.01) were observed during the rest of the period (5weeks), birds fed diet supplemented with dry onion revealed superior body weight. followed by those fed yeast (Y.mos) supplemented diet and anise supplemented diet during the 4th, Birds fed the control diet showed inferior body weight.

4.2 Effect of supplementing dry onion, Anise and Y.mos on weekly feed intake

Feed intake is presented in table (3).

No significant differences were observed between all treatment groups during the 1st, 3rd and the 4th week of the experiment. However, birds fed diet supplemented with dry onion consumed significantly (P<0.01) higher feed during the 2nd and the 5th week followed by those fed diet supplemented with Yeast and anise. Finally the control treatment significantly consumed least amount of feed during the same period, Birds fed anise supplemented diet showed significantly (P<0.05) higher feed intake during the 6^{th} week followed by those fed diets supplemented with dry onion .Yeast and control treatment.

4.3 Effect of supplementing dry onion, Anise and Y.mos on weekly body weight gain (g/bird).

Average Weekly body weight gain is presented in table (4).No significant differences between all treatments were observed during the 1^{st} and the 5^{th} week. Highly significant differences (P<0.01) in body weight gain were observed during the 2^{nd}, 3^{rd}, 4^{th} and the 6^{th} wk. Feeding anise and dry onion resulted in higher body weight gain and during the 3^{rd} week. During the 2nd 4^{th} and the 6^{th} week birds fed dry onion and Y.mos gained more weight and compared to those fed anise supplemented diet and the control treatment group.

4.4 Effect of supplementing dry onion, anise and Y.mos on weekly feed conversation ratio.

Supplementation of Y.mos, anise or dry anion in broiler diets resulted in no significant differences in feed conversion ratio between all treatments group during the 1^{st}, 4^{th}, 5^{th} and the 6^{th} week (Table 5). However highly significant differences were observed during the 2nd and the 3^{rd} week. Birds fed Y.mos showed better FCR during the second week .meanwhile, birds fed anise and dry onion almost had a similar FCR during the same week .the control treatment showed poor FCR. Dry onion supplemented diet and the control treatment showed slightly better FCR during the 3rd week.

4.5 Effect of supplementing dry onion, anise and y.mos on overall performance of broiler chicks.(1=6wk)

Supplementing Y.mos, anise and dry onion showed significant differences (P<0.01) for feed intake, weight gain and final body weight. On the other hand, feed conversion ratio (FCR) and mortality were not significant (Table 6). Birds fed diet with dry onion had significantly higher feed intake. Weight gain and final body weight followed by those fed anise, Y.mos and finally the control group.

4.6 Effect of supplementing dry onion, anise and Yeast (mos) on internal organ weight (g)

Supplementing dry onion, anise and Y.mos were not affected heart and gizzard weight in all tested groups (table 7). On the other hand, significantly (P<0.01) higher carcass weight was noted when the birds fed anise supplemented diet followed by those consumed diets contained dry onion,Y.mos and finally the control diet.Significantly (P<0.05) higher Spleen and proventriculus weight were observed when the birds fed dry onion supplemented diet. Meanwhile, liver weight was increased when supplementing anise in the broiler basal diets compared to other groups. However, abdominal fat signifacally increased when the birds fed dry onion supplemented diet. Followed by those fed Y.mos. anise and the control treatment respectively

4.7 Effect of dietary treatments dry onion, anise and Yeast (mos) on intestinal microbial populations (Log^{-01} cfu/g)

The effects of dietary treatments on bacterial populations of intestinal content are shown at (table 8). The result revealed that none of the samples positive for Salmonella spp. for all treatment groups. While all were positive for E. coli On the other hand, Lactobacillus colonies were detected when Y.mos and Anise were supplemented, the opposite was true when supplementing dry onion and the control treatment.

Table (2) Effect of supplement dry onion, Anise and Y.mos on weekly body weight (mean±std)

Treatment / Weeks	Control g/bird	Y.mos g/bird	Anise g/bird	Dry onion m± st.d	Sig
Wk1	221.5 ±1	226.5 ±2.1794	224.83 ±2.9297	224.83 ±2.020	NS
Wk2	347.9[d]±3.1225	522.5[b] ±9.9874	497[c] ±30.777	530.67[a]±34.757	**
Wk3	785.73[d] ±54.1864	845.6[b] ±21.0798	957.3[a] ±8.3594	951.90[a]±16.7384	**
Wk4	1112[d].20±61.8871	1166[c].4 ±27.5303	1364[b].0 ±30.4961	1549[a].3±59.4664	**
Wk5	1558[d].3 ±114.9840	1821[c].2 ±62.6105	1912[b].4 ±39.6368	2066[a].0 ±113.101	**
Wk6	1976[d].7 ±72.70387	2254[c]. 4 ±97.94255	2330[b].7 ±27.41265	2342[a]. 2 ±59.0749	**

a,b,c: mean within the same row followed by different superscripts are significantly (p<0.05) different

**: significant different at (p≤0.01)

NS: No Significant different (p>0.05)

Fig. (1) **Effect of supplement of dry onion, anise and Y.mos body weight(g/bird)**

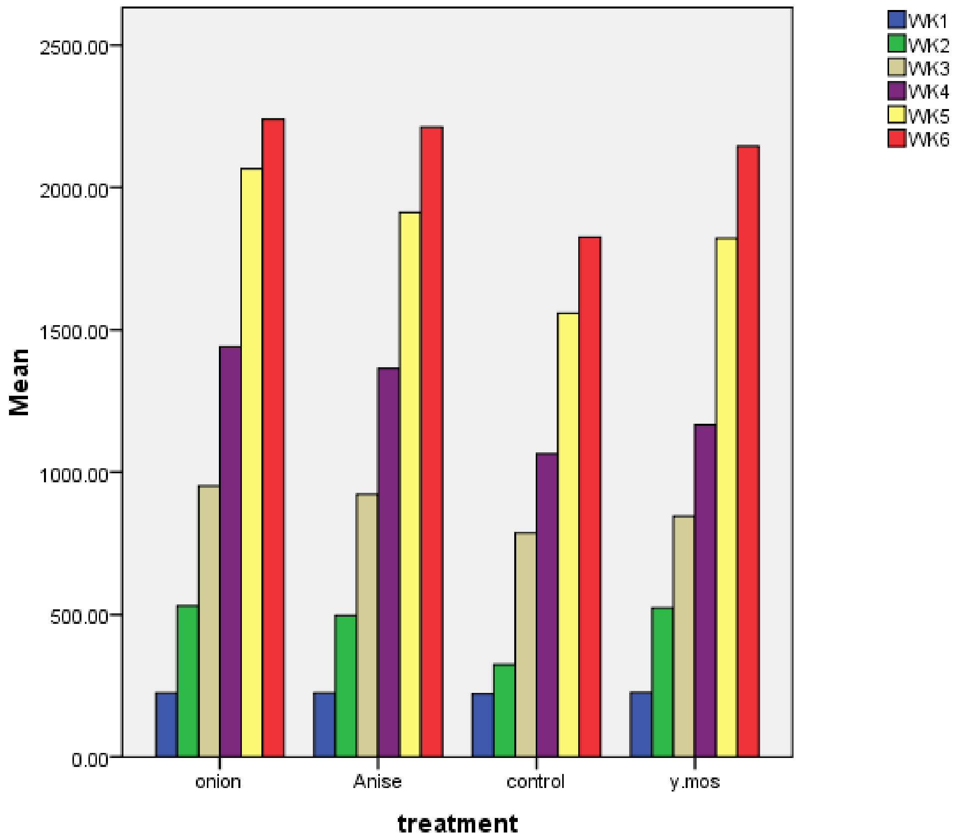

Table (3): Effect of supplement of dry onion, anise and Y.mos on weekly feed intake (mean±std)

Treatment / Weeks	Control **g/bird**	Y.mos **g/bird**	Anise **g/bird**	Dry onion ± SD	Sig
Wk1	476.33 ±18.56	458.67 ±24.09	460.73 ±30.25	439.17 ±9.87	NS
Wk2	301.73[d] ±39.75	432.17[b] ±23.23	418.17[c] ±48.79	454.17[a] ±10.91	**
Wk3	498.3±77.89	471.4±4.27	493.10±70.54	487.40±65.92	NS
Wk4	481.33 ±54.45	466.07 ±44.34	561.13 ±63.01	553.00±45.21	NS
Wk5	608.33[d] ±42.72	751.5[b] ±53.04	670.2[c] ±128.63	834.7[a] ±60.98	*
Wk6	787.0[d] ±65.82	826.43[c] ±85.73	962.2[a] ±33.13	941.33[b] ±32.96	*

a, b, c : mean within the same row followed by different superscripts are significantly ($p<0.05$) different

**: significant different at ($p\leq0.01$)

*: significant different at ($p\leq0.05$)

NS: Not Significant

Fig (2) Effect of supplement of dry onion, anise and Y.mos on feed intake (g /bird)

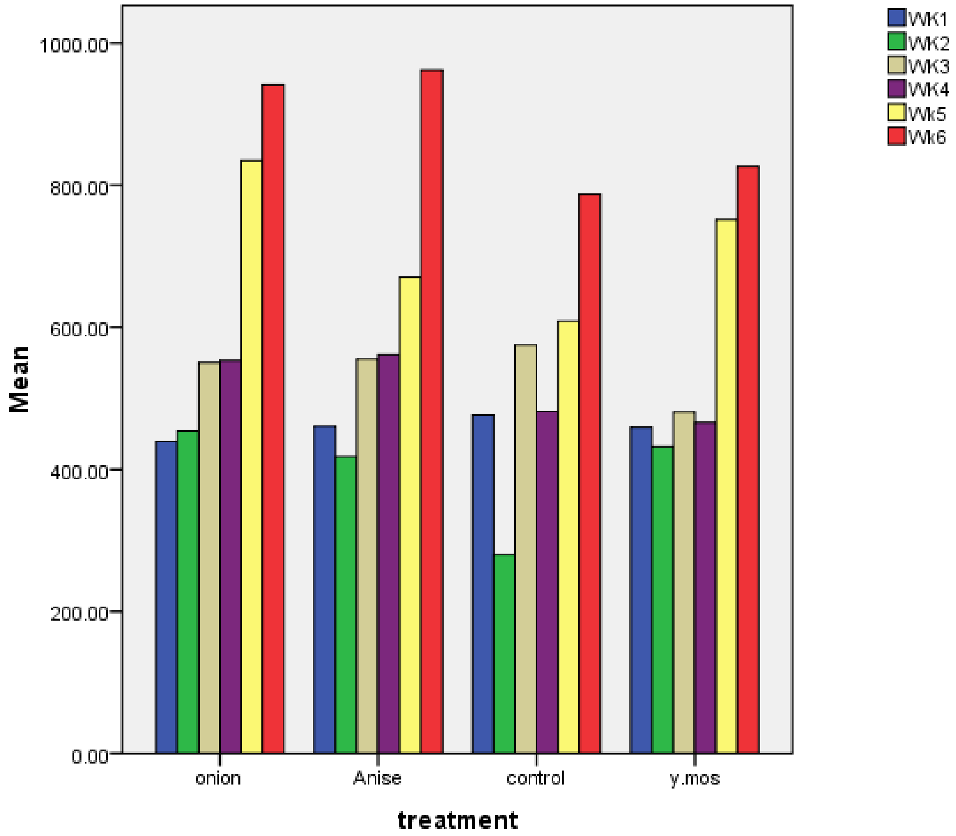

Table (4) Effect of supplement of dry onion, anise and Y.mos on Weekly body weight gain (m±std)

Treatment / Weeks	Control g/bird	Y.mos g/bird	Anise g/bird	dry onion g/bird	Sig
WK1	98.53	109.5±4.0	104.67 ±3.62	106 ±16.97	NS
WK2	102.5^{c} ±3.91	296^{a} ±12.01	272.17^{b} ±28.10	299.17^{a} ±29.19	**
WK3	407.3^{b}±35.03	323.1^{c} ±17.98	425^{a} ±25.04	421.23^{a} ±53.09	**
WK4	326.30^{c}±25.21	320.80^{c} ±36.00	374.43^{b} ±37.52	534.27^{a} ±81.00	**
WK5	464.73 ±62.86	544.77 ±27.72	526.73 ±55.19	478.63 ±70.03	NS
WK6	418.0^{b} ±70.96	432.8^{a} ±81.97	417.60^{b} ±13.99	276.7^{c} ±103.44	**

a, b, c mean within the same row followed by different superscripts are significantly

frgdt(P<0.001) different

**: significant different at (P≤0.01)

NS: Not Significant

Fig (3) Effect of supplement of dry onion, anise and Y.mos on Weekly body weight gain (m±std)

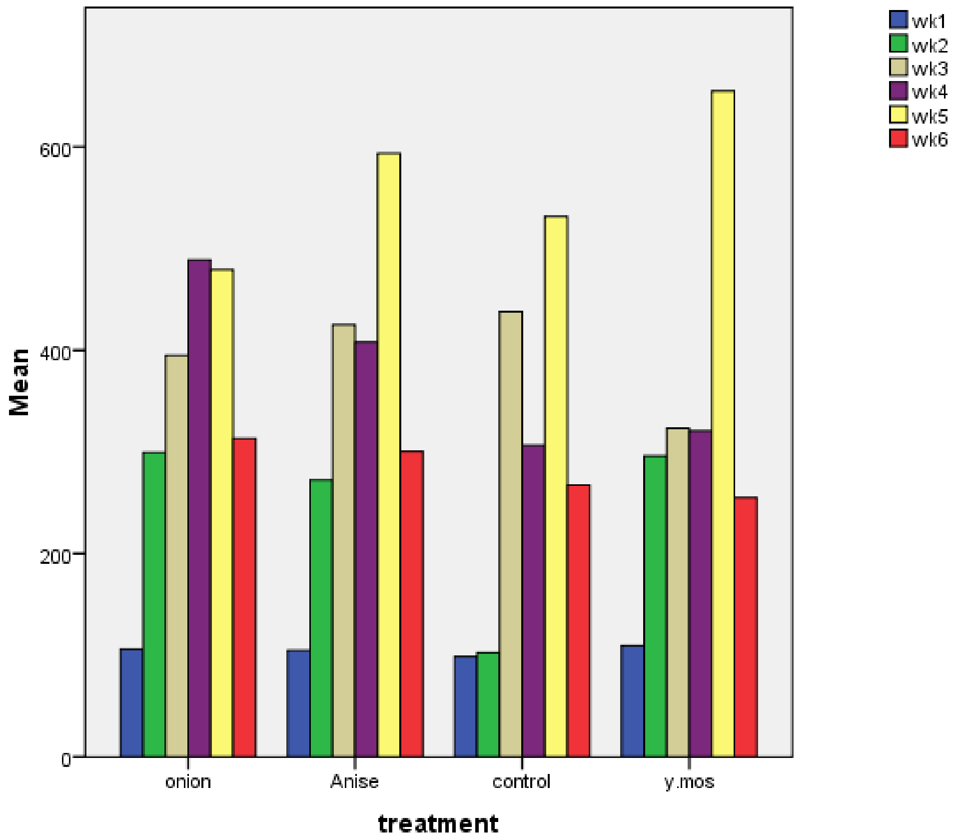

Table (5): Effect of supplement of dry onion, anise and Y.mos on Feed conversation ratio (m±std)

Treatment Weeks	Control G feed/gain g	y.mos G feed/gain g	Anise G feed/gain g	dry onion G feed/gain g	Level Sig
Wk1	2.43 ±0.4	2.16 ±0.1	2.41 ±0.4	2.39 ±0.4	NS
Wk2	2.78[a] ±0.3	1.45[d] ±0.1	1.53[b] ±0.3	1.53[b] ±0.1	**
Wk3	1.10[c] ±0.04	1.45[a]±0.1	1.24[b]±0.1	1.15[c]±0.1	**
Wk4	1.06 ±0.2	1.29 ±0.1	1.4 ±0.3	1.1±0.03	NS
Wk5	1.3 ±0.0	1.2 ±0.0	1.13 ±0.3	1.5 ±0.2	NS
Wk6	1.7±0.9	1.5 ±1.3	1.6 ±0.2	1.7 ±0.9	NS

a b c: mean within the same row followed by different superscripts are significantly different (P<0.05)

NS: Not Significant

**: highly significant (P≤0.01)

Fig(4) Effect of supplement of dry onion, anise and Y.mos on Feed conversation ratio (m±std)

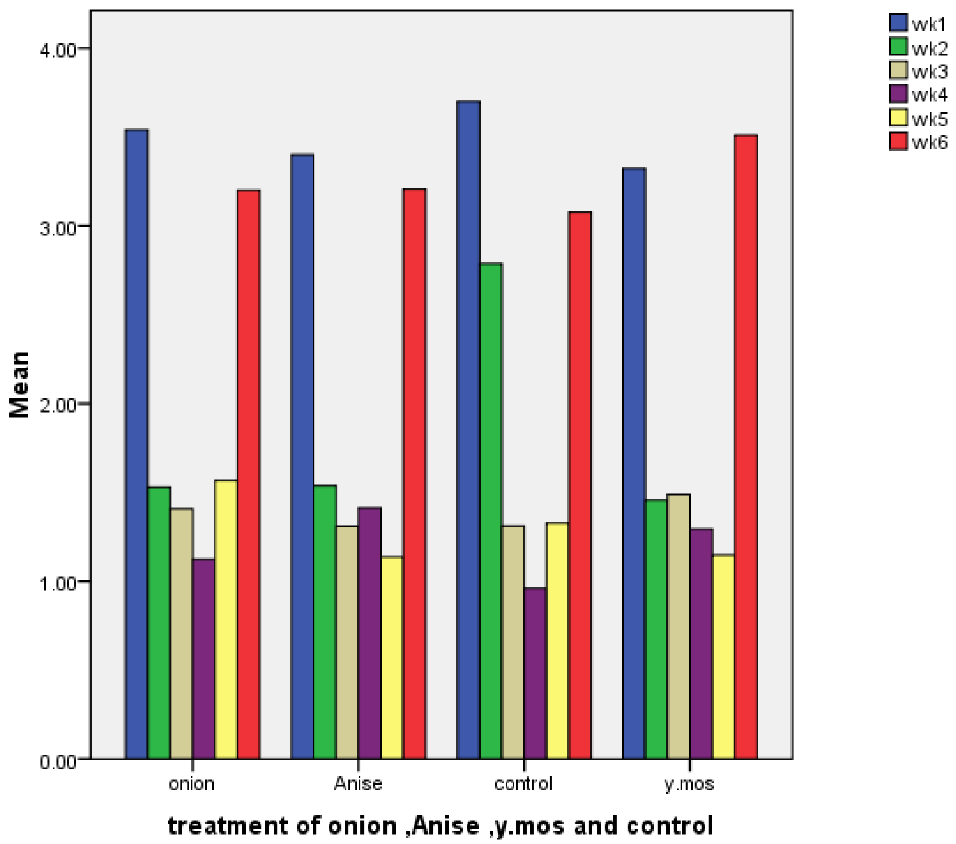

Table (6): Effect of supplementing on dry onion, anise and Y.mos on overall performance of broiler chicks

Parameter	control	y.mos	Anise	Onion	Sig level
Feed intake(g bird)	3025.5^{d}±174.85	3200 ^{c} ±87.16	3447^{b}.7±169.93	3625^{a}.9 ±215	**
Weight gain(g bird)	1755.3^{d}±88.4	2027^{c}.9±96.04	2105.9^{b}.9±18.36	2117.7^{a}.1±71.38	**
F c r(g feed/g gain)	1.72±.121	1.57±.035	1.63±.067	1.71±.123	NS
Final body wt(g bird)	1976^{d}.7±88.69	2254^{c}.4±98.55	2330^{b}.8±18.86	2342.2^{a}.6±172.74	**
Mortality%	o.1%	.03%	0.03%	0.06%	NS

^{a,b,c,d} mean within the same row followed by different superscripts are significantly ($p<0.05$) different.

** highly significant ($P\leq0.01$)

NS: Not Significant

Fig (5) Effect of supplement of dry onion, anise and Y.mos on on Overall performance of broiler chickens

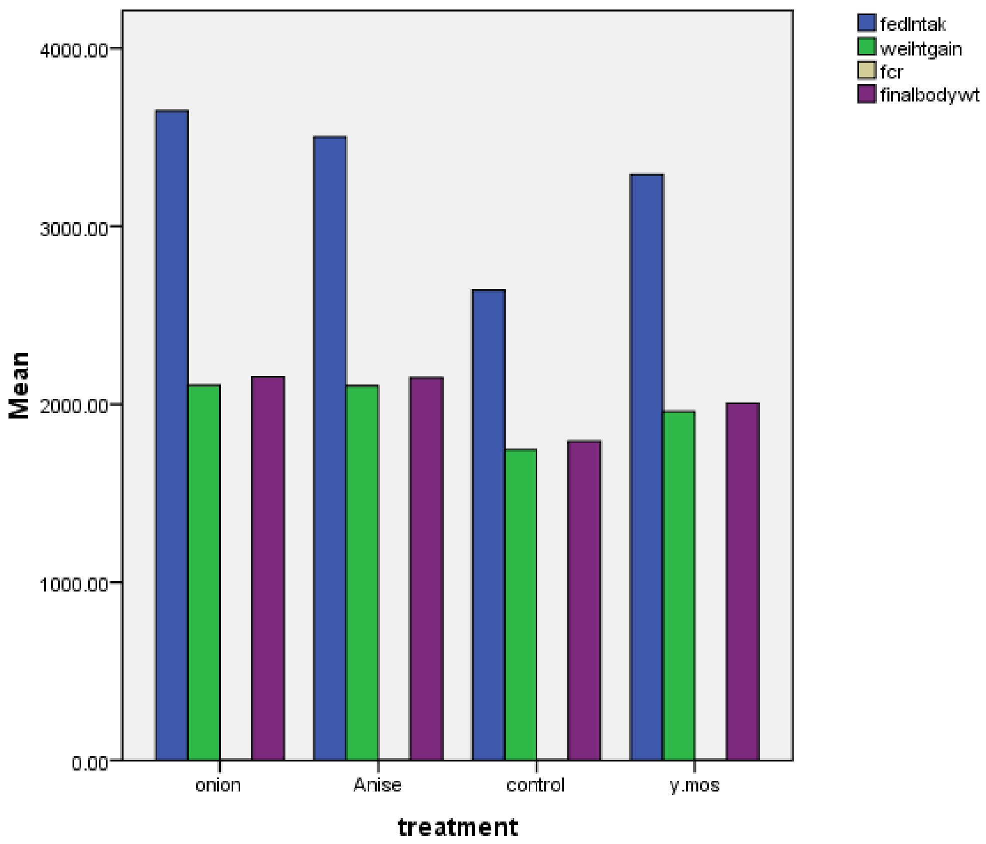

Table (7): Effect of supplement of dry onion, anise and Y.mos on Organs weight (m±std)

Treatment / Parameters	Control (g)	y.mos (g)	Anise (g)	dry onion (g)	Sig. level
Carcass weight	1496.7^{d}±38.8	1698^{c}.7±70.7	1858^{a}.0±25.9	1745^{b}.0±170.3	**
Heart	10.33 ±0.57	11.00 ±1.0	14.33 ±3.21	12.5 ±0.50	NS
Gizzard	48.33 ±6.80	49.33 ±4.04	55.666 ±4.04	55.333 ±4.04	NS
Spleen	2.00^{b} ±00	1.67^{c} ±0.29	2.00^{b} ±00	2.66^{a} ±0.58	*
Proventriculus	8.33^{c} ±0.57	9.00^{b} ±1.0	10.00^{a} ±00	10.33^{a} ±0.58	**
Liver	38.66^{c} ±1.15	44.00^{a}±3.61	46.00^{a} ±1.73	41.00^{b} ±1.0	**
Abdominal fat	15.00^{c} ±1.0	20.66^{b} ±1.15	20.33^{b} ±2.51	22.66^{a} ±2.52	**

^{a,b,c,d} mean within the same row followed by different superscripts are significantly (p<0.05) different

*: significant (P≤0.05)

**: highly significant (P≤0.01)

NS: No Significant different

Table (8) Effect of supplementing dry onion, anise and Y.mos on gastro intestinal bacteria of 6wks age broiler chicks

Mean of bacteria			
Treatments	E.coli	Salmonella	Lactobacillus colonies
Control	Positive	negative	Negative
Anise powder	Positive	negative	Positive
Dry onion	Positive	negative	Negative
Y.mos	Positive	negative	Positive

Count by APHA method (1960)

CHAPTER FIVE

5.0 DISCUSSION

5.1 Effect of supplementing dry onion, anise and Y.mos on the overall performance of 6wks old broiler chickens. Impact of experimental treatments on the performance of broiler chicks up 6wks of age revealed that, supplementing dry onion in the basal diet significantly ($P<0.01$) increased feed intake and weight gain compared with those fed anise and the control treatment respectively. Using dry onion, anise and Y.mos showed significant ($P<0.01$) effect on body weight gain of 42 days age feed conversion ratio (FCR) of broilers was not affected by experimental treatments compared with groups. The herbs and some compound in them could act similar to antibiotics. This compound reduced the growth of some harmful bacteria in the gastrointestinal tract of broilers. This can results in a higher efficiency in the feed utilization, and it can leads to a higher weight gain and better feed efficiency (Bedford, 2000).According to improvement broiler performance by onion probably is due to antibacterial and antifungal effects originated from some of its compounds. These compounds by decreasing harmful microbial population in gut improve healthy level and performance (Lee et al, 2003). It may be reason that spices and herbs will positively affect food digestion. Body weight and other organs can increase by improving the nutrient absorption.

Also, as it mentioned the using of dry onion resulted in increasing of feed intake. This in turn can increase daily weight gain. The using onion in diet can reduce the blood glucose. Hypoglycemia can stimulate nervous system for higher feed intake (Goodarzi et al. 2013) in this started is possible onion could improve growth performance of chicks due to content of organosulphur compounds. Im the same line with the obtained results, Aji et al. (2011) and Goodarzi et al. (2013) reported the positive influence in BW, FCR and feed intake of broilers fed diets containing fresh onion compared with broilers fed diet without any onion and. Unfortunately, there are few reports on the effects of onion on broiler performance.

The weight of carcass, heart, gizzard, spleen, proventriculus, liver and abdominal fat at slaughter indicated that, except for heart and gizzard. Carcass yield and other organs weight were markedly affected by dietary treatments. These results are disagree with those reported by Aji et al. (2011) and Goodarzi et al.(2013).

The effects of dietary treatments on bacterial populations of intestinal content revealed that none of the samples positive for Salmonella spp. for all dietary treatments. While all positive for E. coli. The presence of E. coli might be attributed to the contamination during slaughtering in which birds were slaughtered and manually plucked on nylon sheet in open area.

On the other hand, Lactobacillus colonies were detected when Y.mos and Anise were supplemented; the opposite was true when supplementing dry onion and the control treatment. These inconsistent results might be due to improper mixing of the diets which may resulted to poor distribution of the supplements.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Based on the result of the study the following conclusions can be withdrawn: the addition of onion, yeast and anise in broiler feed was significantly increasing body weight gain and feed intake, Hovered Feed conversation ratio was not improved . the addition of onion give the best performance compared to other groups.

6.2 RECOMMENDATIONS

6.2.1 Owing to the rise in consumer demand for livestock products from antibiotic-free production systems, there exists a great need for the development of antibiotic alternatives that can help improve performance and maintain optimal health of food animals

6.2.2 The effect of using dry onion, anise and Y.mos powders in mixed form on performance, serum cholesterol and immune response.

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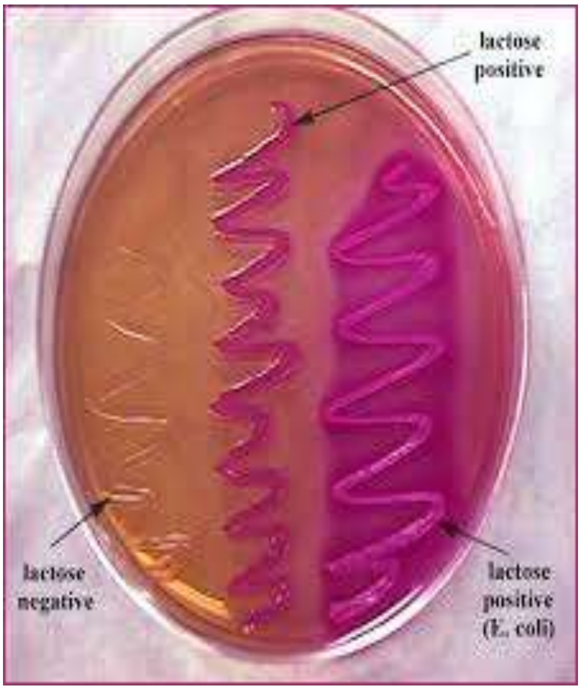
Appendix (1)

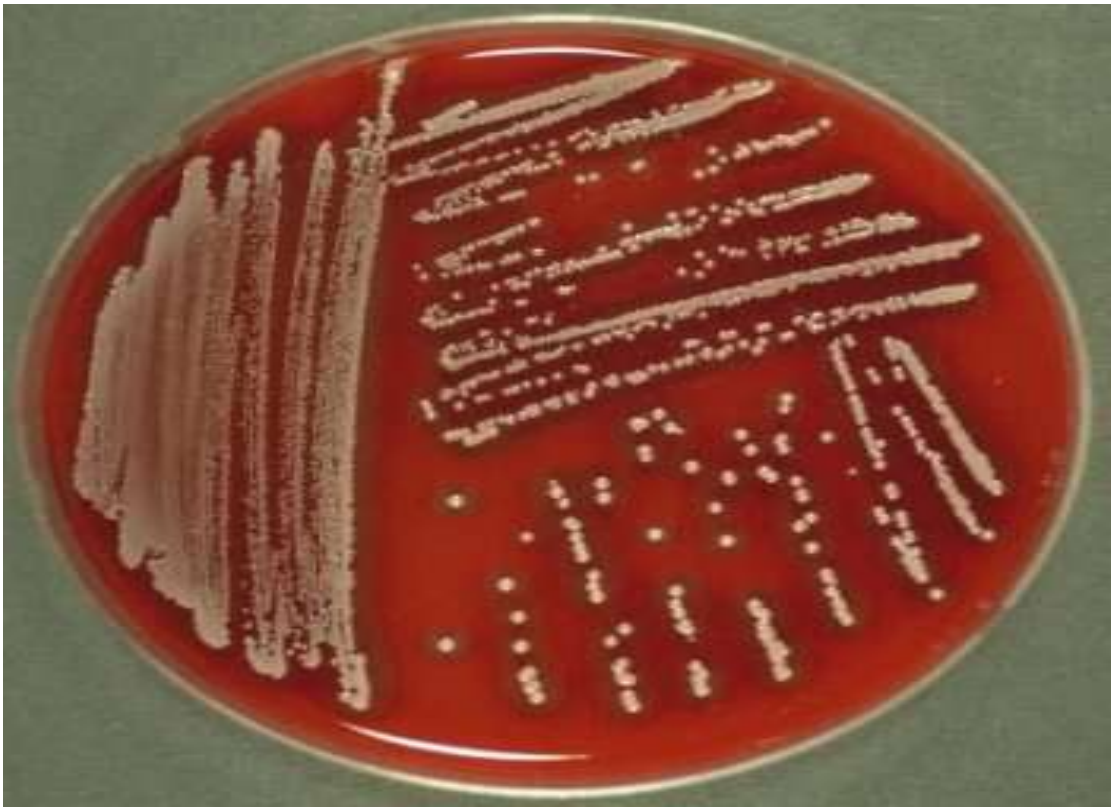


E.coli in mac conkey Agar

Appendix (2)

Salmonella Shegilla Bacteria in. XLD media

Appendix (3)



Lactobacilli in M. R. S Agar