CHAPTER ONE

INTRODUCTION

The practice of feeding live stock with sub therapeutic levels of antibiotics has been in use for over fifty years antibiotic usage is possibly the most important factor that promotes the emergence, selection and dissemination of antibiotic resistant microorganisms in both veterinary and human medicine (Castanon, 2007) at slaughtering, resistant strains from the gut may contaminate poultry carcasses and as a result poultry meats are often associated with multi resistant microorganisms the use of antibiotic growth promoters has been banned in many countries, especially in European union (Castanon, 2007) as a result new commercial additives of plant origin, considered to be natural products that consumers would accept, have been proposed to livestock producers Herbs spices and various plant extracts have been received and increased attention as possible antibiotic growth promoter replacement in this view, aromatic plants and essential oils extracted from these plants become interesting due to their antibacterial (Soliman *et al*., 2002) antioxidant (Dragland *et al*., 2003); Botsoglou *et al.* 2004) antibactor (Dorman and Deans, 2002) antifungal (Jantan *et al*., 2003) activists and as hypo cholesterolemics (Craig, 1999) and stimulate effect of an animal digestive enzymes and improve utilization of digestive products through enhanced liver functions (Hernández *et al*., 2004); lee *et al*., 2003); (Cifitic *et al*., 2005).

Essential oils derived mainly from spices and herbs and their purified compounds have been shown to have antimicrobial actions in vitro Cowan, (1999); Ultee *et al*., (2002); Faleiro *et al*., (2003). Examples of such natural antimicrobial compounds are carvacrol, tymol, limonene and cineole that are present in the essential oil fractions of oregano, laurel, sage and myrtle (Riebau *et al*., 1997); Ultee *et al*., (2002).

Vitamins are defined as group of complex organic compounds present in small amounts in natural food stuffs that the diet causes deficiency disease. Because of the possibility of specific biosynthesis pathways in some species, some vitamins such as carnitine, could be considered only as essential metabolites in these species and dietary sources are not needed.

Super San Soluble is a supplement of amino acid and vitamins for ruminants, pig, rabbits and birds. Vitamins to increase growth. development and production and reduce frequency and severity of many infectious diseases. The protein hydrolysat supplements the diet in certain conditions of a very high protein intake, a requirement which be accomplished with ordinary food.

The objective of this study was to evaluate the effect of super san soluble on the performance of broiler chicks.

CHAPTER TWO

LITERATURE REVIEW

2.1 Feed Additives

The term “additive” is applied by the feed compounder, in abroad sense, to all products other than those commonly called feed stuffs that may be added to the ration with the object of obtaining some special effects. Feed is major components, affecting net return from the poultry business, because 80% of the expenditure in term of cash is spent on feed purchase (Javed *et al.*, 2009).

Feed additives, non nutritive, are sometimes included in the feed mixture in very small quantities and with careful weighing, handling and mixing, to insure that dietary nutritions are ingested, digested, protected from destruction, absorbed and transported to the cells of the body. other feed additives have been used to alter the metabolism of the chicken in an effort to produce better growth or more desirable finished products (Leeson and Summers, 2001).

The most common types of feed additives used are: Antibotics and arsenicals which used to help protect feeds from microbial destruction to prevent production of toxic products by the intestinal micro flora, Anticoccidials which used in broiler feeds and in diet of rearing replacement pullets, Antifungal to prevent the growth of harmful molds and fungi in feed or in digestive tract of the chicken; Antioxidant flavoring agents, pellet binder and caroteniods (Parks *et al.*, 2000) and (Sreenivasaiah, 2006), feed additives like: probiotics, prebiotics, essential oils, enzymes and vitamins.

2.2 Antibiotics

However, the using of antibiotics as feed additives is risky due to, not only cross-resistance, but also to multiple resistance in pathogens Bach

Knudsen, (2001) and Schwarz *et al*., (2001). Therefore, antibiotics have been discredited by consumer associations as well as by scientists, e.g. the use of most antibiotic growth promoters has been banned by the European Union (EU). Consequently, the animal feed industry is under increasing consumer pressure to reduce the use of antibiotics as a feed additive and find substitutes for antibiotics in the diet Hertrampf, (2001); Humphrey *et al*., (2002). Many scientists have searched for alternatives to antibiotics Langhout, (2000); Mellor, (2000); Wenk, (2000) and Kamel, (2001).

The growth promoter effect of antibiotics was discovered in the 1940s, when it was observed that animals fed dried mycelia of *Streptomyces aureofaciens* containing chlortetracycline residues improved their growth. The mechanism of action of antibiotics as growth promoters is related to interactions with intestinal microbial population (Dibner and Richards, 2005; Niewold, 2007). It is commonly known that the sub-therapeutic use of antibiotic growth promoters (AGP) in poultry production may result in the development of antibiotic-resistant pathogenic bacteria, which may be hazardous to human health. In search of effective alternatives to AGP, a special attention is given to their effect on gut microbial community which contributes to the intestine function. Until now, the interest has been focused mainly on fermentable functional feed ingredients, like fructans, or mannanoligosaccharides that exhibit beneficial effect on gut microflora, integrity of intestinal mucosa, enzymes activity and performance parameters in broiler chickens (Kim *et al*., 2011); (Bogusławska-Tryk *et al*., 2012);(Nabizadeh, 2012). An insoluble, non-fermentable fiber fraction, including cellulose and lignin, is conventionally considered as a diet diluent which can influence energy balance of broilers (Svihus and Hetland, 2001; Krás *et al*., 2013), whereas little attention is given to the effect of cellulose or lignin on the gastrointestinal microflora population. However, studies show that cellulose, as an effective feed ingredient, may influence the number of gut bacteria, especially beneficial Bifidobacterium and Lactobacillus as well as potential pathogens and its effect depends on the level of cellulose supplementation and bird age (Cao *et al*., 2003; Shakouri *et al*., 2006; Saki *et al*., 2010). It is generally accepted that phenolic fragments of purified lignin exhibit the antimicrobial properties (Baurhoo *et al*., 2008).

2.3 Prebiotics

Prebiotics defined as non–digestible food ingredient (Gibson and Roberfroid, 1995). The use of prebiotics in broiler's diets does not have a long history . Several authors have observed the positive effects of prebiotics fractions included in the broiler's diet (Rebole *et al*., 2010) reported diet supplemented with inuline had higher body weight gain and increased growth performance, dressing percentage, breast and thigh muscle weight (Park and Park, 2011), prebiotics improved digestion in clouding enhancing mineral absorption (Coxam VCNOV, 2007).

Gibson and Roberfroid (1995) defined prebiotics as the food ingredients that provide beneficial effect to the host by selectively stimulating the growth and/or metabolism of a limited group of bacteria in the intestinal tract, acting closely to probiotics because it would constitute the “food” of probiotic bacteria and also blocking adherence sites, immobilizing and reducing the fixation capacity of pathogenic bacteria in the intestinal mucous (Silva, 2000; Andreatti Filho and Silva, 2005). This association favors the intestinal microbiota by the action of prebiotics that are able to link themselves to the fimbriae of pathogenic bacteria, conducting them along the fecal bolus, stimulating the growth and accelerating the metabolism of a limited number of non-pathogenic microorganisms. The action of prebiotics is added to this mechanism, making easy the nutrition of cells (enterocytes) that recover the digestive tract and provide balance and intestinal health to birds (Gibson and Roberfroid, 1995).

2.4 Probiotics

Probiotics are defined as feed additives that contain live microorganism and promote beneficial microbiota Fuller, (1989); Huang *et al*., (2004), probiotics improve immunity and live weight gain and feed conversion rate of broiler Jin *et al*., (2000); Zulkifli *et al*., (2000) and Huang *et al*., (2004) and improve broiler growth performance and prevent poultry pathogens and diseases Tortucro, (1978); Owings *et al*. (1990); Jin *et al*. (1997); Zulkifli *et al*. (2000); Kalavathy *et al*.; (2003); Kabir *et al*. (2004); Gil De Los Santos, *et al*. (2005); Timmerman *et al*.(2005); Mountzouris *et al*. (2007) and Awad *et al*. (2009).

Probiotic, based on Fuller (1989) definition, “are live microbial feed supplement that beneficially affects the host animal by improving its intestinal microbial balance”. Probiotic efficiency depends on several factors, such as microbial species composition (e.g., single or multi strain) and viability, application procedure, dosing level, frequency of application, age, type of diet, sanitation and environmental stressors factors. However, beneficial effects of probiotic on broilers including: performance (Mountzouris *et al*., 2007; Kralik *et al*., 2004), modification of intestinal microflora (Teo and Tan, 2007; Mountzouris *et al*., 2009), nutrient digestibility (Apata, 2008) and immunomodulation and gut mucosal immunity (Farnell *et al*., 2006; Teo and Tan, 2007) have been reported. These positive effects by application of probiotics could be related to increase population of beneficial microflora and removal of pathogenic bacteria by means of competitive exclusion and antagonism (Fuller, 1989); adapting bacterial metabolism (Jin *et al*., 1997); improving feed intake digestion and absorption (Nahanshon *et al*., 1993) and stimulating the immune system (Havenaar and Spanhaak, 1994). The enhancement of the immune system may be in relation to increase production of antibodies production of antibodies particularly immunoglobulin G (IgG) and immunoglobulin A (IgA) classes and also increase local antibodies at mucosal surface such as gut wall (usually IgA) (Koenen *et al* ., 2004).

2.5 Essential Oils

Definition of essential oils and general introduction: An essential oil is a mixture of fragrant, volatile compounds, named after the aromatic characteristics of plant materials from which they can be isolated (Oyen and Dung, 1999). The term ‗essential' was adapted from the theory of ‗propose by Paracelsus who believed that this quintessence was the effective element in a medical preparation (Oyen and Dung, 1999). Because the term ‗essential oil' is a poorly defined concept from medieval pharmacy, the term ‗volatile oil' has been proposed (Hay and Waterman 1993). However, the name of ‗essential oil' will be used preferentially in this review.

Essential oils are very complex mixtures of compounds and their chemical compositions and concentrations of individual compounds are variable. For example, the concentrations of two predominant components of thyme essential oils, I.e. thymol and carvacrol have been reported to range from as low as 3% to as high as 60% of total essential oils (Lawrence and Reynolds, 1984). Cinnamaldehyde, a main principle of cinnamon essential oil, amounts to approximately 60 to 75% of the total oil (Duke, 1986). Because of the large variation in composition, the biological effects (Schilcher, 1985); Janssen *et al.*, 1987; Deans and Waterman, 1993). If any, of essential oils may differ. This diversity of essential oils us to select four pure principles, i.e. thymol cinnamaldehyde, beta-ionone and carvacrol, for evaluating their possible role as alternatives to antibiotics in poultry production. The chemical properties and biological activities of the four compounds are summarized.

Essential oils are volatile compounds, extracted from plants by steam distillation, which have a variety of beneficial properties, such as flavoring, stimulation of enzyme secretion, and antioxidant or antimicrobial activities. Related to the digestibility of nutrients, thymol, cinnamaldehyde, or a commercial preparation of essential oils (EO) components (CRINA Poultry, DSM Nutritional Products Ltd., Basel, Switzerland) were demonstrated to increase amylase activity in the intestinal digesta of female broilers (Lee *et al*., 2003). With a plant extract, consisting of capsaicin, cinnamaldehyde, and carvacrol, Jamroz *et al*. (2005) observed an increase in the lipase activity in pancreas and in the intestinal wall, which improved feed conversion in broilers. Dietary piperine, which is the pungent principle of black pepper, was found to favorably stimulate the digestive enzymes of pancreas and thus to enhance the digestive capacity and to significantly reduce the gastrointestinal feed transit time (Srinivasan, 2007). Likewise, plant extracts from a mixture of oregano, cinnamon, and pepper or from sage, thyme, and rosemary improved apparent whole-tract and ideal digestibility of the nutrients in broilers (Hernández *et al*., 2004).

For commercial poultry production, the antimicrobial effects of EO are also of particular interest. Respective in vitro broad spectrum activities have been reported for origanum and monolaurin EO (Preuss *et al*., 2005), for rosemary extracts (Santoyo *et al*., 2005), or for EO from chrysanthemum (Shunying *et al*., 2005). Furthermore, oregano and thyme oils were found to be active against poultry and pig derived strains of *Escherichia coli* and *Salmonella* (Peñalver *et al*., 2005). Specific blends of EO components were demonstrated to control colonization and proliferation of *Clostridium perfringensin* the gut of broilers, which is expected to protect against necrotic enteritis (Mitsch *et al*., 2004).

A mixture of capsaicin, cinnamaldehyde, and carvacrol reduced intestinal *E. coli*, *C. perfringens*, and fungi and increased beneficial *Lactobacillus spp*. in broilers (Jamroz *et al*., 2005). The cumulative effects of

EO on digestibility of nutrients and on modulation of the gut microflora eventually result in an improvement of broiler performance. Essential oils from different herbs in Turkey were found to improve weight gain, feed conversion and carcass yield of broilers Alcicek *et al.*, (2003). A plant extract, consisting of 3 EO, improved feed conversion and enhanced breast muscle yield in broilers (Jamroz *et al.*, 2005). When testing dietary inclusion of various culinary herbs or their EO in female broiler chicks, generally dietary thyme oil or yarrow herb inclusion had the most positive effects on chick performance, whereas oregano herb and yarrow oil were the poorest supplements (Cross *et al.*, 2007). Besides EO, organic acids are widely used in monogastric animals to improve performance via a modulation of the gut microflora. Blends of various organic acids induced a shift in the intestinal microbiota toward more homogenous and distinct populations and increased Lactobacillus colonization of the chick ileum (Nava *et al.*, 2009). Furthermore, citric acid was demonstrated to achieve similar performance results in broilers as the antibiotic growth promoter avilamycin (Chowdhury *et al.*, 2009). Recently, benzoic acid has been identified as an efficient feed additive to improve growth performance, nutrient digestibility, and nitrogen balance as well as to reduce gram-negative bacteria in the gastrointestinal tract of piglets (Kluge *et al.*, 2006). In poultry, benzoic acid was found to have rather negative effects, given that a significant growth depression and deterioration of feed conversion were observed, when supplementing this compound to broilers (Jozefiak *et al.*, 2007). Coliform bacteria in the ceca, however, were decreased, indicating that the considerable antimicrobial activity of benzoic acid could beneficially influence gut health in poultry as well. Because an additive effect between organic acids and EO was suggested due to the fact that digestive enzymes work more efficiently under acidic conditions.

2-6 The Enzymes

Supplementation of mixtures broiler with enzymes is applied in order to the efficiency of the production of poultry meat. This is especially interesting if enzymes which enable utilization of feeds of poorer nutritive value are used. Numerous authors have established that by application of enzymes in the production performances can be improved by even 10% (Cowieson *et al*., 2000), Cmiljanic *et al*., 2001). The preparation should provide all requirement nutrients by the broiler chicks. Most of the main feed ingredients used in broiler diets such as cereal grain and oil seed cakes are deficient in essential amino acids quantity and quality wise. The imported supper-concentrate was provided to suffice for essential amino acids and other micro-nutrients which consequently increase the total cost of poultry feed. Researcher now seeking to find means to improve the utilization of the essential amino acids and other nutrients of the plant based diet in order to achieve high production with least cost to maintain and sustain production (Mukhtar *et al*., 2010a; Mukhtar *et al*., 2010b). However, use of more than 20% RB in broiler diets reduces the performance and mineral status of the birds while increasing the mineral excretion (Piyaratne *et al*. 2011). Presence of several anti-nutrients such as phytate (Puminn, 2003); fibre (Gallinger *et al*. 2004); lipases (Sharif, 2009) and anti-proteolytic sub-stances (Mujahid *et al*. 2005); Ersin Samli *et al*. 2006) have reported as the reasons for poor in vivo nutritive value of RB. Selle *et al*. (2007) reported that, rice bran contains 17.8g kg-1 of total phosphorus (P) and 14.2g kg-1 phytate-P. Typically, poultry diets contain from 2.5 to 4.0g kg-1 phytate-P (Ravindran, 1995). Phytate-bound P is poorly utilized by monogastric animals, due to either insufficient quantity or a lack of intestinal phytase secretion (Rafacz-livingstan *et al*. 2005); Mohammed *et al*. 2010). Phytic acid acts as a strong chelator, forming protein-mineral-phytic acid complexes and reduced protein and mineral bioavailability (Akande *et al*. 2010). On the other hand, excretion of undigested P creates environmental problems like eutrophication of water bodies (Selle *et al*. 2007). Consequently increased utilization efficiency of phytate bound P by poultry benefits both industry and environment. Even though the microbial phytase found to be effective in improving phytate degradation, supplementation of diets with phytase increased the litter moisture content (Puminn, 2003). Heat liability of phytase and cost are among the drawbacks of the use of phytase. Therefore alternative methods for increasing phytate degradation need to be developed. Several authors have reported positive effects of citric acid (CA) on phytate degradation (Boling *et al*. 2000; Liem *et al*. 2008; Connelly, 2011), digestibility of protein (Atapattu and Nelligaswatta, 2005); Ao *et al*. 2009) and growth performances (Chowdhury *et al*. 2009; Islam *et al*. 2012) in poultry. Atapattu and Nelligaswatta (2005) showed that CA have positive effects on growth performance and feed intake only when diets are low in available phosphorus (aP). Several other authors (Boling *et al*. 2000); Boling-Frankenbach *et al*., 2001); (Snow *et al*. 2004) have reported that improved phytate-P utilization efficiency in broilers when the diets were deficient in non-phytate P (NPP).

2.7 The Vitamins

Vitamin and minerals are vital nutrients that are involved in both metabolic and physiological processes which are critical for human and animal health and animal feed production. Vitamins are defined as group of complex organic compounds present in small amounts in natural foodstuffs that are essential to normal metabolism and lack of vitamins in the diet causes deficiency disease: Because of the possibility of specific biosynthesis pathways in some species, some “vitamins”, such as carnitine, could be considered only as essential metabolites in these species and dietary sources are not needed. Vitamins are an essential component of a well-balanced diet and their major function is the metabolism and utilization of nutrients. Through research into the biological mechanisms of vitamin action, it has now been established that substantially higher intake of some vitamins may significantly influence the immune process in chickens (Siddique, 2004). In poultry, biotin is an essential coenzyme in carbohydrate, fat and protein metabolism.

Poultry sub-sector is an important avenue to reduce the gap between demand and supply of animal protein. Animal protein has higher biological value in comparison with plant protein. The broiler industry demands a fast growing chick and good quality feed with high level of energy, protein, vitamin and essential minerals to support maximum growth within a short period of time. For the sustainability of broiler industry, the production cost should be as minimum as possible. On the other hand, deficiency diseases may cause mortality, reduce body growth and disease resistance etc.(Singsen, 1947). Chickens are more susceptible to vitamin deficiency because gut flora can synthesize very little vitamins but complete absence of dietary vitamins in intensively kept chickens undergoes many stresses (Ward, 1996). Vitamin A, riboflavin and B12 are usually low in poultry diets. Inclusion of multivitamin and amino acids in the formulated diet has become indispensable practice because blending of feed ingredients do may not ensure all essential vitamins at the right amounts needed for chicken. Some important vitamins like vitamin A, D3, E, folic acid, pantothenic acid, pyridoxine and riboflavin etc should be checked carefully in the diet. As the ultimate goal of broiler is to produce more meat within a short period of time, additional multivitamin and enzyme supplement with commercial feed may increase meat production more rapidly. Enzyme and multivitamin protect deficiency diseases and stimulate growth rate. Beside this, amino acids supplement along with multivitamin reduces mortality, keep birds healthy, increase feed intake, improve digestion and feed conversion rate. products contain non-starch polysaccharides (NPS) such as cellulose, xylose, arabinose, galactonic acid which are not easily digested by poultry. Most of the feed ingredients contain some anti-nutritional factors and indigestible part, which hinders feed utilization and bird's performance.

High ambient temperature reduces feed intake, live weight gain, feed efficiency (Donkoh, 1989), and thus negatively influences the performance of broilers. Hurwitz *et al*. (1980) suggested that decrease in growth rate was due partly to the decrease in feed intake. Animals stressed under improper environmental conditions or subjected to an artificial stress via adrenocorticotropin hormone (ACTH) and epinephrine injections are found to have reduced ∞-tocopherol, retinol and ascorbic acid concentrations in plasma and blood cells (McDowell, 1989), whereas lipid peroxidation levels were found to be high in plasma and tissues due to increased production of free radicals (Naziroğlu *et al*., 2000). Moreover, heat stress impairs absorption of vitamins A, E and C, and thus, increases the requirement of these vitamins (Naziroğlu *et al*., 2000); (Sahin *et al*., (1999); (Klasing, 1998). On the other hand, stress causes reduction in plasma and tissue concentrations of minerals such as Fe, Zn and Cu which are related to immune system (Beisel, 1982).

The increase in environmental temperature in summer has been the major problem to poultry producer in Sudan, which puts an additional effort on body heat regulatory mechanism, and reduces feed consumption which affects the productive performance of chickens. Vitamin and minerals are vital nutrients that are involved in both metabolic and physiological processes which are critical for human and animal health and animal feed production. Puthpongsiriporn *et al*.,(2001) reported that under environmental stress, feed intake, egg production decreased in birds fed with vitamin E and C. Ziaei *et al*., (2013) found that the inclusion of vitamin E and selenium had not a significant effect on feed intake, they decreased it. Mohiti Asli *et al*.,(2007) found no significant effect on egg weigh and feed conversion ratio due to inclusion of vitamin E. However, Ziaei *et al*., (2013) studied the effects of different vitamin E and organic selenium levels on performance and immune response of laying hens, they recorded significant effects on production performance and immune improvement. Increasing the level of vitamin D_3 in the chicks diet increased body weight gain linearly (Edwards *et al*., 2002; Kasim and Edwards, 2000). Broiler breeder diet influences subsequent egg production Peebles *et al*., (2000a), embryogenesis and hatchability of broiler eggs Peebles *et al*., (2000b). Chicks, embryo tissues contain a high proportion of polyunsaturated fatty acids Diplock, (1994). Also, tissues of newly hatched chicks express natural antioxidants (Vit E, glutathione GSH, Carotinoids and ascorbic acid) and antioxidant enzymes cofactors (Se, Zn, Mn, and Fe) Surai, (1999). The level of natural antioxidant in tissues declines progressively after hatching, therefore enhancement of Glutathione peroxidase (GSH-Px) activity as a result of selenium (Se) supplementation is an effective mean of increasing chicks viability post hatch Surai, (2000). Vit E is The main antioxidant of biological membranes Niki, (1996) and due to its location inside the membrane at the water lipid interface, Vit E is able to scavenge free radicals effectively. Trace minerals are essential in poultry diets as they participate in the biochemical processes required for normal growth and development. Selenium is an integral component of glutathione peroxidase (GSH-Px.), which together with Vit E form a part of cellular defense against reactive oxygen species produced during stress Surai, *et al*., (2001). Vitamin E and selenium appear to participate in the same biochemical relationships and food. Selenium is essential for the proper function of the antioxidant enzyme glutathione peroxidase, which protects the cell by destroying free radicals Rotruck, *et al*., (1973). Selenium and vitamin E as antioxidants interact with each other to form an efficient antioxidant defense mechanism and when both are supplemented to birds, they play an important role in maintaining bird health, productivity and reproductive characteristics Surai, (2000).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Experimental Site:

The experiment was carried out at the Department of Animal Production, College of Agricultural Studies, Sudan University of Science and Technology (SUST), from 27th September 2014 and ending on 1st November 2014 in an ambient temperature ranging between (27 - 41) ºC (Appendix).

3.2 Experimental birds:

A total of sixty three, seven days old unsexed broiler chicks strain Aber acre, purchased from local commercial hatchery (Mico). The chicks were selected from the poultry farm after one week of adaptation period. Moreover, The chicks were randomly divided into three experimental groups as follows: A, B and C. each treatment group was subdivided into three replicates of 7 birds per each. The birds in three groups were reared under the optimum environmental conditions and feeds were provided ad-labitum Feed provided freely, chicks were vaccinated against Marek's disease on hatchery. On farm they were vaccinated against Gumboro D78 disease (IBD) at 7, 13, 21 and 28 days of age and New Castle disease in drinking water at 7, 21 and 28 days (Colon 30). On the other hand, a soluble multi vitamin compounds to guard against stresses. Based on a local vaccination program, chicks in all groups were vaccinated against Gumboro D78 disease (IBD) at 10 days old. During the experiment, birds were weighed weekly and feed intake per pen was recorded at the same time. The measured performance parameters includes: final body weight (g), body weight gain (g), feed intake (g), feed conversion ratio, and mortality rate (%).

3.3 Housing:

An open system poultry house was used. The house was constructed on concrete floor with local materials. The roof was made of metal sheets. The sides were permanently covered. The pens, 1×1 m each, inside the house were prepared using wire mesh partitioning. The pens were cleaned commencement of the experiment. A layer of wood shavings (about 3 cm thick) was laid on the pen floor as a litter material.

Each pen was supplied with 2.5 gallon drinker and 5 kg feeder which were cleaned and disinfected before starting the feeding trial. The feeder's height was adjusted according to progressive growth of the chicks. Over head light were provided 24 hours, in a form of natural light during the day and artificial light during the night 1-2 bulb lamps (100 watt) to each pen.

3.4 Experimental diet:

The chicks were fed a commercial broiler pre-starter (Galdus Koudijs, 100 grams per chick during the first week) for week. Then a basal diet fed to the chicks in all groups which was formulated to meet the NRC, (1994) recommendations for broiler chickens. Super San Soluble, added in the water which is composite of a group of vitamins. Group A as control (tap water), group B and C drinking water was supplemented with Super San Soluble (day interval)1 ml/10L and 2 ml/10L for each pen respectively.

Table (1): Composition of the experimental control diet used

Ingredients	**Dura**	**Ground nut Cake**	**Sesame cake**	**Meth.**	**Lysine**	**Oyster shell**	**Salt**	**Conc.***	**Dical Phos.**
%	64.142	14	15	0.159	0.344	0.487	0.25	5	0.618

***Conc**.: Broiler concentrates: Crude protein 22.82%, Crude fiber 4.13%, lysine 1.497%, Methionine 0.63%, Calcium 1.15%, Phosphorus 0.76%, and ME 3105.212.

Table (2): Calculated analysis of experimental diet

ME	CP%	Lysine%	Methionine	Ca%	Phos.%	Fibre%
3105.21 Lodhi *et al.*, (1976)	22.82	1.5	0.63	1.15	0.76	-

Table (3): Chemical analysis of experimental diet

DM	Moisture	CP	Ash	EE	NNF
6.39	93.67	21.9	10.6	3.4	57.71

ME= metabolizable energy, CP= crude protein, EE= ether extract, Ca= calcium Phos.= phosphorus, NNF= nitrogen free extract, DM= dry matter

Table (4): Chemical composition of the experimental diet

Broiler starter		3100	22	1.2	0.5	1	0.8	3.5
	%	ME	CP	Lysine	Meth.	Ca	P	Fiber
Dura	**64.142**	2205.202	8.485987	0.141112	0.07697	0.032071	0.19884	1.539408
Lysine	**0.344**	0	0	0.33712	0	0	0	0
G.N. Cake	**14**	383.46	6.1012	0.224	0.063	0.0868	0.0784	1.3608
Sesame Cake	**15**	416.55	6.2355	0.195	0.18	0.3015	0.1395	1.227
Meth.	**0.159**	0	0	0	0.15741	0	0	0
Oster Shell	**0.487**	0	0	0	0	0.179898	0.000292	0
Salt	**0.25**	0	0	0	0	0	0	0
Dical. Phos.	**0.618**	0	0	0	0	0.14832	0.11124	0
Conc.	**5**	100	2	0.6	0.15	0.4	0.23	0
	100	**3105.212**	**22.82269**	**1.497232**	**0.62738**	**1.148589**	**0.758272**	**4.127208**

ME= metabolizable energy, CP= crude protein, Meth.= methionine, Ca= calcium Dical. Phos.= Di Calcium phosphorus, Conc.= concentration, G. N. Cake = Ground nut cake

3.4.1 Supersan Soluble:

It is a supplement of amino acids and vitamins for ruminants, pigs, rabbits and birds. Vitamins to increase growth, development and production, and reduce frequency and severity of many.

3.4.2 Composition:

Vitamin A 600.000 I.U; vitamin D3 50.000 I.U.; Vitamin E 100 mg; Vitamin B1 100 mg; vitamin B2 100 mg; vitamin B6 200 mg; vitaminB12 1,5 mg; Vitamin K 200 mg; Calcium pantothenate 500 mg; Nicotinic acid 1 g; Glutamic acid 1.4 g; Aspartic acid 960 mg; Arginine 270 mg; Cystine 760; Lysine 500 mg; Histidine 220 mg; Glycine 810 mg; Serine 480 mg; Alanine 700 mg; Tyrosine 340 mg; Threonine 320 mg; phenylalanine 340 mg; Valine 270 mg; Methionine 250 mg; Leucine 760 mg; Isoleucine 250 mg; Tryptophan 100mg; Excipient to 100mL.

3.4.3 Indication:

Cases of stress, convalescence, loss of appetite, decreased organic defenses against infection, illness, after vaccination and transport, male sexual frigidity, artificial feeding in suckling animals and hepatic failure . As a growth stimulant for underdeveloped animals.

3.4.4 Dosage and administration route for Birds and rabbits:

Oral route, 0.07 – 0.13 ml of Supersan soluble per each litre of drinking water.

3.5 Parameters:

Birds of each replicate were group weighed at weekly intervals and feed intake was recorded at the time of weighing. Feed Conversion Ratio (FCR) and body weight gain were calculated weekly and mortality was recorded daily.

3.6 Carcass preparation:

At end of the experiment one bird was selected from each group and was weighed individually. Then they were slaughtered. After bleeding, the slaughtered chicks were scaled in hot water, feather plucked manually then washed. The head was removed close to the skull. Feet and shanks were removed at the hock joint, and eviscerated, gizzard, abdominal fat, heart, gizzard and liver were expressed as a percentage of live weight.

3.7 Calculation:

The cold and hot carcass weights were expressed as a percentage of live weight. The commercial cuts were expressed as a percentage of cold carcasses. Non carcass components such as head, heart, gizzard and liver were expressed as a percentage of live weight.

3.8 Statistical Analysis:

The data obtained were statistically analyzed with the standard procedures of analysis of variance (ANOVA) using SPSS Inc.
(1999) program.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Results:

The effects of Supersan administration via in drinking water on growth and carcass performance of broiler chicks were summarized in Table 2 and 3, respectively. Results obtained showed no significant (P>0.05) effects of treated drinking water on feed intake, feed conversion ratio and mortality rate of chicks compared to control group. Although there was a numerical increase in feed consumption for chicks group supplemented with 2 mg/10 L drinking water compared to other tested groups. While chicks supplemented with 1 mg/10 L drinking water showed significantly (P>0.05) low live body weight, feed intake, body weight gain and feed conversion ratio.

Results also showed no significant (P>0.05) difference for non carcass components due to Supersan administration compared to control group.

Table(5): effect of Supersan administration in drinking water for broiler chicks performance

Treatment	Feed intake (g)	Body weight (g)	Weight gain (g)	FCR
Control	2294.00	1898.00	1529.60	1.50
B	2144.10	1440.00	1218.60	1.76
C	2313.90	1670.40	1379.10	1.70
SE	154.70	133.39	94.59	0.178

Table(6): effect of Supersan administration in drinking water on non carcass components of the experimental broiler chicks

Treatment	Hot weight	Abdominal fat	Liver	Heart	Gizzard	Head
Control	1658.33	0.17	0.64	0.22	0.5	0.57
B	1232.33	0.20	0.49	0.17	0.17	0.54
C	1556.33	0.25	0.53	0.18	0.18	0.60

4.2 Discussion

The experiment was carried out in a semi-closed house, cleaned and disinfected. Feed intake is more or less similar; the highest feed intake was recorded in treated group C (2313.9 g) and the lowest value in treated group B. Similar results were recorded for feed conversion ratio. This may be due to that the environmental condition of the experiment could be considered as responsible factor for inconsistency in results, so the birds did not consumed more water, although the benefit of treatment is not enough, or the dose recommended by the manufacture company did not enough under our condition, and from this view the chicks performance did not affected by treatment. However, chicks on group C (2 gm/10 L) performed better than those of group B (1 gm/ 10 L). This result were similar to the findings of Puron *et al*., (1994) who examined 200 ppm dietary vitamin C supplementation and found no effect on performance and survivability when the average environmental temperature was 26 ºC, Mohiti Asli *et al*., (2007) who found no significant effect on egg weigh and FCR due the inclusion of vitamin E, also Puthpongsiriporn *et al.,* (2001) recorded decreased feed intake for birds fed with vitamin E and C under environmental stress, Preston *et al.*, (2000) who found that enzyme inclusion did not improve performance; Richter *et al.*, (1994) who reported that live weight did not improved by enzyme supplementation and Ziaei *et al*., (2013) when fed laying hens with vitamin E and organic selenium. On the other hand, the results of this study contradict with Edwards *et al*.,(2002); Kasim and Edwards (2000), who found increased body weight gain for chicks fed increasing levels of vitamin D3;Christmas *et al*., (1995); Meng *et al.*, (2005); Saleh *et al.*, (2005) and Wang *et al.*, (2005) who reported improved feed utilization by exogenous enzyme, also Paul *et al*., (2010) who observed that multivitamins and enzyme supplementation significantly ($P<0.05$) increased body weight of carcass traits. Supplementation also did not influence birds weight or weight gain , which was explained by a reduction in feed intake. This may be due to the antimicrobial compounds concentration, composition of diet and environment of the experiment. There are a few studies on this subject.

CONCLUSION AND RECOMMENDATIONS

Conclusion:

Supersan administration via drinking water did not affect growth performance and carcass traits. The dose recommended by Manufactory Company did not enough under our condition.

Recommendations:

- Practical implications
    - The result of the present study showed that the commercial (Supersan soluble) can be used in drinking water in open system at summer season as heat stress control; otherwise it is better to increase the level of inclusion of Supersan soluble in drinking water.
- Suggestion for future study
    - Further research is needed to get better understand about the effect of commercial (Supersan soluble) in improving the performance, carcass characteristics and immune of broiler chicks.

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Abbreviations:
IgG = immunoglobulin G
IgA = immunoglobulin A
EO = essential oils
CA= citric acid
ACTH= adrenocorticotropin hormone
GSH= glutathione
GSH-Px= Glutathione peroxidase
Se= selenium
NPS= non-starch polysaccharides
IBD= Infectious Bursal Disease
CRINA =
DSM= is a global Life Sciences and Materials Sciences company active in health, nutrition and materials.
Bifidobacterium = A genus of Gram-positive, nonmotile, anaerobic bacteria, some of them used as probiotics.

Appendix(1):

COMPOSITION OF SUPERSAN SOLUBLE :

king water.

Vitamin A .... .600,000 IU
Vitamin D3 .... 50,000 IU
Vitamin E ....100 mg
Vitamin B1 ....100 mg
Vitamin B2 ....100 mg
Vitamin B6 ....200 mg
Vitamin B12 ....1.5 mg
Vitamin K ....200 mg
Calcium pantothenate ....500 mg
Nicotinic acid ....1 g
Protein hydrolysate ....10 g
Excipient to .... 100 ml

Appendix (2):

Weekly medium air temperature during the period 7th April to 27th may 2012

Weeks	medium temperature ^{O}C
1	33.4
2	32
3	31
4	32.3
5	30.8
6	31.3
7	34.3

Source: thermometer

Appendix (3):

Appendix (4):