بسم الله الرحمن الرحيم

Sudan University of Science and Technology

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Impact of Added graded levels of sugar cane molasses to drink water on performance of broiler chicks.

تأثير إضافة مستويات متدرجة من مولاس قصب السكر لمياه الشرب في أداء الدجاج اللاحم.

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بسم الله الرحمن الرحيم

قَالَ تَعَالَىٰ:

﴿ وَيَسْـَٔلُونَكَ عَنِ ٱلرُّوحِ ۖ قُلِ ٱلرُّوحُ مِنْ أَمْرِ رَبِّى وَمَآ أُوتِيتُم مِّنَ ٱلْعِلْمِ إِلَّا قَلِيلًا ﴿٨٥﴾ ﴾

صدق الله العظيم

الإسراء :85

DEDICATION

To my mother and father.

To my sisters and brothers.

My friends and colleagues...

ACKNOWLEDGEMENT

Praise to Allah, who gave me the strength and patience to complete this work.

Next , Iwould like to thank and gratitude my supervisor Prof.Dr. Intisar Yousif Turki for this guidance,help and encouragement throughout the period of the research.

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Abstract

This research was conducted to study the effect of adding graded levels of sugarcane molasses to drink water on the performance of broiler chicks. The parameters studied included: feed in-take, body weight gain, feed conversion ratio ,water intake, edible internal organs at week 4,5 and 6 and weight after slaughter at week, 6. A total of 90, one day old commercial broiler chicks (Ross308) having approximately the same weight, were divided into 3 treatments groups (A,B,C),30 per each group ,which in turn sub-divided into 3 replicates of 10 chicks each in stratified and completely randomized design. Starter and finisher diets were formulated to meet the total nutrient requirements of the chicks. The graded levels of the sugarcane molasses added to drink water were zero,1ml/litre and 2ml/litre molasses for group A(control),B and C respectively. The obtained result of feed intake (g/bird) showed a significant difference ($p \leq 0.05$) between the mean values of group A,B and C at week 4, while at week 5and 6 no significant difference was revealed between the mean values of all groups. Concerning body weight gain (g/bird) in association with effect of molasses addition ,a significant difference ($p \leq 0.05$) was detected between average values of the 3 groups at week, 4. At week, 5 no

significant difference, and high difference ($p \leq 0.01$) was found at week, 6. No sig. variation was detected between mean values of group A,B and C for feed conversion ratio(FCR) at week, 4 and 5 but a high sig. variation ($p \leq 0.01$) was recorded at week, 6.

The mean values of water intake (ml/litre) indicated a high significant difference ($p \leq 0.01$) at week, 4,5 and6. The edible internal organs (g/bird), liver ,gizzard and heart were also highly

affected by molasses addition at week 4,5 and 6, where by the average values showed a high sig. variation ($p \leq 0.01$). Finally, average values after slaughter (kg/bird) indicated also a high significant difference ($p \leq 0.01$)at week 4,5 and6. The addition of graded levels of sugarcane molasses to drink water of broiler chicks practiced different effects on performance parameters subject of the current study, of which the gain in weight after slaughtering(carcass) may be considered as an important advantage for the poultry industry.

مستخلص البحث

أجريت هذه التجربة لدراسة تأثير مستويات متدرجة من مولاس قصب السكر المضاف الى ماء الشرب على أداء الدجاج اللاحم. المقاييس التى تمت دراستها تشمل الاتى: إستهلاك الغذاء ،الزيادة الوزنية، معدل التحويل الغذائى ، معدل استهلاك الماء وأوزان الأعضاء المأكولة الداخلية عند الأسابيع 5،4و6. ووزن الذبيح بعد الأسبوع السادس.

استخدمت سلالة (الروس308) للتجربة وقسمت الكتاكيت عمر يوم واحد إلى ثلاث مجموعات أ،ب،ج متساوية تقريبا فى متوسط أوزانها الابتدائية بحيث تحتوى كل مجموعة على 30 طائر وكل مجموعة قسمت على 3 مجموعات 10 طيور لكل مجموعة ثانوية في تقسيم كامل العشوائية.

كونت عليقة البادئ والناهى وفق الاحتياجات الغذائية للدجاج اللاحم. وأضيف المولاس إلى ماء الشرب بمستويات صفر ،1ملليتر و 2 ملليتر/لكل لتر ماء للمجموعات أ،ب و ج على التوالي .

اظهرت النتائج المتحصل عليها الخاصة باستهلاك الغذاء (جم/طائر) فرقا معنويا ($p\leq0.05$) بين متوسطات قيم المجموعات ا،ب وج فى الاسبوع الرابع بينما لم يرصد اى فرق معنوى بين متوسطات قيم كل المجموعات للاسابيع الخامس والسادس.

وبخصوص وزن الجسم المكتسب (جم/طائر) تم رصد فرق معنوى ($p\leq0.05$) بين متوسطات القيم لكل المجموعات فى الاسبوع الرابع اما فى الاسبوع الخامس فلم يتم رصد اى فرق معنوى بينما وجد فرق معنوى عالى فى الاسبوع السادس ($p\leq0.01$). بالنسبه لمعدل تحويل الغذاء لم يرصد فرق معنوى فى الاسابيع الرابع والخامس للمجموعات ا،ب و ج بينما رصد فرق معنوى عالى فى الاسبوع السادس

($p\leq0.01$) . متوسط قيم استهلاك الماء (مللتر/لتر) اشار الى وجود فرق معنوى عالى ($p\leq0.01$) فى الاسابيع 4،5 و6. ايضا تاثرت الاعضاء الداخلية الماكولة (الكبد ، القوانص والقلب) معنويا($p\leq0.01$) فى الاسابيع 4،5 و6.

ختاما بانت متوسطات القيم بالوزن بعد الذبح (كيلوجرام/طائر) فرق معنوى عالى ($p\leq0.01$) للاسابيع 4،5 و6.

اضافه مستويات متدرجة من مولاس قصب السكر لماء الشرب الخاص بالدجاج اللاحم احدث تاثيرات مختلفه فى اداء الدجاج اللاحم بالنسبه للنمو. ويمكن اعتبار الكسب فى الوزن بعد الذبح احد افضل المزايا بالنسبة لصناعه الدواجن.

Chapter one

1. Introduction

Sudan is the second largest country in Africa, covering over 1.882.000 km^2, lies within the tropical zone between latitudes 8.45 to 23.8 North and longitudes 38.24 to 21.4 East (Jadin, 2011). Mean annual temperatures vary between 26^oC and 32^oC across the country. The most extreme temperatures are found in the far north, where summer temperatures can often exceed 43^oC (Sumaya, 2009).

Sudan recognized the potential of the poultry industry in the early fifties of the last century when imported breeds were brought to Sudan by the government and private sector. Subsequently peasants recognized the potential of including poultry production in their farms, this was further accelerated by urban development after the country independence in 1956. In late seventies many investors from Arab Gulf States started commercial egg and broiler production in Sudan. Nowadays poultry industry is booming and growing rapidly (Writer, 2012).

In Sudan investment in poultry industry was estimated at 200 million dollars in the year 2006-2007 by the Animal Production Directorate of the Ministry of Animal Resources and Fisheries (Oashek, 2009). The rise in poultry production and consumption in Sudan generally and in Khartoum State particularly may be attributed to many precipitating reasons including, increased Broiler farming in Sudan has emerged as the fastest growing segment of animal husbandry. However, the profitability of a broiler industry largely depends on the selection of superior commercial strains of broilers quality, economics of feeding, adoption of sound managerial practices and efficient marketing system.

Khartoum State ranks first in broiler production in Sudan; it produces about 90% of the total broiler production country wise (Wagge Allah,

2011). In 2008 the total number of chickens was estimated at 9.5 million (Agricultural Census, 2009). The latter were distributed in the three districts of the State Khartoum Khartoum North and Omdurman, 39%,37% and 24% respectively (Agricultural Census, 2009).

Sugar cane is also widely grown in the Sudan as a raw material for a strategic and expanding national sugar industry. This has been accompanied by substantial amounts of cane molasses produced cheaply as a by-product of sugar production. Molasses can be a source of quick energy and an excellent source of minerals for farm animals and even humans. Molasses can also be a key ingredient for cost effective management of feeds and pastures (Milton, 2012).

Objectives:

- To study the effect of adding different levels of sugar cane molasses to drink water on performance of broilers chicks.

Chapter Two

2. Literature review

2.1- Poultry industry in Sudan:

Poultry keeping in Sudan is an old practice, where the domestic fowl has been kept for generations in villages and backyards of dwellings to supply both eggs and meat for own consumption. Recently, with the increasing in demand for poultry products, poultry production has witnessed an increasing intensification resulting in commercial poultry farming concentrated in Khartoum State, the capital of Sudan and in the peripheries of some other big cities. Other parts of the country depend on the governmental poultry units and small-scale farms (Sharabeen, 1996). Commercial Poultry production in Sudan is divided into three farming systems:

- Open System
- Semi Closed system
- Closed system

Khartoum State produce almost 90% of Sudan's poultry production (Mohamed, 2014). Ninety six percent of the commercial poultry production is located in Khartoum State of Sudan. This could be explained by the continuous urbanization from rural areas to the cities, implying a future rising market demand in this area. However, Sudan remains the Arab country with the lowest intake of poultry meat per capita a year. In 2005, the intake of commercially bread poultry was 0, 77 kg of meat per capita which can be compared to Egypt with 9 kilos per year or Saudi Arabia with a yearly intake of 39 kg of poultry meat per capita (Freiji, 2008).

The low intake of poultry in Sudan can be explained by the price of meat. Traditionally, the price of red meat from sheep and cattle has been low,

but during the last decade, a rise has been noted. In the past, poultry meat production has been dependent on the importation of production inputs such as feed, vaccines and parent stock (Freiji, 2008).

As the industry is growing and the agribusinesses establish themselves, the agribusinesses tend to be able to produce chicken more efficiently. For Sudanese poultry producers, the cost of environmental regulation systems and feed are the two major expenditures affecting the producers' final profit. Feed cost itself stands for 50-70% of the producers' total costs. Depending on the production system used, air conditioning can be the second largest expense (Emmam and Hassan, 2010).

2.2-Feed additives:

Feed additives are important to the business of food in the world. With the help of feed additives, producers can grow more economically the food producing animal that represents large percentage of the protein consumed. Feed additives are compounds that producers add to a diet for reason other than to supply nutrients to the animal. Different additives affect different parts of the body. In general, the purposes of the feed additives are to enhance production efficiency, to improve health, and to reduce morbidity. Feed additives are typically mixed into the feed in very small amounts (Leeson and Summers. 2005).

2.3-Broiler performance:

2.3.1-Feed intake:

Feed intake is an important parameter in poultry production, not only because of economic implications equally because of the fundamental role it plays as a variable interpretation of nutritional responses. Thus nutritional effect can often be explained solely in terms of food intake (Karloy, 2011).

Knowledge of individual examples is of fundamental importance to the poultry productions as intake variably determines both the level of production and economic output. Moreover, feed formulation itself is controlled to a large extent by the level of intake anticipated. Thus, in terms of either protein or minerals requirements, if two birds have dissimilar level of intake for whatever reason, then they will require separate diets; that which eats less will require one of a higher concentration of protein and minerals .For this reason there have been considerable efforts within poultry productions devoted to the study of the precise reason why intake varies and how to control them(Karloy. 2011).

2.3.2-Factors affecting feed intake of broiler chicks:

Control of feed intake is an extremely complex area involving a number of factors and theories which have attempted to explain this phenomenon. Factors include diet(diet nutrient composition,feed formulation and feed stuff inclusion levels, and feed pellet quality) and managerical(feed and water availability to the birds ,environmental management,stocking density and disease control).There are theories which are based on both physiological (controlling mechanisms within the bird which limit and encourage consumption of a particular nutrient or energy yielding components) and physical, (the bird eats the maximum gut fill). Both mechanisms require the presense of sensors within the bird by which it is informed of intake. The amount of feed consumed is closely associated with growth performance in meat-type poultry. Modern commercial broilers and turkeys will not grow to their full genetic potential unless consume their full nutritional requirement each and every day. Aside from adequate diet formulation, maintaing maximum feed intake is the single-most important factor that will determine the rate of growth and efficiency of nutrient utilization(Peter and Abel.,2006).

2.3.3-Body Weight gain:

Food is required for the body maintenance.It is observed that 60 K Cal/Kg metabolizable energy is needed for the maintenance of normal life. So the required energy may vary according to the body weight(Sunil, 1993).

2.3.4-Factors affecting weight gain of broiler chicks:

Feed intake is the major factor that influences the body weight gain in meat-type poultry. Because so many factors can influence feed intake, it is often difficult to correct a problem of poor feed intake unless a complete review of feed and management practices are made. Also anti nutritional factors in foods are produced as a result of fungal or microbial metabolism or by the plants themselves as defensive mechanisms against injury or infection. Fortunately, the presence of a toxic factor per se does not preclude the utilization of the material as a feedstuff (Ferket and Gernat, 2006).

2.3.5-Water intake:

The water requirement of meat birds depends on the environmental temperature and relative humidity, the composition of the diet, growth rate and efficiency of water resorption by the kidney.

Meat birds drink at least twice as much water as the amount of feed consumed on a weight basis. Actual water consumption relative to feed intake varies depending environmental temperature and dietary factors. Increase dietary crude proteins increases water intake and water: feed ratios stay relatively the same. Increase dietary salt and other osmotically active minerals, increase water intake in attempt to flush excess minerals via the kidneys(Marks ,1987). Water availability is dependent upon stocking density and access to drinker space ,drinker placement and hight drinker design and water flow capacity(Mark and Pesti.1984).

2.3.6-Factors affecting water intake on broiler chicks:

Adilibtum water intake of broilers can be highly variable and depends on diet composition and feed form, production performance, intestinal health, stress and on environmental conditions.Water intake of broilers is increased during physiological stress(Virden. et al.,2009).Effects of dietry fiber on water intake can be two- fold .Whether water intake increases or decreases depends on the nature of ditery fiber. Effect of these fibres on nutrients digestability values and gizzard development were presented in more detail (Vander Klis , 2012). Hung ,et al.(2011) showed that 10%feed restriction resulted in a 3.5% reduction in water intake and as a consequence the water to feed ratio was increased by feed restriction . Also physical quality of feed and feed form affect water intake. Furthermore, significantly increased litter moisture in broiler feed pellets instead of fines(as reground pellets)(37.6% vs 31.3%) or pellets instead of mash diet (42.4% vs 35.4%) , which might be related to a higher feed and water intake in broilers fed pellets diets. Such observation would agree with Serrano et al.(2013)who observed an increase in water intake with pelleted diet compared to mash diet, wherease water to feed ratio was not affected.

2.3.7-Effect of water consumption on broiler performance:

Water restriction harms broiler performances during their first week of life, but the negative effects are reversed after water is fed *adlibitum*, allowing the birds to recover performance levels. When birds are submitted to water restriction during the first week of life, they present subsequent compensatory growth, as shown by their better performance during the second and third weeks of the experiment as compared to the bird offered water *adlibitum.* The addition of450ppm of sodium in the

drinking water did not cause intoxication in the broilers as explained by Castro *et al* (2009).

2.4- Molasses:

2.4.1-Molasses definition:

Molasses is a sticky dark by-product of processing sugar cane or sugar beets into sugar. Molasses can be a source of quick energy and an excellent source of minerals for farm animals and even humans. Molasses can also be a key ingredient for cost effective management of feeds and pastures. The calcium content of sugar cane molasses is high (up to one percent), whereas the phosphorus content is low. Cane molasses is also high in sodium, potassium, magnesium and sulphur. Beet molasses is higher in potassium and sodium but lower in calcium. Molasses also contains significant quantities of trace minerals such as copper, zinc, iron and manganese.(Milton.,2012).

Furthermore molasses can reduce the dusty powdery nature of some finely ground feeds. In this role, it makes a feed mixture more palatable and edible to livestock. Molasses can be added to replace missing sugar and trace minerals and help with fermentation in cases of low quality forages especially with low sugar levels.

Molasses are a quickly fermentable source of energy for rumen microorganisms. they have a positive effect on milk protein content for dairy cattle, and can increase the milk yield. Molasses are ideal as a silage additive due to their high energy content. in the case of silage that has a low amount of fermenting substrate, it is worth-while adding 30 to 40 kg of molasses per tonne of silage(Agrana.,2016).

2.4.2- Types of Molasses:

There are many types of molasses which have been described and specified by the Association of American Feed Control Officials (AAFCO, 1982),These types include the followings .

a. Cane Molasses:

Is a by- product of manufacture or refining of sucrose from sugar cane. It is specified by AAFCO(1982) to contain not less than 46% total sugars expressed as invert, its moisture content exceeds 27%, and its density، determined by double dilution method, must not be less than 79.5 Brix. The early literature on production and processing of cane molasses، has been presented by Anonymous (1970), and Meade and Chem (1977). The molasses usually available for animal feeding is known as Black strap or final molasses.

b.Beet Molasses.

c. Citrus Molasses.

d.Hemicellulose Extract.

e. Starch Molasses.

2.4.3- Composition of Molasses: May be given as follows: Table(1):

Analytical Components /kg **	Fresh Matter FM*	Dry Matter DM*
Dry matter	75%	100%
Total sugar	Approx 42%pol	56%
Crude protein	10%	13.3%
Crude ash	12%	16%
Nitrogen-free extract	58%	77%
Calcium (Ca)	< 0,5 g/kg	0,67 g/kg
Potassium (K)	40 g/kg	53 g/kg
Phosphorus (P)	< 0,5 g/kg	0,67 g/kg
Magnesium (Mg)	< 0,2 g/kg	0,27 g/kg
Sodium (Na)	11 g/kg	14,7 g/kg

Agrana (2016).

2.5.4- Production of Molasses:

The major production area of molasses is U.S., and the major consuming areas in the world are the United States, Canada, Europe and Far East. The recent usage of molasses is in the production of alcohol.

In Sudan, the sugar production is from sugar cane, which is famous for its high value of sugar molasses. The total production was estimated to be around 351809.50 tons in addition to 4500 tons from Kenana sugar company in 2006-2007. (Sudanese Sugar Company(SSC), Kenana sugar company (KSC)). Some of the molasses produced from the Sudanese Sugar factories is exported to regional international markets and the rest

is utilized locally as supplement for animal feeds and for fermentation for ethanol production.

2.4.5- Molasses as an animal feed:

This tasty feed component is perfect for providing energy quickly and can therefore be used as a supplement to the feed for cattle, horses, pigs and poultry.

Molasses should only be used to feed pigs when they have a body weight of 40 kg or more. It is a delicacy when used in horse feed and is a valuable supplement(Agrana.,2016).

Table (2): Quantities of molasses given as feed:

Animal	Quantity
Beef cattle	1,5 – 2 kg/day
Calf	1 kg/day
Dairy cattle	3 kg/day
Pregnant sows	up to 10 % of the DA
Fattening pigs	up to 7,5 % of the DA
Piglets	up to 2,5 % of the DA
Poultry	up to 2,5 % of the DA
Ewes	0,25 kg/day

(Agrana.,2016).

2.4.6- Feeding in association with molasses:

The problem of feeding molasses through diet is that it easily forms cake with feed. The caking problem is better solved by feed pelleting which farmers cannot afford (Ndelekwute et al., 2010).

Addition of40g and 60g of molasses, respectively to a litre of drinking water to form molasses solution these were to be fed at the finisher phase only. Result indicated that after four weeks of feeding of the molasses, all

the levels of molasses improved final weight,therefore addition of 60g of molasses per liter of drinking water could be recommended to be added during the finisher phase (Ndelekwute et al., 2015).

Addition of molasses and broiler litre to sheep diet, molasses might be advantageous when the intake of litter is restricted or when voluntary intake of litter is unacceptably low (Mavimbela et al., 2001).

By addition of 0, 5, 10 and15% cane molasses ,respectively to a diet in replacement of sorghum grain by weight, result indicated a significant ($P<0.01$) increase in feed consumption, body weight gain and feed conversion ratio with increased incorporation of dietary molasses(Hajer.,2007).

The effect of molasses as dietary energy replacement for indomie waste in the diet of African catfish was studied .Four experimental diets were formulated; the control, without the test ingredient and the other three diets (diets 2, 3 and 4) contained 1.0, 1.5 and 2.0% molasses inclusion respectively. Results indicated mean weight gain (MWG) significantly increased ($P<0.05$) from 1 to 1.5%, The inclusion of molasses in African catfish diet up to the level tested would not have any negative effect on growth and health of fish.(Aderolu *et al*., 2013).

Chapter Three

3. Material and Methods

3.1- Experimental site and duration:

The study was conducted at Sudan University of Science and Technology, College of Animal Production Science and Technology, during the period between3/11_13/12 ,in which the ambient temperature ranged between (20-37.8C).

3.2- Experimental house:

The experiment was conducted in an open sided deep litter house constructed from iron sheets roofing, wire netting sides and conceret floor.The long axis of the house was extended east-west facing the wind direction for efficient ventilation .The house was partitioned into nine experimental units ($1*1m^2$)(replicates)of equal area with enough working space allowance. The experimental house was dry cleaned, burned and washed by water and soap using high pressure pump. Ground cracks locked by cement and the northern sides of the house were covered by nylon sheets. Then the house was disinfected with cypermethrin 10% 3ml/litre), virocid 0.5% (1:200) litre. The house was left closed until the arrival of the chicks. Fresh wood shaving as litter was spread in the pens at a depth of 5cm before the arrival of the chicks. Each replicate was provided with one feeder and one drinker. Both feeder and drinker washed well by water and soap and disinfected by phonic.

3.4- Experimental birds and management:

A total of ninty ,one day old commercial broiler chicks (Ross) were used in this experiment. The chicks were purchased from Enma Company for Poultry Production. Broilers were divided to three groups each group had three replicate ,the replicate had 10chicks . Chicks were given starter diet for two weeks .Afinisher diet offered was to chicks at the last three

weeks .Molasses was added to the drinking water into two different levels (1ml molasses/litre) and (2ml molasses/litre). The ingrendients composing starter and finisher diets are given in table(3,4).

3.5- Prevention and vaccination:

During incubation period the chicks were given antibiotic (colidad-coliston {as sulphate} 1g/4litre)in water for 5days also given multi vitamins (AD_3 E 1ml/litre)in water for 7days. At day one each chick was vaccinated against infectious bronchitis and Newcastle disease (IB-ND).On the eighth day each chick was vaccinated against Newcastle disease(ND)by injection. On day 11 each chick was vaccinated against Newcastle and infectious bursal disease ND-IBD)by drops in eyes.Amulti vitamin was added in drinking water before and after vaccination . The feed was provided *adlibitum*.

Table(3): Ingredient composition of experimental starter diet:

Ingredients	%
Sorghum	53.55
Groundnut cake	29.50
Wheat bran	8.70
Concentrate	5.00
Polyfat	1.50
Methionine	0.10
Lysine	0.30
Antitoxin	0.10
Anticoccidia	0.05
Lime stone	1.00
Salt	0.20
Total	100

Table(4): Ingredient composition of the experimental finisher diet(%):

Ingredient	Expermental diet
Sorghum	66.30
Groundnut cake	21.00
Wheat bran	4.00
Concentrate	5.00
Polyfat	2.50
Methionine	0.05
Lysine	0.20
Antitoxin	0.10
Anticoccidia	0.05
Lime stone	0.60
Salt	0.20
Total	100.00

3.6- Data collection:

3.6.1-Feed intake:

Feedintake (g) for the birds of each replicate was calculated every day from the date of offer by subtracting the amount of feed remained from the amount of feed given.

3.6.2- Body weight and body weight gain:

Body weight(g) for the birds of each replicate was taken and recorded three times a week. Weight gain was calculated daily by subtracting the body weight of previous day from present body weight.

3.6.3- Feed conversion ratio:

Feed conversion ratio (FCR),(g feed/g gain) was calculated by dividing the amount of feed consumed by body weight gain.

3.6.4- Water intake:

Chicks were offered their daily water in each drinker. Molasses was added to drink water as group A,B,C (0,1ML/L and 2ML/L),

respectively. The amount of water consumption was calculated and recorded every day from the date of offer by subtracting the amount of water remained from the amount of water given.

3.7- Carcasses Measurments:

At the end of experimental period(41 days) .nine birds from each group were taken after weighed and slaughtred for carcass characteristics.

3.8- Statistical analysis:

Complete randomized design (CRD) ANOVA was used to analyse the results obtained from the experiment data by using statistical package for social science (SPSS).

Chapter four

4. Results

The effect of supplemented water with graded levels of molasses (0,1and 2ml of molasses/L) on feed intake was shown in table(5). Results showed that there are no significant differences between treatments ($p>0.05$) in week 5,week6 but there is a significant difference in week 4 ($P<0.05$).

Table(5):The effect of molasses on broilers feedintake(g/bird):

Treatments / parameters	A M±Std	B M±Std	C M±Std	SIG
Week4	86.45±4.197	84.34±2.744	90.60±4.180	*
Week5	166.48±1.770	159.26±5.826	169.26±17.985	NS
Week6	181.23±5.292	187.85±1.834	190.77±5.860	NS

*: Significant ($p<0.05$).

NS :Not significant.

M±SD= Mean ±Standerdeviation.

The effect of added molasses to the drink water of broiler chicks on weekly weight gain was shown in table(6). Results showed that there are no significant difference through week 5,significant difference in week 4 and highly significant difference among experimental groups was observed in week 6 ($p \leq 0.01$) .

Table(6): The effect of molasses on broilers weight gain(g/bird):

Treatments / Parameters	A M±Std	B M±Std	C M±Std	SIG
Week4	54.50 ±7.856	69.81±9.678	64.64±.327	*
Week5	72.98±14.116	77.45±17.612	78.83±4.336	NS
Week6	74.40±11.643	74.93±2.421	87.23±7.984	**

**:Statistically significant ($p < 0.01$).

NS:not statistically significant.

M±SD= Mean ±Standerdeviation.

The effect of supplemented water with graded levels of molasses(0,1 and 2ml/L) on FCR was evident in table(7). The addition of molasses results showed that there are no significant difference in week 4 ,5 ($p>0.05$),but a highly significant difference in week 6.

The effect of molasses on broiler feed conversion ratio(FCR):

Table(7):

Treatment / Parameters	A M±Std	B M±Std	C M±Std	SIG
Week4	1.62± .334	1.21± .200	1.37± .038	NS
Week5	2.34± .494	2.12± .414	2.15± .228	NS
Week6	3.99±1.021[a]	2.51±.056[b]	2.20±.255[c]	**

NS: Not Statistcally significant.

**: Statistically significant.

M±SD= Mean ±Standerdeviation.

The effect of added molasses to the drink water of broiler chicks in water intake was shown in table (8).Results showed that there are highly significant difference between treatments ($p \leq 0.01$).

Table(8): The effect of added molasses to drink water on broilers water intake(ml/litre):

Treatments / Parameters	A M±Std	B M±Std	C M±Std	SIG
Week4	216.60±12.119	250.26±18.601	279.05±40.966	**
Week5	238.98±17.242	247.55±3.376	301.43±15.452	**
Week6	236.57±15.145	262.37±4.750	298.33±11.504	**

**:Statistically significant.

M±SD= Mean ±Standerdeviation.

The effect of supplemented water with graded levels of molasses (0,1and 2ml of molasses/L)on internal organs was shown in table(9).Results showed that there are highly significant difference between treatments ($p \leq 0.01$).

Table(9):The effect of added molasses to drink water on internal organs:

Treatment / Parameters	A M±STD	B M±STD	C M±STD	SIG
LIVER	38.33 ± 7.90^{b}	40.55 ± 5.27^{ab}	51.11 ± 11.39^{a}	**
GIZZARD	80 ± 12.5^{a}	45 ± 4.3^{b}	68.33 ± 25.50^{a}	**
HEART	7.77 ± 2.63^{b}	11.11 ± 2.20^{a}	12.77 ± 2.63^{a}	**
WEIGHT AFTER SLAUTER	1182.8 ± 150^{b}	1308.9 ± 136^{ab}	1404.4 ± 137^{a}	**

**: statistically significant ($P<0.01$).

M±SD= Mean ±Standerdeviation.

Table(10): Effect of added molasses to drink water on weight intial,final and after slaughter:

Treatment / Parameter	A	B	C	SIG
Initial weight(g/bird)	622.6±32	571.5±24	629.8±30	NS
Final weight (g/bird)	1752±85.6	1977±93.9	2070±33.3	**
Weight after slaughter(kg/bird)	1182.8±150	1308.9±136	1404.4±137	**

NS:Not Significant.

**:High significant.

Chapter Five

5. Discussion

Molasses is considered as source of energy for animal feeding. It has been used as an animal feed for livestock and poultry since a long time, starting at the nineteenth century. In the present study, using of molasses in broiler drink water resulted in increased feed intake with increased concentration of molasses in drinking water of the experimental birds. The highest ($P<0.05$) feed consumption level was attained by the birds had 2 ml/litre of molasses in the water ; whereas the lowest levels of feed consumption was attained by the control group that didn't have molasses. Similar results were obtained by Ndelekwute (2015), who indicated that, 60g/litre of molasses improved feed consumption rate and produced higher feed intake. On the other hand, Khalid, (2007a) reported contradicting results, that incorporation of cane molasses in broiler diets above 4% decreased feed intake. Increased feed intake might be due to the fact that, molasses increases the palatability, Which was mentioned by Curtin (1983), who indicated that, beside molasses been an energy source, the palatability of molasses makes it an excellent carrier for other feeds especially unpalatable feedstuffs. Moreover, Crampton, (1956), Gohl ; (1975) and Preston and Leng (1987), addressed that, molasses increases palatability, setting dust, carrier for other essential nutrients, serving as a binder for pelleting and as a source of trace minerals and some microelements. The present study has shown in (table 7) there was no significant ($P>0.05$) increase of body weight during the 5 weeks, while there was significant increase during 4 weeks and highly significant increased during the last 6 weeks ($P< 0.01$). This could be attributed to the increased feed intake at the last 6 weeks. Similarly Aderolu, (2013) showed that, in *Clarias gariepinus juvenile* chicks fed with molasses the

mean weight gain (MWG) significantly increased ($P<0.05$) from 1 to 1.5%.

Moreover, significant increase in body weight has been also reported by Ndelekwute (2015), who indicated that, after four weeks of feeding of the molasses, all the levels of molasses improved final weight. In this study the use of molasses in broiler water during week 4and5 had no significant effects on feed conversion ratio. This finding is in general agreement with that of Aderolu, (2013) who addressed that, There was no significant difference ($P>0.05$) in the feed conversion ratio among experimental chicks.

Concerning the water consumption the present study showed that there was significant ($P\leq0.05$) increase in water intake. The physiological justification of increase water consumption in broiler could be due to the potassium and sugar content in the molasses, which might affect the water intake and electrolyte balance. Jacobs and Scott (1957), however, showed that the liquid intake of 6-week-old chicks was increased significantly when sucrose was added to water, indicating that sugar may also play a role in water metabolism.

It is to be concluded that, the increase in the average feed intake and mean weight gain of Broiler indicated that the diets were adequate to promote growth and improve feed efficiency of the Broiler chicken.

Chapter Six.

6. Conclusion and Recommendations

6.1. Conclusion:

Different feed additives are used in animal nutrition . The main purposes are to enhance production efficiency as well as to reduce morbidity and others. Addition of molasses is one of techniques applied in poultry industry. The molasses used when mixed with different amounts of drink water given to broiler chicks, showed variable effects on e.g water consumption, weight gain ,edible internal organs and final weight after slaughter.

Howerver , Fcr is affected, while feed intake remained at the normal levels. The benefits gained by feeding molasses may be due to the ingredients it contains, palatability and several other factors.

6.2. Recommendations:

- Molasses should be applied and considered as part of the feed diet given to broilers chicks.
- Awaring the poultry breedes by the benefits gained when utilizing molasses in the diet in association with animal productivity, health expected economic impact.
- More research works should be carried out on the influences of molasses involved in poultry industry in terms of the overall performance.

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