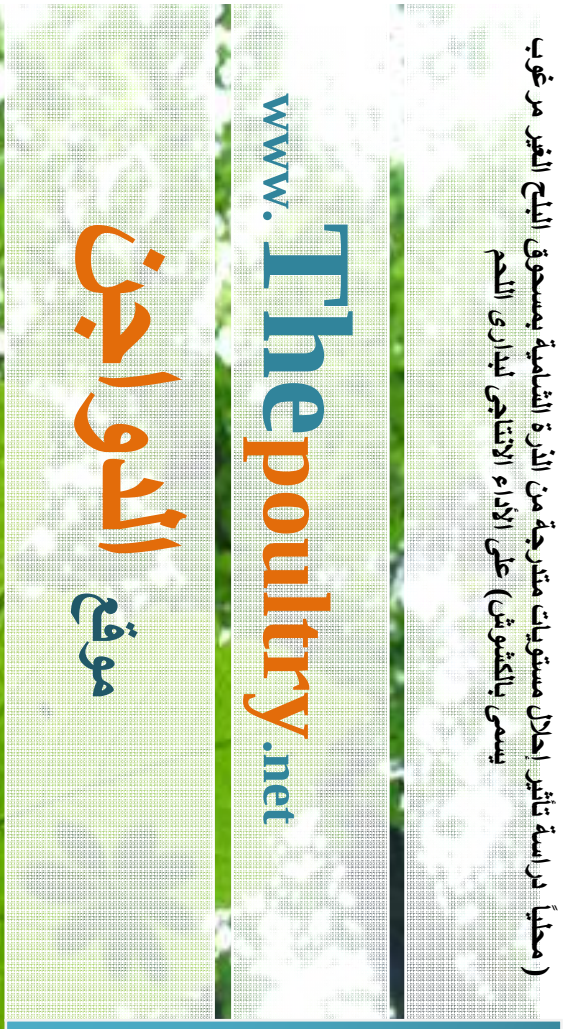

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موقع الدواجن

يمكنك زيارة موقع الدواجن على الانترنت لتجد العديد من المواضيع القيمة عن الدواجن.

جميع المواضيع المطروحة بالموقع موثقة بأخر واحدث المراجع العالمية بعلم الدواجن ومنقحة على يد نخبة من الأساتذة والأطباء البيطريين والمهندسين الزراعيين الحاصلين على شهادات عليا بعلم الدواجن.

تنبيه

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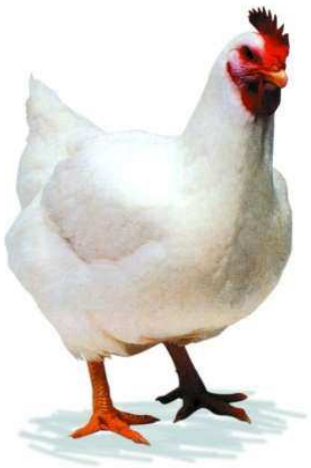
The Influence of Different Levels of Discarded Dates Substitute Maize on Broiler Performance



دراسة تأثير إحلال مستويات متدرجة من الذرة الشامية بمسحوق البلح على الأداء الانتاجى لبدارى اللحم

By

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A thesis Submitted to the University of Dongola in fulfillment of the requirements for M.Sc. Degree in Animal Production

Faculty of Agricultural Sciences

University of Dongola

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DEDICATION

This thesis dedicated with all my heart to my beloved family: my father, my mother my sisters and my wife. Their endless love and encouragement have helped make it all possible.

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ABSTRACT

The experiment were conducted with two hundred fifty broilers feeding *adlibtium* from one week of age up to thirty five days old, formulated by replacing dietary maize by discarded date meal (0,5,10,15, and 20 % date level) to study its effect on productive performance, carcass dressing percentages, non carcass components and digestion coefficients of crude fibre and ash. Birds were randomly divided into 25 groups (pens) of 10 chicks each. Each group received one of the five experimental diets containing equal ratio of calorie: protein (C/P) under the same managerial conditions

The proximate analysis showed that dietary date contains substantial amount of nutrients indicating its feeding value as an ingredient in feeding broiler chicks and promising source of energy.

Replacing maize by date meal at 5% level had no deleterious effects on parameters of feed intake over all the studied growth period. Dietary date meal may be used at 5% level without adverse effects on live body weight, weight gain and feed conversion ratio.

Carcass dressing percentages were not significantly affected by substitution 10, 15 and 20% maize in the tested ration by date meal. Group (B; 5%) gave a highest hot and cold carcass dressing percentages compared with the control and other groups followed by group (A; control).

The liver and pancreas percentages had no significant differences between all the groups except for 5% inclusion level and the control. The experimented diets had no effects on abdominal fat percentages.

Increasing dietary date meal up to 20% level significantly increases the crude fiber digestibility, whereas that of ash was increased without significant effect.

In conclusion feeding discarded date to broilers at level of 5% substitution had positive effect on their performance.

الملخص العربى

اجريت تجربة تقييم غذائى لمدة 35 يوماً باستخدام 250 كتكوت لاحم عمر أسبوع لهدف دراسة تأثير إحلال مستويات متدرجة من الذرة الشامية بمسحوق البلح الغير مرغوب (محلياً يسمى بالكشوش) باستخدام مستويات صفر ، 5 ، 10، 15 و 20% مكونين علائق متساوية بالتقريب فى نسب الطاقة و البروتين وذلك على الأداء الانتاجى لبدارى اللحم وبعض صفات الذبيحة ومعاملات الهضم للالياف والرماد. قسمت الكتاكيت الى خمسة وعشرون حظيرة (بكل منها عشرة كتكوت وكل خمسة حظائر تمثل مجموعة). غذيت كل مجموعة على واحدة من الخمس علائق وقد ربيت تحت نفس الظروف من البيئة والرعاية.

أوضحت نتائج التحليل الكيميائي لمسحوق البلح (الكشوش) احتوائه على كميات مناسبة من العناصر الغذائية التى اعتبرت مؤشراَ لامكانية استخدامه كمصدر من مصادر الطاقة في علائق الدواجن.

وقد خلصت نتائج البحث الحالي الي الاتي :

إستبدال مسحوق البلح محل الذرة الشامية حتى مستوى 5% لم يؤثر على استهلاك العلف

كذلك لم يتأثر وزن الجسم والزيادة المكتسبه والكفاءة التحويلية للغذاء عند الاستبدال بتلك النسبة.

سجلت نسبة التصافى اعلي مستوي معنوي عند تغزية الكتاكيت علي عليقة تحتوي 5% من مسحوق البلح بينما اشتركت بقية المجموعات والتي غزيت علي علائق تحتوي النسب 10، 15 و 20 % مع المجموعة التي غزيت علي العليقة الضابطة.

النسبة المئوية للكبد والبنكرياس لم تتأثر معنوياً عند التغذية علي 5% من مسحوق البلح.

كما أوضحت النتائج عدم زيادة النسب المئوية لدهن البطن عند اضافة مسحوق البلح بأي من النسب المشار اليها.

أدت زيادة مسحوق البلح بالعلائق حتى مستوى 20 % الى زيادة معامل هضم الالياف ،اما الرماد لم يظهر فرقا معنوياً.

لذا ينصح باستخدام مسحوق البلح محل الذرة الشامية حتى مستوى 5% للحصول على أعلى أداء إنتاجي.

Chapter One

INTRODUCTION

Sudan is a vast wide country (2.5 million km^2), lying between latitude 4 and 22^0 north and longitudes 22^0 and 38^0 east. Therefore, it acquires opportunities for climatic diversity and presence of various natural resources. One of these important resources is the present of different varieties of dates palm tree. Date palm is probably the world's oldest cultivated tree. It is believed that, Babylonians have been growing them some eight thousand years ago. Also date palm tree have been found in early Egyptian tombs, from it, cultivation spread through out the Mediterranean basin (FAO, 1999). Date varieties have been developed thousands of years of selection of seedling and only those possessing desirable characteristics have been propagated. The date palm accounts for more than 3.000 varieties all around the world .The main producing countries of the date in world are Iraq, Saudi Arabia, Iran, United Arab Emirates Republic and Pakistan. Come next those countries are Morocco, Libya, Sudan, Tunisia and Oman which are globally described as moderate date producers (FAO, 1996).

Dates are considered as one of the most important food crops in many countries around the world, especially in tropical and subtropical regions. However a substantial amount of this production is inedible due to its low quality. This portion is used mainly as fertilizer, or animal feed. In the Sudan the total area under dates is around 80,000 acres, with possible further expansion of about 320,000 acres. There are about 4.5 million date palm tree in northern region, together with about 0.25 million on other parts of the country adjoining the northern region. The

Sudan produces about 7.5% of the total Arab world (A.O.A.D.1994). According to FAO (1996) estimates; the date production in 1993 was about 140,000 metric tones.

The poultry feeding costs constitute about 60-75% of the total cost of poultry production. Because of that the development of poultry industry depends upon the large extent on the availability of feedstuffs that are used or can be made suitable for use in poultry nutrition. Yellow maize and soybean meal are the two major ingredients used in poultry nutrition. The availability of these two feed ingredients in some areas like Sudan is very rare due to their high cost. In Sudan sorghum grains was used in poultry nutrition, but sorghum grains constitutes the staple food of most of the population. Thus feeding poultry on sorghum grains creates a competition between man and animals. In addition to that some times sorghum grains are also exported to earn foreign currency. Due to these factors the prices of sorghum grains are continuously escalating a thing which necessitated utilization of alternative cheep sources of feed ingredients in animal diets. This has made poultry nutritionists in the Sudan to search and use feed ingredients produced locally at low cost.

In recent times, there is an over demand for poultry products in the Sudan. The economic importance of poultry feeding becomes apparent, because it is well –established that feed, as a major input in poultry industry, represent about 60% to 75% of the total cost.

The present studies were conducted to determine the effect of substitution of maize by different levels discarded dates 0, 5, 10, 15 and 20% in diets on broilers chick performance. Also to study the cheep production of poultry meat (broilers) utilizing discarded dates.

Chapter Two

LITERATURE REVIEW

2.1 Including dates in broiler diets

Date palm (*Phoenix dactylifera)* is one of the major fruit crops in the Sudan, (F A O ,1996). Date pits, as a major by – product remains after consumption of date flesh, proved to be valuable source of energy in animals and poultry rations, (Glaulteiri and Rapiceinin,1990). The Sudan produces about 7.5 % of the total Arab world (AOAD.1994).

replace energy in them to dates enables of content The carbohydrate Homidan, (2003). Hussein et *al*. (1998). Investigated the poultry rations effect of inclusion of 0% and 8% date pits, 10% whole date and 10% depitted fruit in broilers diet. He found that, inclusion of date pits and date fruit in chicken diets significantly improved the body weight compared with that of birds fed on the control diet after the first two weeks of the trial. During week one live weight of chicken receiving 10 % date pits, 10 % date fruit was significantly higher than that of chicken receiving the control diets. after four weeks total body weight gain shown by all groups was not significantly different. Similar trends were observed in feed conversion efficiency. Al. yousef and Vandepopuliere (1985), found a similar result with including levels of 8 - 16 and 24 % whole dates. No significant differences were observed between performance characteristics between birds fed experimental and control diet. Also Afzal *et al*. (2006), studied the effect of different levels of whole dates fed to broilers in the grower and finisher period (20 - 49 days). They did not detect any significant differences in feed intake, live weight , or feed

conversion with levels ranging from 0 to 30 %.Dates pits, which make up about 15 % of the total weight of dates, are rich in energy and fat but very high in fiber (18 – 24%) and very low in protein. Date by - product resulting from molasses production from date is high in sugar and very low in protein. This product is usually very high in moisture and needs to be dried before use in ruminant feeds , a number of studies have been conducted on poultry. Abdulghani *et al*. (2003), fed a date molasses by - product at 4 or 8% of the diet and found that it had no effect on weight gain, feed conversion or dressing percentage. Khalil (2005), concluded that it is possible to use small quantities of certain date by - product in poultry feeds and thus contribute to reduced feed costs in areas where dates are plentiful.

According to FAO ( ) estimates, the date production in 1993 1999 was about 140,000 metric tones . Many researchers were studied the availability of including date pits in diets, Zilisch (1930), reported that the pulp and pits of the African date contain respectively 25% ,13% water, 1.7%, 4.4% nitrogenous matter , 0.2% 5% fat, 49%, 1.25% sugar and 1.9%, 1% ash. Barreveld (1993), reported an indicative picture on the chemical composition of the date pits (Table 1), these results are in agreement with the data of Ralph (1936), Dowson et al. (1962), and F A O (1996). Glaulteiri and Rapiceinin, (1990), found that date pits proved to be valuable energy source as a substitute for cereals in chicken food. Also Sharara *et al* (1992) reported that date pits can partially replace more expensive source of energy such as cereal grains in poultry feeds. Glaulteiri and Rapiceinin, (1990), conducted a trial on chickens (0 – 6) weeks where date pits included in broilers diet based on maize

or sorghum at levels of 0 - 10%. They found that, feed intake, live weight , feed conversion, and mortality did not indicate any significant differences between diets however , small sex difference was evident. As far as the nutritive value of date waste without stones in broiler diets is concerned AL . Hiti and Rous (1978), reported that, diets with date waste at inclusion levels of 5 - 10 and 15% substituting shredded ,maize against a control diets showed promising results for weight gain of broilers at 7 weeks of age. Feed consumption of birds fed diet with the waste included in the three levels was significantly higher than that of birds fed the control diets while the feed conversion was not favorable for the birds fed the experimental diets. These unfavorable results for the feed conversion, were acceptable owing to the low price of the date waste in comparison with the maize. The feed conversion figures were 2.22 – 2.26 -2.26 and 2.07 for inclusion of 5, 10, 15 and 0% of date waste respectively .

The high content of fiber in date waste meal compared with that of yellow corn is a limiting factor in formulating poultry diets as reported by Jumah *et al.* (1993), Yeong *et al.* (1981), Sawaya et *al.* (1984), El-Boushy and Van Derpoel (1994).

2.2. The effect of crude fiber in broiler ration

The extent to which an animal will consume a particular feed is dependent on the fiber source (Linderman *et al.*, 1986) and palatability of the diet (Cherry and Jone 1982). The feed intake seemed to have been dictated by the source of fiber in the diets, lignifications of the feed and chemical variation in the fiber itself (Kass *et al.*, 1980). Dietary fiber has been reported by Pond *et al.* (1988), and Gous *et al.* (1990) to reduce carcass and abdominal

fat. The production of lean carcass in ducks and chickens is achieved according to Siregar et *al*. (1982) by replacing high energy feeds with bulky low energy feeds which are high in crude fiber. Potential feed resources that can prove valuable in this respect are the Agricultural by –products and crop wastes. They are available locally, cheap and are able to replace a certain proportion of maize in Broiler diets. Koong *et al.* (1985) reported that chickens and other monogastrics fed on high fibrous diets usually produced more offal Rezaei and Hafezian (2006) suggested the heavy and medium hens increased their feed intake to compensate for the reduction in energy concentration of the diet with sunflower meal . Light hens did not compensate in the same fashion, he said that sunflower meal inclusion, reduced the metabolizable Energy of the diets because of its high fiber level .

2.3. Factors affecting energy consumption in broiler

Many factors such as species, genetic makeup, and age of poultry; as well as the environmental conditions also influence the precise distribution of dietary energy into the various compartments (Scott et *al.*, 1982). Data from a large number of broiler chicken experiments showed that changes in feed intake were not inversely proportional to changes dietary energy level, especially when broilers were fed moderate – to high energy diets (Fisher and Wilson, 1974)

More studies also illustrated that growing broilers and turkeys consume more energy when fed high- energy diets than those fed low – to moderate – energy diets. (Sell *et al.*, 1981; Owings and Sell, 1982; Sell and Owings, 1984; Brue and Latshaw, 1985; Potter and Mc Carthy, 1985). Factors other than dietary energy and nutrient

balance that affect feed intake includes bulk density of the diet (Cherry *et al.*, 1983) and ambient temperature (National Research Council, 1981).

The latter can have considerable impact on feed consumption of poultry, especially adult birds, because feed Intake decreases as ambient temperature increases. Leghorn - type hens consumed approximately 1.5 g less feed per hen daily for each 1°C increase ambient temperature over the range of 10° to 35°C (Davis *et al*., 1973; Sykes, 1979) at temperatures above 30°C , the decreased consumption may be 2.5 to 4 g for each 1°C increase (Sykes, 1979; Sell *et al*., 1983). Similar responses of decreasing feed intake with increasing temperatures have been reported for turkeys (Parker *et al*., 1972; Hurwitz *et al*., 1980).

2.4. Energy source ingredient in poultry rations

In Sudan the major energy source in poultry feeds is sorghum however , this cereal has been employed , along time ago, as vital source of food for millions of people. This results in high competition between man and animals on this golden cereal. Such a situation leads to emergence of overpriced feeds which contribute substantially to the increase in the total cost, whereby decreasing the net profit per enterprise Elcafe (2002).

2.4.1. Carbohydrates

Dietary carbohydrates are important sources of energy for poultry. Cereal grains such as corn, grain sorghum, wheat and barley contribute most carbohydrates to poultry diets. The majority of the carbohydrates of cereal grains occur as starch, which is readily digested by poultry other carbohydrates occur in varying

concentrations in cereal grains and protein supplements (Moran, 1985a). These carbohydrates include polysaccharides, such as cellulose, hemicellulose, pentosans, and oligosaccharides, such as stachyose and raffinose, all of which are poorly digested by poultry. Thus, these dietary carbohydrates often and some adversely affect the digestive processes of poultry when present in sufficient dietary concentrations. For example, the pentosans of rye and beta glucans of barley increase the viscosity of digesta and there by interfere with nutrient utilization by poultry (Wagner and Thomas, 1978; Antoniou and Marquardt, 1981; Classen *et al*., 1985; Bedford *et al*., 1991)

According to Winter (1929) researches , cane molasses can be used to replace cereal grains kilogram to kilogram for levels up to 10 % .

Date waste meal contains substantial amount of nutrients that are considered valuable ingredients and promising Energy source in poultry feeding by AL-harthi (2006), these results are in agreement with those of Kamel (1981) which were obtained from Zahdi whole dates. Yeong *et al*. (1981), Sawaya *et al*., (1984), El – Boushy and Van Derpoel (1994) and Homidan, (2003) reported that the carbohydrate content of dates enables them to replace energy source ingredient in poultry rations.

2.4.2. Fats

Fats are good source of energy. They contain about 2 .25 times energy in carbohydrates . Fuller and Mario (1977) , found that increasing the energy and nutrient density of the diet by adding fats at the expense of carbohydrates calories without altering the

calorie to protein ratio had no effect on carcass fat deposition .Shingar *et al.* (1975) using graded levels of groundnut oil in the broiler ration, he showed that the critical differences among the treatments revealed that the addition of oil at 6.0% level in the diet significantly (P<0.05) improved the body weight gain of chicken also observed at all levels of supplementations. The addition of fat at those levels (2.0, 4.0, and 6.0%) improved the feed efficiency, while the addition of oil has no effect on the dressing percentage and percent of edible meat. Fats or oils as energy rich feeds are available from animal sources such as tallow and fish oil or from plant sources such as soybean oil, sunflower oil and maize oil. Fats also provide varying quantities of the essential nutrient linoleic acid (Leeson and Summers, 2001).

Another important role of fats in diet is its inhibition from de novo lipogenesis in broiler chickens that could increase energy efficiency in diets (Yeh and Leveille, 1971). Dietary fat also may interact with other nutrients in the diet. Abawi *et al*. (1985) showed that adding 0. 3 and 6 percent tallow in broiler diet increase plasma vitamins (E) and (A). Tallow has traditionally been the principle fat source used in poultry nutrition and its production is noticeable throughout the world and there has been a great use of tallow in blended oils for poultry. Tallow and other saturated animal fats usually have been used in the later phases of feeding, because of limited digestibility in young chicken (Leeson and Summers, 2001). Fat is usually added to the feed for broiler to increase overall energy concentration and, in turns, improve productivity and feed efficiency. Oxidation of fat is an efficient means to obtain energy for the cell in large quantity, whereas anabolic use involves direct

incorporation into the body as a part of growth. Lipid accrual is most obvious in adipose tissue ; however, cell multiplication also requires an array of lipids to form associated membranes. These two uses can occur simultaneously; however, the extent of each may vary considerably. Feed graded fat may come from many different sources, grease from restaurants, the rendering of animal carcasses, and the refuse from vegetable oil refining are major sources. These sources represent several types and categories, each is defined by (A.O.A.C., 1996).

composition for date pits Table (1): Review of chemical

Components composition (%)

Moisture	Crude protein	Oil	Cude Fibers	Carbohydrate	Ash	Reference
5-10	5 - 7	7 -10	10-20	55-65	1-2	Barreved, H.W,(1993)
6.5-6.8	5.22-5.3	6.8-8.5	13.6-18.1	58.5-65.5	0.86-1.12	Ralph,G.H.(1936)
6.46	5.22	8.4	16.2	62.5	1.12	Dowson and Alten (1962)
5.3	7.8	8.7	14.3	62.2	1.7	Ahmed *et al* .(1991)
6.5	5.2	8.5	16.2	62.5	-	FAO(1996)
5	6.5	10.4	22	60	1.1	Sawaya *et al.*(1984)
-	5.4	8.5	23	23	-	Hussein *et al.*(1983)

2.5. Energy intake

Energy intake is considered a fundamental factor in broiler production, not only because it affects growth rate and carcass characteristics (Boekholt *et al.*, 1994; Leeson *et al.*, 1996) but also because it is indirectly involved in metabolic diseases, such as

ascites (Leeson *et al.*, 1995). The control of feed intake is based primarily on the amount of energy in the diet. Thus, increasing the dietary energy concentration leads to a decrease in feed intake and vice versa. This is valid as long as the diet is adequate apropos all of the other essential nutrients and that bulkiness, texture, accessibility do not limit intake (Smith.1990). Leeson *et al* (1996) showed that broiler feed intake increases linearly with decreasing dietary energy level. Albuquerque *et al.* (2003) also described reduction in feed intake due to higher dietary energy density. In addition, Leeson *et al.* (1996) found that broilers fed free - choice on diets with either 2700 or 3300 kcal metabolizable energy / kg presented the same growth rate and constant energy consumption. These findings together suggest that broilers do not control their feed intake in order to supply energy requirements, and one of its most important consequences is the possibility of formulating feeds based on predicted intake according to dietary energy level. However, comparing broilers during finishing phase in two *ad libitum* programs 3,200 and 3,600 kcal / kg of diet, Araújo (1998) did not find any differences in feed intake between the groups, and observed better daily gain in the group fed the high – energy diet. The fact that higher energy consumption promotes better weight gain is well established (Boekholt *et al.*, 1994; Lesson *et al.*, 1996); however, why dietary energy level does not affect broiler feed intake in some cases remains unanswered. In fact, the nutritional factors involved in broiler feed intake control mechanisms are not completely understood, and seemingly other macronutrients than energy influence feed behavior. In mammals it is well established that protein is the first nutrient

in the hierarchy of oxidation, followed by carbohydrates and fat , which corresponds to their ability to induce satiety (Stubbs *et al.*, 1997). In avian species, this chain is not well described, and differences may influence feeding behavior. One possible negative consequence of broiler genetic improvement is the loss of sensitivity to regulate feed intake according to dietary energy level. Richards (2003) reported that broilers selected both for rapid weight gain and muscular mass deposition do not properly regulate voluntary feed intake according to energy level, as in an *ad libitum* program they showed compulsive appetite and excessive fat accumulation. Taking this statement to an experimental vision it is clear that it is difficult to assess different energy consumption of broilers if their feed intake was not restricted. Newcombe and Summers (1985) had suggested that broilers as compared to Leghorns, eat to almost full -gut capacity, thus suggesting that appetite was the main factor controlling feed intake of the broiler. Leeson and Caston (1993), demonstrated that the broiler after 4 weeks of age was eating for below its ability to consume feed and they suggested that energy needs were the main factor controlling intake.

2.6. Energy to protein ratio

The close link between dietary energy to protein ratio and broiler carcass composition was investigated by several researches (Summers *et al.*, 1992; Leeson *et al.*, 1996; Swennen *et al.*, 2004). In general, energy retention as fat increases as the ratio rises. Reginatto *et al.* (2000) in two experiments with different energy to protein ratio, showed that protein utilization was improved with higher levels of dietary energy and with lower levels of dietary crude protein. Other

researchers noted that fat accretion will increase when the energy to protein ratio of broiler diets increase (Kita *et al*., 1993, Nieto *et al*., 1997 and Collin *et al*., 2003). It appears that under such conditions birds can select appropriate protein density to meet the demand for optimum growth. Thus , some studies have shown that birds can select from wide (6.5 to 32%), Medium (12 and 28%), or narrow (16.4 to 26%) ranges of two or four protein contents to meet their protein requirements for maximum growth (Shariatmadari and Forbes, 1993; Kaminska, 1982; Steinruck and Kirchgessner, 1993). However, the selection of protein content can be affected by the strain of birds (Leclercq and Guy, 1991), the fixed energy density (Steinruck and Kirchgessner, 1993), or the quality of the ingredients (Rose and Michie, 1984). In addition, the selected protein contents are also influenced by the animal's age, decreasing as the broiler chicken aged. (Kaufman *et al*., 1978; Kaminska, 1982; Other reports have also shown no effect of early life dietary ME or CP concentration on dietary feed intake by broilers (Summers *et al*., 1992). Pesti *et al*, (1983) concluded that broiler growth rates increased with increasing dietary protein content and simultaneously with dietary energy that contain increased caloric levels in isonitrogenous rations reduced feed intake and the efficiency of energy utilization become progressively poorer. Increasing protein level in isocaloric rations resulted in reduced feed consumption and lower carcass fat. The total amount of protein and energy needed in the ration will depend on the type and the age of the stock being fed (Kekeocha,1984). Onwudike (1983) reported that under the tropical conditions, feed with 22% protein and energy 3.00 Mcal (12.6 MJ) ME/kg would be adequate for broiler growth. It has generally been admitted that to keep the

feed conversion ratio at a satisfactory levels. Starter /growth broiler feed should contain not less than 3.00 Macl (13.6 Mj) ME/kg and the finisher feed 3.20 Mcal (13.44Mj) ME/kg (CTA,1987).

Tabiedian *et al*, (2005) reported that the finding on the effect of different levels of CP in high energy diets on broiler metabolism and body composition are different, and more researches are necessary to understanding of broiler response to different levels of protein in high energy diets with low and high levels of animal fat as a diet energy source.

Chapter Three

MATERIALS AND METHODS

. 1. Experiment (1)3

This experiment was conducted at the Animal Resources Research station at Dongoula, in the North of the Sudan, in the poultry experimental site. An open sided floor pen was used, which was supplied with water and light source.

3 .1.1. Experimental birds

The birds used were one week old unsexed commercial broilers (ROSS) which were purchased from Koral Poultry Company Khartoum state. The experiment started on 14 November 2007. Two hundred and fifty (250) chickens were selected and distributed into 25 pens (10 chicken per pen and 5 pens per experiment.).

3 .1.2. Experimental diets

Five experimental diets were used in which maize compose 61 % of the basal diet approximately, which represent the main source of energy.

Discarded dates (local name; *Alkashosh*) (the dates were finely grounded using a feed grinder and stored in labeled containers until used) were used to replace maize by 0, 5, 10, 15, and 20 %. The diets were formulated to meet nutrient requirement as outline by NRC (1994) and they were approximately isocaloric and isonitrogens.

The composition of ingredients was calculated according to Sulieman and Afaf (1999). As explained in table (2) The dietary ingredients as illustrated in table (2) were purchased from the local market in Dongola city. The super concentrate was obtained from Khartoum state.

The dry ingredients for each treatment were mixed in the mixture of the animal resources research station in Dongola.

Diet A was the maize based only consist of 100% maize 0% dates (control).

Diet B consist of 95% maize 5% dates.,

Diet C consist of 90% maize 10% dates. ,

Diet D consist of 85% maize 15% dates. and

Diet E consist of 80% maize 20% dates.

Vegetable oil was added to whole diets to balance the caloric requirements. The dry ingredients of each treatment were mixed in the mixture then small amount was to be mixed manually with oil , premix , common salt, limestone , and vitamins , then the whole quantity was mixed thoroughly by the mixture.

Calculated analysis of the chemical composition of the experimental diets is illustrated in table (2).

3. 1.3 Management and collection of data

Before the starter of experiments, house cleaned and disinfected by (Detol). It was divided into a number of pens (floor space 1 X 1 meter).

Each one was provided with bulb lamp (100 watts) For continuous lighting .Feed and water were prepared, one tubular feeder and one fountain drinker were allocated for each pen .Feed intake and live weight gain of each pen were recorded weekly . At the end of the 5th week, birds were fasted at night, but allowed water. Then, 5 birds from each replicate were slaughtered and allowed to bleed. Immediately after that, they were immersed in boiling water then defeat hard manually. Slaughtered birds were allowed to drain on a wooden table.

The head and legs from the hock joints were removed.

Evisceration was performed by a ventral cut , then following by complete remove of the total viscera. The following parts were weighted individually, hot and carcass , abdominal fat, liver , pancreas. The carcasses were chilled in a refrigerator at (4^0 C) for 24 hours , and cold carcass weights were recorded.

Table (2): Calculated and determined chemical composition analysis of experimental diets.

Ingredients	Treatment				
	A	B	C	D	E
Maize %	61	58	55	52	49
Peanut cake %	28	25.8	23.6	21.4	19.3
Super concentrate %	5	5	5	5	5
Dates meal %	0	5	10	15	20
Common salt %	0.2	0.2	0.2	0.2	0.2
Vegetable oil %	3	3.2	3.4	3.6	3.7
Lime stone %	1.8	1.8	1.8	1.8	1.8
Minerals and vitamins %	0.2	0.2	0.2	0.2	0.2
Lysine (2) %	0.5	0.5	0.5	0.5	0.5
Methionine (2) %	0.3	0.3	0.3	0.3	0.3
Total %	100	100	100	100	100
Calculated analysis					
ME (kcal/ kg)*1	3100	3100	3102	3111	3115
Crud protein	20.2	20	20.1	20	20
Calcium	1	1	1	,98	1.1

Total phosphorus	**0.53**	**0.51**	**0.50**	**0.49**	**0.49**
Crud fiber	**2.97**	**3.8**	**4.8**	**5.3**	**5.7**
Lysine	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**
Methionine	**0.5**	**0.59**	**0.59**	**0.51**	**0.59**

Composition of super concentrates used in the exp[eriment : Crude protein 40% crude fat 3% crude fiber 1.5% lysine 13.5% Methionine 5.9% meth + cystine 6.25% calcium 6.8% phosphorus .va 4.6% phosphorus total 3% sodium 1.5% Me poultry 2122 kca/kg

Table (3): Proximate analysis of the experimental diets.

Diets	Composition						
	DM	Ash	C.P.	E.E.	C.F.	NFE	ME/MJ/kg
A	93.3	5.3	22.92	8.6	.83	55.38	13.72
B	92.4	5.15	18.8	8.8	93.	58.67	13.56
C	92.3	5.61	18.54	9.07	.24	55.82	13.81
D	90.8	5.58	20.63	9.09	2.5	63.19	14.84
E	90.3	5.21	18	9.1	9.5	67.47	14.96

Table (4): Proximate analysis of the experimental date meal

Ingredient	DM	Ash	C.P.	E.E.	C.F.	NFE	*ME/MJ/kg
Date	84.80	2.97	3.45	0.4	14	89.18	15.07

***ME/MJ/kg = 15.07, equivalent to kcal/kg = 3601.81 (kcal/kg=0.004184 MJ/kg)**

3.4 Experiment (2)

At the end of experiment 1, three birds at 6 weeks age, for each replicate were taken to a battery cage prepared to experiment (2), provided with trays under each pen to feaces collection. Five experimental diets were formulated as a follows: A - Basal diet with 0% dates ,B - Basal diet with 5% dates, C - Basal diet with 10% dates, D - and E- Basal diet with 20% dates. Basal diet with 15% dates

Feed intake was calculated and recorded daily. Excreta were collected daily also. After one week from the beginning of the experiment excreta of each treatment was collected and weight and then analyzed using methods of association of official analytical chemical (A .O. A.C. 1996).

3.5 Statistical analysis

The data were analyzed according to the procedure of statistical package (1995). The data collected from the performance were analyzed by analysis of variance and the significance of differences between the feeding groups for individual traits was evaluated using the Duncan's multiple range test (Stat Soft 1995) (to test the effect of dietary treatment). The linear equation (y = a + bx) was used to study the regression of performance parameters on the different level of feeding groups (to correlate the obtained results).

Table (5): Composition of ingredients used in the experimental diets

Ingredients	ME Mj/kg	CP %	Ca %	P %	Methionine	Lysine
Maize	**14.10**	**8.70**	**0.02**	**0.10**	**0.18**	**0.20**
Peanut cake	**11.71**	**45**	**0.18**	**0.78**	**0.45**	**1.61**
Oil	**36.82**	**-**	**-**	**-**	**-**	**-**
Limestone	**-**	**-**	**37**	**-**	**-**	**-**

Notes on the 1984 feedstuffs analysis table copyright 1984 by Charles H .Hubble

Table (6): Trials digestibility (intake - out put)

Treatment	Digested	ME	SE
A	**642^{b}**	**7.02c**	**1.20**
B	**822 ^{a}**	**7.16^{b}**	**1.15**
C	**675^{b}**	**7.03c**	**16.01**

D	**576^{bc}**	**7.94^{a}**	**0.01**
E	**386^{c}**	**7.06^{c}**	**3.46**

Feed intake – out put = digested
ME digested = ME (total feed intake) – ME (feaces) . Suleiman *et al.*, (1999)

Table (7): Digestion coefficient of crude fiber and ash values of experimental diets as affected by inclusion levels of date meal.

*Treatments Dates inclusion level	Digestion coefficient of	
	Ash	C.F.
A	**17.20^{a}**	**13.40^{ab}**
B	**17.00^{a}**	**11.00^{b}**
C	**17.40^{a}**	**11.50^{b}**
D	**17.52^{a}**	**12.80^{b}**
E	**17.60^{a}**	**14.70^{a}**
SE+	**0.21**	**1.38**

* A= control, Date level, B= 5% Date , C= 10% Date, D= 15% Date and E = 20% Date

Chapter Four

RESULTS

4. 1.Experimental (1)

4. 1.1. Date meal evaluation (DM)

Proximate analysis results of date meal (DM) are shown in Table (4). Values were calculated on a dry matter basis. Moisture content of date meal was 15.2%, ash 2.9.7%, crude protein 3.45%, fat 0.4%, crude fiber 14%, nitrogen free extract and 89.18%.

4. 1.2.Weekly feed intake

During the first week data presented on table ( ) showed that the 8 group (D) consumed significantly more feed than the control and other treated groups. No significant differences (P>0.05) were observed between (B) and the control groups and no differences were found between the groups B, C, and E.

During the 2nd and 3rd weeks data showed that there is no significant difference between the control and the treated groups. At the 4th and 5th weeks the control group consumed significantly (P < 0.05) more feed than the other groups, no differences were found between B, C, and D groups, where as group (E) gave a lower feed intake (P>0.05) comparably with the other groups (Table, 8).

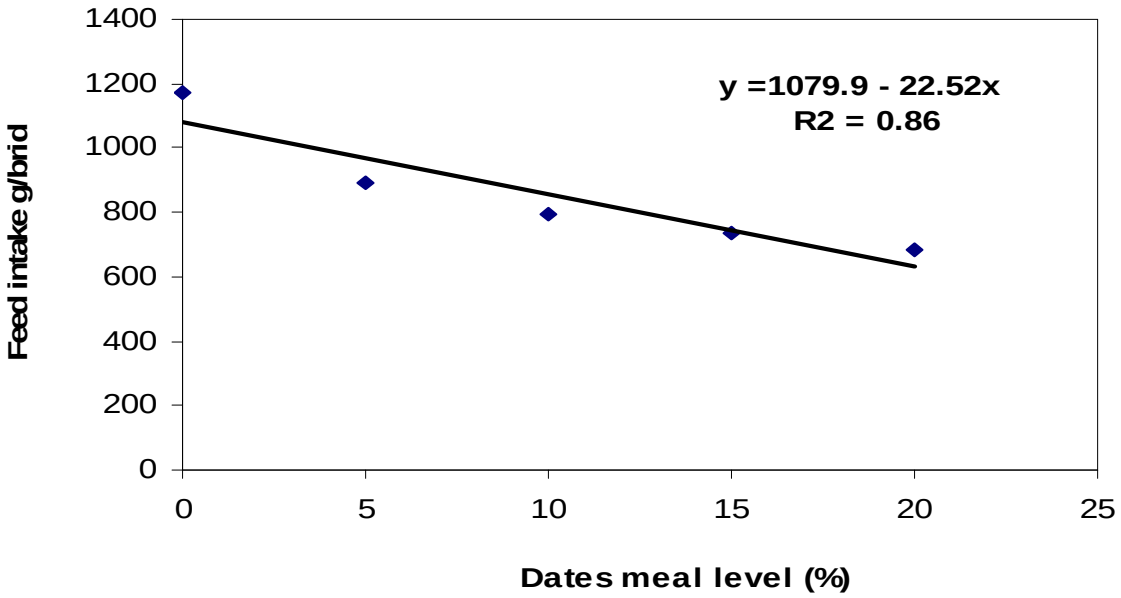
The relationship between the weekly feed intake and dates meal level was presented by the equation: y = 1079.9 – 22.52x as shown in figure (1). Where as y= the weekly feed intake in gram, x = dates meal level in %. The coefficient of determination (R^2 = 0.86) at P < 0.05.

Table (8): Weekly feed intake (g/bird)

Experimental treatments*	Feed intake (g)/week				
	1st week	2nd week	3rd	4th week	5th week
A	362.8^{b}	545.8^{a}	631.2^{a}	885.6^{a}	1170.6^{a}
B	334.6^{bc}	468^{a}	576.2^{a}	809.8^{ab}	891.4^{b}
C	305^{c}	504^{a}	532.6^{a}	699.2^{bc}	791.2^{bc}
D	417.2^{a}	582.4^{a}	655.2^{a}	737^{bc}	736.2^{bc}
E	288.2^{c}	512.4^{a}	540.4^{a}	634.4^{c}	684.6^{c}
±SE	16.7	31	35	40.5	55.8

Values within a column sharing the same superscripts are not significantly different at 5%
A= control, Date level, B= 5% Date , C= 10% Date, D= 15% Date and E = 20% Date

Fig (1): Regression of feed intake in (g) on dates meal level



4. 1.3.Weekly live weight gain

The results for live weight gain are shown in table (9). Data showed that the dietary treatment had no significant result (P >0.05) on weight gain except for group (E) gained significantly (P <0.05) less weight than the control group at the 1st and the last weeks.

During the 2nd week no differences (P>0.5) were found between the control and whole groups except group E which gained less weight than the control, the lowest weight gain among the treated groups.

During the 3rd weeks also group E gained significantly (P <0.05) the lowest weight comparably with the control and the treated groups except group (D) which gained a similar weight to group (E) observed between the control and the treated groups.

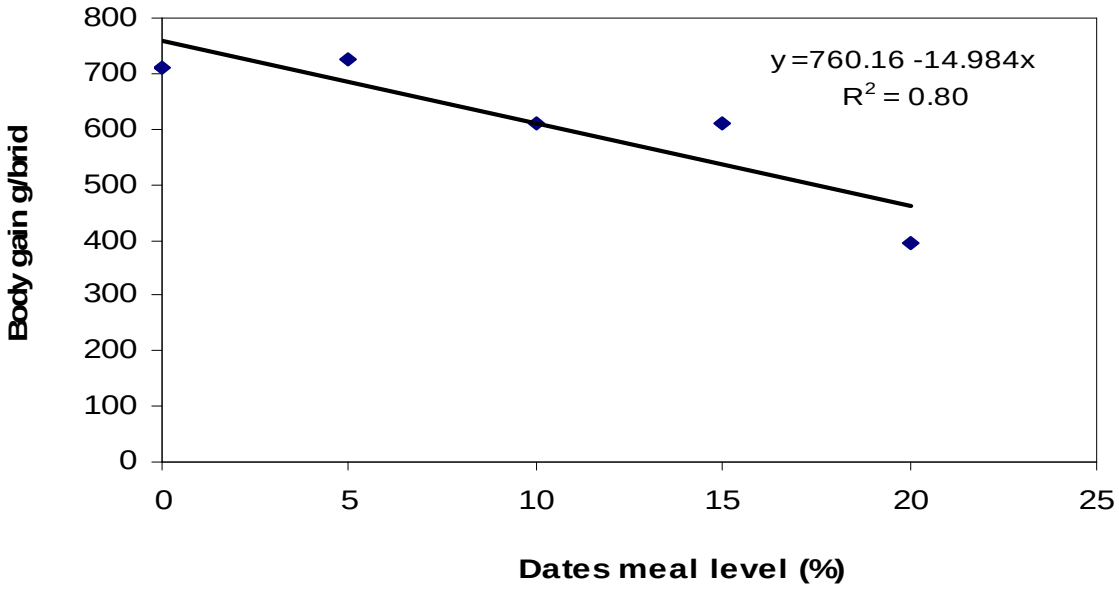
The relationship between the weekly body gain and dates meal level was presented by the equation: $y = 760.16 – 14.98x$ as shown in figure (2). Where as y= weekly body gain in gram, x = dates meal level in %. The coefficient of determination ($R^2 = 0.80$) at $P < 0.05$.

Table (9): Weekly body gain (g/ bird)

Experimental treatments*	Body gain(g), at				
	1st week	2nd week	3rd	4th week	5th week
A	150.2[a]	283.2[a]	394.4[a]	479.2[a]	711.6[a]
B	151[a]	294.8[a]	378.8[a]	520.4[a]	724[a]
C	158.2[a]	226.4[a]	350.2[a]	395.2[a]	612[a]
D	167[a]	220.4[b]	314.8[ab]	420.8[a]	610[a]
E	95.4[b]	214.4[b]	296[b]	307.2[a]	394[b]
±SE	12.04	23.36	40.24	34.9	56.52

Values within a column sharing the same superscripts are not significantly different at 5%
A= control, Date level, B= 5% Date , C= 10% Date, D= 15% Date and E = 20% Date

Fig (2): Regression of body gain in (g) on dates meal level



4.1.4. Feed conversion ratio (F.C.R)

) showed that feed conversion ratio (the lower the value 10Table (
the better feed conversion ratio) results were not significantly (P> 0.05) affected by the dietary treatment except for group(C) (10% date level) in the first week; which was significantly (P<0.05) better than those of the control and the other groups.

Table (10): Weekly feed conversion ratio of the experimental birds (feed intake /live weight gain)

Experimental treatments*[1]	*[2]Feed conversion, at				
	1st week	2nd week	3rd	4th week	5th week
A	2.58[a]	1.93[a]	1.60[a]	1.85[a]	1.65[a]
B	2.63[a]	1.59[a]	1.52[a]	1.56[a]	1.23[a]
C	2.06[b]	2.22[a]	1.52[a]	1.77[a]	1.29[a]
D	2.36[a]	2.64[a]	2.05[a]	1.75[a]	1.21[a]
E	2.5[a]	2.39[a]	2.76[a]	2.07[a]	1.74[a]
±SE	0.17	0.24	0.32	0.06	0.18

Values within a column sharing the same superscripts are not significantly different at 5%
A= control, Date level, B= 5% Date , C= 10% Date, D= 15% Date and E = 20% Date
*[2]The lower the value the better feed conversion ratio

4.1.5. Hot, cold carcass weight percentages and non carcass components

The result for hot, cold carcass weight dressing percentage and non carcass components are presented in table (11). The data showed that the dietary treatment had a significant (P< 0.05) effect on hot and cold carcass dressing percentage. Group (B) gave a highest hot and cold carcass dressing percentages compared with the control and other groups

followed by group (A). No significant (P>0.05) differences were found between group(C), (D) and (E).

Data showed that the liver percentages were significantly (P>0.05) different between group (C), (D) and (E). There is no differences (P>0.05) between group (B) and the control.

Pancreas percentages presented in Table (11) showed that there is no significant (P<0.05) differences between all the groups except for group (B) and the control.

The experimented diets showed no significant (P<0.05) effects on abdominal fat percentages.

Table (11): Hot, cold carcass weight and non carcass components of the experimental chicks.

Treatment	Hot carcass%	Cold carcass%	Liver %	Pancreas %	Abdominal Fat%
A	80.96^{b}	78.48^{b}	2.70^{a}	0.28^{ab}	1.57^{a}
B	92.54^{a}	90.81^{a}	2.95^{a}	0.30^{a}	1.63^{a}
C	61.03^{c}	60.40^{c}	2.10^{b}	0.23^{c}	1.73^{a}
D	59.65^{c}	57.88^{c}	2.25^{b}	0.23^{c}	1.74^{a}
E	51.65^{c}	50.33^{c}	2.25^{b}	0.26^{c}	1.75^{a}
±SE	67.7	66	2.66	0.241	4.7

Values within a column sharing the same superscripts are not significantly different at 5%
A= control, Date level, B= 5% Date , C= 10% Date, D= 15% Date and E = 20% Date

4.1.6. Overall performance of experimental birds

Table (12) shows overall feed intake, final body weight, feed conversion ratio and overall gain in body weight. The result indicated that the dietary treatment had a significant (p<0.05) effect on feed intake. The overall data of live weight gain and final body weight showed that there were a significant (p<0.05) differences between the experimental groups. The

) for inclusion 5% (B) 1.49overall feed conversion ratio figure is better (group than the control group.

Table (12): Overall performance of experimental birds.

Level of Dates %	Final body weight g/bird	Feed intake g/bird	Weight gain g/bird	Feed conversion ratio (F.C.R.)
A	2093.6 [a]	3596 [a]	2018.6 [a]	[b]781.
B	2144 [a]	3080 [ab]	2069 [a]	[b]491.
C	1752 [b]	2832 [b]	1677 [b]	.68 [b]1
D	1708 [b]	3128 [ab]	1633 [b]	1.91 [b]
E	1282 [c]	2660 [b]	1207 [c]	2.28 [a]
±SE	51.13	72.19	22.11	0.31

Values within a column sharing the same superscripts are not significantly different at 5%
A= control, Date level, B= 5% Date , C= 10% Date, D= 15% Date and E = 20% Date

4. 2. Experimental (2)

Digestion coefficients of crude fiber and ash of the experimental diets are shown in Table (7). Result revealed that increasing date meal levels up to 20% increased the digestion coefficient value of crude fiber. The opposite was true with that of ash which was not significant.

Chapter Five

DISCUSSION

5. 1. Experimental (1)

5. 1.1. Date meal evaluation (DM)

Proximate analysis results of date meal (DM) are shown in Table (4). Values were calculated on a dry matter basis. Moisture content of date meal was 15.2% indicating the possibility of storing it for a long time without deleterious effects. Date meal contains a substantial amount of nutrients that are considered valuable ingredients and promising energy source in poultry feeding. The results are in agreement with those of Kamel (1981) which were obtained from Zahdi whole dates. Although date meal contain relatively less amount of ether extract (0.4) and nitrogen free extract (89.18) than yellow corn, many researchers have investigated the possibility of using it to partly replace a portion of a diet, as an energy source, in poultry diet (Kamel 1981 , Homidan,2003). Consequently, the carbohydrate content of dates enables them to replace energy source ingredient in poultry rations.

The metabolizable energy (ME) of the date meal was calculated to be 15.07 MJ/kg (equivalent to 3601 kcal/kg) on the basis of its chemical composition according to NRC (1994). Al-Yousef (1985) reported that ME of *Khudri* date was estimated to be 2409 kcal/kg. The difference in ME value of date meal may be attributed to its varieties as well as chemical and physical related characteristics. Najib *et al* (1995) reported that different values of the proximate composition of date meal may be due to the variety, stage of maturation of the fruits, agronomic conditions of dates and the length of the storage.

5. 1.2.Weekly feed intake

As shown in Table (8), inclusion level (D) of date meal (15%) resulted in a significant increase in the feed intake values by about 14.99% over that of the control (A) during the first week. Increasing dietary date meal up to 20% in the experimental diet did not exhibit any significant increase for feed intake compared to the control during the period second and third weeks old. With feeding during fourth week feed intake was significantly decreased by about 8.56, 21.05, 16.78 and 29.36% than that of the control group for treatments of 5, 10, 15 and 20% date level (B, C, D and E group) of tested material during the fourth week. During the fifth week, extremely feed intake represented similar trend as that of fourth week were feeding diets decreased significantly by about 23.85, 32.41, 37.11 and 41.52% than that of the control group for treatments of 5, 10, 15 and 20% of tested material during this period. This may be attributed to the un-palatability of the diet as the result of increasing fiber contents. In this regard this result were explained by Jumah et al., (1993) found that high level of fiber in broiler diets decreases the passage of ingesta in the gastrointestinal tract, resulting in a decreased feed intake.

5. 1.3.Weekly live weight gain

Throughout the starter period (first week) as shown in Table (9) live weight gain was not significantly affected by feeding diets of 5, 10, and 15% date level compared to the control group. While, increasing dietary date meal up to 20% recorded the lowest live weight gain value. At the fourth growth period, substitution of maize by date meal did not yield any deterioration in live weight gain and the differences among experimental groups were insignificant compared with the control group. The same trend was observed during the last period with date meal (5, 10, and 15 %). Increasing the date meal up to 20% significantly reduce the

live weight gain. This decrement may be attributed to the decline in the availability of the nutrient at high level of studied meal.

The observation with respect to the values of live weight gain due to the effect of date levels at 0, 5 and 10% levels in our study Table (9), is not comparable to the finding of Kamel (1981) who reported a higher live weight gain values (507, 525 and 535 g for 0, 5 and 10% levels respectively) for *Zahdi* date. The contradiction between our result and those of Kamel (1981) may be attributed to the different variety of date and different breed of bird.

5.1.4. Feed conversion ratio (F.C.R)

The inclusion levels of date meals had no significant effect on feed conversion ratio throughout the experimental period except for group C (10% date level) at the starting period. Broilers on group C (10% date level) diet can be more efficiently utilize feed to improve the rate of gain and to decrease the amount of feed required per unit gain. The result were partially in agreement with the findings of Kamel (1981) found that broilers given 10% inclusion ground *Zahdi* date had better feed conversion ratio than the control and other groups. These results are in good agreement with those obtained by Jumah *et al*., (1993) on feeding broilers who reported that feed conversion figures increased with the increased of date pits in the diet.

5.1.5. Hot, cold carcass weight percentages and non carcass components

Data in Table (11) demonstrate significant effects due to date meal levels on the different carcass weight dressing percentage and organ percentage of broilers except abdominal fat. Carcass dressing percentages

were not significantly affected by substitution 10, 15 and 20% maize in the tested ration by date meal. The reduction in dressing percentages are a consequence of experimental effect on body weight. Sharof (1968) reported that date seeds increased body weight and organs (heart, liver, spleen, kidney, ovary and abdominal fat) in rabbit and chickens. Our results could be explained by Kamel (1981) indicated that variation obtained among treatments could be attributed to both individual differences and to dates as an energy source because when date pits totally replaced corn in practical rations, organ weights were not different from those of birds fed the control diet.

5.1.6. Overall performance of experimental birds

Results in Table, 12 indicated that the dietary treatment had a significant effect on feed intake, live weight gain and final body weight. The overall feed conversion ratio value (1.49) is better for 5% inclusion (B) than the control group. The overall data of experimental broilers in the experiment Append. (1) as affected by the levels of dates showed a linear increase in feed intake and weight gain with increasing dates level in broilers diets, and that broilers fed on 5% inclusion dates progressively consumed more feed than other groups.

5. 2. Experimental (2)

Results in Table, (7) revealed that increasing date meal levels up to 20% increased the digestion coefficient value of crude fiber. The opposite was true with that of ash which was not significantly improved by 2.33 % over that of the control.

Conclusion and Recommendation

Discarded dates are free or cheep and readily available source of plant protein, which help in reducing the production cost of poultry products.

Feeding discarded date to broilers at the level of 5% substitution (group B) had positive effect on their performance. The level of this ingredient had variable effects on most of the parameters measured. This experiment indicated that feeding different level of date inclusions of the broilers rations will be of no harmful effects and might be economically feasible.

It could be concluded that to achieve the maximum return from bird keeping in the developing countries, information is needed about the wastes or neglected resources, which could be transferred into protein in the form of meat to save the cereals and legumes for human consumption.

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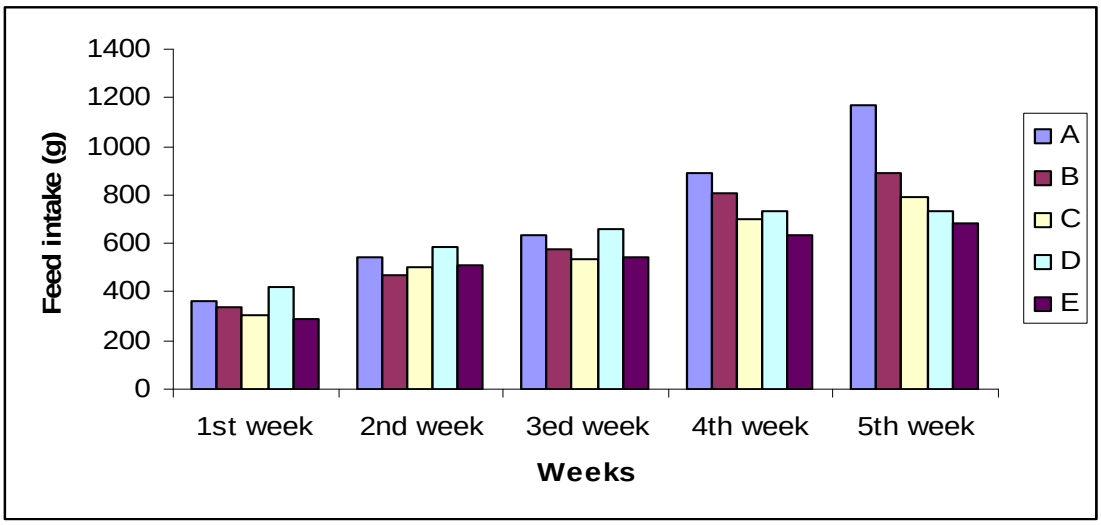
Appendix (1): Regression of performance and carcass characteristics % on the levels of dates

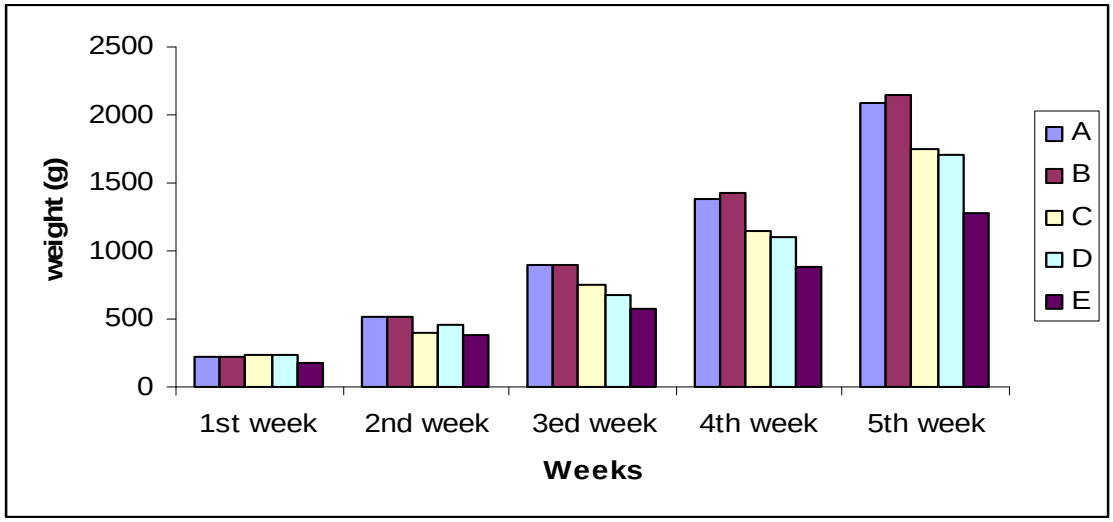
Level of Dates %	*[1]Final body weight g/bird	Feed intake g/bird	Total weight gain g/bird	Feed conversion ratio	Hot carcass%	Cold carcass%	Abdominal fat%	Liver%	Pancreas%
0	2093.6	3596	2018.6	781.	80.96	78.48	1.75	2.70	0.28
5	2144	3080	2069	491.	92.54	90.81	1.73	2.95	0.30
10	1752	2832	1677	.68 1	61.03	60.40	1.37	2.10	0.23
15	1708	3128	1633	1.91	59.65	57.88	1.51	2.25	0.23
20	1282	2660	1207	2.28	51.65	50.33	1.75	2.25	0.26
*R^2 Value	R^2 = 0.876	R^2 = 0.858	R^2 = 0.802	R^2 = 0.586	R^2 = 0.728	R^2 = 0.722	R^2 = 0.235	R^2 = 0.496	R^2 = 0.369
SEM	155.5	158.8	148.6	0.13	134.4	131.6	2.1	2.8	0.25
*[3]Y= a + bx	y=2207-41.2 x	y=1079-22.5 x	y=760.1-14.9 x	y=1.73-0.03 x	y=87.5-1.8 x	y=85.4-1.8 x	y=1.7-0.002x	y=2.8-0.03 x	y=0.3-0.002 x
±SE	119.6	41.2	36.5	0.12	61.5	60.12	1.4	1.6	0.14

*[1] The initial live weight of bird = 75 gram. *[2] R^2 = coefficient of determination. *[3]The linear regression equation = y = a + bx; a = constant , b = regression coefficient, y=dependent variable and x= independent variable.

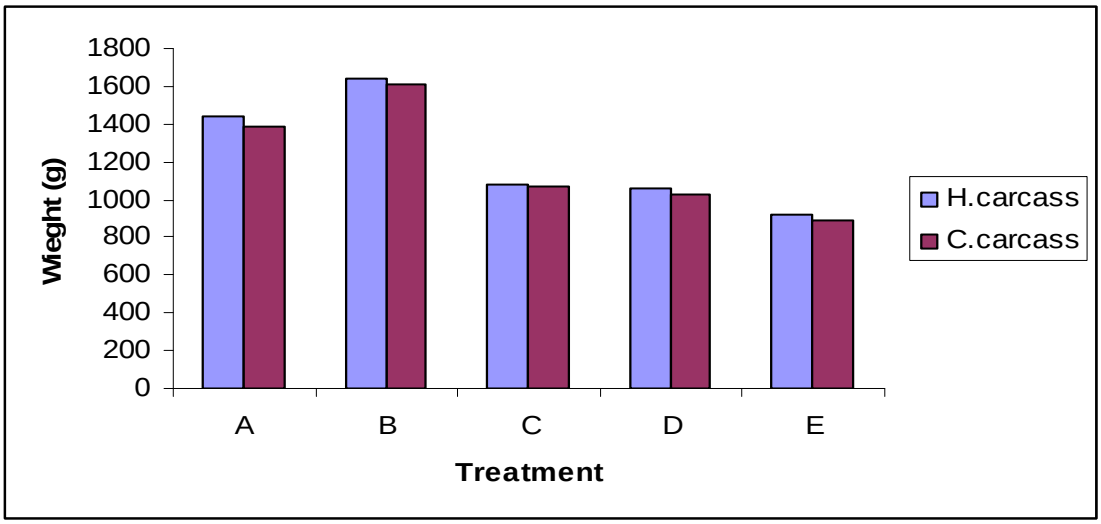
Appendix (2): Feed intake per week



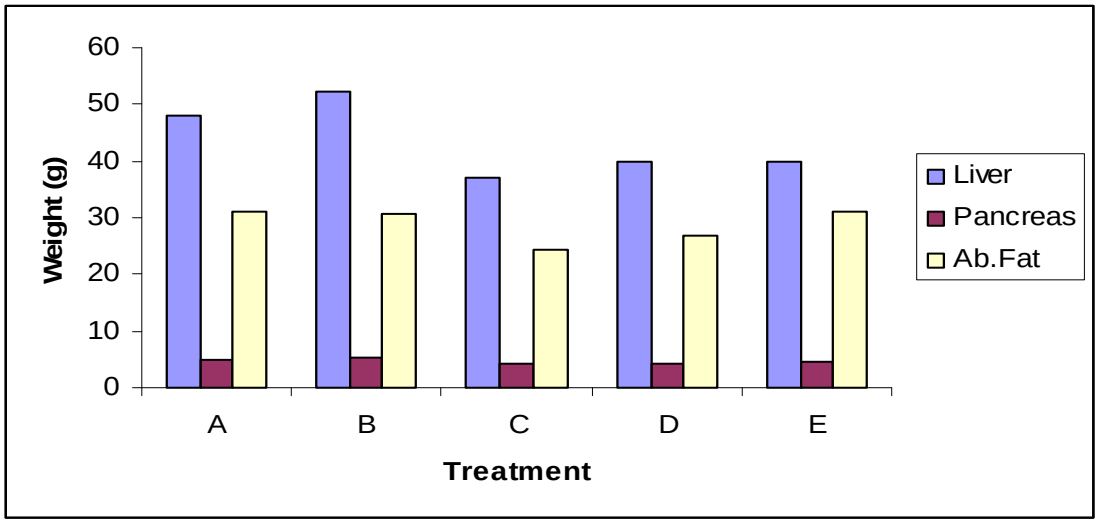
Appendix (3): The weekly body weight



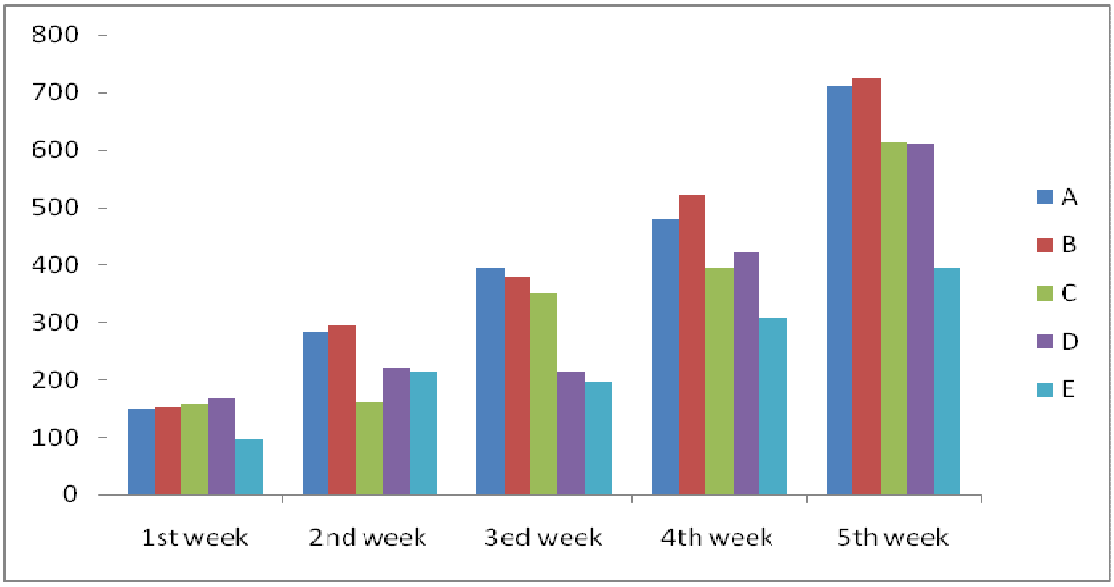
Appendix (4): The hot and cold carcass weight per treatment



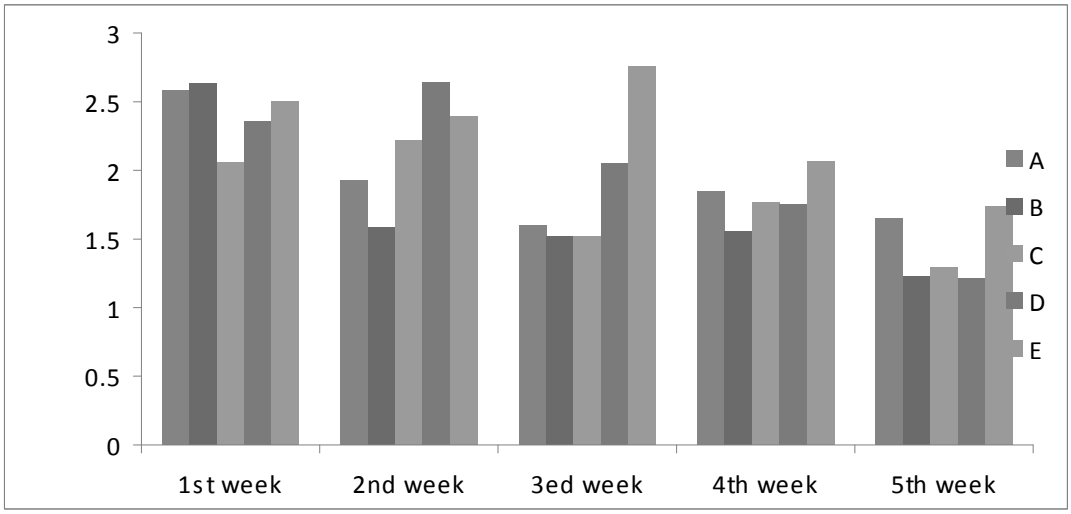
Appendix (5): The weight of liver, pancreas and abdominal fat per treatment



Appendix (6): The weekly body gain per week



Appendix (7): The feed conversion ratio per week



Appendix (8): The weekly body weight (g/ bird)

Weight (kg)	No of weeks				
	1st week	2nd week	3rd	4th week	5th week
A	225.2[a]	508.4[ab]	902.8[a]	1382[a]	2093.6[a]
B	226[a]	520.8[a]	899.6[a]	1420[a]	2144[a]
C	233.2[a]	394.6[c]	744.8[c]	1140[b]	1752[b]
D	242[a]	462.4[b]	677.2[b]	1098[b]	1708[b]
E	170.4[b]	384.8[c]	580.8[bc]	888[c]	1282[c]
±SE	13.5	15.9	52.9	62	57.8

*Values within a column sharing the same superscripts are not significantly different at 5%

Appendix (9): Regression of body weight in (g) on dates meal level