Sudan University of Science and Technology

College of Graduate Studies

Improvement of the Raw Bagasses Nutritive Value

رفع القيمة الغذائية للبقاس الخام

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الآية

قال تعالى:

(أَلَمْ تَرَ أَنَّ اللَّهَ أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَسَلَكَهُ يَنَابِيعَ فِي الْأَرْضِ ثُمَّ يُخْرِجُ بِهِ زَرْعًا مُخْتَلِفًا أَلْوَانُهُ ثُمَّ يَهِيجُ فَتَرَاهُ مُصْفَرًّا ثُمَّ يَجْعَلُهُ حُطَامًا إِنَّ فِي ذَلِكَ لَذِكْرَى لِأُولِي الْأَلْبَابِ)

صدق الله العظيم

سورة الزمر الآية (21)

Dedication

To my father, mother. Brothers and friends

Who Help Me To Present This Degree

Acknowledgement

I thank my god for giving me the health and mine to complete this research.

Thank to my supervisor Dr. Salaheldin sidahmed Ahmed for suggestion , helping and guidance to accomplished this study.

Thank to my family, wife, child and all my friends who guide me to write this research.

Abstract

The experiment was conduct to study the improvement of nutritive value of the raw bagasses. Bagasse was placed in the nine plastic bags distributed in three treatments each treatment replicated in three groups. Group (A) treated with 2kg raw bagasses with 200ml water, group(B) treated with 2kg raw bagasses with 200ml water and 80g urea and group (C) treated raw with 2kg bagasses with 200ml water, 80g urea and 600g molasses. These plastic bags were closed to enhance anaerobic fermented for two weeks, three weeks and four weeks. Samples taken from each plastic bags after two weeks three weeks and four weeks measure dry matter, fat, crude protein, crude fiber, Ash, nitrogen free extract, and metabolizable energy of raw bagasses treated with fermented in treatment (A, B, and C). The results were pointed that the dry matter increased significantly ($p<0.05$) in bagasse from (89.86%) to (90.29%) treatment (A, B and C) expect in treatment (A and B) at four weeks and two weeks, percentage of crude protein increased significantly ($p<0.05$) , in raw bagasse from (4.33%) to (5.36%) , (10.27%) , (11.66%) in treated (A , B and C) respectively .The percentage fat was a significant difference ($p<0.05$) in raw bagasse from (2.57%) to(3.89%) , (7.12%) , (7.71%) in treatment (A, B and C) respectively .crude fiber percentage was a significant difference ($p<0.05$) in treatmed raw bagasse from (36.83%) to (63.46%) and (36.83) to (60.64) in treatment (A and B) respectively . and decreased from (36.83%) to (34.13%) in treatment (C), Ash percentage were significant difference ($p<0.05$) in all treatment (A, B, and C) compared with control (3.22%),(2.57%) and (4.64%) compared (10.29) respectively, nitrogen free extract were significant difference ($p<0.05$) in all treatment (A,B, and C) compared with control (12.53%),(16.72%) and (20.34%) with (36.19%) and metabolizable energy was a significant difference ($p<0.05$) in control (8.18%)and treated raw bagasses (9.30%) in treatment (B) at three weeks.

Recommended that by used water, urea and molasses to improvement the raw bagasses nutritive values at the three weeks of experiment which crude protein percentage reach high percentage.

المستخلص

تناولت هذه الدراسة رفع القيمة الغذائية للبقاس الخام، تم وضع البقاس في تسع أكياس من البلاستيك وحوي كل كيس 2 كيلو جرام من البقاس الخام، وتم توزيعها إلى ثلاثة معاملات الأولى(أ) 2 كيلوجرام من البقاس الخام أضيف إليها 200 مللتر من الماء، المجموعة الثانية (ب) 2 كيلوجرام من البقاس الخام أضيف إليها 200 مللتر ماء و 80 جرام من اليوريا والمجموعة الثالثة(كيلوجرام من البقاس الخام أضيف إليها 200 مللتر من الماء 80 جرام من اليوريا و 600 جرام من المولاس. تركت هذه الأكياس معزولة من الهواء الخارجي تماماً لمدة 2, 3 و4 أسبوع.

تم اخذ عينة من كل معاملة في الأسبوع الثاني، الثالث والرابع لقياس المادة الجافة، الدهون، البروتين، الألياف الخام، الرماد، مستخلص الإيثر، والطاقة الممثلة في البقاس الخام في المعاملات (أ،ب،ج) وقد أظهرت النتائج وجود فروق معنوية عن مستوي معنوية (0.05) في زيادة المادة الجافة من (89.96%) إلي(92.29%) في المعاملات (أ، ب، ج)، ما عدا في المعاملات (أ، ب،ج) في الأسبوع الثاني والرابع. كما أظهرت النتائج وجود فروق معنوية عن مستوي معنوية (0.05) في زيادة البروتين الخام في البقاس الخام من (4.33%) إلي (5.36%)، (10.27%)، (11.66%) في المعاملات (أ، ب،ج) علي التوالي.

هنالك وجود فروق معنوية عن مستوي معنوية (0.05) في الدهون من (2.57%) إلى (3.89%)، (7.12%)، (7.71%) في المعاملات (أ، ب،ج) علي التوالي، وجود فروق معنوية عن مستوي معنوية (0.05) في زيادة نسبة الألياف الخام من (36.83%) إلي (63.46%)، (60.64%)، في المعاملات (أ، ب) ونقصان من (36.38%) إلي (34.13%) في المعاملة (ج). كما أظهرت النتائج وجود فروق معنوية عن مستوي معنوية (0.05) في الرماد في كل المعاملات (أ، ب،ج) مقارنة مع البقاس الخام غير المعامل. وأيضا وجود فروق معنوية عن مستوي معنوية (0.05) في الطاقة الممثلة.

من خلال هذه الدراسة نوصي باستخدام والماء واليوريا والمولاس في تحسين البقاس الخام المخمر في الأسبوع الثالث من التجربة الذي وصلت فيه نسبة البروتين اعلي نسبة.

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CHAPTER ONE

INTRODUCTION

Sudan located in north-east Africa. It is bordered by Egypt to the north, the Red Sea, Eritrea, and Ethiopia to the east, South Sudan to the south, the Central African Republic to the southwest, Chad to the west and Libya to the northwest. The River Nile divides the country into eastern and western halves. Robert (2008). Sudan lies between latitudes 8.4° and 23.3°N and longitudes 21.5° and 39.0° E Sudan population (2015). With an area of 1,886,068 km^2 (728,215 sq mi). Sudan Country Studies (2010). Population of Sudan was estimates to be increased by 994,079 peoples and reach 41,029476 in the beginning 2016. Sudan population (2015).Over 80% of Sudan‘s employment takes place in the agricultural sub-sector of the economy, the majority of the population are farmers and pastoralists living on subsistence farming and livestock herding in a nomadic way of life. Saud Badri (2012).

Livestock form an important component of the agricultural sector, with production mainly based on traditional pastoral systems (90% of the livestock in the country belong to the traditional pastoral production systems. Mahgoub (2006).

The livestock population was estimated 104 million head for the Sudan. The Sheep 39483,cattle 29840,goats 30837,and camle4751 million heads. MARF (2012).

Feeding these animals really problem in Sudan because animals are owned mainly by nomadic groups who depend on poor range land for their feeding. Concentrates are very expensive and not available in great amount in production areas, so there are many difficulties that made concentrates out of reach for more farmers. Suksombat (2004).

Hay is rarely complete food and must be used as part of an overall feeding system. Crop residues, straws and stoves mainly but not exclusively from cereals, are also important as lean season feed for ruminant, and are often used in as association with hay. Kundu ***et al*** (2005).

Hay must be stored in a dry environment. Hay can be based and stored under cover. Hay can also be stored by creating hay stacks. These may be created in a field near the source, or close to where the hay will be required later in the year. Kundu ***et al*** (2005).

Bagasse is a highly fibrous by product after sugar cane is crushed to remove sucrose. Many sugar milling factories around the world release large quantities of bagasse as a part of their byproducts, some even dispose it as a waste. In addition the one major potential use of bagasse is as a feed stuff for cattle. Rivers (1988).However its low digestibility limits its use in the row state. Anakalo and Anakalo (2009).

Excess forages can be conserved as hay or silage. However, ensiling generally produces better quality roughage than hay because less time is required to wilt the feed, when the forage loses nutrients, causing a reduction in feed quality. Hay making requires a longer period of rain-free days, which are often rare in the tropics during the wet season when feed excesses generally occur. John Moran (2005).

The objectives of the study is:

1. To improve the nutritive value of raw bagasse.
2. To decrease the total cost of diet.
3. To utilization of byproduct of agriculture residues.

CHAPTER TWO

LITREATURE REVEIEW

2-1 Animal feed and nutrient:

Feed is material which, after ingestion by animals, is capable of being digested, absorbed and utilized. In a more general sense is edible material, components capable of being utilized by animals or nutrients. Morgan ***et al*** (2010).

Nutrient may be defined as any chemical element or compound in the diet that supports normal reproduction, growth ,lactation, or maintenance of life processes. The six classes of nutrients are water, protein, amino acids, carbohydrates, lipids, vitamins, and inorganic elements. Energy which is required in the diet of all animals can be provided by fat, by carbohydrate and by the carbon skeleton of amino acids after removed of nitrogen. Kundu ***et al*** (2005).

The diet of farm animals in particular consists of plants and plant products, although some foods of animal origin such as fishmeal and milk are used in limited amounts. Morgan ***et al*** (2010).

2-1-1 Roughages:

Feeds such as hay, straw, and silage, which are high in fiber and low in total digestible nutrients. Silages are derived from legumes and grasses that have been an aerobically fermented. About 70 percent of hay is consumed on-farms animal. USITC (2000**).**

2-1-2 Concentrates:

feeds low in fiber and high in total digestible nutrients; they include various grains and high-grade by-products such as wheat bran, oilcake, skim milk, etc. Concentrates are intended to be further diluted and mixed to a supplement or a complete feed. USITC (2000).

Produce In feeding practice a concentrate is usually described as a feed or a feed mixture which supplies primary nutrient (protein, carbohydrate, and fat) and contains less than 18% crude fiber. Kundu ***et al*** (2005).

2-1-3 Range:

Which is About 37% of the total animal feeds requirements in Sudan estimated to 92.9 million tons in 2011 are derived from rangelands, which is equivalent to 70% of the available total animal feed. While agricultural by-products contribute 28.3 % (14.1million tons), the irrigated forage contributes 1% (0.54 million tons) of the feed and 0.5% (0.2 million tons) from cereals, cakes and concentrates. RPGD (2012).

Implements and tools such as mowers and balers are now available in Sudan and if they are used there will be an advantage of capturing the high nutritive value of forage when it is still young. This might possibly reduce the gap in feed now existing in Sudan. Abusuwar and Darrag (2002).

The first consideration in planning range use is to insure that the basic plant and soil resources are used in such a way that they continue to be productive under the grazing system employed. The selection of particular system will depend upon the kind of vegetation, the physiology of the range, the kind of animals, and the management objectives of the operation. Abusuwar (2007).

2-1-4 Forage:

Forages include the stem and leafy parts of a plant and are generally higher in fiber. They are more bulky, and provide less digestible energy than concentrates. Common forages include baled hay, haulage, and corn silage. Richard and Chrch (2010).

2-1- 4 -1 Leguminous:

Leguminous is a high quality sown forages such as leguminous fodder have been found to provide adequate dry season supplementation and improve the productivity of grazing cattle. Mohammed (1986).

The protein content in fodder legumes consist of both soluble and insoluble components and as such is used both as an important source of nitrogen for increased rumen microbial activity and by-pass protein for supplying amino acids to the lower gut of the host animal. Leng (1997).

Legumes to being a good source of protein, fodder legumes are also an important source of minerals such as sulphur, calcium, copper and iron even though they have been shown to be a poor source of manganese, zinc and phosphorous. The other advantage of using fodder legumes as a source of feed for ruminant animals is that supplementation of forages up to about 35% does not seem to have any effect on the intake of fibrous feed materials. As such the intake of dry matter is often increased by the amount of green fodder given to the animal. Dixon and Egan (1987).

2-1-4-2 Grasses:

Grasses include some of the most versatile plant life-forms. They became widespread toward the end of the Cretaceous period, and fossilized dinosaur dung (coprolites) have been found containing phytoliths of a variety that include grasses that are related to modern rice and bamboo. Piperno and Suse (2005).

Grasses have adapted to conditions in lush rain forests, dry deserts, cold mountains and even intertidal habitats, and are currently the most widespread plant type; grass is a valuable source of food and energy for all sorts of wildlife and organics. A clad gram shows subfamilies and approximate species numbers in brackets. GPWG (2012).

2-2 Compound of Animal Feed:

2-2-1 Water:

The water content of the body varies according to the animal age. The newborn animal contains 750–800 g/kg water but this falls to about 500 g/kg in the mature fat animal. It is vital to the life of the organism that the water content of the body be maintained: an animal will die more rapidly if deprived of water than if deprived of food. . Many of the chemical reactions brought about by enzymes take place in solution and involve hydrolysis. Because of the high specific heat of water, large changes in heat production can take place within the animal with very little alteration in body temperature. Morgan ***et al*** (2010).

The animal obtains its water from three sources: drinking water, water present in its food, and metabolic water, this last being formed during metabolism by the oxidation of hydrogen-containing organic nutrients. Where the water content of foods is variable and can be ranged from as little as 60 g/kg in concentrates to over 900 g/kg in some root crops. Because of this great variation in water content, the composition of foods is often expressed on a dry matter basis, which allows a more valid comparison of nutrient content. Morgan ***et al*** (2010).

2-2-2 Dry matter and it's components:

The dry matter (DM) of foods is conveniently divided into organic and inorganic material, although in living organisms there is no such sharp distinction. Many organic compounds contain mineral elements as structural components, that the main component of the DM of pasture grass is carbohydrate, and this is true of all plants and many seeds. Morgan ***et al*** (2010).

2-2-3 Carbohydrates:

Chemical compounds one composed of carbon, hydrogen and oxygen, made up of sugars, starches, cellulose and lignin.

The main functions of this nutrient are as energy that powers the muscular movement, as a source for body heat, as building block for other nutrients and it's dietary excess is stored as fat. Simple carbohydrates (sugar and starches) are referred as nitrogen free extract and are mostly present in cereal grains (corn, etc). Complex carbohydrates (cellulose and lignin also called fiber) are difficult to digest and can be found mostly in roughages (hay, grass, etc).Carbohydrates utilization by animals depends on their digestion system. Simple stomached animals cannot digest large amounts of fiber, and their ration must be made up of mostly cereal grains. Ruminant animals can eat large amounts of fiber, and a high percentage of their ration is roughage. Becker (2004).

2-2-4 Lipids*:*

Fats or oils, as well as carbohydrates, are neutral chemical compounds essentially of carbon, hydrogen and oxygen, but contain more carbon and hydrogen atoms than carbohydrates. For this reason fats have 2.25 times as much energy value than carbohydrates. At body temperature fat are solids and oils are liquid. The main functions of this nutrient are as energy source (stored at higher concentrate than carbohydrates), as a source of heat, as insulation, as body protection (cushioning), as carrier of fat-soluble vitamins and has an immune function through essential fatty acids. Lipids are easily digested by animals. Lipids for feed sources are mostly soybean oil, corn oil, fish oil, and by product fats (lard or tallow from livestock rendering). Becker (2004).

2-2-5 Proteins:

Protein are complex organic are compounds of high molecular weight. As with carbohydrates and fats, proteins contain carbon, hydrogen and oxygen, but in addition they all contain nitrogen and generally sylph. Morgan ***e t al*** (2010).

In both plants and animals, proteins are the major nitrogen-containing compounds. In animals, muscle, skin, hair, feathers, wool and nails consist mainly of protein. Like proteins, nucleic acids are also nitrogen-containing compounds and they play a basic role in the synthesis of proteins in all living organisms, they also carry the genetic information of the living cell. The organic acids that occur in plants and animals include citric, malice, numeric, succinct and pyretic acids. Other organic acids occur as fermentation products in the rumen, or in silage, and these include acetic, prop ionic, butyric and lactic acids. Morgan ***et al*** (2010).

The crude protein content was increased by urea treatment because urea is a good source of nitrogen . It is interest to point out of that urea treatment as a chemical substance let to enrich the treated of sugar cane bagasse and tops with nitrogen beside its chemical role on the breakdown of ligno-cellulosic bonds. Pretreatment with aqueous ammonia of residues promote the removal of the external fiber which led to increased surface area ,which may have made cellulose more accessible to enzymes. Bak ***et al*** (2009).

Mohamed (1998), Shoukry ***et al***., (1992) and Abd El-Baki ***et al.,*** (1984). According with those obtained that the crude protein content was really increased by urea treatment because urea is a good source of nitrogen.

Reported by Intesar (2003), who found the crude protein of untreated bagasse was (1.7%).

And reported by AFFRCS (1999),who found the protein content of bagasse silage was(5.7%).

Norozy and Alemzadeh (2006) how found that the sugarcane tops treatment with 3% urea at 40%moisture level for 3 weeks was found to give maximum improvement in terms of chemical composition with enhanced CP content from 4.91 to 13.76% and NDF and ADF content from 72.44 to 80.39% and 41.20 to 47.11%, respectively. In another study, lower CP value of raw sugarcane.

Ebrahimi ***et. al***.(2009), showed that the chemical composition of treated sugarcane bagasse treating with 5% urea at 40% moisture level for 4 weeks enhanced crude protein content from 2.17 to 14.35% and hemicelluloses content from 16.22 to 24.85%.

2-2-6 Vitamins:

Vatamins are the organic compounds required as a nutrient in tiny amounts by an organism. Their classification is divided in two categories: water soluble and fat soluble vitamins. Water-soluble vitamins, vitamins B and C, dissolve easily in water. Because they are not readily stored, consistent daily intake is important. Vitamin C helps teeth and bone formation and prevents infections, and vitamin B complex is needed for chemical reactions in the body and helps improving appetite, growth and reproduction. Lipid-soluble vitamins, vitamins A, D, E, and K, are absorbed through the intestinal tract with the help of lipids (fats). Because they are more likely to accumulate in the body, they are more likely to lead to hyper vitamins is than are water-soluble vitamins. Vitamin A is associated with healthy eyes, good conception rate, and disease resistance, vitamin D is associated with good bone development and mineral balance of the blood, vitamin E is associated with normal reproduction and muscle development and can also help immune system, and vitamin K helps with blood clotting and prevents excessive bleeding from injuries. Most vitamins have multiple functions in body involving metabolism, enzyme reactions, etc, and both deficiencies and excesses lead to disease. Becker, (2004).

Vitamin are present in plants and animals in minute amounts, and many of them are important as components of enzyme systems. An important difference between plants and animals is that, whereas the former can synthesis all the vitamins they require for metabolism, animals cannot, or have very limited powers of synthesis, and are dependent upon an external supply. Morgan ***et al*** (2010).

2-2-7 Minerals:

Minerals are the inorganic matter contains all those elements present in plants and animals other than carbon, hydrogen, oxygen and nitrogen. Calcium and phosphorus are the major inorganic components of animals, whereas potassium and silicon are the main inorganic elements in plants. Morgan ***et al*** (2010).

In feed are the chemical elements required by living organisms, other than the four elements carbon, hydrogen, nitrogen, and oxygen that are present in nearly all organic molecules. They are needed in small amounts and may be classified regarding its nutrition requirement rate as major or trace minerals. Some dietitians recommend that these be supplied from foods in which they occur naturally or at least as complex compounds, or sometimes even from natural inorganic sources (such as calcium carbonate from ground oyster shells). Some are absorbed much more readily in the ionic forms found in such sources. On the other hand, minerals are often artificially added to the diet as supplements; the most famous is likely iodine in iodized salt which prevents goiter. Minerals provide material for growth of bones, teeth, tissue, regulate chemical processes, aid in muscular activities, release energy for body heat, protein synthesis, oxygen transport, fluid and acid-base balance in body, enzyme reactions, and many other benefit. Becker (2004).

2-3 Hay:

Hay making is process where moisture content of cut herbage is reduced from initial moisture of 70-90% to 15-20%, hay is classed as roughage means a feed having more than 18% crude fiber and less than 20% crude protein in the dry matter**.** Hay making seems to be ancient but most important of conserving forage/fodder despite its dependence on suitable weather at harvest time and crop harvesting stage . Hay making is one of the traditional ways for conservation of forage and crop residues for lean scarcity period utilization as well as to store in hay bank for the utilization during natural calamity**.** Drying of forage in sunlight and wind naturally to dry is the commonest way of conserving fodder, natural grass and crop residues, however auxiliary artificial drying is used, occasionally, in some of the more highly mechanized system. Kundu ***et al*** (2005).

2-3-1 Crops for hay making:

Crop with thin, soft and pliable stem are more suitable and convenient for hay making unlike the hard thick stemmed crop (oat-Berseem-Lucerne-cowpea-Sun hemp along with range legumes like stylosanthes. Care should be to ensure minimum leaf losses (shattering)while preparing hag from leguminous crops.hag from leguminous crops is more nutritive and usually used to supplement the straws and stoves and other fibrins Feed to animal :Annual and perennial crops (mainly grasses) also from good hag provided they are harvested at optimum Stage of their growth. Kundu ***et al*** (2005).

Hay making is not a common practice among small livestock keepers in the tropics, probably because of the very poor quality of mature tropical. Hay is the oldest and most important conserved fodder. It can be made with simple equipment, manually or with mechanization. Many small scale farmers make hay and store crop residues to carry livestock through periods of shortage. Practices vary in different parts of the world, but follow some basic principles. Kundu ***et al*** (2005).

2-3-2 Silage:

Silage is forage, crop residues or agricultural and industrial by-products preserved by acids, either artificially added or produced by natural preservation, in the absence of air. It must be emphasized that air is the biggest enemy of silage. John Moran (2005).

Silage is the material produced by the controlled fermentation of a crop of high moisture content. Almost any crop can be preserved as silage, but the commonest are grasses, legumes and whole cereals, especially wheat and maize. Tropical grasses and legumes are difficult to ensile as they have a low water-soluble carbohydrate content and a high buffering capacity. Therefore, steps must be taken to ensure satisfactory ensilage. Options include wilting of very wet crops, the use of acid or inoculants additives, mixing of legumes with cereal crops, and adding cereals or molasses at ensilage to provide a source of water-soluble carbohydrate. Morgan ***et al*** (2010).

Silage consists of green forage preserved by fermentation in a silo for succulent fodder during periods of feed scarcity. The process of making silage is called ensiling. Silage is the product of controlled fermentation of green fodder retaining high moisture content. The material is normally stored in pits under anaerobic conditions. Naturally produced organic acids, chiefly lactic acid, preserves the fodder. The silo should be airtight after filling. During periods of abundant green fodder availability, fodder that is surplus to immediate requirements can be converted to silage and stored for use later in the year. El Wakeel ***et al*** (1993).

If the fresh forage cannot be wilted, the fermentation of the silage will be improved by mixing the chopped material with 3% to 5% molasses (on a fresh weight basis) just prior to ensiling. Although this is a time consuming and messy job, the rewards are well worth it. Adding water to the molasses is not recommended as the forage is already too moist and extra water will just reduce the fermentation quality. Rather than mixing it in thoroughly, the molasses can be spread as layers in the forage, say every 10 to 15 cm. Where the molasses is applied, the silage ferments better and is sweeter smelling, but the overall silage quality is still good. Other suitable fermentable substrates include rice bran or formulated concentrates (mixed at 10%) in layers with molasses (5%) poured on top of the rice bran. John Moran (2005).

2-3-2-1 Ensiling:

Ensiling is the preservation of a forage (or crop residue or by-product) based on lactic acid (ideally) fermentation under anaerobic (no air) conditions. John Moran (2005).

2-3-2-2 Crop for silage making:

Practically any crop can be used for silage making . However, the quality of silage depends on the kind of crop and its stage of harvest . the crop rich in soluble sugars\carbohydrates (more than 10%) most suitable for silage making . These are oat, maize, Baja, sorghum, hybridnapier, and guinea grass . These crop are rich in sugar and carbohydrates and low in protein Good silage can be prepared for one a mixture of grasses \cereals and legumes (berseem-lucerne -stylosanthes, etc) in a ration of 3:1 Cultivated natural grasses can be conserved as a good silage with the addition of molasses at 3-3.5%. Kundu ***et al*** (2005).

2-4 Crop residues:

Crop residues are available from irrigated as well as dry land crops. They include cereal straws and stoves (wheat, sorghum, millet, maize), cereal stubble, legume haulms (groundnuts, cowpea, lablab) sugar cane tops and bagasse, and water melon residues. Agro-industrial by-products include molasses, oil seed cakes (cotton, groundnuts, sesame, sunflower), grains and by-products of cereal milling (bran). The crop residues are a strategic source of feed for livestock during the dry season, with a part grazed in situ and part transported and stored for subsequent use. However, transportation of these bulky materials of low nutritive value is a major constraint to their large scale utilization. Mahgoub (2006).

Agricultural residues from the major component of feed and fodder base available for feeding ruminant livestock in the develop world . Such residues are characterized by low energy and protein concentration, high lignin content, low voluntary intake, poor digestibility and utilization and presence of ant nutritional factors. Krishna ***et al*** (1998).

2-4-1 Agro industrial byproducts:

Byproducts providing essentially easily fermentable energy through digestible cell walls, starch or sugars. They may constitute the basis or the major part of the diet. They derive mainly from sugarcane, citrus, roots and tubers, bananas, coffee Byproducts which are mainly used as a source of supplementary protein: oilseed cakes animal wastes from slaughterhouses and fisheries, byproducts from pulses, single cell proteins. Byproducts providing both energy and protein: e g : cereal milling byproducts, brewer's and distiller's grains and whey .other byproducts coming from fruit, bakery and other food industries which provide various kinds of nutrients. Chenost and Mayer (1977).

The main product of Sugarcane is sugar, however, there are many byproducts of sugarcane industry are bagasse, molasses, press mud and green top, which are used by various industries like Bagasse based industries mainly produce pulp, paper, particle boards using bagasse as a fuel, cattle feed, medium for cultivation of edible mushroom, production of furfural etc., Molasses based industries mainly produce potable alcohol for Distillery, Acetic Acid, Fuel Alcohol, Cattle feed and many Pharmaceutical products etc. Press mud based industries mainly produce fertilizer and the wax and compost industries, as animal feed. Floor ***e t al*** (2013).

2 -5 Supplement feed

A supplement is a feed or a feed mixture used with another to improve the nutritive balance or performance of the total and intended to be fed undiluted as supplement to another feeds, or offered to be choice with other parts of the ration separately available, or further diluted and mixed to produce complete feed. Kundu ***et al*** (2005).

Supplements are classified by their ability to supply additional energy, protein, fiber or vitamins and minerals to dairy cows. They come in the form of concentrates, fresh forages, conserved fodder, roughage by-products and concentrate by-products John Moran (2005).

Researches all over the world today are focusing on ways of utilizing either industrial or agricultural wastes as a source of raw materials for the industry. These wastes utilization would not only be economical, but may also result to foreign exchange earnings and environmental pollution control. Aigbodion ***et al*** (2010).

2-6 Fermentation:

The microbes in the rumen include bacteria, protozoa and fungi. These microbes feed on forages ingested by the cow, and, by fermentation, produce end products that are utilized by the cow as well as by the microbes themselves for their own reproduction and cell growth. Bacteria and protozoa are the most important microbes. Billions of bacteria and

Protozoa are found in the rumen. They digest about 70% to 80% of the digestible dry matter in the rumen. Different species of bacteria and protozoa perform different functions. Some digest starch and sugar while others digest cellulose. Carbohydrate and lipids are the two major source of energy for the animal body. John Moran (2005).

Variations in the proportion of concentrate in the ruminant diets led to unfavorable ruminal environmental conditions for fermenting roughages which are usually associated with reduction in the voluntary intake. Gabr (2000).

In the rumen, most starch is easily and rapidly fermented by amylolytic microorganisms, although its degree mainly depends on the physical and chemical properties of the starch granules, as grains submitted to intense physical (grinding or crushing) and/or chemical (gelatinization) processing have higher ruminant digestion. Owen and Jayasuriya (1986).

2-7 Urea:

Urea is an interesting alternative to anhydrous ammonia in the treatment of lingo-cellulose its low cost, easy handling, danger-free and non toxic for animals when used at a dose of 5% of the ration or lower. Caneque ***et al***, (1998).

Urea is a source of non-protein nitrogen and it has been frequently used in ruminant feed. However, for the best utilization of urea by ruminants, it is important to increase energy source. Freitas and Gonzales (2003).

Urea is a common source of nitrogen, but being a form of non-protein nitrogen, it is not a true protein. It has no energy value and is all degradable in the rumen. It is sometimes used as a substitute for true protein sources in feed mixtures and pellets, but is only effective when fed in combination with an energy source such as cereal grains or maize silage. It is recommended that urea only be fed to animals that have a fully functioning rumen and at a maximum rate of 1% of total DM intake. John Moran (2005).

Manufactured Non-protein Nitrogen (NPN) such as urea can also be fed to ruminants, but too much can decrease palatability and how much a cow will want to eat. A good rule of thumb is, not more than one-third of total Nitrogen should come from urea or other NPN sources and in complete feeds; ideally it should be 2% or less. Richard and Church (2010).

Treatment of agricultural by-products by urea released ammonia which reacted with the lignocelluloses materials and improved their feeding values. Sundstol and Mowat (1978).

Urea is accepted that crop residues need to be offered with supplementary nitrogen to improve their fermentation in the rumen. Urea is often the cheapest source and can either be added at the point of feeding (often in conjunction with a soluble energy source such as molasses) or used as a treatment agent. Saadullah and Dolberg (1982).

2-8 Molasses:

Sugar beet or sugarcane - By-product of the sugar production. Commonly fed in the liquid form (70 to 80% DM). Readily available source of energy, and quite palatable. Often used as a pellet binder and to reduce dustiness. Form the basis for most liquid protein supplement containing urea. Should not use more than 10% of the replacement value of corn in livestock diets. Most commonly fed to ruminants or horses at 3 to 7% of the diet. Lee I. Chiba (2014) .

Between 10 and 30% of the diet, as is traditionally the case there is no particular problems with molasses for all types of livestock. However when the diet is based on molasses (eg: >70%) the behavior of cattle is different and the management of the herd must be more careful. Preston and Willis (1974).

Molasses is a good alternative, besides improving the palatability of urea, it improves intake. It has been shown that when provided in adequate amounts, molasses is a good source of energy, improves the palatability of food, stimulates the activity of microorganisms in the breakdown of cellulose and is good source of trace minerals. Molasses can be an excellent binder for making up rations and is a good solvent for urea, vitamins and other ingredients. Freitas and Gonzales (2003).

Molasses which is an excellent carrier for urea as a source of non protein nitrogen for ruminants can be more easily used as a supplement and distributed to small farmers when is part of solid multi nutrient blocks. Sansoucy ***et al*** (1988).

If the fresh forage cannot be wilted, the fermentation of the silage will be improved by mixing the chopped material with 3% to 5% molasses (on a fresh weight basis) just prior to ensiling. Adding water to the molasses is not recommended as the forage is already too moist and extra water will just reduce the fermentation quality. John Moran (2005).

2-9 Bagasses:

Sugarcane bagasse is one of a highly fibrous residue remaining after extraction of juice from cane stem which can be used as a source of roughages for ruminants. Sugarcane bagasse annual production in Sudan is more than three million tons. Small proportions of these quantities are burnt during the production cycle of sugar and the rest creates problems of its disposal. Utilization of Sugarcane bagasse for animal feeding is limited due to their bulkiness that hinders their transport to areas of consumption and their poor digestibility due their high content of fiber which contain more than 60% of its dry matter in the form of cellulose, hemicelluloses and lignin. Kewalramani ***et al***, (1988).

Bagasse is the matted cellulose fiber residue from sugar cane that has been processed in a Sugar mill. Previously, bagasse was burnt as a means of solid waste disposal. However, as the cost of fuel oil, natural gas, and electricity has increased, bagasse has come to be regarded as a fuel rather than refuse in sugar mills. Aigbodion ***et al*** (2010).

Agricultural residues, such as sugarcane bagasse are rich in lignocelluloses biomass, which is mainly composed of cellulose, hemicelluloses and lignin. Sugarcane bagasse, the major by-product of the sugarcane industry, is a very promising raw material for the production of glucose, lose, ethanol and methane. Hofsetz and Silva (2012**).**

Sugarcane bagasse is an agricultural residue from industrial sugar extraction process. Although utilized in the sugar factories as fuel for the boilers, large quantities are accumulated in the mills, creating environmental problems. Recently, there is an increasing trend towards the utilization of sugarcane bagasse, as it represents a large and inexpensive source of raw material, which can be used as solid support also in several biotechnological processes. Pandey ***et al***., (2000).

Sugarcane bagasse and sugarcane pith, the residues after rind removal, are lignified by-products of the sugar and paper industries (Muller, 1978).

2-9-1 Composition of bagasse:

Bagasse consists of approximately 50% cellulose and 25% each of hemicelluloses and lignin. Chemically, bagasse contains about 50% cellulose, 30% pentoses, and 2.4% ash. Because of its low ash content, bagasse oersnumerous advantages in comparison to other crop residues such as rice straw and wheat straw, which have 17.5% and 11.0%, respectively, ash contents, for usage in bioconversion processes using microbial cultures? Also, in comparison to other agricultural residues, bagasse can be considered as a rich solar energy reservoir due to its high yields (about 80 t/ha in comparison to about 1,2, and 20 t/ha for wheat, other grasses and trees, respectively) and annual regeneration capacity. Pandey and Soccol (1998).

2-9-2 Chemical composition of sugar cane bagasse:

Chemical composition of sugarcane bagasse % as reported by some authors. Their findings showed that sugar cane bagasse contains in percentages, DM (88.63-94.57) with an average of 91.30 ; CP(1.0-3.95) with an average of 2.48 ; EE (0.7-4.05) with an average of 2.18 ; CF (26.72-51.78) with an average of 38.17 ; N-free extract (36.82-58.6) with an average of 48.59 ; OM , (85.8-94.69) with an average of 90.62 ; Ash (2.25-9.95) with an average of 5.01 ; ADF, (59.0-65.77) with an average of 57.88 and NDF, (80.95-86.0) with an average of 83.47 Bassuny ***et al*** (2003). , Fouda (2008). The effect of chemical treatments on the changes in chemical composition of sugar cane bagasse (SCB) and sugarcane tops as a result of chemical treatments with urea (3, 4 and 5 %) and moisture (40, 50 and 60 %) for different incubation periods (2, 3 and 4 weeks), respectively. Tiwari ***et al*** (2013).

The chemical composition of treated sugarcane bagasse showed that treating with 5% urea at 40% moisture level for 4 weeks enhanced CP content from 2.17 to14.35% and hemicelluloses content from 16.22 to24.85%. Ebrahimi ***et al*** (2009).

All biochemical and chemical treatment increased total ash on all treatments were a reflection to the decrease in CF and NFE contents. It could be concluded that all treatments had great effects on degradation of CF from 49.5 to 39.10% and increasing CP content from 1.8 to 8.8% of treated bagasse. Chandra et al. (1991)

And reported by Paturau,(1982)and Ahmed (1996), who found that the crude fiber of baggasse silage was(43% – 52%).And reported by Gado ***et al*.**,(2007), Zadrazil ***et al*.,** (1995); Neclakantan and Singh (1998) and Rane and Singh (2001) who found that There were decreases in the NFE contents of bagasse from 42.24% in untreated to 42.10, 38.21 and 37.56% in chemical, biological and biochemical treated bagasse.

The chemical composition of raw and treated sugar-cane bagasse ensiling raised CP from 2.18% of raw sugar-cane bagasse to10.40% for the ensiled for 28 days. The ash content was lower for raw bagasse than for ensiled bagasse. Mohammed ***et al*** 2013).

Reported by (AFFRCS1999), who found the crude fiber of bagasse silage was (31.9%). The treatment was effective on crude fiber of bagasse which was increased from (36.83% to 63.46%).

Abd El-Ghani ***et al***., (1999). Reported that the decrease in crude fiber content by urea treatment.

And reported by AFFRCs (1999.), who found the ash content of bagasse silage was (3.2%).

Paturau (1982), pointed out that the moisture content of baggasse,in general, was between (64-52%) of fiber (43-52%) and of soluble solid 2.6%.

The additives in the 3 experiments were:

(A) 1 % urea, 5% molasses or 5% molasses + 0.5, 1, 1.5 or 2% urea

(B) 5% molasses, 0.5% urea and 0. 10. 20. 30 or 40% fresh cattle manure.

(C) 5% molasses, 20% sugar cane baggasse, 30% fresh cattle manure, 0.5% urea and 0.5 25% pea pods. After 45 days the silages were analyzed.

The results showed that addition of molasses and urea increased the CP, NH_3-N and ethanol contents of the silage. It also increased the dry matter digestibility from 79.4 % to 83.6 – 89.4%. With molasses, the optimum urea level was 0.5% ; 1% urea without molasses gave even better results Nour **et al** ,(1987).

Tewatia and Khatta (1999) stated that sugar cane baggasse was ensiled with water, 4% urea, 4% urea + I % NaoH in glass silos at 45% moisture level for a period of 28 days. The ensiled material was soft and more pliable than untreated baggasse. Dry matter loss during ensiling varied from 2.16 to 4.56%. The pH of the silage varied from 5.56 to 8.53 compared with 6.42 of the raw baggasse. Urea – ammonia treatment of baggasse improved its crude protein content from 2.37 (raw baggasse) to 8.92 (in 4% urea treatment).

Pereira ***et al***,(1992) :found that the treatment of maize and bagasse by8% urea increased the crude protein in the maizefrom4.36to10.57%,the crude fiber decreased in the maize from 43.19 to 38.25% and the treatment of raw bagasses increased the crude protein from 2.59 to 8.76% and crude fiber decreased from 15.9 to 9.84% in the treated bagasses.

Kahn***, et al*** (1992) pointed that the used forage content about50% bagasses, 5%urea, 15% organic matter and 35% water closed in the plastic bags for 50 to 60 days increased the dry matter of the treated bagasse from 47.4 to 54.4% and crude protein from 18.4 to 22.4%. And found that the ammonia decreased the crude fiber after 60 days. Wilkinson (1984). Indicated that the treatment of roughage by urea increases the moisture conservation. And found that the roughage contain about 57% dry matter and storage inside the plastic bags at 120 days and added 3% urea the loss of untreated digested matter 3% the dry matter decreases to 54% by loss about 20% digested matter.

Hassoun ***et al***,(1995):who reported that in some treatment from bagasses and found that in the first treatment 90% bagasse treated by 70,88,106 and 124gm/kg dry matter storage in the closed plastic bags in 24c at period 2-4-6-8 weeks after opening the bags found that the increase period of treatment decreased the percentage crude fiber in the treated bagasse from 30, 50% to 22.5 to 47.5% respectively. These results indicated that the treatment by urea let to improvement the native value of raw bagasse to let the increases the level of nitrogen.

2-9-3 The use of bagasses:

One major potential use of bagasse is as feedstuff for cattle. Griffith (1994).

Bagasse is used as a basal diet, it's important to give the correct supplementation in order to obtain satisfactory physical and economic responses. The supplementation must take account of the productivity of the animals (e.g. Growing fattening, lactating, and etc. Mahala ***et al*** (2007).

Sugarcane is a major cash crop grown in many parts of the country. It is popular among farmers in many regions for its ability to withstand extremes of environmental conditions and because of its assured market price. The by-product of sugarcane i.e. sugarcane tops, sugarcane bagasse, molasses can be fed to cattle and buffaloes during scarcity period. A number of methods have been evolved for improving the nutritive value of sugarcane bagasse. Urea when used for treatment of bagasse enhances its nutritional quality however; its digestibility can be increased by steam treatment. Singh and Chandramoni (2010)

Bagasse is commonly used as a substitute for wood in many tropical and subtropical countries for the production of pulp, paper and board, such as India, China, Colombia, Iran, Thailand and Argentina. It produces pulp with physical properties that are well suited for generic printing and writing papers as well as tissue products but it is also widely used for boxes and newspaper production. Rainey (2009).

2 -10 Biological treatments:

Biological treatments of some agricultural by-products become essential in order to degrade lignocelluloses materials and improve its crude protein content. It is well known that some micro-organisms, including cellulose enzymes from anaerobic bacteria and white rot fungi (Pleurotus ostreatus) can degrade lignin in the cell walls, while numerous attempts have been made to improve digestibility of plant residues. Abdel-Aziz and Ismail(2001).

2-11 Chemical treatments:

Efforts have been made in order to improve the nutritive value of straw, stalks or other crop residues by chemical and other treatments. It has been stated that , the chemical composition of roughages may be improved variably by the chemical treatment depending on the type of chemical , concentration , duration of treatment, volume of used water and temperature under treatment, rather than the nature of the roughage itself. Abou-Hussein ***et al***., (1982).

Chemical treatment increases the potential feeding value of crop residues. Alkali treatment of fibrous residues has been well researched and the possibility of using urea as a source of ammonia led to the expectations of rapid adoption of the technology in developing countries. However, for various reasons this has not been realized. Owen and Jayasuriya (1989).

CHAPTER THREE

MATERIAL AND METHOLD

3-1-1 Study Area:

This experiment was conducted in the department of Animal Production college of agricultural studies Sudan University of Science and Technology (Shambat) which is located between latitudes150 40′ N. ,320 32′ E , elevation 380m. Climate is semi desert with a low percentage of humidity and average rain-fall with annual rate of 158mm and a mean temperature of (20.3 C° -36.1 C°) and clay soil Celtic with semi-desert region (PH7.5-8.7). Abdelhafeez (2001).

3-1-2 Sample collection:

Bagasse was collected by hands in bags from to the dairy farm of department of animal production which was brought from to the aligned sugar company (Sudan sugar company).

3-1- 3 Material of experiment:

The material of this experiment includes raw bagasses. And other which as Water, urea, molasses, plastic bags, electronic balance, bottle to dissolved urea, ropes to lock the bags, gloves and masks. The following components, 600 gm molasses, 80 gm urea, and 200ml water mixed with raw bagasses.

3-1-4 Method:

The experiment was divided in to three transaction and three replicates from each treatment:

First one treatment (A) by added 200ml water to 2 kg raw bagasses mixed manually then put inside the plastic bags, pushed by hands, tide with ropes to prevent the air enter to the bags and put in the dry place (stage).

Second treatment (B) by added water and urea, dissolved 80g of urea in 200ml water to 2kg of the raw bagasses mixed manually then put inside the plastic bags, pressed by hands, tide with ropes to prevent the air entering, and put it in the dry place (stage).

Third treatment (C) by added water, urea, and molasses. Dissolved 80g of urea in 200ml water mixed with 600g molasses this quantity were distributed and mixed manually in 2kg of raw bagasses, then put it inside the plastic bags, pressed well, tide with ropes to prevent the air entering, and put it in place (stage).

3-1-5 Duration of experimental:

Nine bags were made and each was filled with treated bagasse compressed and tightly closed, bags were recognized and divided into three fermented periods of 14, 21 and 28 days with three replicates for each and stored. The chemical composition of the treatment was done in the laboratory of the faculty of animal production, university of Khartoum. Each treatment was executed in three replicates:

1. The first sample was taken after two weeks, three bags to the laboratory one from each treated (water, water + urea and water + urea + molasses).
2. The second sample was taken after three weeks three bags to the laboratory one from each treated (water, water + urea and water + urea + molasses).
3. The third sample was taken after four weeks three bags to the laboratory one from each treated (water, water + urea and water + urea + molasses).

The chemical composition and nutritive value were analyses in the laboratory of the faculty of animal production, university of Khartoum.

3-2-1 Chemical analysis:

Samples of raw and fermented bagasse were analyzed for proximate composition (DM, FAT, CP, CF, Ash, NFE, and ME) according to AOAC. (1999).

3-2-1-1Moisture (dry matter)

Sample is dried in an oven to obtain a constant weight. The loss in weight is the moisture. Moistures may be determined in two stages: drying at 60c which yields air dry sample and drying at105 overnight135c for 2h which yield a total dry sample.

Procedure

1- place marked dishes in an oven set at 135cfor 2h: cool in a dessicator (about 20 min)and record the weight (X 2-place about 2g of sample (in duplicate)in the dishes and record the weight of dish + sample (y)

2- Place the dishes containing samples in an over set at 135c for 2h. Remove and cool in a desiccator (about 20 min) and record the weight (z) .Calculate loss in wt as water.

Calculation the dry matter:

Calculate dry matter percentage as ((z-x)-(y-x)) x 100/wt of sample.

3-2-1-2 Fat:

In determining the lipids (ether extract) sample is placed in continuous extractor for about 16h and subjected to extraction using petroleum ether. Weigh increased is the lipid, which is expressed as percentage.

Determination of total volatile fatty acids by steam distillation is described. Distillate titrated against 0.05N NaOH**.**

Procedure:

1. Connect the distillation apparatus.
2. Heat the large flask containing distilled water and(KMno4)
3. Pipette 5ml of rumen fluid into the semi macro kjeldahl flask and add 30ml distilled water-followed by 10ml (MGSO4) and(H2SO4).
4. Open up the cooling system and distil by heating at the large flask (No2 above) and bottom of kjeldahl flask.
5. Collect 150ml of distillate in one flask and in another collect 150ml.
6. Place 1-2 drops of phenolphthalein indicator into the 2 flask and titrate using 0.05N NaOH solution.

Calculation of fat content:

Calculate Ether Extract percentage as (y-x) x 100/wt of dry matter.

3-2-1-3 Nitrogen and Crude protein:

Kjeldahl method is used to determine the total nitrogen content and then the crude protein by multiplying with a factor 6.25. The sample is digested in H_2SO_4 using $CuSo_4$ as a catalyst converting N to NH_3 which is distilled and titrated**.**

Procedure:

1. Weight about 1.2g of air dry sample into kjeldahl flasks.
2. Add about 5g (2spatula) of $cuso_4$ and wash down with some distilled water.
3. Carefully add 20ml of (H_2So_4).
4. Place the flasks on digestion racks heat. Swirl the flasks gently and continue heating ion about 2h.

5. Cool and cautiously add 20ml distilled water.
6. Place 25ml of boric acid into Erlenmeyer flask and add 3-4 drops of methyl red indicator.
7. Open the water tap to the cooling system and switch on the heaters of distillation apparatus.
8. Add 2-3 pieces of zinc mossy granules followed by 70ml of (naoh) into kjeldahl flask.
9. Immediately connect flask to distilled apparatus, mix completely and distilled for about 20 minutes or until you collect about 100ml distillate. The distillate tarns from red/pink to green.

Calculation of nitrogen (crude protein):

Calculate nitrogen percentage as titrate NH x acid factor x 0001.0 x100/wt of dry matter.

3-2-1-4 Fiber:

The total fiber in fibrous feed is determined using the neutral detergent procedure. The fiber includes cellulose, hemicelluloses and lignin as major component. Sample is boiled in fiber solution for 1h and later a shing at 550c**.**

Procedure:

1. Weight 1-2g air dry sample (duplicate) ground to pass though a 1mm mesh into a600ml refluxing beakers.
2. Add70ml neutral detergent fiber and place the beaker on hot refluxing apparatus and put the condenser in place.
3. Heat to boiling (5-10min)and adjust onset of boiling to about 60c and reflux ion 1h from onset of boiling.
4. Place previously tarred crucibles (x) on the filtering apparatus.
5. Swirl beakers to suspend the solids and fill the crucibles. Filter using a low vacuums initially and increases when necessary.

6. Rinse sample in the beaker into the crucible with minimum hot water (100c), and filter again. Repeat it twice with acetone.
7. Dry the crucible at 135c for 2h. Cool in Dessicator and weight (y).
8. Ash the residue in the crucible for 3h at 550c and weight (z).

Calculation of fiber content:

Calculate NDF percentage as (y-z) x 100/wt of sample.

3-2-1-5 Ash:

Burning sample in a muffle furnace set at 550c gives a total mineral content. As a result the organic constituent such as protein carbohydrate and lipids disappear**.**

Procedure:

1. Place marked porcelain crucibles in an oven set at 135c for 2h.Cool in a dissecator and record the weight (x).
2. Place about 2g of the sample (in duplicate) in to the crucible and record the weight of crucible and sample (y).
3. Place the crucible with samples into a muffle furnace set at 550c for 3h.
4. Set the furnace temperature to 135c and let the crucible cool in this temperature ,then transfer to Desiccators and cool.
5. Weight the crucible immediately and record the weight (z).

Calculate the ash content:

Calculate the Ash percentage as(y-x)-(z-x) x 100/wt of sample.

3-2-1-6 ME:

The estimate of the metabolizable energy (MJ/Kg) and organic matter digestibility dry roughage feed from the following equations Menke and Steingass, (1988) :

Calculation of the metabolizable energy as

ME (MJ/Kg DM) =14.78 - 0147 ADF

OMD (%) = 18.53 + 0.9239GP + 0.0540CP.

*Where:

GP = gas production (ml/200mg).

CP = crude protein.

ADF = Acid detergent fiber.

3-3-1 Statistical Analysis:

The data obtained from the experiment were subjected to analysis of variance using SPSS computer programmed (1984). Means were examined for significance by Duncan's multiple range tests(1955). (four different treatments of silage material A. B. C and D (control), replicates for each treatment with additives, to determined which treatment is different.

CHAPTER FOUR

RESULTS

The percentage of the dry matter in the control experiment was (89.86%).

The result in table (4-1) and figure (1) pointed that there were significant differences between treatments (A, B, C and control) ($P<0.05$) in the dry matter percentage. Except at the 4th week in treatment (A) and 2nd week in treatment (B). Which were the highest percentage of dry matter (92.83 and 92.54%) respectively and low percentage were (87.22%) at 2nd in treatment (C).

Table 1: Dry matter (DM%) of the raw bagasses:

Treatment	**Weeks**		
	2	**3**	**4**
Control	89.86^{d}		
A	85.83^{h}	88.33^{f}	92.83^{a}
B	92.54^{a}	90.29^{c}	90.95^{b}
C	87.22^{g}	88.39^{f}	89.00^{e}
$Lsd_{0.05}$	0.3513^{**}		
SE±	0.114		

A-Treatment for raw Bagasse and water **B**-Treatment for raw bagasse, water and Urea. **C**- Treatment for raw bagasse water, urea and Molasses.
Mean(s) sharing same superscript(s) are not differ significantly ($P>0.05$) according to DMRT.

The percentage of the fat in the control experiment was(2.57%).

The result in table (4-2) and figure (2) indicated that there were significant differences between treatments (A, B, C and control) ($P<0.05$) in the in the fat percentage, except between treatment (A) and (B) at 2nd week. Which were the highest percentage of fat (7.71%) at 4th week in treatment (C) and low percentage (1.43) in treatment (A) and (1.39%) in treatment (C) at 2nd week.

Table 2: Fat content (FAT%) of the raw bagasses:

Treatment	**Weeks**		
	2	**3**	**4**
Control	2.57^{f}		
A	1.43^{h}	3.89^{d}	$\mathbf{0.345^{i}}$
B	2.33^{g}	7.12^{b}	5.06^{c}
C	1.39^{h}	3.05^{e}	7.71^{a}
$Lsd_{0.05}$	0.2179^{*}		
SE±	0.07071		

A-Treatment for raw Bagasse and water **B**-Treatment for raw bagasse, water and Urea **C**- Treatment for raw bagasse water, urea and Molasses.
Mean(s) sharing same superscript(s) are not differ significantly ($P>0.05$) according to DMRT.

The percentage of the crude protein in the control experiment was (4.33%).

The result in table (4-3) and figure (3) showed that there were significant differences between treatments (A, B, C and control) ($P < 0.05$) in the crude protein percentage, except in control and treatment (A) at 2nd week, treatment (B) at 3rd week and 4th week and in treatment (B and C) at 2nd and 4th week. Which were highest percentage of crude protein (11.66%) at 3thd week in treatment (C) and low percentage of crude protein (4.53%) at 2nd week in treatment (A).

Table 3: Crude protein (CP%) of the raw bagasses:

Treatment	**Weeks**		
	2	**3**	**4**
Control	4.33^{f}		
A	4.53^{f}	5.16^{e}	5.36^{e}
B	10.27^{b}	8.95^{d}	8.78^{d}
C	9.53^{c}	11.66^{a}	10.51^{b}
$Lsd_{0.05}$	0.2578^{*}		
SE±	0.08367		

A-Treatment for raw Bagasse and water . **B**-Treatment for raw bagasse, water and Urea. **C**- Treatment for raw bagasse water, urea and Molasses.
Mean(s) sharing same superscript(s) are not differ significantly (P>0.05) according to DMRT.

The percentage of the crude fiber in the control experiment was (36.83%).

The result in table (4-4) and figure (4) showed that there were significant differences between treatments (A, B, C and control) ($P < 0.05$) in the crude fiber percentage. Which were highest percentage of crude fiber (63.46%) at 2^{nd} in treatment (A) and low percentage of crude fiber (34.13%) at 3rd week in treatment (C).

Table 4: Crude fiber (CF%) of the raw bagasses:

Treatment	**Weeks**		
	2	**3**	**4**
Control	36.83^{i}		
A	63.46^{a}	49.31^{e}	48.79^{f}
B	60.64^{b}	42.86^{h}	51.65^{c}
C	51.32^{d}	34.13^{j}	44.92^{g}
$Lsd_{0.05}$	0.0689^{**}		
SE±	0.02236		

A-Treatment for raw Bagasse and water. **B**-Treatment for raw bagasse, water and Urea. **C**- Treatment for raw bagasse water, urea and Molasses.

Mean(s) sharing same superscript(s) are not differ significantly (P>0.05) according to DMRT.

The percentage of Ash content in control experiment was (10.29%).

The result in table (4-5) and figure (5) pointed that there were significant differences between treatments (A, B, C and control) ($P<0.05$) in the percentage of the ash content, except between treatments (A and B) at 2nd and 4th week. Which were highest percentage of ash content (6.32%) at 3th week in treatment (C) and low percentage of ash (2.57%) at 2nd week in treatment (B).

Table 5: Ash content (%) of the raw bagasses:

Treatment	**Weeks**		
	2	**3**	**4**
Control	10.29^{a}		
A	3.89^{f}	3.22^{h}	3.98^{e}
B	2.57^{i}	3.64^{g}	3.85^{f}
C	4.64^{d}	6.32^{b}	5.53^{c}
$Lsd_{0.05}$	0.0689^{**}		
SE±	0.02236		

A-Treatment for raw Bagasse and water **B**-Treatment for raw bagasse, water and, urea **C**- Treatment for raw bagasse water, urea and Molasses.

Mean(s) sharing same superscript(s) are not differ significantly ($P>0.05$) according to DMRT.

The percentage of nitrogen free extract in control experiment was (36.19 %). The result in table (4-6) and figure (6) pointed that there were significantly different between percentage of nitrogen free extract content in treatment (A,B,C and control),($P<0.05$) except in 2nd week and 4th week in treatment (C) .And show the highest percentage of nitrogen free extract in 4th weeks at treatment (A).

Table 6: Nitrogen free extract (NFE %) of the raw bagasses:

Treatment	Weeks		
	2	**3**	**4**
Control	36.19^{a}		
A	12.53^{i}	26.78^{e}	34.37^{b}
B	16.72^{h}	27.72^{d}	21.61^{f}
C	20.35^{g}	33.23^{c}	20.34^{g}
$Lsd_{0.05}$	0.5806^{**}		
SE±	0.1884		

A-Treatment for raw Bagasse and water **B**-Treatment for raw bagasse, water and, urea **C**- Treatment for raw bagasse water, urea and Molasses.
Mean(s) sharing same superscript(s) are not differ significantly ($P>0.05$) according to DMRT.

The content of metabolic energy in the control experiment was (8.18%).

The result in table (4-7) and figure (7) pointed that there were significant differences between treatments (A,B,C and control) ($P<0.05$) in the metabolic energy, except in treatments (A) at 3rd and 4th week, in treatment(C) at 3rd and 4th week and between control and treatment (B) at 4th week. Which were highest (kcal/kg) of metabolic energy (9.30%) at 3rd week in treatment (B).

Table 7: Metabolic energy (MEkcal/kg) of the raw bagasses:

Treatment	**Weeks**		
	2	**3**	**4**
Control	8.18^{c}		
A	5.91^{g}	8.04^{d}	8.00^{d}
B	7.33^{e}	9.30^{a}	8.23^{c}
C	7.01^{f}	8.70^{b}	8.74^{b}
Lsd$_{0.05}$	0.0689**		
SE±	0.02236		

A-Treatment for raw Bagasse and water **B**-Treatment for raw bagasse, water and, urea **C**- Treatment for raw bagasse water, urea and Molasses.
Mean(s) sharing same superscript(s) are not differ significantly ($P>0.05$) according to DMRT.

CHAPTER FIVE

5-1 Discussion:

The chemical composition of the raw and treated sugar-cane bagasse indicated that water, urea and molasses treatment improved all the parameters studied.

The dry matter increased from (89.86%) to (92.83 %) in treatment (A) at 4th week these result in agree with kahan ***et al***(1992) who found that the dry matter increased from (47.4 to 54.4%) when treated bagasse by urea in the plastic bags. Also in agree with Turner ***et al*** (1988) who found that treated bagasse by 0.75% NH_4oH increased the dry matter. This increase of dry matter may be due to increase in the crude protein. Except in treatment (A) at 2nd week these result in agree with Wilkinson(1984). Who pointed that the dry matter decreased from (57%) to (54%) when added 3% urea in roughage these decrease my due to increased the moisture. The dry matter increase in the treated bagasse by water, urea and molasses (87.22,88.39 and 89.00%) at 2nd, 3rd, and 4th week respectively these result in agreement with Nour Eldin ***et al*** (1991) who showed that the dry matter increased from (79.4 to 83.6 and 89.4%).

Fat percentage was(2.57%) in untreated sugarcane bagasse in agree with Bassuny ***et al*** (2003) and Fouda (2008) who found that the chemical composition of sugarcane bagasses was (2.18%).

The increased in crude protein from (4.33%) to (10.51%) in treatment bagasse by urea and molasses at 4th week these result were in agree with Pereira ***et al***,(1992) who found that the crude protein increased in the treated maize by urea from (4.36%) to (10.57%), and the treatment of raw bagasses by urea and molasses increased the crude protein from 2.59 to 8.76%. The crude protein increased in treated raw bagasses by water, urea and molasses from (4.33%) to (11.66%) at 2nd week. these result was the same result showed by Mohamed (1998), Shoukry ***et al,*** (1992**)** and Abd El-Baki ***et al*.,** (1984) those obtained that The crude protein content was really increased by urea treatment because urea is a good source of nitrogen. Improvement of chemical composition of sugarcane bagasse by 2% urea at 40% water level 4th week increase percentage of crude protein from (4.33% to 10.51%) this was in agree with (Ebrahimi ***et. al***.2009).how reported that the chemical composition of treated sugarcane bagasse by 5% urea at 40% moisture level for 4th week increase crude protein percentage from 2.17 to 14.35%.when it was storage for 2nd, 3rd and 4th week.

The crude protein content of treated raw sugarcane bagasse by water, urea and molasses were increased from(4.33%) to (10.51%) for the treatment at 28 days these result in agree with Mohammed ***et al*** (2013) who found that the treated sugarcane bagasses raised crude protein content from 2.18% of raw sugar-cane bagasse to10.40%for the ensiled for 28 days.

The crude fiber decreased from (36.83%) to (34.13%) in the treated bagasses by urea and molasses these in agree with Pereira ***et al***,(1992) who found that the crude fiber decreased in the maize from 43.19 to 38.25% and crude fiber of raw bagasses decreased from 15.9 to 9.84% in the treated bagasses by water, urea and molasses.

Crude fiber content of treated bagasse by urea at 3th and 4th weeks were (42.86) .(51.65) respectively the same result was obtained by Paturau, (1982) and Ahmed (2013), who pointed that the crude fiber of baggasse silage was (43% – 52%).

Crude fiber percentage were decreased in the treatment with urea (60.64%to42.86%) these result were in agree with (Abd El-Ghani ***et al***., 1999).who found that The crude fiber percentage decrease in treatment raw bagasses treated by urea.Also in agree with Hassoun ***et al***,(1995) who reported that the decrease the crude fiber from (30, 50%) to (22.5, 47.5%) in treated bagasse by 70,88,106 and 124gm/kg dry matter storage in the closed plastic bags in 24c at period 2-4-6-8 weeks after opening the bags.

In these study the nitrogen free extract decreases in treatments (A,B,C and control) these result in agree with Nuor and ElTorky (1987) who found that the nitrogen free extract decrease in ration content bagasse treated by urea due to increase in the crude protein.

The nitrogen free extract were decreased in all treatment (A,B,C) (12.35%,16,72% and 20,34) respectively from control(36.19%) these result were in agree with (Gado ***et al.,*** 2007). Zadrazil ***et al.*** (1995); Neclakantan and Singh (1998) and Rane and Singh (2001) who found that There were decreases in the nitrogen free extract percentage of treatments raw bagasse by water, urea and molasses from 42.24% in untreated to 42.10, 38.21 and 37.56% in chemical, treated bagasse.

The result showed that the significant difference ($p<0.05$) between treated and untreated ingredient in treatments (A,BC and control).

Result indicated that there was increase in the metabolic energy from (8.18kcal/kg) to (9.30 kcal/kg) at 2nd week in treatment B, in agree with Brigstock,(1994).who found the metabolic energy of bagasse was (11.2 MJ/kg) when treated bagasses by urea.

5-2 Conclusion:

The results indicated that the used water urea and molasses has made good quality of fermentation sugarcane bagasses.

The study also showed an increase in the crude protein percentage of the fermentation sugarcane bagasses and decrease losses of dry matter,{ so we can recommended that when using poor quality of raw bagasse}.

The study pointed that when used urea in treatment (B) at 2nd week was increased percentage of crude protein and decreased when used molasses urea in treatment (C) at the same weeks ,because urea is a good source of nitrogen and molasses is a good source of energy.

The result showed that the good incubation period for raw bagasses fermentation it is at 3rd week which result in a highest percentage of crude protein, ash, fat and lowest percentage of crude fiber and nitrogen free extract.

5-3 Recommendation:

- Based on the results of this study the improvement of the nutritive value of raw bagasses may be used as useful tool for utilization of agricultural by products and residues.
- Uses of improved and treated molasses decreased the cost of the animal diet.
- Further studies required for improvement and conservation of agricultural by products and residues.

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Appendix

Fig (1): Dry matter (%)

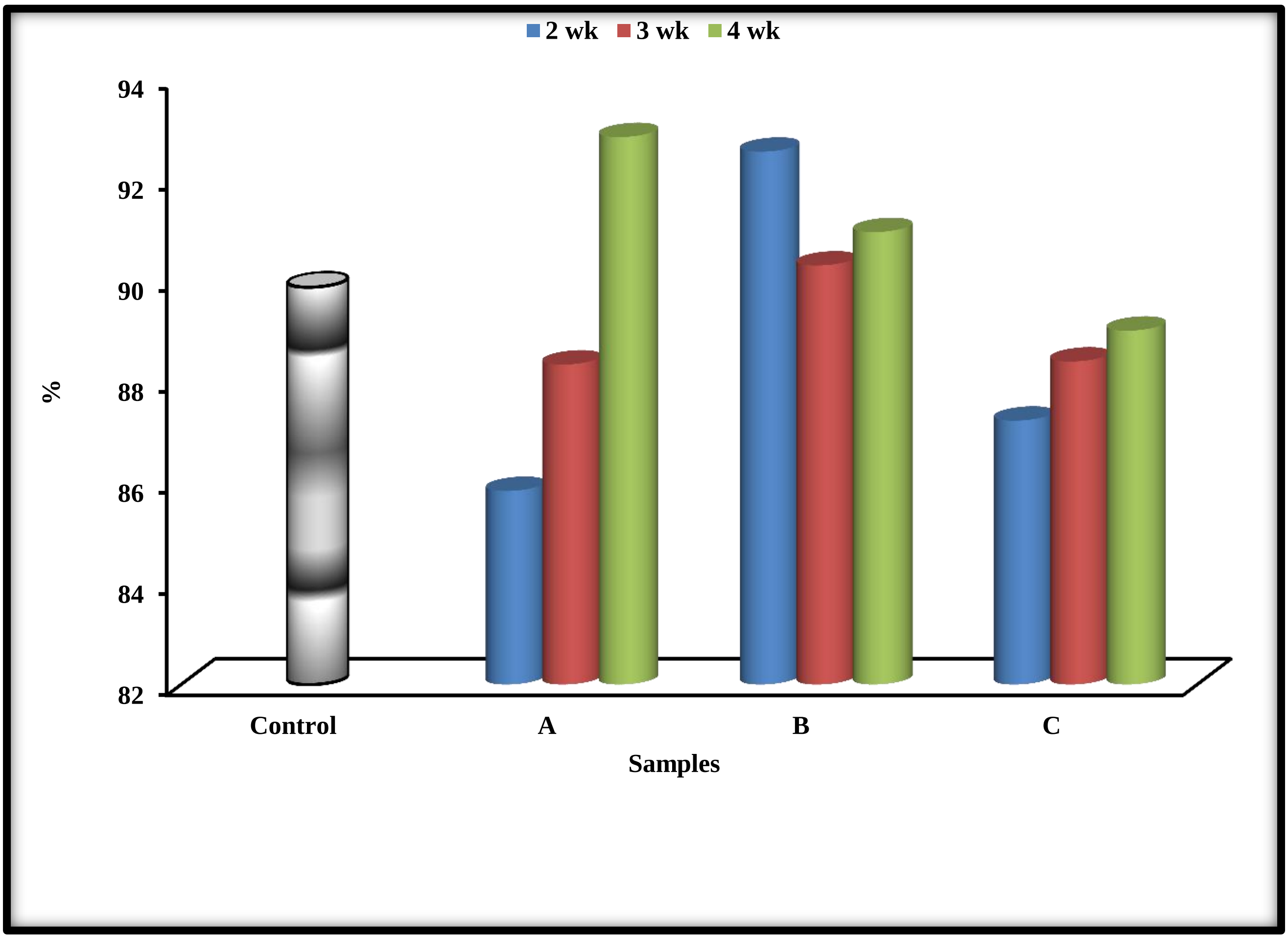

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Fig (2): Fat content (%)

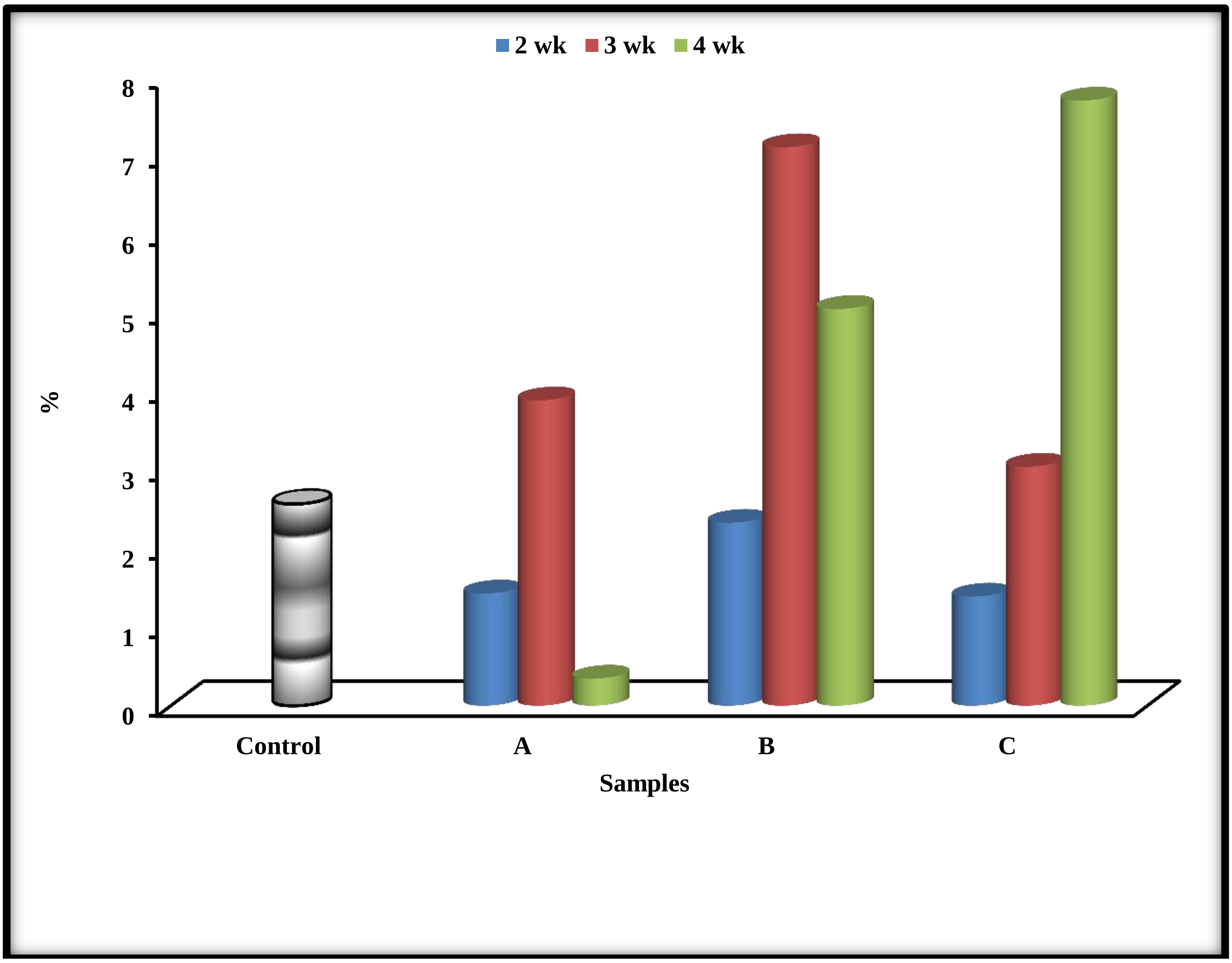

Fig (3): Crude protein (%)

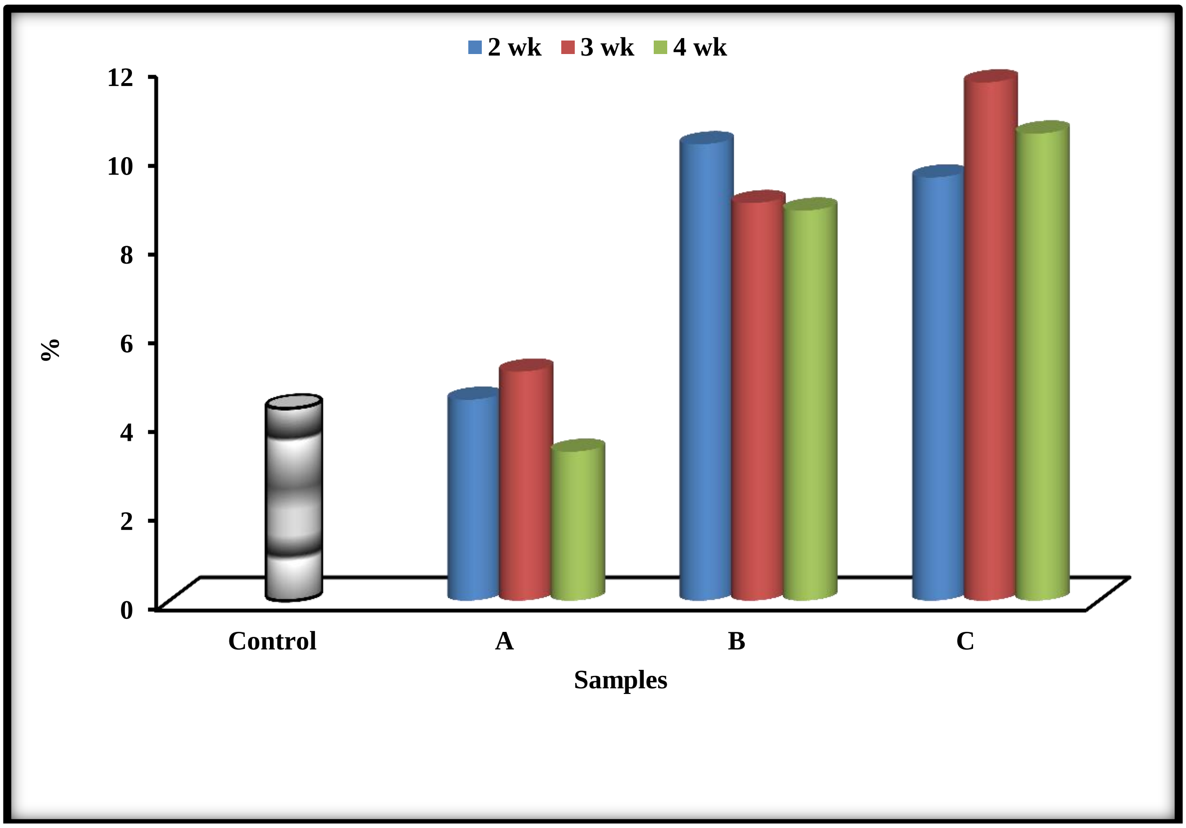

Fig (4): Crude fiber (%)

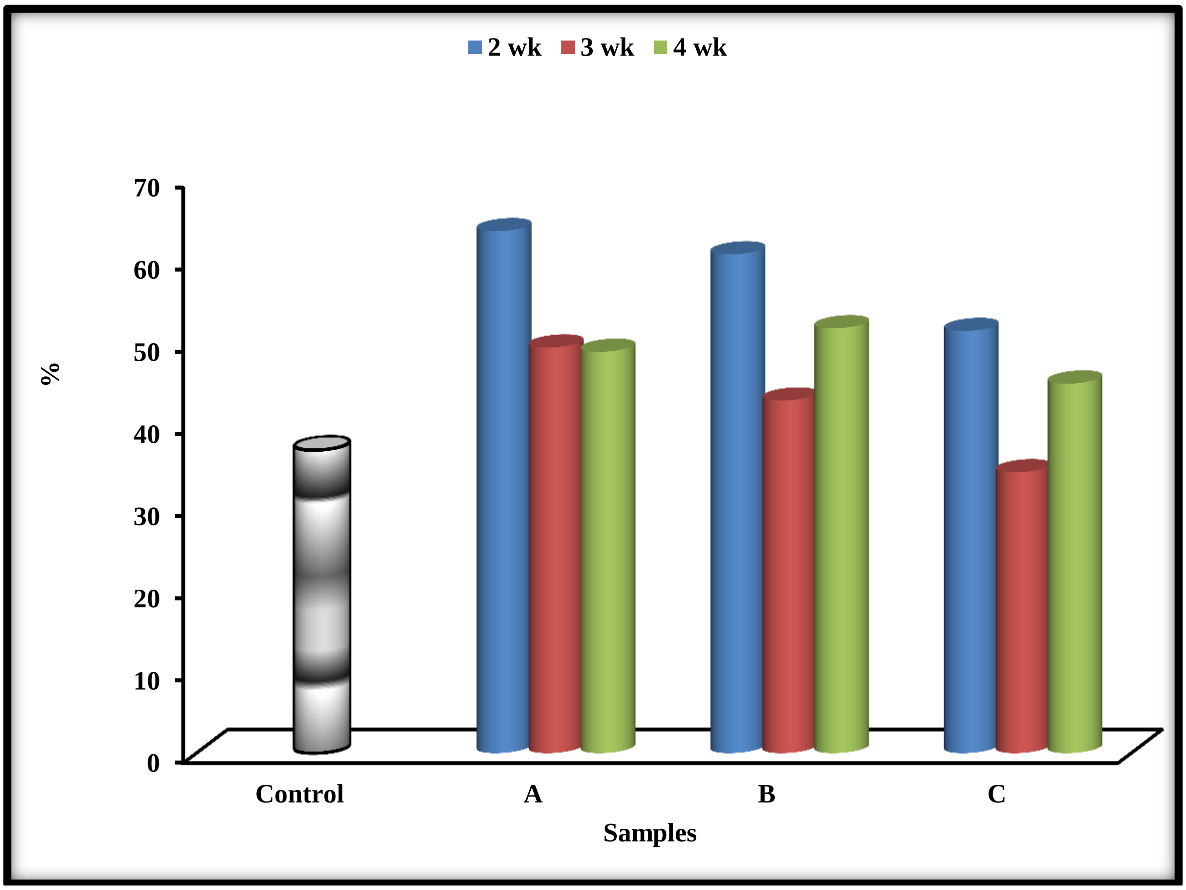

Fig (5): Ash content (%)

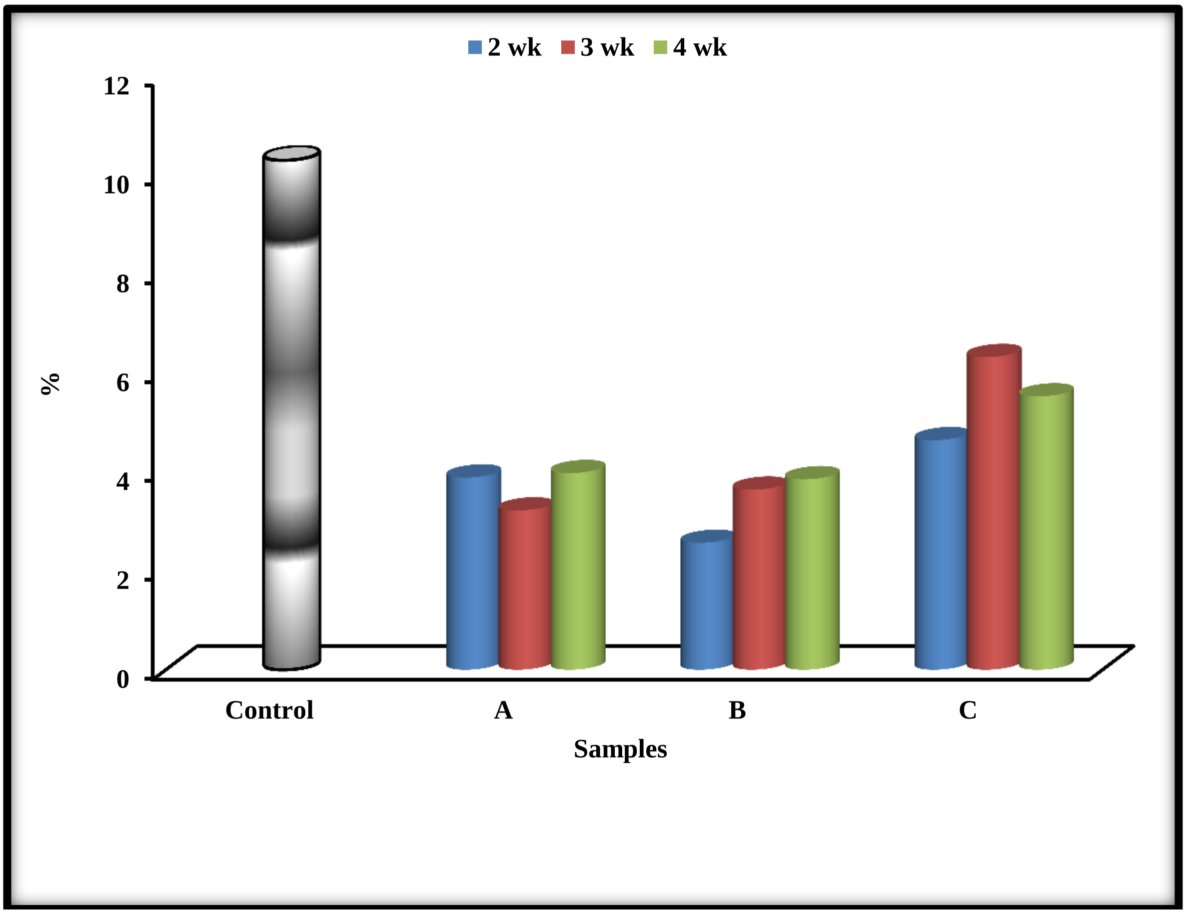

Fig (6): NFE (%)

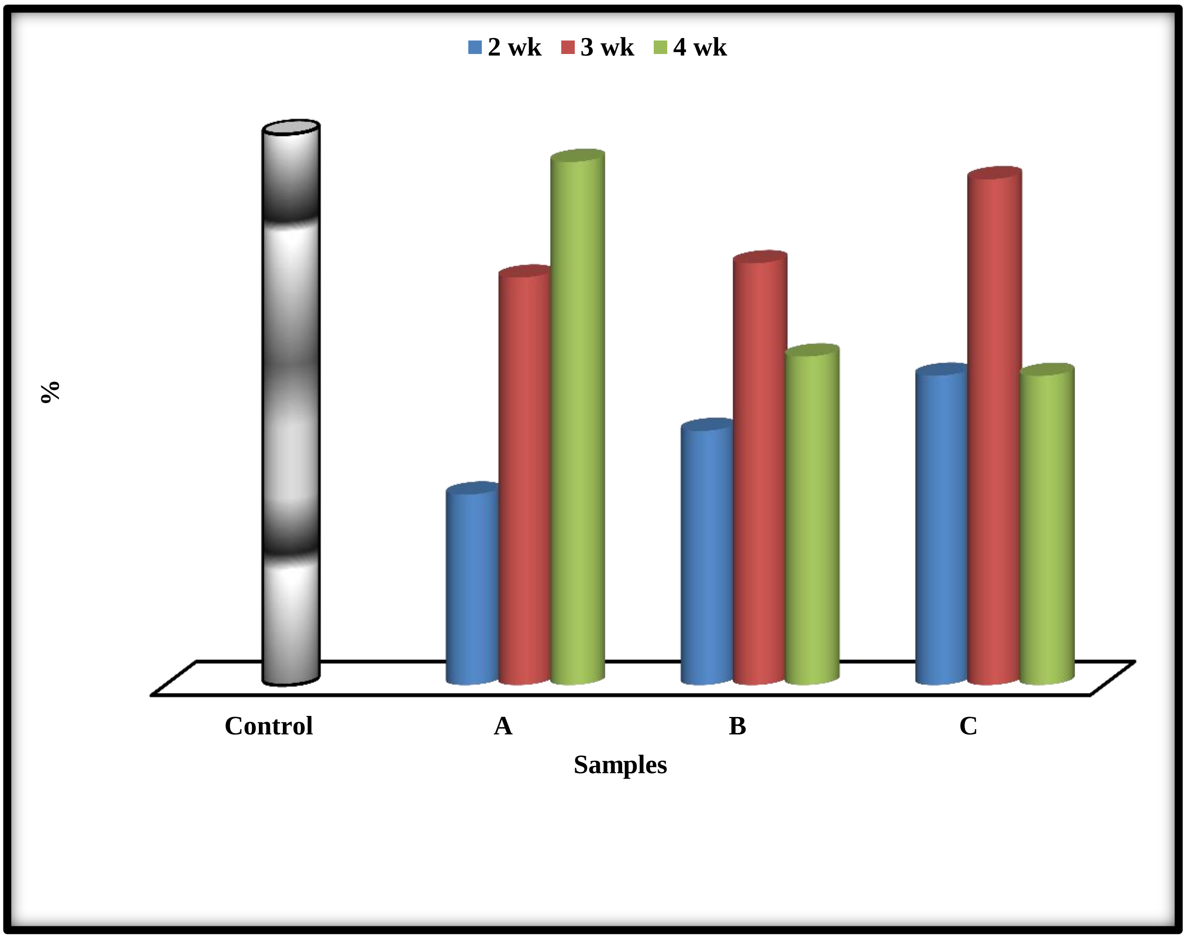

Fig (7): ME (kcal/kg)