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The effect of Conocarpus lancifolius silage on blood characteristics and mineral in the blood serum of calves and an economic return

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Abstract

The purpose of this study was to examine the effects of Conocarpus lancifolius silage on the mineral elements and blood features in calves' serum, as well as the financial benefits. The study included 12 Friesian calves purchased from the local markets of Dhi Qar/Shatrah Governorate at the age of 6-8 months, with an average weight of 109.33 kg. Calves were randomly divided into three treatments (4 calves per treatment). The treatments were the control (50% concentrate: 50% alfalfa hay), treatment two 50% concentrate: 25% alfalfa hay: 25% conocarpus silage, and the third treatment 50% concentrate:50% conocarpus silage. The feeding period was 105 days including 15 days of adaptation. The results showed that there were no significant differences in blood characteristics (RBC, PCV, and hemoglobin) in all conocarpus silage addition treatments compared to the control group. There were no significant differences in the average concentration of serum calcium and phosphorus among the experimental treatments. However, there were significant differences ($P \leq 0.05$) in the sodium concentration of the control and the third treatment (144.33, 139.68) mmol/L, respectively, compared with the second treatment, (136.00 mmol/L). The net profits from using conocarpus silage was 393, 533, and 593 thousand Iraqi dinars for the control and the addition of 25% and 50% of the silage, respectively. Adding silage led to an increase in profits equal to 1.5 times the profits generated from control with no negative impact on animal health.

Keywords: Conocarpus lancifolius Silage, Holstein calves, economic return, blood characteristics

Introduction

The importance of manufacturing feed materials increases day after day with the development of animal husbandry methods, increased production, and the growth of newborns (Mekoya et al., 2009). Attention is paid to preserving the nutritional value of feed materials during the management and manufacturing processes of mowing, collecting, transporting, pressing, drying, and storage. The silage process is the most important method of manufacturing and preserving feed materials without significant loss in their nutritional value. The manufacture of silage is also necessary in order to provide fodder at a time when fodder is not available, especially in the winter, and the basic nutritional elements in silage differ slightly from that of raw materials. Silage causes a decrease in the percentage of sugars that transformed into organic acids (lactic acid) and proteins into non-protein nitrogenous compounds (Carroll and Evers, 1998). Silage quality differ from the raw materials. Silage provides higher amounts of nutrients overall than hay. It can be added to hay rations in amounts ranging from 10% to 30%, particularly for dairy cows and goats. For low-quality diets, it can be utilized as food additives or only as fodder (Wambui et al., 2006). Silage humidity percentage ranges from about (55-75%). It ferments in isolation from the air and is made from green crops as whole plants or from the remains of field crops, and it is palatable by animals. It has a certain amount of lactic and acetic acids that are appetizing, which causes animals to get used to it (Ruiz, 1992). Conocarpus lancifolius is the most widespread park plant species in public parks and

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highways throughout Iraq. It can be used to feed animals and preserve it in the form of silage (Zaroug, 1985). Due to their high tolerance to salinity and moderate drought, Conocarpus trees and shrubs are widely used in landscaping and ornamentals, planted as an abundant pioneer tree in afforestation projects and green space programs in Iraq, the Gulf countries and throughout the Arabian Peninsula (Bhat et al., 2009). Plant residues from Conocarpus green spaces can be used as alternative feeds in livestock feeding systems as they are low cost (Razzaque et al., 2001). Studies have confirmed that Conocarpus is nontoxic and palatable to animals, and therefore it can be used in animal feed (Suleiman et al., 2005).The aim of this study was to investigate the effects of silage from Conocarpus lancifolius on blood characteristics and mineral elements in the serum of calves, as well as the financial benefits.

1. MATERIALS AND METHODS

This study was conducted in the animal field/Department of Animal Production/College of Agriculture/University of Basrah. The rearing period started from 15/ 11/2022 to 28/2/2023, lasted 105 days included 15 days for adaptation. Animals and feeding groups The study included 12 Friesian calves were purchased from the local markets in Dhi Qar/Shatrah, at the age of 6-8 months. They were distributed equally among three treatments. The calves were placed in cages of equal area, 12 x 3 m for each treatment, inside a semi-closed barn. The cages contained a longitudinal feeder and were provided with drinking water outlets. The calves were fed for 15 days on the basic ration as an introductory period for the purpose of adaptation. Then the calves were weighed using an electronic scale, and this was considered the initial weight. (109.33 kg). Calves were randomly divided into three treatments (4 calves per treatment). The treatments were the control (50% concentrate: 50% alfalfa hay), treatment two 50% concentrate: 25% alfalfa hay: 25% conocarpus silage, and the third treatment 50% concentrate:50% conocarpus silage. Blood parameters Before meals in the morning, blood samples were drawn by 10 ml syringe from the jugular vein at the start and finish of the study using a sterile plastic tube that contained gel to separate the serum. A sample was placed in a test tube free of anticoagulant (heparin) to allow the blood to coagulate (a gel container) to facilitate the isolation of the blood serum after leaving the tubes slightly tilted in the refrigerator at 4°C for 24 hours. Then isolate the blood serum the next day by placing the tubes in a centrifuge at a speed of 5000 rpm for 5 minutes. The serum was separated using a clean medical syringe, placed in sterile tubes, and kept in the freezer at a temperature of (-20°C) until the biochemical components of the blood serum were estimated. Mineral elements in the blood serum were measured using a spectrophotometer using a ready-made analysis kit produced by the French company Biolabo, and following the steps indicated by the company. Before meals in the morning, blood samples were drawn by 10 ml syringe from the jugular vein at the start and finish of the study using a sterile plastic tube that contained gel to separate the serum. A sample was placed in a test tube free of anticoagulant (heparin) to allow the blood to coagulate (a gel container) to facilitate the isolation of the blood serum after leaving the tubes slightly tilted in the refrigerator at 4°C for 24 hours. Then isolate the blood serum the next day by placing the tubes in a centrifuge at a speed of 5000 rpm for 5 minutes. The serum was separated using a clean medical syringe, placed in sterile tubes, and kept in the freezer at a temperature of (-20°C) until the biochemical components of the blood serum were estimated. Mineral elements in the blood serum were measured using a spectrophotometer using a ready-made analysis kit produced by the French company Biolabo, and following the steps indicated by the company.

Statistical analysis

Data were analyzed by using statistical package SPSS (version26, 2019). The study was designed as complete randomized design (CRD) described as, $Yij = \mu + Ti + eij$, where Yij is the studied observation j in a treatment i, μ is the common mean, Ti is the effect of ith treatment and eij is the error effect associated with each observation.

II. Conclusion

When compared to conocarpus leaves, it was shown that the silage had higher percentages of crude protein and crude fiber. It was found that RBC, PCV and Hb were not significantly affected by the addition of conocarpus silage to the calves' diet. Although there are notable variations in the percentage of sodium in the blood serum of calves, there are no notable variations in the concentrations of the mineral components calcium and phosphorus. When the economic return was computed, the conocarpus silage was determined to have the lowest cost when compared to the control group.

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. III. Results and discussion

Table (1) shows the chemical analysis of conocarpus silage. The analysis included dry matter, ash, crude protein, crude fiber, and fat. There are no significant differences between conocarpus leaves and the silage in terms of dry matter, organic matter, fat, and ash, while an increase in the percentage of crude protein and crude fiber was observed in silage compared with conocarpus leaves.

Table (1). Chemical analysis of conocarpus silage (5) Item

Item	DM	OM	CP	CF	EE	NFE	Ash
Silage	86.11	83.15	11.12a	13.50a	5.50	53.03	16.85
Leaves	85.13	83.19	10.30b	9.65b	5.30	57.94	16.81

*DM: Dry Matter, OM: Organic Matter, CP: Crude Protein, CF: Crude Fiber, EE: Ether Extract, NFE: Nitrogen Free Extract (A.O.A.C, 2001). Means with different superscript differ significantly (P<0.05) for each parameter.

Blood parameter

Table (2) shows that there are no significant differences in the average red blood cells, the packed cell volume and hemoglobin between the experimental treatments which conocarpus silage was added at the following levels (, 0, 25, 50 %), respectively.

Table (2) Effect of adding different levels of conocarpus silage on the average RBC, PCV, and Hb for the different experimental diets ± standard deviation

Treatment	RBC	PCV	Hb
Control	7.03±0.56	44.80±2.05	14.93±0.68
25% silage	6.91±0.33	41.46±1.95	13.82±0.65
50% silage	7.29±0.70	43.74±0.42	14.58±0.14

- RBC: Red Blood Cell, PCV: Packed Cell Volume, Hb: Hemoglobin.

Blood biochemicals

Calcium, Phosphors and Sodium Table (3) shows that there are no significant differences in the average concentration of calcium and phosphorus in the blood between the experimental treatments. There were significant changes (P≤ 0.05) in the average concentration of sodium in the control treatment and the third treatment (144.33, 139.68) mmol/L, respectively, compared to the second treatment, 136.00 mmol/L. Sodium is the most important cation in the extracellular fluid, and is responsible for maintaining osmotic pressure. It works with chlorine (Cl), cooperating in water metabolism and regulating the acid-base balance in the organism in ruminants (Jazbec 1990). Much of the sodium that comes into the digestive system originates from saliva. The rumen can contain up to 50% of the total amount of sodium available to the organism. The body eliminates it with urine, feces, and milk (Underwood and Suttle, 2001). In cases of diarrhea, calves lose larger amounts of sodium. Maach et al., (1992) found a significantly lower concentration of sodium in the serum of calves with acute diarrhea (131.2 ± 7.2 mmol/L) compared to healthy calves of the same age (140.0 ± 9.9 mmol/L). In newborn calves after ingestion of colostrum. The sodium concentration increased due to absorption from colostrum (Steinhardt et al., 1993). But Maach et al., (1991) determined a higher concentration of Na before colostrum intake when it was (145.7 ± 3.7) mmol/L as after (137.8 ± 6.8 mmol/L). The sodium concentration did not change much in the first three months, it was about 145 mmol/L, and at the age of 6 months it was slightly lower, about 136.6 ± 5.1 mmol/L (Bouda and Jagoš, 1984). Reece (1980) found a higher concentration of Na in the serum of calves that received a milk replacer compared to calves that were fed milk. Table (3) Effect of adding different levels of conocarpus silage on the average concentration calcium, phosphorus, and sodium) in the blood serum of calves for the different experimental diets ± standard devition.

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Treatments	Ca (mg/100 ml)	P (mg/100ml)	Na (mmol/L)
Control	2.50±0.36	1.80±0.15	144.33±2.72 a
25% silage	2.44±0.03	1.79±0.08	136.00±1.47 b
50% silage	3.08±0.28	2.1±0.23	139.68±2.90 ab
P-value	NS	NS	0.05

* Different letters vertically mean there are significant differences at the P≤0.05 level. NS: Not Significant

Table (4) showed the costs and economic returns from using different percentages of Coronocarpus silage. The net profits from using conocarpus silage was 393, 533, and 593 thousand Iraqi dinars for the control and the addition of 25% and 50% of the silage, respectively. It is known that the highest economic cost in agricultural exploitation of livestock production projects is nutrition, as it constitutes about 80% of the total cost of the project (Mohammed and Saqb, 2017). It can judge an agricultural project from an investment perspective is by reducing the cost and giving the same economic return (FAO, 1985). One of the objectives of this experiment is to reduce the cost of feeding through the use of green fodder that reduces the cost and is available locally in proportions that ensure that there are no negative effects on the productive performance of animals and to compensate for the use of high-cost, imported concentrated feed, in addition to the fact that grains are one of the sources of nutrition. An estimation of the weight gain that occurred in the calves of the experimental diet by administering one diet with fixed proportions of concentrated feed and different proportions of roughage feed (Conocarpus silage) is based on the experiment's results as well as the type of feed paid to the animal.

Table (4) Economic cost of using conocarpus silage in calf feed

Cost	Control	25% silage	50% silage
Price of calves at the beginning of study	656.25	656.25	656.25
Cost of concentrate feed (ID)	10.057	8.61	9.435
Price of claves at the end (million)	1.238	1.277	1.400
Price of concentrate feed (1000)	113.146	117.900	141.52
Alfalfa price (1000)	75.431	39.300	0
Price of silage (1000)	0	3.930	9.435
Net profit (1000)	393.183	532.620	592.790
Price of 1 kg live meat (1000)	6.5	6.5	6.5

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