Effect of feeding Different levels of *Conocarpus lancifolius* Silage on body Dimensions and some blood Biochemical parameters of Holstein calves

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Abstract

The aim of this study was to investigate the effect of feeding different levels of *Conocarpus lancifolius* silage on body dimensions and blood biochemical parameters of calves. In this study, 12 Holstein calves, 6-8 months old, with an average weight of 109.33 kg were used. Calves were randomly divided into three treatments. The first treatment is control, in which calves were fed a diet consisted of 50% concentrate and 50% alfalfa hay. Calves in the second treatment were fed a diet consisted of 50% concentrate 25% alfalfa hay and 25% *Conocarpus* plant silage (CS). Calves in the third treatment were fed a diet consisted of 50% concentrate and 50% CS. The results showed that there were no significant differences in the body dimensions of calves including shoulder height, thigh height, chest circumference, and body length among treatments. There was a significant decrease ($P \leq 0.05$) in the concentration of serum cholesterol and urea nitrogen in the third treatment as compared with the other treatments. The results also showed a significant ($P \leq 0.05$) superiority in the concentration of serum glucose and triglycerides in the third treatment as compared with the other treatments. *Conocarpus* silage did not affect the concentrations of serum protein, albumin, globulin and liver enzymes.

Keywords: *Conocarpus lancifolius* Silage, Holstein calves, Body measurements, blood biochemical parameters

Introduction

The importance of forage manufacturing is increasing day by day with the development of animal husbandry systems and the increase in production and the growth of newborns. The ensiling is the most important method of preserving the green material and the making silage is necessary in order to provide forage at a time when fodder is not available, especially in the winter season. The nutrients in silage differ slightly as compared with those found in basic materials, as silage causes a decrease in the proportion of sugars that are converted into organic acids such as lactic acid and proteins that are degraded non-protein nitrogenous compounds (1, 8) . Silage in general contains larger quantities of nutrients compared to hay, and silage can be added in the range of 10-30% of the diet with hay, especially in the diets of dairy cows and goats, and it can be used as forage alone or as additives nutritional value of low-quality forages (19). In silage, the moisture levels typically range from 55-75%. It is produced from green crops, such as whole plants or the residuals of field crops, and stored anaerobically, because it contains some pleasant lactic and acetic acid, it is acceptable to animals if they become accustomed to it (16).

Conocarpus lancifolius is the most widely dominant species of park plant in public parks and highways throughout Iraq, it is a species of *Conocarpus* of the family *Combretaceae*. It can be used in animal feeding and preserved in the form of silage (20). Due to its high tolerance to salinity and moderate drought, *Conocarpus* trees and shrubs are widely used in landscaping and ornamentals, planted as an abundant main tree in afforestation projects and landscaping programs in Iraq, the Gulf countries and throughout the Arabian Peninsula (5). The *Conocarpus* tree is available all year round and more than 120 tons of residual by-products are produced daily in Kuwait at 2013 (3). Although a small proportion is fed to ruminants, it is usually burned (4, 9). Plant residues can be used in the green spaces of *Conocarpus* and as an alternative feed in livestock feeding systems as they are low cost (15). Studies have confirmed that *Conocarpus* is non-toxic, palatable by animals, and thus can be used in animal feed (18). The aim of this study was to investigate the effect of feeding different levels of *Conocarpus lancifolius* silage on body dimension and some biochemical blood parameters in Holstein calves.

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Materials and methods

Current study was carried out at the University of Basrah, College of Agriculture, Department of Animal Production, Animal Field from 15/11/2022 to 28/2/2023. The calves were reared for 105 days.

Animals, feed and treatments

Twelve Holstein calves with a mean live body weight (LBW) of 109.33 kg and 6-8 months age were allocated randomly to three treatments 4 animals each. The calves were placed in pens of equal size 12×3 m in a semi-closed barn. The pens contained a longitudinal feeder and were equipped with drinking water channels. The calves were exposed adapted for 15 days. The diets (concentrate and roughage) were offered at 3% of LBW in three equal meals (8:00 AM, 1:00 PM and 7:00 PM). The calves of the first treatment (control) were fed a diet consisted of 50% concentrate (Table 1) and 50% alfalfa hay. Calves in the second treatment were fed a diet consisted of 50% concentrate, 25% alfalfa hay, and 25% CS. Calves in the third treatment were fed a diet consisted of 50% concentrated and 50% CS. Wheat straw was offered to the calves *ad libitum* throughout the experiment.

Veterinary medical care continued throughout the study period, during which, the animals were dosed against intestinal and liver worms.

Table 1. Chemical compositions of the alfalfa hay, wheat straw, concentrate diet, and *Conocarpus* silage used in this study (% on DM basis)

Treatment	DM	OM	CP	CF	EE	NFE	Ash	ME ($MJ.kg^{-1}DM$)
First (control)	93.24	92.09	14.71	20.09	2.43	54.86	7.91	11.20
Second (25% CS)	91.99	89.56	13.39	15.39	3.49	57.29	10.44	11.47
Third (50% CS)	90.22	87.04	12.06	10.70	4.54	59.74	12.96	11.74
Concentrate diet	89.19	85.60	14.72	7.94	4.25	58.69	3.69	11.70
Alfalfa hay	91.11	93.25	16.40	32.28	1.28	34.40	6.75	8.79
Wheat straw	94.35	90.00	1.52	37.18	0.43	44.77	10.00	8.44
Conocarpus silage	86.11	83.15	11.12	13.50	5.50	53.03	16.85	11.14

First (control): 50% concentrate and 50% alfalfa hay; Second (25% CS): 50% concentrate, 25% alfalfa hay+25% *Conocarpus* silage; Third (50% CS): 50% concentrate and 50% *Conocarpus* silage;

DM: dry matter; OM: organic matter; CP: crude protein; CF: crude fiber; EE: ether extract; NFE: nitrogen free extract was analyzed according to AOAC (2).

ME ($MJ.kg^{-1}DM$): Metabolizable energy was calculated according to the equation of MAFF (11). ME ($MJ.kg^{-1}DM$) = 0.012×CP + 0.031×EE + 0.005×CF +0.014×NFE

Concentrate diet consist of 20% barley grain, 44% wheat bran, 24% corn grain, 10% soybean meal, 2% minerals and vitamins mixture.

Measurements of body dimensions

Body dimensions were measured using a tape measure. Animal body dimensions included shoulder height, thigh height, chest circumference, and body length. Measurements of body dimensions were performed monthly throughout the experimental period.

Blood biochemical tests

Blood samples were collected before feeding in the morning, from the jugular vein using a 10 ml syringe. Blood samples were collected in sterile plastic tubes containing gel in order to separate the serum. A sample was placed in a test tube free of anticoagulant (heparin) in order to allow the blood to coagulate and facilitate the isolation of serum after leaving the tubes in a slightly tilted position in the refrigerator at 4 °C for a period of 24 hours. The serum was isolated the next day by placing the tubes in a centrifuge at a speed 5000 $rpm.min^{-1}$ for 5 min. The serum was separated using a clean medical syringe and placed in sterile tubes and kept in the freezer at -20 °C until the determination of the biochemical components of the blood serum. Using a spectrophotometer, the concentration of total protein, albumin, glucose, cholesterol, urea nitrogen, triglycerides, and aspartate transaminase (AST) and alanine transaminase (ALT) were measured in serum using the ready-made analysis kit prepared by the French company (Biolabo) and following the steps indicated by the company. The globulin was calculated by subtracting albumin concentration from the total protein concentration (6).

Statistical analysis

The data were analyzed statistically using the statistical program (17) using Completely Randomized Design (CRD) on basis of the following model:

$Y_{ij}=\mu+T_i+ e_{ij}$,

Y_{ij} represent an observation $_j$ in the i^{th} treatment for each trait, μ is overall mean, T_i is the effect of i^{th} treatment (i=3) and e_{ij} is the experimental error associated with j^{th} observation normally distributed with a mean of zero and variation of σ_e.

Results and discussion

Body dimensions

Table 2 shows that there were no significant differences in the average body dimensions in the first, second, and third months among the experimental treatments to which *Conocarpus* silage was fed.

Table 2. Body dimensions of Holstein calves fed different levels of *Conocarpus* silage throughout the study (means ±SE)

Month	Item	Treatments			Significant
		First (Control)	Second (25% CS)	Third (50% CS)	
First month	Shoulder height (cm)	111.50±2.87	102.50±2.50	104.75±1.65	NS
	Thigh height (cm)	125.27±3.01	113.00±2.42	109.00±2.04	NS
	Chest circumference(cm)	135.00±2.04	123.00±3.08	124.75±4.79	NS
	Body length (cm)	135.00±5.05	134.75±5.47	136.75±3.75	NS
Second month	Shoulder height (cm)	118.50±3.66	104.50±2.18	108.00 ±1.96	NS
	Thigh height (cm)	129.00±2.35	115.00±2.00	114.25±1.32	NS
	Chest circumference(cm)	141.00±1.87	131.75±2.50	134.50±3.23	NS
	Body length (cm)	137.75±4.77	140.75±3.71	144.00±3.67	NS
Third	Shoulder height (cm)	120.50±4.01	115.25±2.06	116.00±2.27	NS

month	Thigh height (cm)	133.50±2.18	117.25±2.14	122.75±1.65	NS
	Chest circumference(cm)	145.25±2.66	142.00±2.58	143.25±2.29	NS
	Body length (cm)	140.75±4.82	154.25±3.04	157.25±8.22	NS

First (control): 50% concentrate and 50% alfalfa hay; Second (25% CS): 50% concentrate, 25% alfalfa hay+25% *Conocarpus* silage; Third (50% CS): 50% concentrate and 50% *Conocarpus* silage; NS: Not Significant.

Biochemical parameters

In Table.3 the results showed that there were no significant differences in serum total protein, albumin and globulin concentrations in Holstein calves and the values are within normal range (13, 20) of healthy animal (5.5-7.5, 3.0-4.0. and 2.5-4.5 g.100 ml^{-1}, respectively). The obtained results in the current study are not consistent with those reported by Baroon and Razzaque (3) who offered silage to cows at levels 0, 20, 30, 40, 50 and 60% of the dry matter of diet.

Table 3. Effect of feeding different levels of *Conocarpus* silage on some blood biochemical parameters Holstein calves ± SE

Item	Treatments			Significant
	First (Control)	Second (25% CS)	Third (50% CS)	
Total protein (g.100 ml^{-1})	7.16 ±0.75	7.25 ± 0.49	7.75 ± 0.19	NS
Albumin (g.100 ml^{-1})	3.80±0.11	3.64± 0.05	3.62± 0.06	NS
Globulin (g.100 ml^{-1})	3.36± 0.70	3.61± 0.08	4.12± 0.20	NS
Triglycerides (mg.100ml^{-1})	93.68^{b} ±1.18	93.43^{b} ±2.65	102.75^{a}±1.03	P≤ 0.01
Cholesterol (mg.100ml^{-1})	200.00^{a}±4.08	190.68^{a}±3.09	167.00^{b}±10.98	P≤ 0.01
Urea nitrogen (mg.100ml-1)	43.00^{a}±0.70	37.00^{b}±1.41	37.68^{b}±0.47	P≤ 0.01
Glucose (mg.100 ml^{-1})	70.00^{b}±6.57	81.68^{ab} ±6.13	96.00^{a} ±1.63	P≤ 0.05
AST (IU. L^{-1})	39.88±10.90	51.00±10.82	53.00±10.22	NS
ALT (IU. L^{-1})	25.50± 0.87	25.75± 1.25	29.00±1.08	NS

[a,b] letters with different superscripts horizontally differ significantly at 0.05 level ; NS: Not Significant
First (control): 50% concentrate and 50% alfalfa hay; Second (25% CS): 50% concentrate, 25% alfalfa hay+25% *Conocarpus* silage; Third (50% CS): 50% concentrate and 50% *Conocarpus* silage; AST= Aspartate transaminase; ALT= Alanine transaminase

According to Table 3 there were significant differences (P≤ 0.01) among the treatments in which CS was introduced at different levels. Triglycerides concentrations were 93.68, 93.43, and 102.75 mg.100ml^{-1}, respectively, in the third treatment (CS 50%) higher (P≤ 0.05) than other treatments.

Results in Table 3 also showed significant decrease (P≤ 0.05) on cholesterol concentration. The cholesterol concentrations were 200.00, 190.68, and 167.00 mg.100 ml^{-1} when CS was introduced at 0, 25 and 50% levels, respectively. This may be due to the effective substances present; the most significant of these are saponins found in the *Conocarpus* plant, which function to bind and form complexes with cholesterol in order to stop its absorption (7).

Urea nitrogen concentrations were reduced (P≤ 0.05) in which CS were introduced at 25% and 50% as compared with control treatment. The presence of active compounds in the *Conocarpus* plant, such as tannins, is thought to be the cause of the decline in blood urea levels (14). These compounds work to inhibit protein breakdown in the rumen, which reduces the production of ammonia. As a result, there is a decrease in the amount of ammonia that can be absorbed into the bloodstream.

These results were comparable to those of Hoseini and Chaji (10), silage was introduced in the diet of cows at various levels of 0, 20, 30, 40, 50, and 60% on DM basis, noting that there were significant differences in the mean concentrations of triglycerides, cholesterol, and urea nitrogen at all levels of inclusion, with no decrease in the concentration of urea and cholesterol.

Table 3 demonstrated that there were significant differences ($P \leq 0.05$) in serum glucose concentrations among experimental treatments in which *Conocarpus* silage was added and the values were 70.00, 81.68, and 96.00 mg.100 ml^{-1} for 0, 25% and 50 % CS treatments respectively. This could be due to the increase *Conocarpus* silage in the diet led to increase in the concentration of volatile fatty acids, particularly propionic acid (2), which is converted into glycogen in the liver and is the cause of the rise in blood glucose levels in the treated animals. Finally, Table 3 demonstrates that there were no significant differences among the experimental diets containing 0, 25 or 50% of CS in the AST and ALT enzymes activity.

These findings were consistent with those reported by Mahrous *et al.* (12), who discovered that introducing *Conocarpus* silage at different levels in cow diets led to a significant rise in the glucose concentration at all level of inclusion.

Conclusion

Adding 50% *Conocarpus* silage to the ration produced the best effects in terms of higher glucose and triglyceride concentrations, decreased cholesterol and urea nitrogen concentrations, and no effect on total protein, albumin, globulin, and liver enzymes as when compared with the control group. The addition of *Conocarpus* silage had no effect on the animal's body dimensions.

Conflict of interest

The author has no conflict of interest.

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