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Impact of Dry, Soaking, or Germinated Fenugreek Seeds Addition on the Production and Reproductive Performance of Friesian Heifers

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Abstract

TWENTY Friesian heifers with average live body weight of 216 kg and aged 12 months were divided into four similar groups according to their live body weight and age. All heifers were fed the basal ration. Control group was received basal ration without any supplementation (R1), while, groups 2, 3 and 4 were fed the basal ration and supplemented with 50 g fenugreek seeds (FRS)/head/day used as dry (R2), soaked (R3) or germination (R4), respectively. Results showed that R4 significantly higher in all nutrients digestibility and feeding values followed by R3 then R2, whereas R1 had lowest values. The FRS supplements led to increase concentrations of blood globulin, urea and ALT whereas decreased concentration of cholesterol in R4 than in R1. The FRS supplement in R4 led to significant increase in ammonia-N, TVFA's and pH value, but R1 had lowest values. Growth performance in R3 showed significantly the highest final live body weight, average daily gain and the least amounts of DM, TDN and DCP required per kg live body weight gain followed by R4 then R2, whereas R1 had the poorest values. Feed cost per kg gain was decreased significantly with FRS additives compared with control R1. The price of weight gain, net revenue and economic efficiency were increased significantly with FRS than in control, which tested ration R3 had the higher values. Ration R4 showed significantly the shorter ages at first service and conceive service and parturition followed by R3 and R2, whereas R1 had the poorest ones.

Keywords: Heifers, Fenugreek seeds, Digestibility, Growth and Reproductive performance, Economic efficiency.

Introduction

Leguminous plants, like fenugreek, are abundant in saponins, which are present in both their leaves and seeds [1, 2]. As secondary plant metabolites (glycosides), saponins are known to have antimicrobial properties in the rumen. As a result, they alter rumen fermentation in a positive way, improving nutrient utilization as well as raising the quality of milk production [3].

The fenugreek seeds (FRS) is well known for their hypoglycemic, hypocholesterolemic, gestero, hepatoprotective, and antioxidant qualities. Additionally, concentration of total cholesterol, low-density lipoprotein cholesterol and triglycerides in serum all dramatically decreased. The sapogenins in fenugreek, which can promote biliary cholesterol extraction and therefore lower serum cholesterol levels, may be the cause of these effects [4]. Additionally, FRS is using to treat diabetes mellitus in various countries, including India [5].

In accordance to a recent analysis by Ahmed et al. [6], significant amounts of phospholipids, glycolipids, choline, oleic acid, linolenic acid, nicotinic acid, niacin, and several other beneficial substances are present in FRS chemically. Additionally, according to Naseri et al. [7], FRS contains 10 g/kg total phenol, 3.8 g/kg total tannin

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and 27.3 g/kg saponins. The beneficial impact of FS on improving lactation performance of sheep and dosages has been the subject of numerous researches [8, 9, 10]. But few research have been done to determine how FS affects growth performance [11, 12, [13], rumen fermentation and nutrient digestibility in lambs [14].

On the other hand, germination processes have been proven to generally improve the nutritive value of seeds [15] .Additionally, Chen et al. [16] found that seeds could germinate without sunshine or soil, and that sprouting time was short with great yield and quality. There is a wealth of information available now about the use of and impact of adding FRS that have germinated to .bovine diets to boost their producing efficiency

The purpose of this research is to examine the impact of adding dried, soaked or germinated FRS to rations on digestibility, rumen fractions, growth performance, feed and economic efficiency, economical evaluation and reproductive performance of growing Friesian heifers.

Material and Methods

Experimental animals and rations

Twenty Friesian heifers with an average live body weight of 216 kg and aged 12 months were separated into four comparable groups based on their body weight and age. All heifers were fed the basal ration to cover their recommended requirement according to NRC [17]. Basal ration consisted of 47% concentrate feed mixture (CFM), 21% corn silage (CS), 16% berseem hay (BH) and 16% rice straw (RS). Control group was received basal ration without supplementation (R1), while, groups. 2, 3 and 4 were fed the basal ration supplemented with 50 g FRS/head/day used as dry (R2), soaked (R3) or germination (R4), respectively. Fresh water was available at all day.

Digestibility trials

Using three animals from each group, four digestibility trials were carried out throughout the feeding experimental period to assess the nutrients digestibility and feeding values of the experimental rations using the acid insoluble ash (AIA) method as an internal Marker, as described by Van Keulen and Young [18]. According to AOAC [19], representative samples of the feed and faeces were chemically analyzed. Nutrient digestibility was calculated using the equations of Schneider and Flat [20]. Total digestible nutrients (TDN) and digestible crude protein (DCP) were calculated by standard formula of McDonald et al. [21].

Sampling of rumen liquor

Rumen liquor samples were collected from heifers using stomach tube and the automatic milking machine's draw pulse power three hours after the morning meal. Every sample was put through four layers of cheese cloth before being used to measure the rumen pH, which was done immediately using Orian 680 digital PH meter. Using the AOAC [19] method, saturated solution of magnesium oxide distillation was used to determine ammonia nitrogen (NH3-N). According to Warner [22], the total volatile fatty acids in rumen fluid were measured using the steam distillation method.

Blood samples

Blood samples were obtained from jugular vein of three heifers in each experimental group and centrifuged at 3000 rpm for 20 min to obtain blood serum. For upcoming analysis, the supernatant was frozen and kept at -20oC. Armstrong and Carr [23] and Doumas et al. [24] were used to quantify total protein and albumin, respectively, while discrepancies were used to determine globulins. According to Schirmeister [25], Fawcett and Scott [26], and Young [27], respectively, creatinine and urea levels were evaluated, and aspartate (AST) and alanine (ALT) amino transaminases activities were identified as indicators of liver function.

Reproductive performance traits

Friesian heifers in estrus state were detected by visually monitoring. Animals were first artificially inseminated when they reached 350 kg of live body weight at the first heat. Rectal palpation was commonly used to diagnose pregnancy 45 days after service. The heifers were inseminated once more if conception failed to occur if the animals were noticed to be in estrus. Reproductive performances of heifers were estimated as ages at first service, conceive service and parturition, service period and number of services per conception.

Feed conversion

Feed conversion was expressed as the amounts of DM, TDN and DCP required for producing 1kg live body weight gain for each heifer.

Economic efficiency

Economic parameters analysis were including feed cost, feed cost per kg weight gain, price of average daily gain, net revenue and economic efficiency according to prices of inputs and outputs of the production (year??).

Statistical analysis

Data were statistically analyzed using the SAS [28] one-way ANOVA general linear model approach. The level of significance between the means was also determined using the Duncan [29] test within the SAS programme.

Results and discussion

Chemical composition of feed ingredients

Chemical composition of feedstuffs showed that dry, soaked or germination FRS were nearly the same in their chemical composition except crude fiber (CF) was higher and NFE was lower in germination than those of dry or soaked FRS. Despite of that, the chemical composition of rations was nearly the same and not affected by FRS supplementation, which can be caused by the low level of supplemented FRS (Table 1). The resulted in the same line by Abou-Elenin et al. [30], who suggested that CF content of germination FRS was higher than the dry FRS, however, NFE content of germination FRS was lower than the dry FRS.

Nutrients digestibility and values of feeding

The nutrients digestibility and feeding values of the tested rations are listed in Table 2. Based on control ration (R1), ration (R4) that has been supplemented with germinated FRS revealed significantly higher in digestibility of all nutrients and also the feeding value as TDN and DCP. Similar trend was followed by the ration (R3) which supplemented with soaking FRS but the differences in some nutrients between R1 and R3 did not significant. Results of the digestibility coefficients showed that no any significant improvements respecting all nutrients digestibility, TDN and DCP values due to the dietary treatment (R2) that supplemented with DFS in comparison with control (R1) and in addition both treatments R1 and R2 have lower values.

These findings are supported by Balgees et al. [31], who discovered that the digestibility of DM, CP, and OM was considerably higher ($P<0.05$) for rations supplemented with 10 or 15% FRS than both the animals fed on only 5% and the control diet that was devoid of the supplement. Additionally, the current findings are consistent with those made by Abo El-Nor et al. [32], who discovered that the digestibility coefficients of lactating buffaloes feed containing various amounts of FRS had improved. Given that FRS contain saponins that may promote digestive effectiveness, the improvement in digestibility may be warranted. Additionally, FRS has been shown to enhance the amount of good bacteria in breastfeeding cows' rumens [33, 34]. By promoting bile acid synthesis in the liver, fenugreek also appears to aid in the digestion and absorption of lipids [35]. Additionally, Gad et al. [36] showed that sprouting fenugreek significantly reduced the amount of phytic acid and oxalate, which increased the nutritional value of flavor-deficient fenugreek [37]. It is suggested to take it as a food supplement since it is a good source of easily digested proteins rich in amino acids [38]. Phytic acid concentration decreased when seeds were sprouted for 2 and 4 days, respectively, by 23 and 47.7%, but inorganic phosphorus content increased [39]. According to Abou-Elenin et al. [30], utilizing germinated FRS with 30 g significantly (P 0.05) enhanced digestibility for all nutrients compared to the control and dry FRS groups. The feeding values (TDN, DCP, and DE) showed the similar trend.

Feed intake

The amount of DM intake by the various groups was quite similar (Table 3). While tested ration (R3) was found a significantly ($p<0.05$) the increase intake of TDN, but, the tested ration R4 had increase intake of DCP. But, tested rations in R2 and R1 had the lowest intake of both TDN and DCP. The improvement in TDN and DCP levels with the addition of soaked and germinated FRS may be the cause of these outcomes. The current study's findings are consistent with those made by Petit et al. [40] and Abo El-Nor et al. [32], who, discovered that breastfeeding buffaloes fed rations with various amounts of FRS led to consume more DM. Furthermore, Tomar et al. [41] discovered that the fenugreek seed boosts dairy cattle's feed intake, leading to a noticeably higher milk output. Additionally, Ismail [42] discovered that increasing the amount of FRS caused DM intake to steadily rise. More recently, Balgees et al. [31, 43] discovered that increasing the dose of FRS supplementation (5, 10 and 15%) raised dry matter intake by around 49.57, 55.65, and 58.56%, respectively. Additionally, Degirmencioglu et al. [44] showed that adding ground FRS to the ration of buffaloes caused an increase in lucerne DM and total DM consumption ($P<0.05$). Numerous researchers have generally acknowledged the beneficial impact of FS on DMI [40, 45, 32]. According to a later author, FRS may stimulate the hypothalamus gland, which in turn stimulates the brain's hunger centre and increases the desire to eat. Additionally, according to a different interpretation, the rise in DMI, TDNI, DCPI, and DEI observed in groups fed diets supplemented with varying amounts of FRS may be attributable, in part, to the saponins present in these seeds, which reflect on rising feed intake and are supported by the findings of Petit et al. [40], who also noted that the presence of steroidal saponin fraction in the FRS. As suggested by Borca et al. [46] and Kamel [47], FRS may potentially be responsible for the increase in feed consumption. Thirdly, while sprouting fenugreek reduced the amount of oxalic acid and total oxalates in the seeds, DFS had 0.82% total oxalate and 0.55% oxalic acid concentration. Oxalic acid and total oxalate levels were decreased during sprouting by a range of 12.0 to 15% and 13.5 to 17.1%, respectively [48]. As the amount of oxalate in the ration increased, feed intake seemed to decline [49]. Last but not least, Abou-Elenin et al. [S] discovered that employing germinated FRS with 30 g enhanced feed intake significantly ($P<0.05$) compared to the control and dry FRS groups.

Blood biochemical

Data of blood parameters in Table (4) showed that FRS supplementation led to increase the concentrations of globulin, urea and ALT, while the concentration of creatinine and cholesterol ($P<0.05$) were recorder the lowest values in R3 and R4, respectively. As well as, total protein, albumin and AST levels were nearly similar among all groups. These outcomes align with those attained by Abo-El-Nor [45] who there is no significant changes respecting plasma total protein, albumin and urea concentrations, also, GOT and GPT activity due to FRS supplementation. In opposite, according to Allam et al. [50], adding FRS had no discernible effects on the serum TP and albumin concentrations, although globulin levels were marginally higher ($P>0.05$) than the control group lacking the supplement Zaraibi. While, utilizing New-Zealand doe rabbits, Rashwan [51] discovered that supplementing with fenugreek reduced blood total protein while having no effect on serum creatinine. According to Tomar et al. [41], adding FRS did not significantly increase the blood total protein concentration ($p>0.05$). When heifers were fed dried, soaking, or germinated FRS as feed additives in their rations over an extended period of time, there generally weren't any negative effects on their health.

Activity of rumen fermentation

Data of rumen fermentation activity in Table (4) revealed that pH was significantly ($P<0.05$) higher in all groups supplemented with FRS than the control group, and their values were ranging at (6.00- 6.34), and seemingly are within the optimal range (pH 6.0 -7.0), in which the beneficial microbial population in the rumen could be working properly and synergistically [52]. Ruminal NH_3-N ranged from (19.31- 21.28 mg/dL), and their values were lower in animal fed the control and dry FRS diets. In opposite it was higher in germinated FRS ($P<0.05$), whereas soaked FRS not significant differ with the other groups. Wanapat et al. [53] reported that ruminal NH_3-N concentration increased linearly with increasing supplemental rumen degradable protein (RDP) levels. The increase of NH_3-N concentration in the present study might be due to the supplementations of both = soaked and germinated FS that probably having a high level of RDP, which therefore leads to a high ruminalNH_3-N. Likewise, this might be due to the diets which containing a high level of digestible crude protein sources where they were resulting in an increase in NH_3-N concentration in the ruminal environmental. These results are in agreement with those observed by Ngyuen et al. [54]. On the other hands, total VFA for supplemented rations was significantly increased with FRS either soaking or germinating. Also, in general the diets that characterized by higher digestibility showed higher values of VFA accordingly. This is presumably because VFA was the main end product rumen fermentation and also more VFA produced with the increasing, feed intake. These results are in agreement with the finding recorded by Ngyuen et al. [54] and Elmnan et al. [55] they found that the rations with higher nutrients digestibility (DM, CP) showed higher values of VFA.

Growth performance

Data of growth performance are presented in Table (5) revealed that R3 had recorded the highest final live body weight, total weight gain and average daily gain followed by R4 then R2, while R1 had the lowest values. This means that the soaking FRS had recorded the best growth performance of heifers following by germinating FRS in compared to dry FRS. Additionally, an increase in energy status and enough recovery time may be to blame for the increase in production [56]. Broilers fed diets supplemented with 1.0% FRS experienced improvements in live body weight and body weight gain [57]. This benefit may be attributable to the FRS ' presence of undiscovered fat-soluble components. Antibacterial, antifungal, anti-inflammatory, carminative, and antioxidant substances present in the mixture have boosted body gain [58]. The growth performance of Sasso broiler diet was increased by adding FRS powder (as natural feed additives) at level 1.0% [59].

Feed conversion

Results in Table (6) revealed that FRS supplements improved feed conversion ratio. Ration R3 had recorded significantly ($P<0.05$) the least amounts of DM, TDN and DCP required per one kg body weight gain followed by R4 and R2, while the control ration R1 had the highest ones. These results showed similar trend the daily gain, so the control ration was appeared the respecting poorest feed conversion among all experimental rations. These findings are in line with those published by Allam et al. [50], who found that adding dried FRS to rations boosted milk production efficiency by about 16% compared to the control group. Furthermore, Abdelhamid et al. [60] discovered that feed conversion improved as DMI and CPI/milk output increased to roughly 9.5 and 10%, respectively, in comparison to control. When employing various medicinal plants in small ruminant rations, Abdelhamid et al. [61] and Morteza et al. [62] also noticed a positive impact on feed conversion efficiency.

Economic efficiency

Economic efficiency presented in Table (6) showed that the daily feed cost was increased insignificantly with FRS additives with higher cost could be observed with the tested ration (R3). However, feed cost per kg of gain was decreased a significantly ($P<0.05$) for all tested rations in comparison with the control (R1). The tested ration having the soaked FS (R3) had performed the best. Whereas, weight gain revenue, net revenue and economic efficiency were a significantly ($P<0.05$) increased in all groups received the different forms of FRS compared with those of the control one, which R3 had recorded the highest and better values. These findings are in line with those distributed by Mirzaei [63], who claimed that using medicinal herbs could help farmers earn more money by having their animals produce more milk. Additionally, Abd El-Mola [64] discovered that the use of diets containing medicinal plants for breastfeeding animals might be cheaply and successfully done to increase economic efficiency.

Reproductive performance

Results of reproductive performance features in Table (7) showed that a significantly improvements with all kinds of bioprocessing FRS supplements based on those of control ration that free from these supplements. Obviously, ration R4 showed significantly ($P<0.05$) the least ages at first service, conceive service and parturition, service period and number of service per conception followed by R3 then R2, whereas R1 had the poorest ones. Generally, there were improvements in reproductive performance of heifers fed rations supplemented with FRS. These findings agree with those presented by Thomes and Williams [65], who suggested that FRS (*Trigonella foneumgraecum* L.) may cause the pituitary gland to release gonadotrophines that inhibit progesterone secretion. This is consistent with findings made by Shesworth and Esdon, [66] and Blauwiekel and Kincaid, [67], who discovered that dietary protein can change the progesterone and LH secretion in cattle. According to Bocquier et al. [56], the ovulation period in ewes was more closely associated to changes in body weight.

TABLE 1. Chemical makeup of the feedstuffs and diets that were tested.

Item	Dry mater %	Chemical composition % , on DM basis					
		Organic mater	Crude portion	Eesr extract	Crude fiber	NFE	Ash
Feedstuffs							
CFM	92.61	90.79	16.81	3.51	12.39	58.09	9.21
BH	90.52	88.15	14.19	2.41	27.81	43.74	11.85
CS	33.51	90.90	9.63	2.58	16.91	61.78	9.10
RS	90.60	85.83	3.25	1.41	36.21	44.96	14.17
DFS	92.10	96.49	22.32	8.11	7.78	58.28	3.51
SFS	86.04	96.50	22.80	8.60	7.95	57.15	3.50
GFS	85.79	96.63	23.11	8.95	10.12	54.45	3.37
Rations							
R1	67.50	89.46	12.94	2.79	20.17	53.56	10.54
R2	67.54	89.50	13.00	2.82	20.10	53.58	10.50
R3	67.60	89.50	13.00	2.82	20.10	53.58	10.50
R4	67.60	89.50	13.00	2.83	20.11	53.56	10.50

DFS: dry FRS, SFFS: soaked FRS, GFS: germination FRS.

TABLE 2. Nutrients digestibility and feeding values of experimental rations.

Item	R1	R2	R3	R4
% Digestibility				
DM	61^{c}.69.11±	09b^{c}.69.75±	72.10±1.0^{b}	75.61±0.7^{a}
OM	70.94±0.69^{b}	71.34±1.47^{b}	73.44±1.27^{ab}	76.89±0.59^{a}
CP	72.92±0.54^{c}	74.48±0.34^{bc}	76.87±0.54^{b}	80.41±1.45^{a}
EE	78.13±1.48^{b}	81.19±0.86^{b}	84.85±0.37^{a}	85.88±0.94^{a}
CF	66.24±0.51^{c}	66.62±0.78^{c}	70.85±1.19^{b}	75.00±0.58^{a}
NFE	71.43±0.62^{b}	71.73±0.51^{b}	72.96±0.98^{b}	76.20±0.77^{a}
Feeding values				
TDN	66.45±0.58^{c}	66.68±1.19^{c}	68.71±0.58^{b}	71.82±0.52^{a}
DCP	9.44±0.02^{b}	9.68±0.12^{b}	9.99±0.46^{ab}	10.45±0.10^{a}

The values of a, b and c in the same raw but with distinct superscripts differ significantly ($P<0.05$). R1: control, R2: dry FRS, R3: soaked FRS, R4: germinated FRS.

TABLE 3. Feed intake of Friesian heifers fed the excremental rations.

Item	R1	R2	R3	R4
As fed (kg/head/day)				
CFM	4.3	4.3	4.5	4.4
CS	5.2	5.4	5.5	5.4
BH	1.5	1.5	1.6	1.5
RS	1.5	1.5	1.6	1.5
DFS		0.050		
SFS			0.054	
GFS				0.054
Total	12.5	12.75	13.25	12.85
As DM (kg/head/day)				
DM	8.30±0.52^{b}	8.50±0.18^{ab}	8.80±0.17^{a}	8.60±0.36^{ab}
TDN	^{b} 5.51±0.25	5.67±0.19^{b}	6.05±0.1^{ab}	6.18±0.35^{a}
DCP	0.783±0.05^{b}	0.823±0.05^{ab}	0.879±0.04^{ab}	0.899±0.03^{a}

The values of a and b in the same raw but with distinct superscripts differ significantly (P<0.05). R1: control, R2: dry FRS, R3: soaked FRS, R4: germinated FRS. DFS: dry FRS, SFFS: soaked FRS, GFS: germination FRS.

TABLE 4. Some blood parameters and rumen fermentation activity of Friesian heifers fed the excremental rations

Items	R1	R2	R3	R4
Blood parameters				
Total protein (g/dL)	6.9±0.40	7.33±0.09	7.56±0.20	7.6±0.22
(Albumin (g/dL	3.15±0.10	3.37±0.07	3.38±0.09	3.27±0.18
(Globulin (g/dL	3.75±0.26^{b}	3.96±0.09^{ab}	4.18±0.08^{ab}	4.33±0.17^{a}
(Creatinine (mg/dL	1.30±0.18^{a}	1.12±0.027^{b}	1.00±0.019^{b}	1.06±0.05^{b}
Urea (mg/dL)	23±1.5^{b}	24±0.71^{b}	71^{ab}.26±	28±0.71^{a}
AST (U/L)	26±0.71	26.7±0.51	25.5±0.47	27±0.71
ALT (U/L)	13.3±0.58^{b}	14±0.71^{b}	17±0.28^{a}	17±0.84^{a}
Cholesterol(mg/dL)	77±0.71^{a}	75±0.71^{b}	^{b} 74.5±0.78	73.86±0.35^{b}
Rumen fermentation activity				
Ammonia-N mg/dL	19.31±0.41^{b}	19.46±1.36^{b}	20.37±0.65^{ab}	21.28±0.54^{a}
TVFA meq/dL	10.46±1.21^{b}	12.51±0.61^{ab}	12.91±0.15^{a}	12.93±0.39^{a}
PH	6.00±0.03^{b}	6.20±0.07^{a}	6.28±0.09^{a}	6.34±0.05^{a}

With various superscripts, the values of a and b in the same raw differ significantly (P< 0.05).
R1: control, R2: dry FRS, R3: soaked FRS, R4: germinated FRS.

TABLE 5. Growth performance of Friesian heifers in different treatment groups

Item	R1	R2	R3	R4
(Initial body weight (kg	217±0.94	215±o.35	216±1.17	215.5±0.22
Final body weight (kg)	418.75±0.75^{c}	437.5±1.85^{b}	462.5±2.24^{a}	451.25±0.89^{a}
(Total weight gain (kg	201.75±0.79^{d}	222.50±0.58^{c}	246.50±1.24^{a}	235.75±0.65^{b}
(Daily weight gain (kg/d	0.961±0.09^{d}	1.060±0.06^{c}	^{a} 1.174±0.03	1.123±0.02^{b}

The values of a, b and …, d in the same raw but with distinct superscripts differ significantly (P<0.05). R1: control, R2: dry FRS, R3: soaked FRS, R4: germinated FRS. Feeding trial period was 210 day.

TABLE 6. Feed conversion ratio and economic efficiency for different dietary treatments.

Item	R1	R2	R3	R4
Feed conversion				
Kg DM / Kg gain	8.64±0.11^{a}	8.02±0.08^{bc}	7.50±0.29^{c}	7.66±0.02^{b}
Kg TDN / Kg gain	5.73±0.21^{a}	5.35±0.06^{bc}	5.15±0.03^{c}	5.50±0.15^{b}
Kg DCP / Kg gain	0.815±0.02^{a}	0.776±0.02^{bc}	0.749±0.01^{c}	0.801±0.03^{b}
Economic efficiency				
Feed cost (L.E./day)	78.128±0.62	78.453±0.74	82.085±1.11	80.009±2.52
Feed cost (LE/kg gain)	81.30±3.0^{a}	74.009±1.60^{b}	69.92±1.51^{b}	71.25±1.11^{b}
Weight gain revenue ((LE/day	144.15±3.21^{d}	159.0±2.50^{c}	176.10±1.15^{a}	168.45±1.26^{b}
(Net revenue (LE/day	66.022±2.01^{c}	80.547±2.07^{b}	94.015±1.37^{a}	88.441±4.74^{a}
Economic efficiency	100±1.15^{d}	122.00±1.45^{c}	142.40±2.53^{a}	133.96±3.73^{b}

The values of a, b and …,d in the same raw but with distinct superscripts differ significantly (P<0.05). R1: control, R2: dry FRS, R3: soaked FRS, R4: germinated FRS. * The prices of 1 kg were 15.46 LE for CFM, 1 kg were 1.00 LE for CS, .0.80 LE for RS and, 25.00 LE for SFG, 150 LE for live body weight according to the prices of the second half of 2023

TABLE 7. Reproductive performance of Frisian heifers in different treatment groups

Item	R1	R2	R3	R4
Age at first service month	17.60±0.25^{a}	16.50±0.30^{b}	16.00±0.17^{b}	15.20±0.17^{c}
Age at conceive service month	19.40±0.07^{a}	18.27±0.33^{b}	17.5±010^{c}	16.43±0.08^{c}
Service period day	54±1.38^{a}	53.1±1.35 ^{a}	45±1.18^{b}	36.9±1.02^{c}
Number of service per conception	2.71±0.18^{a}	2.00±0.31^{b}	2.14±0.14^{ab}	1.86±0.14^{b}
Age at parturition month	28.63±0.05^{a}	27.47±0.41^{b}	25.67±0.14^{c}	24.63±0.12^{d}

The values of a, b and …,d in the same raw but with distinct superscripts differ significantly (P<0.05). R1: control, R2: dry FRS, R3: soaked FRS, R4: germinated FRS.

Conclusion

We conclude from these results that adding germinated fenugreek seeds at a rate of 50 g/head/day achieved the best results in digestion rates, blood measurements, rumen activity, and some reproductive traits in Friesian heifers. While adding soaked fenugreek seeds at a rate of 50 g/head/day achieved the best results in growth rate, feed conversion rate, and economic efficiency.

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Conflict of Interest

None

Author`s contributions

All authors contributed to the study's conception, and design. Data collection, examination and experimental study were performed by GSE, WAR, WEMF and MAA. All biochemical analysis and data analysis were performed by MAA, GSE and AEBG, SHS, WAR. WFMF and SHS drafted and corrected the manuscript; MAA and WAR revised the manuscript. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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تأثير إضافة بذور الحلبة الجافة أو المنقوعة أو المستنبتة على الاداء الإنتاجي والتناسلى لعجلات الفريزيان

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الخلاصة

تهدف استخدام فى هذه الدراسة عشرين عجلة فريزيان بمتوسط وزن حي ٦١٢ كجم وعمرها ٢١ شهرًا، قسمت الى أربعة مجموعات وفقًا لوزن الجسم والعمر. تمت تغذية جميع العجلات على العليقة الأساسية التي تتكون من 74% مخلوط علف مركز (MFC))، ١٢% سيلاج الذرة (SC)، ٦١% دريس برسيم (HB) و٦١% قش الأرز (SR)، على أساس المادة الجافة. المجموعة الاولي غذيت على العليقة أساسية بدون إضافة (1R)، في حين أن المجموعات الثانية والثالثة والرابعة تم تغذيتها علي العليقة الأساسية مع اضافة 05 جرام من بذور الحلبة (SRF) / رأس / يوم تستخدم جافة (2R) أو منقوعة (3R) أو مستنبتة (4R) على التوالي. أظهرت النتائج أن 4R أعلى معنوياً في جميع قيم الهضم والقيم الغذائية من NDT وPCD يليها 3R ثم 2R، في حين أظهرت مجموعة المقارنة (1R) أقل القيم. فيما يخص صفات الدم، ازداد تراكيز كل من الجلوبيولين واليوريا وTLA مع إضافة SRF، في حين انخفض تركيز الكولسترول مع وجود فرق معنوي فقط بين 4R و 1R. ارتفاع تركيز الأمونيا فى 4R مقارنة مع 1R, 2R بينما لم تختلف معنويا مع 3R. أدت اضافة SRF فى 4R إلى زيادة كبيرة في تركيز AFVT وقيمة الرقم الهيدروجيني، فى حين سجلت 1R أقل القيم. أوضحت نتائج أداء النمو أن 3R حققت أعلى وزن حي فى نهاية فترة التجربة والزيادة الكلية فى الوزن ومعدل النمو اليومى وأقل كميات من MD و NDT و PCD اللازمة لكل كجم زيادة في وزن الجسم الحي يليها 4R ثم 2R، بينما أظهرت 1R أقل القيم. انخفضت تكلفة العلف لكل كجم زيادة معنويا مع إضافات SRF مقارنة مع مجموعة الكنترول 1R ومقارنة مع مجموعة 3R كانت الأقل. ارتفع سعر الزيادة في الوزن والعائد الصافي والكفاءة الاقتصادية بشكل ملحوظ في 3R مقارنة بالكنترول. قصر الأعمار عند التلقيحة الأولى والتلقيحة الازمة للحمل والولادة وفترة التلقيح وانخفاض عدد التلقيحات اللازمة للحمل بشكل ملحوظ في 4R و3R ثم 2R مقارنة بـ 1R.

نستخلص من هذه النتائج أن اضافة بذور الحلبة المستنبتة بمعدل ٠٥ جم/رأس/يوم حققت أفضل النتائج المعدلات الهضم وقياسات الدم ونشاط الكرش وبعض الصفات التناسلية فى العجلات الفريزيان. بينما حققت اضافة بذور الحلبة المنقوعة بمعدل ٠٥ جم/رأس/يوم أفضل النتائج بمعدل النمو ومعدل التحويل الغذائي والكفاءة الاقتصادية.

الكلمات الدالة: الأبقار، بذور الحلبة، الهضم، النمو، الأداء التناسلي والكفاءة الاقتصادية.