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Effect of Feeding Hay Treated with Urea on The Reproductive Efficiency of Local Female Goats in The Northern Part of The Governorate

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Abstract. Nutritional deficiencies, particularly protein shortage, negatively affect reproductive performance and metabolic functions in ruminants. Urea-treated roughages are increasingly used as an economical non-protein nitrogen source to enhance feed quality and improve reproductive efficiency in goats. However, evidence on their physiological and reproductive effects in local goat breeds remains limited. Few studies have systematically evaluated how different urea concentrations in treated barley straw influence reproductive efficiency, metabolic biomarkers, hormone profiles, and offspring performance in female local goats. This study aimed to determine the effects of feeding barley straw treated with 1% and 3% urea on feed intake, reproductive efficiency, blood biochemical parameters, reproductive hormones, and offspring growth in local female goats. Twenty-one goats were divided into three equal groups (control, 1% urea, 3% urea). The 3% urea group showed the highest roughage intake and final body weight (55.28 kg). Fertility and reproductive efficiency varied among groups, with the 3% group achieving notable performance. Blood urea concentrations significantly increased in urea-treated groups ($P < 0.01$), while total protein, albumin, globulin, creatinine, estrogen, LH, and progesterone showed no significant differences ($P > 0.05$). AST increased and ALT decreased non-significantly. FSH levels increased significantly in urea-treated groups ($P < 0.05$). Offspring in the 3% urea group recorded the highest birth and weaning weights. This study provides one of the first detailed physiological and reproductive assessments of urea-treated barley straw in local Iraqi goats. Urea treatment at 1–3% can enhance feed quality and support reproductive and growth performance without adverse metabolic effects, offering a cost-effective feeding strategy for local goat production.

Highlights

1. Feeding goats with 3% urea-treated barley straw improved roughage intake, final body weight, and offspring birth and weaning weights.
2. Urea treatment significantly increased blood urea and FSH levels, while other biochemical and hormonal parameters remained within normal ranges.
3. Urea-treated straw enhanced reproductive efficiency without causing adverse metabolic effects, supporting its use as a cost-effective feeding strategy.

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Keywords: Urea-treated barley straw, Local goats, Reproductive efficiency, Blood biochemical parameters, Offspring growth

Introduction

A deficiency in essential nutrients, such as protein, is evident in both males and females. This leads to weight loss, vitamin D and A, as well as deficiencies in minerals like cobalt and phosphorus, and carbohydrates. In young animals, this results in decreased fertility and emaciation, leading to ovarian inactivity. In large animals, malnutrition directly affects reproductive functions. It causes cellular metabolism disorders in reproductive organs, leading to impaired function. Indirectly, this results in delayed estrus and delayed puberty. Consequently, it leads to a deficiency in the secretion of gonadotropins, which stimulate the reproductive glands, including LH and FSH (1,2). This results in decreased secretion of sex hormones and impaired growth of Graaf follicles. This leads to irregularity or estrus, and the occurrence of atresia (or cessation of ovulation). In males Whether it was the nutritional level of the animals and the increase in estrous cycles. This is called the mating season before the breeding season in females, and this leads to an increase in the fertility rate in these animals. It has been found that following this system leads to an improvement in reproductive performance for each animal, and it has been found that by pushing the feed (3).

On the contrary, grains contain large quantities of water, which is difficult to digest. Therefore, they are called feed materials, as they contain large quantities of easily digestible nutrients. Concentrated Goats and sheep depend on what they consume to obtain the elements they need. Cattle need protein for their various functions and to maintain their life (4,5). The animal's growth and production depend on its food, which is the determining factor for its growth and tissue formation. If its sources decrease, protein is used in the feed, as it provides amino acids. What is excess may be converted into fat. Due to the high cost of protein sources for animals and the high cost of ruminant protein feed, scientists are conducting research to provide additional protein sources. Some traditional feed sources are good for their nutritional value, and this is achieved by creating different types of feed (6). Traditional feed production relies on concentrated raw feed materials. Others are non-traditional. Both are rich in protein or energy. Raw feed is a homogeneous mixture of non-manufactured or traditional feed materials. Roughage is commonly used as a feed material after increasing its nutritional value by adding certain substances. Raw feed is also commonly used as a byproduct of factories, such as nitrogenous non-protein urea. Some nutritional additives, such as vitamins and minerals, may be added to it, along with some antioxidants and other preservatives (7). The term non-protein nitrogen (NPN) is used in the field of animal nutrition. It refers to a group of elements such as urea, biuret, and others. It can be

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converted into proteins by microbes, but it is not a protein. It is less expensive than the previous compounds compared to plant proteins, and its use in ruminant animals is economical. However, its excessive use in animal feed is economical. It may lead to a decrease in the growth rate of animals, as it is converted by microbes to ammonia (8-10). Non-protein nitrogen can also be used to increase the value of crude protein, which is measured industrially. It is used in protein manufacturing and then converted to ammonia. Non-protein nitrogen constitutes about 16% of the nitrogen content in protein, which is based on the nitrogen content of urea. For example, commercial or used urea contains about 47% nitrogen. Urea does not contain nitrogen from any source. Field fertilizers contain 45% nitrogen (11,12). Their use is concentrated on essential amino acids or even energy sources. The possibility of converting them into protein by bacteria present in the ruminant ruminant's rumen. The first experiments using non-nitrogenous protein compounds (NPN) in ruminant feed began (13-15).

Study Objective:

This study aims to investigate the effect of treating barley straw with urea at concentrations of 1% and 3% on the reproductive efficiency of local female goats by examining:

1- Fertility rate and birth rate.

2- Growth performance of offspring during lactation.

3- Some biochemical components and reproductive hormone components in the blood of the mothers.

Methodology

Place and Time of Experiment

This study was conducted in a specific area in the rural area of Al-Rifai city, from 12/20/2019 until 6/25/2020.

Experimental Animals 3-2

The experimental animals were placed in pens prepared two months prior to the start of the study. The animals were placed in pens with an average weight of 19 ± 7.3 kg. For the purpose of distinguishing between them, there were 7 females in each pen, with an average weight of 1.21 ± 2.4 kg. The animals were tagged with numbers using a special numbering machine. The animals were tagged in the ears using a special numbering machine. Tubs were prepared and treated with urea. Two large tubs were prepared and constructed using bricks. To prevent insects from entering the soil, small holes were lined with cement. After completion, cement Each basin

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is approximately 3 meters x 3 meters in length and width, and the straw is thoroughly submerged to prevent ventilation.

Each basin can hold approximately 500 kilograms of straw. 3-4% (3% and 1%) Straw Treatment with Urea Two tanks were prepared in which 1% of the straw was treated with urea. 5 kg of urea was dissolved in 50 liters of water, where the quantity of straw was based on dry matter. 3% of the quantity of straw was placed in the second tank and stirred well. 15 kg of urea granules were dissolved in 50 liters of water, where the weight was determined. 500 kg of straw was placed in the straw and the weight was determined using a scale. Stirred well. Each tank was sprayed with the urea solution in a separate container. A mound of straw was placed in the tank. The straw was stirred during treatment, taking care to ensure it reached the correct ratio. The solution was applied to all parts of the tank in a complete manner to guarantee the correct treatment ratio. The tank was completely covered with a large piece of nylon. After completing the correct quantity of straw, the tank was filled. Due to the ammonia leakage resulting from the urea decomposition during the incubation period, weights were placed on top. Before removing the straw from the urea treatment tank, a special area was prepared to ventilate it. This is for the action of the urea enzyme. After the end of the incubation period (30 days), the straw was spread in the tank, the cover was opened, and the weights were removed. The tank was dried under sunlight for 3 days with daily stirring until it evaporated. The excess straw was removed from the tank.

Concentrated feed preparation 3-5 - The concentrated feed is prepared as shown

Table (1) Concentrated feed mix

the components	quantity kg	Percentage
barley	259	51,8
Wheat bran	135	27,0
crushed fava beans	90	18,0
Limestone	10	2,0
table salt	5	1,0
Mineral amines and salts	1	0,2

Each kilogram of the mixture contains 5000 IU:A vitamins

450000 IU:D (C:3750mg, B12 1%:1875mcg, B2:750mg, B1:750mg E:7500mg 45000 mg manganese sulfate, 93750 mg folic acid sulfate 30000 mg zinc sulfate, 30000 mg copper sulfate 37500 mg iron sulfate, 18750 mg potassium iodide, 75000 mg cobalt

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30000 mg calcium phosphate, 250 mg niacin, 7500 mg methionine Half of the daily rations from concentrated feed for goats were calculated throughout the feeding period.

The following weight is calculated Today, at 8:00 AM and 3:00 PM, the experiment was conducted in two periods: To calculate the daily food intake, the remaining portion of the ration was divided into two groups: the treated and untreated hay. The ration was adjusted to determine the animal's satiety level. At the beginning of the experiment, the animals were fed 2 kg of hay. The quantities were increased until the end of the experiment to increase the animal's weight. After two weeks, the amount of hay and concentrated feed was increased for each group. The ration was adjusted until the end of the experiment. The amount of feed was increased to 4 kg according to the animal's weight gain.

Table (2) shows the approximate chemical analysis of untreated barley straw, where the percentages of dry matter were estimated (1% and 3% concentrated feed mixture), soluble matter, organic matter, carbohydrates, crude fat, ash, and crude fiber.

the components(%)	Untreated straw	Urea-treated straw 1%	Hay treated with erythritol 3%	Concentrated feed mix
dry substance	97,98	94,40	95,51	93,44
organic matter	989,95	85,98	87,07	87,48
ash	8,03	8,51	8,44	5,96
raw protein	2,62	11,82	20,56	13,79
raw fat	0,63	1,04	0,97	2,23
soluble carbohydrates	61,40	47,33	39,38	65,44

The females were randomly divided into three groups of equal number and similar size, with an average weight of 1% urea. The treatment group and the control group were also randomly divided into three groups. One male was randomly distributed to each group and fed 3% urea. The first group (control) was fed barley straw without the treatment. The numbers specific to each group were recorded. The second group was fed straw with the urea treatment. The numbers specific to each group were recorded. The third group was fed straw with the urea treatment. Each group was placed in a separate pen and given a specific number Tests 3-6 Blood samples were taken every two weeks for approximately 6 months. Blood samples were taken from the jugular vein via injection. Each animal was individually tested. A serum was used to facilitate the blood collection process. A needle holder and needles were used for each sample. Samples were collected at 8:00 AM. The experimental tubes contained anticoagulants. The blood was carefully separated and placed in a special container to prevent hemolysis. After collection,

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the samples were frozen and then centrifuged at 4000°C. Eppendorf tubes at -20°C: Estimation of blood components 3-6-1 Biochemical analysis of serum, creatinine, urea, total protein, and albumin was performed.

Variables

Aspartate Aminotransferase (AST) Alanine Aminotransferase Measurement was performed using ALT (Transferase) solutions with a kit. Total protein was measured by subtracting globulin from albumin. Central Spectroscopy: Reproductive Hormones Estimation 3-6-2

Follicle Stimulating Hormone (FSH) estimation (Fortress Company) Reagents were used. For estimation of Luteinizing Estrogen and Progesterone (Bio Check, Inc.) reagents were used The sample was washed with the reagent using the BioTek ELX800 device. LH Hormone was measured and estimated using a distilled water analyzer. Digestive Weight and Performance Changes in Diet 3-6-3 The weight of the animals was measured for each experimental group over two weeks, from the time of insemination until the end of the breeding period. The birth date and number of offspring were recorded for each female, and the birth date was recorded. The weaning date was recorded.

3. Statistical Analysis: This study employed a completely randomized experimental design (CRD). Statistical analysis of the data obtained from the experiment was performed using the general linear model (GLM) for analysis of variance (ANOVA 2003, SPSS).

The statistical model used for hormones and blood components is:

Yijk = Ti + Sj + TS ij + E ijk

where:

Yijk = observational characteristic,

Ti = treatment,

Sj = sampling time i,

Tsij = interaction between treatment and sampling time,

Eijk = random error associated with the observation k in treatment i and sample j.

Means were compared using the least significant difference (LSD) method.

Results and Discussion

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Average Feed Consumption (kg) During the Experiment

There are significant differences (p>0.05) between the treatments in terms of roughage and concentrate intake. The average intake of concentrate was 2.65 ± 8.48 kg. For roughage, the results showed the superiority of the group treated with 3% urea (average 38.2 ± 18.39 kg) over the control group and the group treated with 1% urea (average 42.2 ± 32.35 kg and 53.2 ± 77.37 kg, respectively). This indicates the goats' palatability of urea-treated straw in the presence of a concentrated ration containing supplementary nutrients. This is consistent with the findings of (16,17) regarding the treatment of wheat straw with urea and molasses and its use in feeding Damascus goat kids. Urea improves the nutritional value of straw by breaking down cellulose and hemicellulose bonds with lignin on the one hand, and fixing ammonia (NH3) to the cellulose wall on the other.

Change in Female Weight In the three groups, no significant differences were found in the final weight between them (p > 0.05). The third group outperformed the other groups with an average weight of 55.28 kg. The average weight change for the first and second groups was 86.26 kg, while the average weight change for the first and second groups was 5.8 kg. This indicates that the weight change was 7.4 kg, 1.7 kg, and 41.24 kg, respectively. The use of urea with a 3% concentration in the concentrated feed gave a better growth rate. This is attributed to the effect of urea as a source of easily digestible energy and release in the rumen, which led to the utilization of the components of hay, protein, and energy. The importance of providing urea is reflected in the daily weight gain in a better way. The effect of urea is reflected in the rumen through the concentrated feed mixture, and gradually and simultaneously through the rumen. Bacteria Urea-treated straw, along with other vitamins, was administered daily in batches mixed with bran, barley, and beans. When wheat straw was treated with urea, bacterial growth and activity increased. (Without any additions or treatments) (The control group) The average daily weight gain for the wheat straw group was (171 ± 30 g/day), which was (P < 0.05). The average daily weight gain for the second group of animals was (with wheat straw). The average daily weight gain for the third group of animals was (137 ± 44 g/day) (20% urea with wheat straw). The average daily weight gain for the fifth group was (136 ± 36 g/day) (20% urea with wheat straw). The average daily weight gain for the sixth group was (138 ± 29 g/day) (20% urea with wheat straw). There was a significant difference between the average daily weight gains. There were no significant differences in the average dry matter conversion rate of the goats on day 141 ± 26/g The fourth group and the control group were (20% urea and 1% sulfate with wheat straw). There were no significant differences in the average dry matter conversion rate on day 146 ± 29/g. This explains the goats' appetite for large feeds. The treatment also indicates a high degree of utilization of various coarse feed materials, as well as a high percentage of nitrogen in the goats' blood when given urea. This indicates the goats' ability to utilize dietary nitrogen from urea. Fertility and reproductive efficiency ratio 4-3

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Table (3) shows the calculation of the fertility and reproductive efficiency ratio in female goats.

The transaction	fertilized females	female mothers	Fertility rate	Reproductive efficiency
witness	7	5	85	71
1%	7	5	85	42
3%	7	5	71	57

Number and Weights of Births 4-4

There are significant differences ($p > 0.05$) between the birth weights of the recorded births from weaning to the mother. The average weight in all groups was 3% (20.2 ± 91.0 kg), followed by the third group, which had the highest weights (19.0 ± 46.2 kg). The average weight in the second group was 1% (36.0 ± 80.1 kg), followed by the second group (12.88 ± 0.94 kg). The average weight in the third group was 1% (12.30 ± 0.42 kg). The second group had the highest average daily weight gain (61.8 ± 23.1 g). Finally, the third group had an average weight of 3%, and the control group had an average weight of (13.4 ± 12.1 g). The strength and vitality of the young goats during pregnancy, as well as their ability to carry loads, were good, as were their feeding and support during pregnancy (51.7 ± 22.1 g). The increase in weight of the young goats at weaning and at midday reflects on energy sources. Changes in blood urea concentration (mg/dL) There were significant differences in urea analysis ($P < 0.01$) in group (4), as shown in Table 4 results. While the control group's urea concentration increased within the normal range (51.5 ± 7.54), it remained within the normal range. The urea concentration in the second and third groups was (49.2 ± 5.71, 36.2 ± 4.82, respectively). Although this study indicates that serum protein is a measure used to assess protein levels in animals, the elevated urea level in serum was not due to dietary changes in diets containing urea. The disease has a negative impact on goat reproductive health. Its high levels can be explained by the hydrolysis of proteins in the rumen of ruminants (18,19). Some living organisms in the rumen are activated to convert ammonia into carbon dioxide and carbon monoxide. These organisms need non-protein nitrogen in their food. When protein is used, they utilize it. A large supply of carbohydrates is used to generate energy, which is consumed in greater quantities. The absorbed materials are then transferred to the liver. Non-protein nitrogen is absorbed through the rumen wall. The liver excretes it via the blood and concentrates it in the body tissues, where it is converted into urea. Urea concentrations in the blood are closely related to the removal and breakdown of the amino group from the kidneys. This increases the rate of protein breakdown in the blood, which clouds the rumen. This decreases protein excretion in the urine (20-22).

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Table (4) Average changes in blood urea concentration (dl/mg) in female goats

The transaction	Number of samples	Urea (dl/mg)
witness	91	C54,7 ±1,55
1%	91	B71,5 ±2,49
3%	91	A82,4 ±2,36

0.05 <P Significantly different averages in different letters c / b a

Total samples = * 13 females × 7

Changes in the blood concentration of female goats (mg/dl) during periods 4-6.

Experiment The urea concentration in the blood of female goats was unstable, fluctuating between decrease and increase. It was always at its highest level in the two groups. This increase in the result of feeding the control group is attributed to the result of feeding the control group. The urea concentration in the serum was within normal limits in the control group, while in the control group, it was within normal limits. (The result of feeding the control group with straw.) Blood Effect of biurea treatment on total protein and globulin concentration in female goats' blood (mg/dl)

Table (5) shows that blood protein concentrations were within the normal range in the third group. There were no significant differences in total protein and globulin concentration (P >0.05). This indicates the absence of any effect of biurea treatment on blood protein levels. This is consistent with (23,24) stated. A sufficient quantity of proteins is required to maintain their levels in blood serum and total protein. This is especially important during gestation when utilizing amino acids and increasing fetal growth.The average protein and total protein levels in the three groups were ±25.7, respectively. 0.13 ± 3.84, 0.12 ± 3.59 For albumin (0.23 ± 7.21, 0.24 ± 7.32, 0.25) in all treatments (3.59 ± 0.22, 3.48 ± 0.21, 3.66 ± 0.24) and globulin (0.10 ± 3.62)

Table (5) The effect of barley straw on the average protein concentration of total albumin in the blood of female goats

Transactions	Number of samples	Total protein g/ml	Albumin g/ml	Globulin g/ml
witness	91	7,25±0,25	3,59±0,12	3,66±0,24
1%	91	7,32±0,24	3,84±0,13	3,48±0,21
3%	91	7,21±0,23	3,62±0,10	3,59±0,22

Number of samples = 13 × 7 females

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- Effect of urea treatment on the concentration of liver enzymes (L/U AST-ALT) in the blood of female goats. The results in Table 6 show differences between the three groups, but these differences were not statistically significant (P>0.05). The liver is the primary and essential site for monitoring the effects of dietary changes, as enzymes (AST and ALT) are measured to diagnose nutritional damage to the liver (25,26). ALT and AST activity increased above normal levels. The study by al et al., 2014, confirmed a significant increase in AST and ALT enzymes, likely due to the urea content of the diet and also due to the consumption of saline water. Elevated AST occurs in the later stages of pregnancy, raising AST levels without increasing ALT levels, and a decrease is observed during lactation. A significant decrease in AST and ALT is observed in the later stages of pregnancy. The reason for the high experimental error was... This is due to a low number of replicates (number of animals). The issue is addressed by increasing the number of replicates, which reduces the differences between units and thus reduces the average experimental error, thereby revealing the differences between treatments.

Table (6) shows the effect of urea-treated barley straw on the average concentration of liver enzymes (L/U AST and ALT) in the blood of female goats.

Transactions	Number of samples	AST(U\L)	ALT(U\L)
witness	84	190.5±10.44	63.45±4.96
1%	84	213.1±14.44	57.27±3.70
3%	84	196.6±12.20	56.02±3.23

Number of samples = 7 females × 12 periods

Effect of urea treatment on creatinine concentration in female goats' blood (mg/dl) Hamad et al. (2010) indicated that creatinine is affected by elevated urea levels. Table 7 shows that there were no significant differences in the result of high-protein diets. This is the result of creatinine analysis in all three treatments, respectively (P > 0.05) (0.1 - 10 mg/dl) were within the normal range for the stomach, where (0.63 ± 1.45, 0.06 ± 1.33) The rate of creatinine depends on the components of the diet, whether it is the protein or urea treatment. We observe an increase in the creatinine rate during the rearing period (27). When the fetal muscular system develops

Table (7) Barley straw treated with urea on the average creatinine concentration (dl/mg) in the blood of female goats

Transaction	Number of samples	Creatinine (dl/mg)
witness	91	1.40±0.07
1%	91	1.33±0.06
3%	91	1.45±0.63

Number of samples = 7 females × 12 periods

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The effect of urea treatment on FSH hormone concentration in goats (ml/mlu) - 12 mlu. FSH hormone levels range in the first and second phases of the estrous cycle. This hormone is very important because it is responsible for the release of estrogen from the ovary (2). The results obtained in Table 8 show that it is secreted from the anterior lobe of the pituitary gland. A significant increase in FSH levels was observed in animals treated with urea, where a significant increase of <0.05 was observed. In animals treated with urea, 3% (93.11 ± 28.2) were treated, followed by group 1 (4.8 ± 71.5), which explains why FSH hormone directly affects ovarian follicle growth (60.6 ± 73.1). This was conducted. This increases estrogen secretion and promotes follicular growth. Significant increase in the effect of urea in goat feed, where hormones are increased, is observed in this study. We need more studies on this topic to verify the results

Table (8) Barley straw treated with urea on the average concentration of FSH hormone (ml/mlu) in the blood of female goats

Transaction	Number of samples	ml/mlu(FSH)
witness	84	c 6.60±1.73
1%	84	b 8.04±1.75
3%	84	A 11.93±2.28

c b a The different means for the letters are significantly different from each other ($p < 0.05$)

Number of samples = 7 females × 1 The effect of urea treatment on estrogen concentration in female goats (ml/pg). There were no significant differences between the treatments in the average estrogen level. The results in Table (9) show that: The treatment group outperformed the control group, with an average estrogen concentration of 1% (10.9 ± 68.8), followed by the treatment group with a concentration of 3% (53 ± 7.36). This is attributed to the increased estrogen concentration in mature ovarian follicle formation in control animals. This works by preparing the uterus to receive the embryo at a high concentration of 1%, thus activating the process of protein synthesis and accelerating water and nutrient absorption(28,29). The decrease in estrogen levels in both treatment groups ($p > 0.05$) was not significant. Sha in a group compared to urea.

Table (9) Effect of barley kernels treated with urea on the average concentration of estrogen (ml/pg) in the blood of female goats

Transaction	Number of samples	Estrogen (ml/pg)
witness	84	74.8±11.1
1%	84	68.8±10.9
3%	84	53±7.36

Number of samples: 7 females x 12

Effect of urea treatment on LH concentration (ml/mL) in the blood of female goats.

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The normal range of LH hormone in goats during the first half of the estrous cycle is 61.0 to 3.16 mL/mL, while the hormone level at ovulation reaches 80 to 15 mL/mL. Table 10 shows that there were no significant differences (P>0.05) between the groups. When straw was treated with urea at concentrations of 1.5% and 3% in the cattle feed, the results showed that the average hormone concentration in the urea-treated group was 68.2 ± 28.15 mL/mL, followed by a higher value recorded at 66.2 ± 44.15 mL/mL, and then 12.18 ± 1.81 mL/mL. This is consistent with the findings of a study on wheat straw treated with high concentrations of urea. Urea levels reached 4% in cattle feed in the presence of nutritional supplements. No significant differences were observed, and it did not affect pituitary gland function. This hormone is responsible for egg maturation and ovulation, assisted by FSH(30).

Table (10) Effect of barley kernels treated with urea on the mean concentration of LH hormone (ml/mlu) in the blood of female goats

Transaction	Number of samples	mL/mLu (LH)
witness	84	15.28±2.68
1%	84	12.18±1.81
3%	84	15.44±2.66

Number of samples = 7 females in 12

Effect of urea treatment on progesterone concentration (ng/ml) in the blood of female goats. During the growth and maturation stage of the Graafian follicle, normal progesterone levels were observed.

The results, shown in Table 11, indicate a non-significant decrease (P>0.05) in progesterone levels as a result of urea treatment. The average progesterone level in the control group was 13.1 ± 11 ng/ml, followed by the treatment group (1% 10.5 ± 1.09 ng/ml), and then the treatment group (1% 10.5 ± 1.09 ng/ml).

Table (11) Effect of urea-treated barley straw on the mean progesterone concentration (ml/ng) in female goats

Transaction	Number of samples	(ml/ng)progesterone
witness	84	11.1±1.13
1%	84	10.5±1.09
3%	84	10.0±1.06

Number of samples = 7 females in 12

Conclusion

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This study demonstrated that treating barley straw with 1% and 3% urea effectively improved feed quality and supported the reproductive performance of local female goats without causing adverse metabolic effects. Goats fed 3% urea-treated straw showed the highest roughage intake, better final body weight, and superior offspring birth and weaning weights. Although blood urea levels increased significantly in the urea-treated groups, other biochemical indicators—including total protein, albumin, globulin, creatinine, AST, and ALT—remained within normal ranges, indicating that the treatment did not negatively impact metabolic health.

Hormonally, only FSH levels increased significantly in goats receiving urea-treated straw, suggesting enhanced follicular stimulation, while estrogen, LH, and progesterone levels showed no significant differences among treatments. Overall, the findings indicate that urea-treated barley straw at 1–3% can serve as a cost-effective feeding strategy that enhances reproductive efficiency and growth performance in local goats, providing higher feed utilization without compromising physiological stability.

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