

# Effects of Adding Dry *Mulberry* Leaves (*Morus alba*) in the Concentrate Diet on Digestibility and Some Blood Parameters in Female Goats

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## Abstract

This experimental study was conducted at the animal farm of the College of Veterinary Medicine of Baghdad University during the period 15/3/2019 until 30/4/2019. Fourteen female local breed goats, at aged between 1.5–2 years and range weight 23–27kg. The animals were divided into two equal groups as following G1 (control) was fed on concentrate diet 2% B.W and alfa - alfa hay .G2 group was fed the same diet and 2% grinding *Mulberry* leaves of concentrate diet .water was offered freely. For evaluation some animal performance. Bodyweight, some nutrients digestibility, blood picture and biochemical parameters. Results revealed that an excellent improvement was observed in body weight and nutrients digestibility were significantly ( $P < 0.05$ ). Similar effects in blood biochemical parameters (total protein and urea), while no differences were determined in triglycerides and cholesterol. other blood parameters showed that hemoglobin (Hb) and packed cell volume (PCV) which were significantly higher ( $P < 0.05$ ) and further improved in erythrocytes, leucocytes, lymphocytes and neutrophils in the group received *Mulberry* leaves than control groups.

**Keywords:** goat, *Mulberry* leaves, cholesterol, performance, digestibility, leucocytes

## Introduction

Livestock, mainly goats and sheep, rearing are a mainstay in many countries and most of the rural population depends on livestock and them by-products<sup>1</sup>. The lack of feedstuffs and their high prices, especially in dry seasons, are among the most important difficulties that stand in front of ruminants' breeders<sup>2,3</sup>. Livestock have the ability to respond to the different feed additives that improve their overall performance by improving the efficiency of utilizing nutritional content and reducing the risk of metabolism<sup>4</sup>. There are a number of non-food additives, such as antibiotics, they are improve the performance of the animal, but they have a number of side effects due to their toxicity the rumen microorganisms. In addition to their sedimentation inside living tissue cells and the transmission to their products<sup>5</sup>. This led to the

searcher for sources for other natural food additives such as *Mulberry* tree leaves, which are distinguished by their high ability to produce green leaves containing different nutrients<sup>6</sup>. High the protein content with slightly dissolving in the rumen and soluble carbohydrates<sup>7,8</sup>. In addition to being rich in sulfur and other mineral elements and they are free of toxic substances, they are highly palatable by ruminant animals<sup>9,10</sup>. It is further; contribute to improve the digestion nutrients, rumen fermentation by improving the internal environment of the rumen<sup>11</sup>. Flavonoids, the most important were isolated from the leaves of *Mulberries* which have nine flavonoids<sup>12</sup>. It was found when adding the *Mours* leaves to the diets lead to improve the overall animals performance, increases the feed intake improved digestion, absorption, growth and development of the mammary glands and improve the immune functions of the body<sup>13,14</sup>. Also it, could be used fresh or dry berries leaves as natural food additives with concentrated or roughages in poor-quality feed-in ruminants<sup>15</sup>. For that, this study was conducted to evaluate the effect of adding *Mours* leaves to the concentrated diet on the performance and some blood parameters in female goats

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**Materials and Methods**

**Animals and diets.**

This study was carried out from 15/March till 30/April, 2019 at the animal farm of College Veterinary / University of Baghdad. Total animals, fourteen female local bred goats, aged 1.5-2 years and weight range 23-27kg, The animals were divided into two equal groups . Group 1(G1) received concentrate diet by 2%B. Was the control. Group 2(G2) received concentrate diet (2%B.W) contain 2% *Mulberry* leaves dry (grinding), each group had water *ad libitum* and green grass while the concentrate diet was offered twice daily. Considerationa basal diet<sup>16</sup>, dietary ingredient (Table 1) and chemical compositions in( table 2 ) .

**Samples collection and laboratory analysis.**

Diet and feed refusals measured and samples were

collected daily for five sequential days on the end week. Also the fecal samples were collected twice daily from each goat before each feeding, daily feed consumed was calculated for each goat for digestibility, subsampled, and then stored at -20°C until analysis. Fecal samples were composited for each pen for 5days and subsequently stored at -20°C until analysis.(Associateon of official analysis<sup>17,18</sup> .Blood samples, 5 ml from each animal into two tubes with and without EDTA, were collected 2 hours after morning feeding at 8:00 on the final week by jugular venipuncture for CBC analyses and for serum separation by centrifuged for the 10-15 min at 2500 rpm. Sera was separated and stored in refrigerator at -20°C until analyzesfor total protein, urea, triglycerides and cholesterolwere determined by using commercial kits,and according to the manufacturer’s instructions. All data received were statistically analyzed using SPSS17.0.

**Table 1. The ingredients composition of experimental diet %**

Item %	Experimental diet%	
	Basal diet for G1control group	Treated diet for G2 group
Barley	30	30
Corn	34	32
Soybean	10	10
Wheat bran	25	25
Sun-dried Mulberry leaves	0	2
Sodium bicarbonate	0.3	0.3
Salt	0.5	0.5
Premix2	0.2	0.2

**Metabolic EnergyMG/kg=CP×0.012 +EE× 0.031+CF×0.005+NFE×0.014 <sup>19</sup>.**

Table 2. Chemical compositions (%) of experimental feed (DM)

Parameters diet concentrate	Dry matter	Organic matter	ASH	Crude protein (Cp)	Crude fibers (CF)	Ether extract (EE)	Nitrogen free extract (NFE)	Metabolic energy MJ/kg
G1diet (control)	89.78	81.86	7.91	15.87	17.21	4.25	62.37	12.41
G2diet (treated)	87.95	80.20	7.78	15.67	16.99	4.14	60.94	12.15
Mulberry leave	89.15	83.30	11.75	19.25	13.13	5.50	29.00	7.64
Alfa alfa hay	88.75	80.86	7.89	14.34	30.46	1.49	46.82	10.25

<sup>2</sup> Added per kilogram of dietary DM: 15 mg of Cu, 65 mg of Zn, 28 mg of Mn, 0.7 mg of I, 0.2 mg of Co, 0.3 mg of Se, 6,000 IU of vitamin A, 600 IU of vitamin D, and 47 IU of vitamin E.

## Results and Discussion

### Effects of *Mulberry* leaves on body weight gain and nutrient digestibility.

The bodyweight gain was affected by *Mulberry* leaves powder in the concentrate diet is presented in Table 3. as shown, goats fed concentrate diet content *Mulberry* leaves powder, a noticeable increase in body weight while the total gain (kg) elevate ( $P < 0.05$ ) than those goats fed the concentrate diet without content *Mulberry* leaves. The positive effects of *Mulberry* leaves in general has been reported by many researchers<sup>20,21,22</sup>.

This may be caused improvement in the rumen environment and increased rumen microorganisms, which has a role in raising levels of dry matter digestion and more nutrient absorption, Similar attribution was derived by<sup>23</sup> which showed that the effects of adding flavonoids of *Morus* leaves, 0 and 2 g/animal/day to the diets of Dorper xThin tailed ewes has caused an increase in the digestion of organic matter, total nitrogen and fiber extract. Moreover, the flavonoids are available to the animal when adding the berry leaves to the diets lead to improves the overall animals performance, increases the feed intake improves digestion, absorption, growth and development of the mammary glands in addition to improving the immune function of the body<sup>13,14</sup>.

While the<sup>24</sup> explained that adding dry berries leaves (*Morus*) by 0, 0.5, 1.5 and 2.5% of the live weight to the grass hay which provided freely to the Wollo sheep has resulted in overweight at end of experiment at a rate 21.4, 23.2, 25.6 and 25.0 kg/animal respectively. On the

contrary, showed no significant differences in body weight for Abergelle sheep supplied to wheat bran and *Guizotia abyssinica* seeds in addition to the natural grass when adding dry berries leaves 0.25, 50 and 75%<sup>25</sup>. Regarding the nutrient digestibility, the statistical analysis as shown in table 4) revealed that dry matter (DM), organic matter (OM), and other nutrient digestibility, were significantly affected by dietary *Morus*. This may attribute to the phytonutrients in the *Morus* leave<sup>6</sup>, impacted diet taste. Furthermore, the presence of flavonoids in leaves enhances the digestive enzyme that has a positive effect on nutrients digestibility. This confirms with mentioned<sup>26</sup>, the flavonoids have been used as feed additives to improve the production efficiency and health of adult cattle. Also consistent with<sup>23</sup> showed that the effect of adding flavonoids of berries leaves, 0 and 2 g / animal/day to the diets of Dorper xThin tailed ewes has caused an increase in the digestion coefficient of dry matter, organic matter, total nitrogen and fiber extract. Rodríguez<sup>27</sup> mentioned that adding four different of dry tree leaves varieties, including *Moringastenopetala*), *Murule* leaves, *Trichanthera* and *Leucaena*, by 0 and 1 g to the rumen liquor dairy cattle with fistula which nutrients on natural grass in a free form, the addition led to an increase in laboratory digestion for dry matter and organic matter. While the feeding local male goats on corn bran and green raspberry leaves or dry raspberry leaves have caused an increase in the digestibility of the dry matter<sup>28</sup>.

**Table3. The effects of adding *Mulberry* leaves on body weight gain of female goat (mean ± SE)**

parameters groups	initial body weight (Kg)	final body weight(Kg)	Total gain (g)
G1 control	25.30±0.65	27.25±0.45	1,950±0.34B
G2treated	25.50±0.78	29.00±0.26	3,500±0.31A

Means with different capital letters in the same Column denoted significant differences at level (P<0.05)

**Table4. The effect of adding *Mulberry* leaves on digestibility parameters of female goat (mean ± SE)**

Parameters Groups	Digestibility %				
	Dry matter (DM)	Organic matter(OM)	Crude protein (CP)	Crude fiber (CF)	Ether extract (EE)
G1 control	58.36±0.29 B	59.12±0.46 B	59.27±0.35 B	52.18±1.22 B	70.41±0.55 B
G2 treated	67.83±0.34 A	68.87±0.31 A	64.59±0.22 A	59.78±0.42 A	74.89±0.32 A

Means with different capital letters in the same Column denoted significant differences at level (P<0.05)

**The effect of adding *Mulberry* leaves on blood biochemical parameters.**

The blood parameters investigated the biochemical changes, that may occurs during the nutritional circumstances mainly due to metabolic processes in addition to the correlation with characteristics of ruminal fermentation. Therefore, the changes in some blood parameters may possibly help to explain the beneficial effect of additives in the diet<sup>29,30</sup>. On this basis, the variations in ruminal NH3-N concentrations and blood urea concentrations were greatly influenced by the feeding patterns of the diet<sup>31</sup>. The effects of *Mulberry* leaves on the blood biochemical parameters are shown in Table 5.

There were differences (P<0.05) in the total protein and blood plasma urea nitrogen . Blood urea nitrogen is the end product of proteolysis of protein metabolism; its concentration is dependent on the crude protein level. Additionally, blood urea nitrogen is negatively correlated

with body nitrogen deposition and the utilization rate of proteins. increase blood urea-N concentrations, when increased levels of casein in the diet conception<sup>32</sup>.

These significant (P<0.05) changes it may be dietary *Mulberry* leaves which have positive effect on the nutrient utilization leads to increased blood protein and urea. The similar result concerning total protein and urea were also, reported by<sup>23</sup>, via increased digestibility of organic matter and total nitrogen. Whereas a supplemental energy or glucose decreasing the blood urea nitrogen concentrations <sup>33</sup>. The *Mulberry* leaves have improve the nutrients digestion and rumen fermentation by improving the ruminal environment<sup>11</sup>. Regarding triglycerides and cholesterol concentration, they were observed that group fed *Mulberry* leaves with concentrate diet resulted in a significantly less than control group, that agreement with several studies showed that use of *Mulberry* leaves in animals diet, decreased level of serum triglycerides and cholesterol<sup>34,35</sup>. It is noting that elevated cholesterol can be indicative of dietary lipid content or tissue

catabolism<sup>29</sup>. On the other hand, that triglycerides and cholesterol was not affected by the supplemented feeds with the *Mulberry* leaves according to reported by<sup>36</sup>.

**Table5. The effect of adding *Mulberry* leaves on some blood biochemical parameters of female goat (mean ± SE)**

parameters group	Total protein gr/100 ml	Urea mg/dl	Triglyceride mg/dl	Cholesterol mg/dl
G1 control	4.15±0.34 <sup>B</sup>	36.77±0.33 <sup>B</sup>	22.61±1.25 <sup>B</sup>	150.93±2.30 <sup>B</sup>
G2 treated	6.50±0.31 <sup>A</sup>	48.67±2.19 <sup>A</sup>	20.53±0.79 <sup>A</sup>	147.10±3.77 <sup>A</sup>

Means with different capital letters in the same Column denoted significant differences at level )P<0.05(

**Effect of adding *Mulberry* leaves on blood parameters.**

Statistical analysis was conducted on a group fed diet content *Mulberry* leaves were compared to the control group, during this experimental period to determine the changes in hematological parameters at the end of the treatment period Table6. There were a significant differences (P<0.05) in hemoglobin percentage and the mean of PCV%, while the good effect on red blood cell count, white blood cell count, lymphocytes and neutrophils respectively.

The improvement in the hematological parameters in the treated group.that is possibility due to an increase in nutrients absorption in the intestine and an increase the microbial activity in the rumen, provide high nitrogenous and condensed tannins, because the presence

of condensed tannins could be useful in enhancing rumen fermentation<sup>37</sup>. Also the increasing bodyweight might be enhance the blood-producing to maintenance tissue requirement. In the same direction, the<sup>36</sup>, indicated that hemoglobin concentration was significantly (p<0.05) higher in treated group than the control group in goat kids. In addition to the *mulberry* leaves is rich in nutrients, also contain bioactive substances, such as anthocyanin, flavonoids, jasmonic acid, stilbene, and terpenoids<sup>38,39</sup>. These bioactive substances have positive effects, such as antibacterial, antipyretic, anticancer, anti-oxidation, hypoglycemic and metabolism-improving properties<sup>40,32</sup>.

Also, they could be influence the physiology of animals, that confirmed by<sup>37</sup> which reported the *Mulberry* leaves can be considered safe, and no adverse effects on general behaviour, BW, hematology, and coagulation parameters obtained in the SD rats tested.

**Table6. The effect of adding *Mulberry* leaves on blood parameters of female goat (mean ± SE)**

parameters groups	Hb (g/dL)	PCV %	RBCs (106/L)	WBCs (103/L)	Lymphocyte (%)	Neutrophils (%)
G1(control)	9.62±0.35B	28.87±0.32B	10.06±0.48	9.87±2.8	36.40±1.70	53.50±1.27
G2 treated	11.90±0.29A	33.13±0.52A	11.47±0.59	10.81±5.8	37.53±0.71	54.80±0.80

Means with different capital letters in the same Column denoted significant differences at level (P<0.05)

## Conclusion

This study has compared the female goats performance variables, between those fed on a standard ration and those that included these ration with *Mulberry*, that led to positive affects on general performance, blood pictures and biochemical parameters. According to this study, the use of dry *Mulberry* leaves (2%) from concentrate diet, improve the animal health.

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**Ethical Clearance:** Taken from the Scientific Committee, College of Veterinary Medicine, University of Baghdad.

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