STUDY THE EFFECT OF BLUE PANIC (*PANICUM ANTIDOTALE*) ON DIGESTIBILITY, HEMATOLOGY AND SOME BIOCHEMICAL PARAMETERS OF LOCAL IRAQI GOAT

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Received on: 13.03.2021
Accepted on: 27.05.2021

ABSTRACT

The study has been conducted to determine the effect of complete substitution of blue panic hay (*Panicum antidotale*) instead of alfalfa hay on the nutrient Intake, apparent digestibility and growth performanceas well as hematology and biochemical parameters on goats by using ten adult male goat weight range (22.4± 1.3 kg), and divided into two groups (5 for each) first group animal feed on wheat bran and alfalfa hay for 3 months while the second group feed on wheat bran and blue panic hay. Bodyweight and food consumption were estimated through the experiment time. Blood was collected from each goat and transported to the laboratory for hematology analysis (total WBC and differential, RBC, PCV, HB, MCV, MCHC, MCH, PLT) and the parameters of biochemical such as (AST, ALT, ALP, glucose, urea, albumin and globulin, total protein, and creatinine). Results revealed there was a significant increase ($P<0.05$) in body weight gain (BWG), daily weight gain (DWG), and improved in dry matter intake in group B compared with group A. The results revealed no significant differences ($P>0.05$) in HB, RBC count, MCH,MCV, PCV, MCHC, PLT as well as WBC, Lymphocytes, Neutrophil, Eosinophil and Basophil in goats between groups. Moreover, monocytes level has been increased significantly in group B compared with group A. These results indicate that BP enhanced the immunity system in goats by improving the monocytes' level. The result appeared ALT and ALP were significantly higher in group B compared with group A. This study can conclude to use blue panic hay as a feed for the small ruminant animals without deleterious physiological effect.

***Key words*:** apparent digestibility, blue panic, hematology and biochemical parameters, goats

Introduction

Recently, there has been a problem of high salinity in the river water of Basra Governorate, which directly feeds the population. Not only drinking water but also the cessation of agriculture and desalinization of the soil led to the lack of vegetation cover, which led to a shortage in the animal feed and the expensive cost of breeding. The introduction of alternative animal feeds which might overcome the difficulties of harsh environment and costs of production is an intriguing challenge for researchers in the animal nutrition field. Nevertheless, production yield, product quality, and animal health must all be preserved. Substitution feed stuffs could be compensatory in the diets of wild animals such as sheep, goats, and cattle in the regions of arid and semiarid. Especially in harsh environments, the development of animal farming systems that integrate the use of alternative feedstuffs with the huge local amount of feed resources resulted from the recognition of the potential of alternative feed resources to produce a large amount of energy and high protein-biomass (Devendra, 1990).

Blue panic (*Panicum antidotale*) is a plant that has the ability to grow in different conditions, soil and environments, and the best growth is in sandy clay soil or light clay with high temperature and light intensity (FAO, 2011).

Nonetheless, one of these alternative feed resources is the Blue panic, that consumed as green or dry feed (Geren and Kavut, 2015). The nutritional value of the plant is higher than that of Rhodes and compared to the alfalfa, which contains 20-22% dry matter, a blue panic plant containing 35-43% dry matter, and the production of blue panic 150 - 180 tons/ha per year while alfalfa is 115 t / Ha in the year and the blue panic contains 8 - 18% protein (Geren 2014). Animals that feed on alfalfa only get impaction, but when alfalfa is mixed with a substance (blue panic) that has higher dry matter, it can prevent impaction. The main advantages of the blue panic plant are consuming less water than alfalfa by about 50%, and its salt tolerance is higher than alfalfa and Rhodes grass (Bakhashwain *et al*., 2010). The Rhodes is considered the best tolerant of high temperatures, but the blue panic is concerned that it does not enter a period of silence during the winter. Restoring the growth in the plant after the grazing or herding is very fast, especially in the summer, 18-20 days between each slice and another. Also, it can tolerate the salinity of soil till 10000 ppm (Al-Solaimani *et al*., 2006). The objective of the present work was to identify the influence of the blue panic plant (*Panicum antidotale*) on digestibility and some of the hematology and biochemical parameters of local goats as health indicators for use as feed for small ruminants.

Materials and Methods

Study location

Current research has been carried out from January to March 2019 at the faculty of Veterinary Medicine Farm/ Basrah University in Iraq. Temperatures vary from a mean maximum and mean minimum of 23 and 17ºC in January to 35 and 21ºC in March.

Animals and management

Ten adult male goats with weight range (22-23.5kg) and eight months old were selected randomly for present study. The animals have been treated against external and internal parasites and used in a trial lasting 90 days following 10 days for the adaptation period. Each goat was housed individually in pens of 1.3 × 1.1 msq. The goats were randomly divided into two groups (n=5); free water and a salt block were available. The animals have been fed diets that are formulated based on the NRC (2001) recommendations. The composition of the diets has been analyzed according to AOAC (2002). Feed compositions of treatments in this experiment are shown in Table 1. Control group

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(A) fed basal diet and alfalfa hay, and group (B) received basal diet and Blue panic (Bp) plant (*Panicum antidotale*). Feed diets ingredients have been mixed, and feed was offered twice a day at 7:00 am and 3:00 pm at 2% bodyweight of the animals. Feed consumed was recorded daily. The changes in BW gain have been estimated by animals weighing at the beginning of trial then every two weeks following that. Feed consumption was determined, and the average DWGs were calculated.

The apparent digestibility trial

The digestibility trial was carried out between 50-70 days of the experiment and lasted 15 d (10 d for faeces collection and turn down feeding and 5-d for adaptation). Each goat has been placed in the metabolic pen equipped individually with drinking and feeding facilities. Goats have been fed twice daily at 7.00 am and 3.00 pm. The feed consumed was recorded daily, and the residual feed and individual faeces were collected daily and weighed, and 100g samples were stored at -20°C until analysis.

Table 1: Ingredients of basal diets and nutrient level

Ingredients (g/ kg DM)	Basal diet	Alfalfa hay	Blue panic
Yellow Corn	520		
Wheat Bran	170		
Barley	170		
Soybean Meal	120		
Limestone	10		
Mineral-Vitamin Premix	5		
Salt	5		
Nutrient level% DM			
Dry matter	92.87	91.87	88.76
Organic matter	94.67	90.45	85.80
Ash	7.45	2.82	2.32
Crude protein	20.39	6.32	7.64
Ether extract	2.76	1.89	0.90
Crude fiber	7.65	27.78	32.8
Neutral detergent fiber	40.96	66.54	64.9
Acid detergent fiber	13.42	39.87	42.4

Blood collection

At the end of the experimental diet, blood samples were collected. Ten ml of blood was drawn from the jugular vein for each goat and split immediately into two parts; 2 mL has been placed into test tubes containing EDTA to determine the hematological parameter such as WBC, DLC, RBC, PCV, HB, MCV, MCHC, MCH, PLT using hematology analyzer (Abbott Laboratories, Abbott Park, Illinois, U.S.A.), and the other part was separated by centrifugation at 500 × g for 10 min. The serum has been collected to determine biochemical parameters such as (AST, ALT, ALP, glucose, urea, albumin and globulin, total protein, and creatinine) using chemical autoanalyzer Mandary, German.

Statistical analysis

The data of growth efficiency parameters, feed intake, nutrient digestibility, and hematology and biochemical parameters was performed by analysis of variance using (GLM) procedure of SAS (2003), which diets have been fitted as a fixed effect while parameters and goat were fitted as random effects. Means were tested by Duncan's multiple ranges ($p<0.05$) among groups.

Result and Discussion

The effect of complete substitution of alfalfa hay with blue panic hay on growth performance, nutrient intake, and apparent digestibility are presented in Table 2. The present study results revealed significant differences ($P<0.05$) in total DM intake in group B compared with group A but had no significant differences in CPI, EEI, NDFI, ADFI, and OMI. The differences observed could be attributed to the palatability of the blue panic (Sallam *et al*., 2019). The most significant forage characteristics which determine DMI are dietary fiber concentration, rate of degradation, and its digestibility in the rumen. These results agree with Sallam *et al*. (2019), who observed that total DMI was higher in group blue panic (*Panicum antidotale*) 100% than in other groups in Barky lambs.

Moreover, results reveal that there were no differences ($P>0.05$) in initial body weight, final body weight between groups but there were significantly improved total body gain and average daily weight gain, while final body weight differed numerically. Also, there was a significant increase in blue panic hay intake compare with alfalfa hay intake and total DM intake in group B compared with group A. These results might attribute to the increased DMI in group B led to an increase in body weight gain and average daily weight gain. This finding is in agreement with that of Adegun *et al*. (2018), who informed that Yankasa rams fed Panicum maximum fodder supplemented with concentrate mix under intensive feedlot had no significant difference ($p>0.05$) in feed intake among treatments while metabolic weight gains and average daily weight gain have been significantly improved ($p<0.05$) with increased supplements. Contrarily, Sallam *et al*. (2019), who observed that Barky lambs fed blue panic (*Panicum antidotale*) forage instead of sorghum had no significant ($P>0.05$) difference between groups on feed conversion ratio, final body weight, body weight gain, average daily gain.

The effect of total replacing of alfalfa hay with blue panic hay on DM, CP, EE, NDF, ADF, and OM digestibility are shown in table 2. The results appeared to have no significant ($P > 0.05$) effects of digestibility parameters between groups. These findings are in line with Sallam *et al*. (2019), who observed that total replacement of sorghum with blue panic (*Panicum antidotale*) had no significant effects ($P > 0.05$) in apparent digestibility on OM,DM, NDF, ADF, CP, hemicellulose, and cellulose between groups.

The effect of complete substitution of blue panic hay instead of alfalfa hay on hematology and biochemical parameters are shown in Table 3. The results revealed no significant($P>0.05$) differences in HB, RBC count, PCV, MCH,MCV, MCHC, and PLT in animals fed on blue panic hay plant compared to the animal fed alfalfa hay. While there are increases numerically in hematological parameters in group B compared with group A. this finding could be attributed to that improved intake and digestibility in group B compared with group A. Currently, results are in line with Yusuf *et al*. (2012) reported that used panicum plant to feed young goats found the RBC, Hb, and PCV were not significantly influenced. Contrarily, Adegun *et al*. (2018) found that used *Panicum* maximum as feed to replace concentrated feed for rams and found an increase in most of the blood indices for these rams feed on panicum L. plant. Another study used the panicum as the basal diet for rats found a significant elevation in most of the hematological indices and referred to the improvement of animal health and body weight reflected the blood indices and appeared better than other treatment (Temitope *et al*., 2017).

Table 2: The effects of complete substitution of blue panic (*Panicum antidotale*) hay instead of alfalfa hay on growth performance, nutrient intake and apparent digestibility

Parameters	Experimental rations			
	Group A	Group B	SEM	*P value*
Nutrient Intake (g/d)				
Dry matter	1123.98[b]	1250.18[a]	56.24	0.019
Crude protein	152.785	153.295	0.520	0.917
Ether extract	4.462	4.815	0.248	0.505
NDF	810.52	818.40	45.939	0.816
ADF	459.43	465.36	70.448	0.939
Organic matter	1057.49	1121.33	53.104	0.140
Apparent digestibility (%)				
Dry matter	67.048	65.750	3.367	0.556
Crude protein	60.155	60.993	1.402	0.480
Ether extract	58.233	59.835	5.136	0.681
NDF	68.458	68.443	0.0004	0.994
ADF	50.693	49.193	4.500	0.539
Organic matter	69.373	70.99	5.232	0.339
Growth performance				
Initial body wt. (kg)	22.085	22.252	0.056	0.792
Final body wt. (kg)	30.017	30.920	1.629	0.196
Total body gain, kg	7.932[b]	8.667[a]	1.080	0.096
Average daily body weight gain, g	88.138[b]	96.303[a]	5.875	0.097
Concentrate DMI (g/day)	348.12	350.73	13.65	0.763
alfalfa hay DMI (g/day)	823.98[b]	0.00	62.556	0.029
Blue panic hay DMI (g/day)	0.00	950.18[a]	62.556	0.029
Total DMI (g/day)	1123.98[b]	1250.18[a]	56.24	0.019

a,b means there are significantly different($p<0.05$) between groups, SEM= standard error of mean

Table 3: The effects of complete substitution of blue panic (*Panicum antidotale*) hay instead of alfalfa hay on hematology and biochemical parameters

Parameters	Experimental rations			
Haematological indices	Group A	Group B	SEM	*P value*
RBC (10^6µL)	6.275	7.225	1.309	0.2848
HB g/dl	9.10	9.930	1.236	0.3319
PCV %	33.750	38.07	7.681	0.456
MCV f/l	46.650	49.825	6.876	0.1377
MCH pg	132.70	136.75	32.053	0.864
MCHC g/dl	242.60	275.00	18.796	0.0506
PLT 10^6/µl	74.500	81.500	52.33	0.220
WBCx10^3/µl	10.780	12.1950	1.732	0.1792
Lymphocytes%	42.650	43.020	5.624	0.8327
Monocytes %	1.050[b]	1.957[a]	0.202	0.0291
Neutrophil%	52.995	53.725	4.183	0.6317
Eosinophil%	0.875	0.575	0.146	0.3098
Basophil%	0.350	0.235	0.012	0.1937
Serum biochemical parameters				
T. protein	10.675	10.680	1.484	0.995
Albumin	3.400	3.917	0.442	0.313
Globulin	7.325	7.252	1.035	0.923
AST	154.00	130.45	24.840	0.228
ALT	12.250[b]	17.250[a]	9.916	0.065
ALP	232.50[b]	286.78[a]	15.030	0.002
Glucose	38.500	42.500	7.505	0.4796
Urea	40.50	39.250	3.994	0.6736
creatinine	0.750	0.675	0.006	0.2283

a,b means there are significantly different ($p<0.05$) between groups, SEM= standard error of mean

In addition to that, Table 3 shows replacement of blue panic hay instead of alfalfa hay had no effect ($P>0.05$) on WBC, lymphocytes, neutrophils, eosinophil and basophil in goats, but there are increases numerically. Moreover, monocytes level was significantly greater in group B than group A. These results indicate that BP enhanced the immunity system in goats. The white blood cell and their differentials major functions are to protect the body from foreign organisms by phagocytosis against invasion, produce or transport and distribute antibodies in immune response, and fight infections. Monocytes are necessary for the immune system

as they are precursors of macrophages and lymphocytes essential for humoral and cell-mediated immunity responses (Mahgoub *et al*., 2008). These findings are consistent with those of Soetan *et al*. (2013). Who found that feeding concentrate to rams that had high WBC values was capable of generating antibodies in the process of phagocytosis with a high degree of resistance to diseases, whereas feeding control diet to rams that had low WBC values were likely to be exposed to the risk of diseases.

The biochemical parameters (Table 3) of the present study appeared non-significant in most studied parameters (T. protein, albumin, globulin AST, glucose, urea, and creatinine) except ALT and ALP enzymes activities that showed significant differences between the two groups. These two enzymes are specific indicator for liver function, an increase in their levels is referred to as hepatic damage or disorder (Thrill *et al*., 2012). The causes of this elevation are still unclear and need more research. Conversely, the other biochemical parameters (T. protein, albumin, globulin AST, glucose, urea, and creatinine) indicate blue panic as healthy substitute for the animal's feed. These results agree with those reported by Sallam *et al*. (2019), who study the effects of partial or total replacement of sorghum by blue panic (*Panicum antidotale*) in sheep. On blood biochemical examinations parameters differ significantly in energetic metabolite concentration and serum nitrogenous metabolites.

Furthermore, no significant variations (P>0.05) in all blood parameters were identified due to time or treatment ? time interaction. Contrarily, another study observed that feeding blue panic grass to dairy cows had lesser urea, glucose, total protein, globulin, and cholesterol in the blood (P<0.05) than their alfalfa-fed counterparts, but greater creatinine in blue panic fed cows. The content of condensed tannins in blue panic grass might be increased recycling of nitrogen efficiency to the rumen by lowering ammonia levels in ruminal to enhance urea inflow into the rumen (Allam *et al*., 2013)

Conclusion

The present study demonstrates that feeding blue panic hay to goats improved nutrient digestibility and growth performance without compromising health status and biochemical parameters.

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