

Evaluation of Mulberry Leaf Meal Feeding on the Growth and Hematological Profile of Cross Bred Heifers

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Abstract. Mulberry (*Morus alba*) is a multipurpose fodder tree with a high voluntary intake. Mulberry foliage is characterized by high digestibility and excellent level of protein which makes it comparable to commercial concentrates for dairy cattle. To evaluate the effect of dietary inclusion of mulberry leaf meal as a concentrate replacement (20%) in the crossbred heifers ration the present investigation was carried out at dairy farm Dr YSPUHF Nauni Solan. In the study, a total of 12 cross bred heifers (1-2 yr) were divided into two equal groups of 6 animals each, on the basis of body weight. The animals of the treatment group were supplemented with mulberry leaf meal to replace concentrate mixture at the level of 20% for a period of 4 months. All the animals under experiment were weighed and blood samples were collected at fortnightly intervals to assess the live weight gain and hematological profile. The mulberry leaf meal contained 15.44 % CP, 14.32 % ash, 15.27 % CF, 43.57% NDF and 31.66 % ADF. The mean body weight (159.65kg), weight gain (40.65kg), average daily gain (338.75gm/day) blood glucose (41.07 mg/dl) and blood total protein (83.27 g/litre) was higher in the treatment group as compared to the body weight (157.08 kg), weight gain (37.36kg), average daily gain (311.33gm/day), blood glucose (40.09 mg/dl) and blood total protein (82.03 g/litre) of the control group. Mean Hb concentration was higher in crossbred heifers of the treatment group (9.19 g/dl) as compared to the control group (9.17g/dl). While blood creatinine ($\mu\text{mol/l}$) and blood urea level (mmol/litre) were higher in the control group (116.08 and 5.67) as compared to the treatment group (112.34 and 5.09). The study concluded that the replacement of concentrate mixture @ 20% by mulberry leaf meal in animal feeding resulted in better growth performance at a lower cost and did not have any adverse effect haematological profile of the crossbred heifers.

Introduction

Mulberry is an agroforestry tree species belonging to family Moraceae primarily used in sericulture and animal feeding. Due to its ability to grow in a wide variety of climatic, topographical, and soil conditions, mulberry is found in temperate and sub-tropical regions of the northern hemisphere, as well as in the tropics of the southern hemisphere. Mulberries are grown at considerably higher altitudes in the Himalaya-Hindu Kush region (Imran *et al.* 2010). Mulberry is a multipurpose fodder tree that plays a very important role in the nutritional security of both animals and human beings (Moses, 2006). Besides the nutritive value, mulberry leaves are nontoxic natural therapeutic agents known to possess antidiabetic, antimicrobial, antimutagenic, and antioxidant activities (Yang *et al.* 2012). The attractive biomass yield, palatability and exceptionally high nutritive value for ruminants and monogastric animals have been the reason behind the great interest in mulberry for animal feeding (FAO 1999). High crude protein content and low crude fiber content make mulberry a perfect animal feed supplement. Mulberry foliage is characterized by high digestibility and excellent level of protein (20-24%), which makes it comparable to commercial concentrates for dairy cattle. (Ba *et al.* 2005) reported that mulberry foliage silage could be safely used as the sole feed for growing goats. Himachal Pradesh is a state situated in the western Himalayan region of India and faces a shortage of as much as 59% of dry fodder and 37% of green fodder (Vashist and Pathania, 2001). In recent years, there has been a growing interest in many fodder deficit regions to identify potentially important feed sources among shrubs and trees for inclusion in ruminant diets. Therefore, the present study was undertaken to evaluate the effect of feeding mulberry leaf meals on the growth and haematological profile of crossbred heifers.

Methods The experiment was conducted in the Department of Silviculture and Agroforestry, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during 2016-17. A total of 12 crossbred heifers (1-2 years) were selected from the dairy farm and were divided into

two groups of 6 animals in each group based on their body weight. The animals of the treatment group were supplemented with dried *M. alba* leaf meal @ 20% to replace the concentrate mixture whereas in the control group were maintained as per the standard feeding schedule of the farm. The body weight of the individual animal was measured subsequently on fortnightly interval during the feeding trial of 4 months to assess the live weight change in the period. The blood samples were collected from the animals of both groups before starting the feeding trial and subsequently at fortnightly intervals to analyze the haemoglobin, blood glucose, total protein, creatinine and blood urea. For the preparation of mulberry leaf meal lopping of 60 trees in the university campus was carried out during the post-monsoon period *i.e.* mid-August. The leaves were subjected to uniform spreading on the cemented floor in a well-ventilated area. The leaves were flipped over twice a week for the duration of one month to ensure each side dries evenly without undergoing decomposition and to protect the leaves against fungal infestation. Thereafter, the dried leaves were crushed and grinded and stored in air tight gunny bags to protect against dust and contamination. The leaf meal, so prepared, was utilized in the feeding trial during December to March.

Result and Discussion The results pertaining to the effect of mulberry leaf meal feeding on growth performance and haematological profile of the crossbred heifers are presented in table 1. The average body weight of crossbred heifers was significantly higher in the treatment group (159.65kg) as compared to the control group (157.08kg). The body weight of crossbred heifers increased from an initial value of 137.79 to 175.15 kg in a feeding trial of 4 months in the control group whereas, it increased from an initial value of 137.79 to 178.44 kg in the treatment group. The mean Hb concentration was higher in crossbred heifers of the treatment group (9.19 g/dl) as compared to the crossbred heifers of control group (9.17g/dl) and the difference between Hb level of both the groups was non significant. In the control group, blood glucose level increased from 38.63 to 41.30 mg/dl and in the treatment group, it exhibited an initial and final value of 41.57 and 41.19 mg/dl, respectively, which was well within the normal range of the species.

Mean total blood protein content was significantly higher in the crossbred heifers of treatment group (83.27 g/litre) as compared to the heifers in the control group (82.03 g/litre). In the treatment group, the initial value of the total protein level in blood was 82.56 g/litre and total protein level at the end of the feeding trial was 84.36 g/litre. The total urea was significantly influenced by the feeding of the mulberry leaf meal. The average value of total urea content was significantly higher in the crossbred heifers of the control group (5.67 mmol/litre) as compared to the heifers in the treatment group (5.09 mmol/litre). Blood creatinine levels were also significantly influenced by feeding of mulberry leaf meal as higher mean total creatinine ($\mu\text{mol/l}$) were observed in the control group (116.80) of animals as compared to the treatment group (112.34).

Table:1 Effect of mulberry leaves supplementation on growth performance of the cross bred heifers

Observations	Feeding intervals	0 day	15 day	30 day	45 day	60 day	75 day	90 day	5 day	120 day	Mean
	Feeding Type										
Body weight (kg)	Normal feeding (C)	137.79	144.07	149.18	153.94	157.97	161.07	164.75	69.79	175.15	157.08
	Mulberry leaf meal feeding (T)	137.79	146.89	152.96	156.76	159.94	163.08	168.43	72.55	178.44	159.65
Haemoglobin (Hb g/dl)	Normal feeding (C)	9.54	9.35	9.1	9.07	9.01	9.03	8.96	9.17	9.27	9.17
	Mulberry leaf meal feeding (T)	9.56	9.33	9.13	9.07	9.05	9.01	9.07	9.23	9.29	9.19
Blood glucose (mg/dl)	Normal feeding (C)	38.63	39.21	39.56	39.89	40.27	40.55	47.66	41.07	41.3	40.9
	Mulberry leaf meal feeding (T)	41.57	39.66	38.99	39.56	47.15	40.21	40.5	40.83	41.19	41.07
Total Blood Protein (g/l)	Normal feeding (C)	82.55	82.37	82.1	81.84	81.56	81.36	81.86	82.17	82.45	82.03

	Mulberry leaf meal feeding (T)	82.56	82.35	82.65	82.95	83.13	83.44	83.67	83.96	84.36	83.27
Blood Urea (mmol/litre)	Normal feeding (C)	5.26	5.43	5.57	5.66	5.85	5.95	6.13	5.79	5.37	5.67
	Mulberry leaf meal feeding (T)	5.23	5.36	5.46	5.27	5.06	4.97	4.85	4.81	4.77	5.09
Creatinine (µmol/lit)	Normal feeding (C)	113.63	114.72	116.73	117.66	118.53	119.76	117.66	16.68	115.83	116.8
	Mulberry leaf meal feeding (T)	113.82	114.78	113.91	113.25	112.79	111.7	110.93	10.36	109.54	112.34

The results pertaining to changes in body weight in the present study are in agreement with the previous findings of (Malisetty and Jatoth, 2013) where higher final body weight (196.05 kg) was observed in animals fed with chopped sorghum straw and chopped mulberry hay in 1:1 ratio *ad libitum* and concentrate mixture as compared to the body weight (195.14 kg) recorded in animals fed with chopped sorghum straw *ad libitum* and concentrate mixture.

Results of the present study are being supported by (Bhatta *et al.* 2005) where higher Hb concentration (11.70 and 11.75 g/dl) was recorded in animals fed on *Prosopis cineraria* and *Albizia lebbek*. Feeding of ensiled mulberry leaves (8%), and sun-dried mulberry fruit pomace (6.3%) has also resulted in higher blood glucose levels in steers (Zhou *et al.* 2014). Feeding of *Quercus leucotricophora* leaves has also resulted in higher blood glucose level (52.7 mg/dl) in the heifers (Paswan and Sahoo, 2012). The findings of the study also get support from (Pal *et al.* 2010) where replacing 50% concentrate mixture with dried leaves of *Leucaena leucocephala*-*Melia azedarach*-*Morus alba* in equal proportions reported 6.24g/l blood protein in the treatment group of goats.

Conclusion

Body weight and average daily gain (gm/day) were higher in the animals under the mulberry leaf meal-fed treatment group as compared to the control group. Mulberry leaves feeding had a positive impact on the growth performance and haematological profile of the crossbred heifers and the values of different parameters were well within the normal physiological range of the species. All the blood biochemical parameters were indicative of a positive nutritional status of the animals in the mulberry leaf meal-supplemented treatment group. The study concluded that the replacement of concentrate mixture @ 20% by mulberry leaf meal in animal feeding resulted in better growth performance at a lower cost and did not have any adverse effect haematological profile of the crossbred heifers.

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