Mulberry-Fruit-Based Feed Blocks

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A Key Supplement for Livestock in Mountainous Regions

Chitral is an isolated mountainous tract of 14,850 km^2 in the northernmost part of Pakistan, bordering on Afghanistan to the north and west, and surrounded by the high ranges of the Hindu Kush and Karakoram. As only about 18% of Chitral is cultivable, its people are heavily dependent on livestock for their livelihood. Generally, livestock in the area are undernourished owing to the diminishing supply of feed on deteriorating rangelands. Local livestock feed resources in Chitral include grazing (78.1%), crop residues (20.76%), fodder crops (0.81%), and cereal bran (0.32%). Fluctuating nutrient supply caused by extreme weather conditions has considerably reduced livestock productivity. Feed is scarce during the long winters extending from November to April, during which animals subsist entirely on stall-feeding consisting of mature grass, hay, and crop residues. Concentrate supplements are expensive and not affordable by poor farmers. Molasses-urea blocks, although highly relevant to the feed situation in Chitral as a strategic supplement, cannot be prepared locally due to unavailability of molasses in the area. High transportation costs for molasses and feed blocks from plains areas are additional prohibitive factors. The present study explores the use of mulberry fruit, abundantly available in Chitral (Figure 1), to make solidified multinutrient feed blocks.

Testing the making of feed blocks

Use of fresh mulberry fruit

Six different combinations of ingredients were tested to make blocks of desired hardness. The blocks were prepared manually with the cold method. Fresh mulberry containing more than 85% water was first crushed to a paste. Urea was added slowly and thoroughly dissolved in the paste. The water content of the mulberry was enough to dissolve the urea with no additional water required. The other ingredients were added and thoroughly mixed. Finally, after the addition of wheat bran or dried lucerne leaves, the mixture turned into dough and was transferred to a wooden mold (6 x 6 x 4 inches). After

FIGURE 1 A large mulberry tree with a production capacity of about 70 kg of mulberry fruit per season. (Photo by Ghulam Habib)

TABLE 1 Composition (in percent) of mulberry-based multinutrient blocks.

Ingredients	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Fresh mulberry fruit	48	45	45	45	45	45
Urea	5	5	5	5	5	5
Lime powder	10	10	5	5	5	5
Cement	0	5	5	5	5	0
Clay	0	0	0	0	0	5
Mineral mixture	10	10	10	10	10	10
Salt	5	5	5	5	5	5
Wheat bran	22	20	25	0	13	25
Dried lucerne leaves	0	0	0	25	12	0
Hardness after 24 hours	Soft	++	+	Nil	+	+
Hardness after 48 hours	Soft	+++	+++	Nil	++	+++

pressing, the mold was removed and the block was left in the shade and allowed to dry and harden over the next 48 hours. As shown in Table 1, all the blocks, except blocks 1 and 4, turned hard almost to the same degree. Block 1, with no cement or clay, never solidified and remained very soft at all times. The mixture of block 4, containing a maximum quantity of lucerne leaves (25%) in place of wheat bran, was dry with no cohesion and could not be molded to a definite shape. Finally, the composition of blocks 3, 5 and 6 was considered suitable for on-farm adaptation. Substitution of clay for cement in block 6 was effective and reduced the cost of the block.

Use of dried mulberry fruit

Dried mulberry fruit was suspended in an equivalent quantity of water (W/W) and boiled for about 10 minutes with continuous stirring, which turned the mixture into a viscous liquid almost similar to molasses in consistency. After the mixture cooled to about 60°C, urea was added and dissolved. The remaining ingredients were added in the order listed in Table 2. The blocks quickly settled and achieved the desired hardness in 24 hours. Overnight soaking of dried mulberry in water without heating was found to be equally effective.

On-farm demonstration

The technique of making the blocks according to the recipe using fresh or dried mulberry fruit was demonstrated in 3 community organizations, each comprising an average of 15 member farmers, including women farmers. The benefits of the block strategy and the necessary precautions in making the blocks were first explained in detail. At each location, an educated person designated as a master trainer was present to help the farmers continue the activity. Household utensils were used to mix and mold small quantities of the block ingredients. In the case of large quantities, the ingredients were mixed on a concrete floor using a shovel.

All the farmers took a keen interest in making the blocks. The blocks were checked for hardness after 2 days and found satisfactory. The farmers were then asked to start offering the blocks to their animals and continue preparing the next batch of blocks under the supervision of the master trainer. Each farmer thus prepared 4 to 6 blocks, and the technique was also extended to neighboring farmers. The farmers suggested the blocks should be named "*kitori* blocks." The word *kitori* in the local Chitrali language means mulberry fruit.

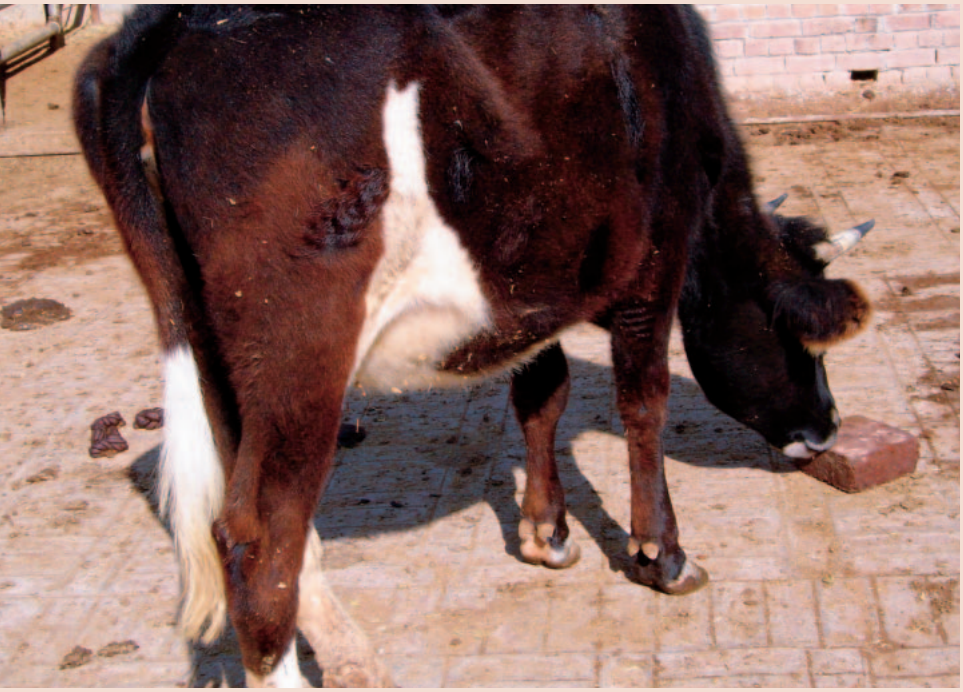

FIGURE 2 Livestock readily accept the new feed blocks, which are beneficial for health and productivity. (Photo by Ghulam Habib)

Monitoring of animals' responses

Initially, the farmers were advised to offer the blocks to milking cows or goats only, and record changes in daily milk production. Necessary precautions to ensure licking rather than chewing of the blocks by animals were explained, and farmers were told to monitor the animals' eating habits. The master trainers were also asked to visit the farmers twice a week and record their observations.

TABLE 2 Composition of Multinutrient Block (3 kg) using dried mulberry fruit.

Ingredients	Percent	Grams
Dried mulberry fruit	23	690
Water	22	660 ml
Urea	5	150
Lime powder	5	150
Clay	5	150
Mineral mixture	10	300
Salt	5	150
Wheat bran	25	750
Total	**100**	**3000 g (3 kg)**

All farmers in the 3 community organizations regularly reported that the animals readily accepted the blocks and started licking from day 1 (Figure 2), with the exception of a few animals (5%) that took 3 to 4 days to get used to licking the blocks. Daily consumption ranged from 150 to 300 g for cows and 50 to 100 g for goats. These rates were in line with expectations, according to which a block weighing 3 kg would last about 10 days for a cow and one month for a goat. Small cows of the local hill breed, weighing 140 to 180 kg, were expected to consume a maximum of 300 g per head per day. Most of the animals licked the blocks and only 4 farmers reported chewing, which was discouraged by placing the block in a wooden frame. Two farmers cut the blocks in small pieces and fed small quantities to cows daily at milking time.

All farmers consistently reported that daily milk production by animals consuming the blocks increased by 30 to 50%, with visible improvement in their health and consumption capacity.

An income-generating activity

The average on-farm production cost of mulberry blocks was calculated as PKR (Pakistan Rupees) 4.60 per kg or PKR 13.80 per block (3 kg). This is far below the prevailing market price of PKR 8–12 per 1 kg of conventional concentrates such as oil cakes and wheat bran in Chitral. A cow consuming one 300 g block per day would thus cost PKR 1.40 per day. In turn, for a value of PKR 6 milk production would be increased by a minimum of 0.5 l per day per cow. This ratio of input to output provides a good margin of profit. In addition, some invisible benefits accrue to animals with block feeding. These include improved body condition, better fertility, and low incidence of disease.

It is estimated that a farmer can earn about PKR 1000–1500 (approximately US$ 17–26) per month during the mulberry season from commercial preparation of mulberry blocks. This demonstrates the enormous potential of this technology as an income-generating microenterprise. Income-generating activity appears to be best suited for women in the area. In Chi-

FIGURE 3 Family members participate in making mulberry-fruit blocks. (Photo by Ghulam Habib)

tral and other hilly areas of Pakistan, women are almost entirely responsible for rearing livestock. In fact, the male farmers suggested that the women should be trained to make the feed blocks (Figure 3), both for their own animals and as an income-producing activity.

Implications

The successful use of mulberry fruit to make multinutrient blocks as a strategic supplement for ruminant livestock in the Chitral region suggests that the technology should be propagated on a large scale in the region and extended to other areas where mulberry trees are abundant. The Northern Areas in Pakistan and the Hindu Kush Himalaya have similar agroclimatic conditions and are appropriate for implementation of mulberry block technology. The technology is environmentally friendly and ensures efficient utilization of natural resources that otherwise go to waste. Apart from increasing farm income through enhanced animal productivity, the technology has considerable scope as an on-farm microenterprise for income generation.

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Ghulam Habib has a PhD in animal nutrition. He has specialized in ruminant nutrition, with a major research focus on development of supplementary strategies for efficient utilization of low-quality roughage. His current research also includes protein nutrition and use of nonconventional feed resources for dairy livestock.

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