

Overviewing Forage Shortage for Dairy Animals and Suitability of Forage Sorghum for Ensiling

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Abstract: Milk and meat are considered to be the major products of livestock. Pakistan has been bestowed with rich treasure of cattle and buffalos by nature. Pakistan is ranked third largest milk producing country in the world with milk production of 51 million tons during 2013-2014. But the productivity and performance of dairy animals suffers a serious setback due to shortage of forages during forage scarcity periods. Sorghum forage preservation as silage holds the key in bridging the gap between forage supply and demand during lean periods. Sorghum is a heat and drought resistant crop and produces more biomass with better water use efficiency and that too by using fewer fertilizers. Dairy farmers in Pakistan continue to remain ignorant of this forage preservation technique and forage sorghum potential to provide nutritious forage during lean periods. Forage sorghum silage must be made an integral feed resource for dairy animals to produce milk on sustainable basis.

Key words: Feed Resources • Forage Preservation • Hay • Animal Nutrition • Silage

INTRODUCTION

Livestock are an integral and vital component of different farming systems in Pakistan. Livestock sector contributed 11.8% to national GDP of Pakistan during 2013-14, while its contribution to agriculture value addition was Rs.776 billion [1]. Pakistan is endowed with huge treasure of animals which serves as a shock absorber in the wake of crop failure particularly for small farmers. The major livestock products are milk and meat, while some of the minor products are animal skins, blood, bones, wool, fat and dung [2-4]. This sector has a critical role to play in poverty alleviation efforts and can bridge the gap in economic disparities. The skyrocketing population, spreading urbanization, rising per capita income and better export opportunities have mounted pressure on this sector. Feed stuffs play a vital role in ensuring the good productivity of livestock particularly of dairy animals. Forages in combination with crops residues provide 51% of nutrients supply. The share of rangelands and post-harvest grazing in nutrient supply was 38% and 3% respectively. Cereals by-products and oil seed cakes provide 6% and 2% of total nutrients requirement respectively [5]. It is a matter of great concern that dairy

animals are deficient by 29% and 33% in total digestible nutrients (TDN) and crude protein (CP) respectively [6]. It is because of this that in Pakistan, the productivity of dairy animals is much low than their known potential. As forages are the biggest source of nutrient supply to dairy animals, therefore occupy the central space in feed supply chain for dairy animals. The area under forage crops is decreasing at the rate of 2% per decade [7, 8]. Spring cereal forages include maize, millet and sorghum, while oat is the major autumn cereal forage. The rangelands are continuously overgrazed and have lost their potential to support livestock in long run if current situation of negligence and state of inertia remain in place [9-14]. Concentrates are costly and can be included in rations to a limited scale only. So the only option left at disposal of dairy owners is to focus on production and preservation of forages. The importance of forage preservation becomes even more important when country confronts two periods of severe forage shortage during May-June and again in November-December. During these forage scarcity periods, the productivity and performance of dairy animals suffers a serious setback in terms of milk production. Lack of awareness about hay and silage making has made the situation from bad to worse. Among

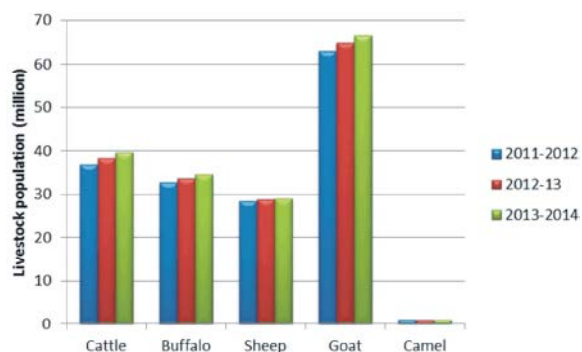


Fig. 1: Livestock population of Pakistan (millions)

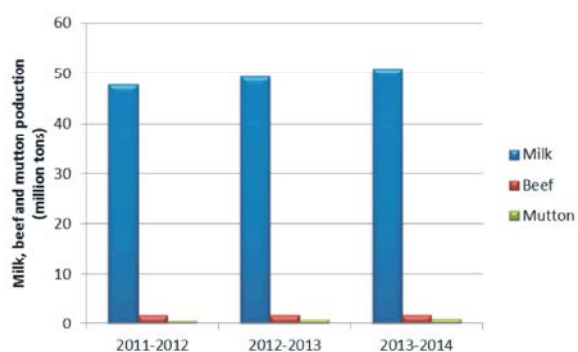


Fig. 2: Milk, beef and mutton production (million tons) in Pakistan

spring forages, sorghum is excellent forage with drought and heat tolerant characteristics [15-20]. Sorghum forage preservation as silage can be an answer to forage shortage.

The objective of this review study is to analyze the severity of forage shortage for dairy animals and to consider the suitability of forage sorghum preservation as silage to be fed during forage scarcity periods.

Livestock Population with Milk and Meat Production Dynamics in Pakistan: The number of animals in Pakistan is continuously increasing as cattle and buffalo also referred to as large ruminants were 39.7 million and 34.6 million respectively during 2013-2014 against 36.9 million and 32.7 million during 2012-2013 (Fig. 1) [1]. Similarly sheep and goat population is also increasing with passage of time, while camel (1 million), horse (0.4 million), mules (0.2 million) and assess (4.9 million) population has remained stagnant over period of time. Milk and meat are considered to be the major products. Despite the fact that milk production is increasing with each passing year as its production during 2013-2014 stood at 50.9 million tons against 47.8 million tons during 2011-2012. Similarly meat (beef + mutton) production has also increased over time

Table 1: Share of different feed resources in nutrient supply for livestock [30]

Feed Resource	Share
Forages and Crop residues	51%
Rangelands	38%
Post-harvest grazing	3%
Cereal by-products	6%
Oil cakes	2%

but production of both milk and meat is much less if number of animals and their known genetic potential is taken into consideration. During 2013-14, beef production was 1.88 million tons, while mutton production stood at 0.98 million tons (Fig. 2) [1] which is quite insufficient to meat dietary needs of teeming millions.

Role of Forages in Increasing Milk Production: Forages are deemed to be the most palatable animal feed resource and provide major chunk of feed resource base for dairy animals in combination with crop residues (Table 1). These are cheaper, economical and easy to produce and feed dairy animals. Forage crops include cereals like maize, sorghum, barley, millet and oat. Other specialized forages include berseem (king of forages), shaftal and lucern. In addition to these forage crops, forage legumes such as cowpea, cluster bean, soybean etc. which are traditionally grown in intercropping systems with forage cereals. Cereal forages give fairly high forage yield but are poor in terms of quality attributes particularly in crude protein. Dairy require protein in suitable proportion in their diet for their vital body functions. In Pakistan, there are two periods of extreme forage shortage during May-June again in November-December, during which productivity of milch animals suffers a serious blow in terms of milk production. Other feed resources such as concentrates can only be given to dairy animals in limited quantities [21-28]. Crop residues are poor in terms of quality attributes and animals fed on crops residues also yield less milk [29-31]. Pakistan's rangelands have continuously been over-utilized and over grazing has done a serious and permanent damage to this precious animal feed resource. Thus the only option left at the disposal of dairy farmers is to depend on forage production to produce milk on sustainable basis. Cereal forages grown in intercropping systems with forage legumes provide high production of green forage and quality of mixed forage also improves [32-40] and ultimately milk production can be increased on sustainable basis. To cope with forage scarcity periods, again forages hold the key. In Pakistan, there has been given no attention to forage preservation in the form of hay and silage. Excessive forage especially forage

Table 2: Comparison of forage sorghum with other cereal forages in terms of quality attributes. [47]

Name of Forage	DM (%)	CP (%)	EE (%)	CF (%)	Ash (%)	NFE (%)
Maize	23.7	9.8	1.8	27.1	9.8	51.6
Sorghum	33.4	6.8	1.5	31.8	6.8	53.1
Millet	25.0	4.4	1.5	32.6	11.5	50.1
Barley	19.8	13.3	3.6	21.9	13.5	47.7

DM=Dry matter CP= Crude protein EE= Ether extract CF= Crude fiber
NFE= Nitrogen free extract

sorghum preserved as silage provides nutritious forage during green forage scarcity periods, but due attention has not been given to sorghum forage preservation as silage and ultimately dairy animals remain under-nourished.

Suitability of Forage Sorghum as a Silage Crop: Dairy animals need optimum concentration of protein, crude fiber and ash in order to produce milk on sustainable basis. In order to cope with forage scarcity, both forage maize and sorghum are the most common forage crops which are ensiled to be fed to dairy animals in advanced countries. Silage is the fermented forage which is prepared in anaerobic conditions. The structures used for making silage are referred to as silos. Ensiling ensures forage preservation over a longer period of time without any deterioration to forage quality. It is matter of great interest that forage sorghum holds more advantage as a silage crop in comparison with forage maize. Forage sorghum silage is preferred over maize silage because it requires less soil fertility to grow and its production cost is also less. It is drought resistant as well as temperature resistant [41-43]. Furthermore, it yields more biomass in less time which is the most important factor which determines the economic viability of any forage crop. It can be grown in varying soils, gives more soil cover, reduce soil erosion and requires fewer pesticides [44-46]. It has low buffering capacity (resistance to pH change) and high water soluble carbohydrates. Forage sorghum contains dry matter 33-36%, 6.5-7.8% crude protein, 30-32% crude fiber, 6.5-6.8% ash, 1.5-2.5% ether extracts and nitrogen free extract in the range of 52-54% (Table 2) [5]. All these characteristics make sorghum excellent forage crop for silage making under semi-arid to arid conditions of Pakistan. The ability of sorghum to adopt in hotter climates has made this crop popular in Pakistan and countries of extreme aridity like Sudan and other African countries. Tannins are naturally occurring high molecular weight compounds which bind protein and reduce the quality of forage sorghum. Tannin content can be decreased with effective fermentation technique during

silage making process. The quality of forage sorghum silage can be improved by adjusting chopping length, dry matter content, its digestibility and different additives that are added during silage making such as urea and molasses. Furthermore, the quality of sorghum silage is increased to a great extent when crop is harvested at appropriate stage (50% heading stage). Sorghum silage has the potential to increase the milk production as demonstrated by various researches.

CONCLUSION

Feed resources play a vital role in increasing the productivity of dairy animals. Excessive forage sorghum preserved as silage provides nutritious feed to dairy animals. Sorghum silage prepared in proper way has the potential to increase the milk production of dairy animals. During lean periods when forage shortage seriously hampers the performance of dairy animals, sorghum silage holds key in producing milk on sustainable basis. There is a dire need to impart silage preparation skill through a skill enhancement programs by provincial livestock departments. Forage sorghum and its preservation as silage can help dairy farmers to increase milk production to cater the needs of skyrocketing population.

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