I. INTRODUCTION

In many developing countries of the world, the growing human population exerts an increasing pressure on land usage. Arable land available for cultivated food crops is dwindling and pasture lands are being used to grow cash crops. The feed supply for productivity of ruminant livestock is largely dependent on byproducts and crop residues. Cereal crop residues are considered as low quality feedstuffs and often do not meet the maintenance requirements of the animals. There were many attempts to improve the quality of straws by urea enrichment and chemical treatment. However, these techniques were not adapted by small holders to significant extent (Blummel, 1994). In the northern parts of Karnataka, sorghum or bajra forms a staple food for human consumption and as such sorghum stover forms major available roughage for feeding livestock.

Sorghum (*Sorghum bicolor*) is a subsistence crop grown by small farmers with few inputs under rainfed conditions. Due to its versatile use, hardiness, dependability, stability of yield and adaptability over a wide range of climates, sorghum is grown in both tropical and temperate zones of Africa, West and South East Asia and North and South America. It is the fourth major cereal crop of the world in production and fifth in acreage behind wheat, rice, maize and barley. The cultivated sorghum is a cereal crop adapted to hot, semi-arid tropical and dry temperate areas of the world. (Anonymous, 2006). It grows to a height of 50 cm to 6m. It is cultivated both for its grain and fodder. Sorghum is cultivated over an area of 43.75 million hectares in the world producing about 54.15 million tones of grains with an average productivity of 12.38 quintals/ha. Asia and Africa account 86% of the total area under sorghum, but their contribution
towards total production is only 58%. India is the largest sorghum grower in the world with an area of 10.05 million hectares and ranks second in production. Among cereals grown in India, sorghum ranks third in area and production after rice and wheat. Karnataka stands second after Maharashtra with an area of 2.1 million hectares of sorghum cultivation with 1.82 million tones of production. The productivity of Maharashtra and Karnataka is the highest during *Kharif*, while the post rain productivity is high in Andhra Pradesh and Karnataka. Sorghum adapts to many environments, requiring 90 to 140 days to mature. Highest yields are obtained from varieties maturing in 100 to 120 days. Such grain sorghum usually has a grain to straw ratio of about 1:1. Late maturing varieties tend to yield more foliage and make less grain increasing the grain to straw ratio as high as 1:1.5. Sorghum requires less moisture for growth than other cereal crop. Studies had shown that sorghum requires low water (332 kg) of water per kg of accumulated dry matter, than barley and wheat. (Anonymous, 2006)

The nutritive value of straw is determined by their concentration of digestible nutrients, intake and efficiency of utilization of absorbed nutrients. The utilization of cell wall components is influenced by species, variety and agro - climatic conditions under which it is grown. There are two types of straws based on morphological characteristics *viz.* coarse (sorghum, finger millet, pearl millet and maize) and slender straw (wheat and paddy). The coarse straws have higher leaf to stem ratio (Prasad *et al.*, 1993). Energy requirement for maintenance in cattle and buffaloes can be nearly met with sorghum stover alone and further improvement in intake and digestibility due to treatment could be beneficial in meeting the production requirement to some extent (Prasad *et al.*, 1993). The sorghum stover has smooth and waxy surface with solid stem
pith. Smooth surface of unchaffed stover would pose problems for urea treatment (Joshi et al., 1988). Since sorghum has high energy content, spraying of urea solution to stover at the time of feeding could provide the rumen degradable nitrogen and may improve the synthesis of microbial biomass (Blummel, 1994).

It has been well recognized that sorghum stover has poor feeding value because of low nitrogen and high fiber content. The use of exogenous fibrolytic enzymes as feed additives has been investigated in the last decade as a means to improve forage utilization by ruminants (Beauchemin et al., 2003). Enzyme additives have been shown to enhance colonization of feed by ruminal microorganisms and increase the rate of degradation in the rumen. Some products have been demonstrated to be stable in the rumen and to survive passage to the duodenum, suggesting that exogenous enzymes may function ruminally and postruminally (Colombatto et al., 2003). The use of fibrolytic enzymes in the diet of ruminant livestock has been found to improve the digestibility and body weight gains in the wheat straw based diets (Balci et al., 2007, Singh and Das, 2009). No work has been reported on the use of fibrolytic enzymes in the utilization of sorghum stover in dairy cattle.

The local cattle breed in Bidar and Marathwada region is Deoni breed. The population of Deoni cattle in Karnataka is 1.02 lakhs (Appannavar, 2001). The breed possesses high genetic potential for milk production and draftability. Deoni breed had been evolved through crossbreeding of Gir cattle with Dangi breed of Marathwada and local desi cattle of erstwhile Nizam state covering Bidar and Osmanabad. The average
lactation milk yield and average fat content of Deoni cattle at field level was 868 ± 49.36 liters and 4.3 per cent respectively (Appannavar, 2001).

The major feed resource locally available for feeding Deoni cattle is the sorghum stover. Farmers tend to use sorghum stover as conventional staple food for these animals supplemented with limited quantity of concentrate ingredients. Recent studies have shown that Gir bullocks lost body weight when sorghum stover was used as sole feed and they concluded that animals could not maintain body weight due to low protein intake (Patel et al., 2007). Therefore, supplementation of urea or protein sources could be beneficial to provide a source of nitrogen. Conventionally, large ruminants are being fed twice a day. The increased feeding frequency can also be a useful managerial tool to improve the productive benefits in ruminants like increased efficiency of microbial fermentation, and increased feed intake (Robinson, 1989).

Considering these facts, the present study was contemplated to improve the nutritional value and utilization of sorghum stover using growing Deoni cattle by urea treatment, enzyme supplementation or increased frequency of feeding. The specific objectives of study are;

1. To study the effect of feeding frequency on the utilization of sorghum stover
2. To compare the growth performance of urea and groundnut cake supplementation for sorghum stover based diets
3. To study the effect of supplementing fibrolytic enzymes to sorghum stover on the growth performance.