

# NILI-RAVI BUFFALO PERFORMANCE IN RESPONSE TO DIETARY NDF

*Mini Review*

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## **ABSTRACT**

In recent scientific approach, the fiber contents of feed stuffs have been fractioned into acid detergent fiber (ADF) and neutral detergent fiber (NDF). NDF is more complete measure of total fiber since it measures all of the cellulose, hemicellulose and lignin in the diet. Optimum level of NDF contents in ration is important not only in regulating voluntary intake but also may improve the milk production, milk composition, body weight change, dry matter intake and NDF digestibility. A proportional forage increase in the diet decreases voluntary dry matter intake and high forage intake results in lower rumen digestibility. Hence fiber is considered to be the negative index of voluntary intake. In early studies, the dietary NDF less than 25 percent depresses milk fat and lactating buffalo fed diet containing above 28 percent NDF produced more milk with higher milk fat & protein than those that consumed diets containing 32 percent NDF. But concerning the Nili Ravi buffaloes in Pakistan most of research summarized that 33 % and 38 % NDF contents on dry matter basis in terms of Milk production (4 % FCM) & composition in lactating and weight gain in Nili Ravi buffalo heifers, respectively is optimum. It is concluded that Nili Ravi buffalo is better NDF convertor as compared to cattle and there is provision to conduct research on the other breeds of Buffalo also in Pakistan to prepare NDF based ration.

**Keywords:** Nili Ravi buffalo, Neutral detergent fiber, Digestibility, voluntary feed intake

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## **INTRODUCTION**

The reduction in roughage content of the ration as a result of high grains is closely related to the change in milk fat and is associated with metabolic problems such as, acidosis, hoof problems, displaced abomasums, liver abscesses and a general decline in health. Adequate fiber and quality promotes good health and better performance. In feeding lactating buffalo there is economic advantage in using a maximum amount of forages and by product feedstuffs. In the newer system of identifying fiber, the fiber content of feedstuffs has been named according to the laboratory procedure namely, acid detergent fiber and neutral detergent fiber. NDF is more complete measure of total fiber since it measures all of the cellulose, lignin and hemicellulose in the diet. Hence optimum level of NDF contents in the diets must be assessed in term of milk production and growth rate to get the optimum performance in Nili Ravi buffaloes. An application of varying level of contents in diets concerning the physiological and production traits is discussed below to understand the phenomenon of the optimum fiber level in terms of NDF contents.

### **Effect of NDF contents in ration on voluntary intake.**

The diets of ruminants must contain a minimum concentration of low energy roughages for proper function of the rumen and signals from ruminal distension to control feed intake when the drive to eat is high. Basically the effect of diet on feed intake varies with the physiological stages of animal. The objective of this review paper is to determine the effect of NDF contents of ration on voluntary feed intake in Nili Ravi Buffaloes. Basically the information about intake is very important because a cow/buffalo require quantities rather than percentages of nutrients. Fiber is considered to be the negative index of feed intake. Van Soest, (1994) in their respective studies concluded that feed intake can be limited by the bulkiness (fill effect) of the feed in relation to the voluntary intake of the reticulo-rumen. This is the characteristic of diet that describes the physical regulation of intake. Further, it is explained that ruminant's reticulo-rumen volume determines the potential physical intake of forages. The bulkiness of diet is related with the fiber part. Earlier studies showed that forage NDF in diets can inhibit feed intake. A proportional increase in forage in diet decreases voluntary dry matter intake (Dado and Allen, 1995) and diets with high forage contents usually exhibits lower rumen digestibility. Obviously such diet spends longer time in the rumen, pass through slowly, create more distension and thus reduce intake. Distension in the rumen is determined by both the weight and volume of the digesta. Percentage of neutral detergent fiber of the diet in the voluntary intake of animals plays a crucial role. In this respect, Dado and Allen (1995) demonstrated that in early lactating cows 35 % NDF diets restricts DMI but DMI was not limited when 25 % NDF diets were fed with or without inert bulk in the rumen. Allen, (2000) summarized fifteen studies and concluded that there was a general decline in voluntary dry matter intake with increasing NDF concentration in the diets above 25% NDF. Likewise a research conducted by Adin *et al.* (2009) fed two diets containing 12.8% (experimental) and 18.7% (controlled) roughage NDF. According to the results there were 7.2% higher dry matter intake experimental cows than in controlled cows. Although most of the researchers has reported a significant decrease in dry matter intake as forage neutral detergent fiber increased, the dry matter intake response was variable, that was depending upon the degree to which intake was limited by fill of the rumen. High producing cows are limited by fill to the

greater extent and the filling effect of forage fiber varies depending upon characteristics of fermentation and particle size. Similarly it has also reported that NDF and ADF decreased as ration energy content was increased. However maximum intake of digestible energy was observed when the level of neutral detergent fiber was 40 to 44% and level of acid detergent was 16% in the diet of cow. This study showed that if dietary fiber content was beyond the optimum level, then reduced the animal performance. Dry matter intake have been limited when cows producing approximately 40kg of milk/ day were fed feed with more than 32% neutral detergent fiber. Kendall *et al.* (2009) showed that dry matter intake was greater for cows consuming diets with 28% NDF. Likewise other scientists reported that the intake is limited by the capacity of animal to consume dietary NDF, estimated as 1.2% body weight of a ruminant animal.

### **Effect of NDF contents on milk production and composition.**

Proper NDF ratio in ration is important to get optimum milk yield from the animals. In a study conducted by Dado and Allen, (1995) showed that cows produced 5.2 kg/day more milk and consumed 5.1 kg/day more dry matter when fed low fiber diets (25 % NDF) compared with high fiber diet (35 % NDF of dietary dry matter) on iso-nitrogenous rations. In dairy cattle, increased dietary NDF concentration would likely increase milk fat which might partially compensate, from an economic standpoint, for lower milk production associated with increased net energy intake. Adin *et al.* (2009) conducted an experiment on total mixed ration fed to dairy cattle containing 20.5% less NDF in experimental ration than control total mixed ration (11.7 vs. 14.1% of DM respectively). By this way a favorable condition for NDF digestion was created in the rumen of experimental cows. The advantage of the experimental cows in intake and digestibility were reflected in associated increase of 7.4% in milk production and of 9.2% in FCM yield as compared with control cows. Yang and Beauchemin, (2005) prepared 3 diets consisting of high (11.5%), medium (10.3%) and low. 8.9%) NDF contents and observed significant effect due to dietary NDF to a greater extent than other nutrients. However increased digestibility due to increased dietary NDF did not significantly improve milk production or milk composition. Another study conducted by many scientists fed diets to early-lactation cows that

were formulated to be low or high in fiber fill value and that had been formulated to differ in rate and extent of NDF digestion, although cows produced significantly more milk and milk protein on the low fill diet. Likewise another research conducted by Greter *et al.* (2008) on dairy heifers. They prepared 3 diets, control diet containing silage, diet with 10% straw, diet with 20% straw. According to the results there was a linear decrease in dry matter intake of the heifers with the addition of straw to the diet as well as there was a linear decrease in consumption of crude protein, ADF, NDF, non fibrous carbohydrates, and total digestible nutrients.

Diets having with 25% NDF resulted in similar milk production with a similar composition of milk as did diets with higher NDF concentration. In these studies dietary dry matter contained 16 to 20% NDF from forages. Many studies depicted that diets with less than 25% total NDF and less than 16% NDF from forage depressed milk fat percentage. Kendall *et al.* (2009) reported that cows fed diet consisting of 28% NDF produced more milk, fat, and protein than those cows who consumed diets containing 32% NDF. According to NRC, (1989) a minimum amount of 28% NDF is needed in dairy cattle diet, but it is reduced to 25% during the time of high milk production in order to maintain normal milk yield and milk fat and to minimize digestive disorders. Likewise Hoffman and Bauman (2003) conducted an experiment on dairy cows. They used total mixed rations with different consistency of NDFD contents such as 45.0%, 50.0%, and 55%. According to the results there was more dry matter intake and more milk production when fed forages that had a higher NDF digestibility. Ivan *et al.* (2005) reported that milk yield per ton of corn silage on dry matter basis was 168 lb. higher for high fiber than low fiber corn silage by feeding high fiber (53% NDF) and low fiber (49% NDF) corn silage in 30% NDF diets respectively. But the research conducted by Knight *et al.* (2005) fed lactating dairy cow alfalfa hay that contained either low neutral detergent fiber 36 to 37% of diet dry matter or high neutral detergent fiber such as 41 to 42% of dry matter. Results have shown that milk yield was not increased by the higher neutral detergent fiber digestible alfalfa hay. Likewise the research conducted by Mertens (1994) found a relationship between 4% fat corrected milk yield and neutral detergent fiber content of the ration and concluded that there was a maximum milk production when cow was fed ration with 35% NDF contents on dry matter basis. Likewise another research conducted by Holt *et al.* (2010) on dairy cows, they conducted an experiment to determine the effect of corn silage and non forage fiber sources in high forage diets which was formulated with alfalfa hay and corn silage on production performance in lactating dairy cows.

Production of milk protein is economically important to dairy producers and milk manufacturers. When we feed forage that is higher in NDF in the diet that may increase the milk protein contents as described by Hoffman and Esser (1997).

### **Effect of NDF contents on body weight change**

The research conducted by Adin *et al.* (2009) who prepared two total mixed rations of varying level of NDF. Experimental TMR contained 20.5% less physically effective NDF than control TMR (11.7 verses 14.1% of dry matter respectively), There was non significant difference with respect to efficiency of utilization of feed on milk production and body weight gain. Likewise Ware and Zinn, (2004) conducted a trial on Holstein steers and used fiber in a range (4-8%), which did not limit rumen function and growth performance. Lippek *et al.* (2000) conducted an experiment on steers to determine the effect of supplementary fiber and grain on weight gain. They concluded that there was no change in body weight gain at different supplementary fiber levels in total mixed rations.

## **CONCLUSION**

In early studies, the dietary NDF less than 25 percent depresses milk fat and lactating buffalo fed diet containing above 28 percent NDF produced more milk with higher milk fat and protein than those that consumed diets containing 32 percent NDF. But concerning the Nili Ravi buffaloes in Pakistan most of research summarized that 33 % NDF contents on dry matter basis in terms of Milk production (4 % FCM) and composition and 38% in growing Nili Ravi Buffalo Heifers for growth parameters is optimum. It is concluded that Nili Ravi buffalo is better NDF convertor as compared to cattle and there is provision to research on the other breeds of Buffalo in Pakistan to determine the optimum level of NDF in their diets and it is suggested that NDF content is 2 to 3 times as important as fiber digestibility in affecting production and intake. Thus, rations should be formulated first to obtain proper NDF content in buffalo breeds and then NDF digestibility can be used to fine -tune rations.

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