

## VALUE ADDITION OF WHEAT STRAW WITH CORN STEEP LIQUOR AND ITS PERFORMANCE ON GROWTH RATE IN GROWING BUFFALO CALVES

F. Ahmad<sup>1</sup>, M. A. Khan<sup>2</sup>, F. Wadood<sup>3</sup>, M. Mubeen<sup>1</sup>, A. Asghar<sup>1</sup>, A. Yaseen<sup>1</sup>, M. N. Mujahid<sup>3</sup>, M. Akmal<sup>1</sup>, H. M. A. U. Haq<sup>4</sup>, <sup>5</sup>M. Ikram and S.G. Mohyuddin<sup>6</sup>

<sup>1</sup>Livestock Production Research Institute, Bahadurnagar, Okara

<sup>2</sup>Buffalo Research Institute, Pattoki, Kasur

<sup>3</sup>Livestock and Dairy Development Department, Lahore, Punjab, Pakistan.

<sup>4</sup>Poultry Research Institute, Punjab, Rawalpindi

<sup>5</sup>University of Veterinary and Animal Sciences, Lahore

<sup>5</sup>Directorate of Planning and Evaluation Livestock Department Government of Punjab, Pakistan

<sup>6</sup>Department of Veterinary Medicine, Guangdong Ocean University, Zhanjiang 524088, China

Corresponding author's E-mail: arfan105@gmail.com

**ABSTRACT:** The current study was undertaken to see the benefits of mixing /soaking of wheat straw with 20% corn steep liquor on palatability, growth and digestibility in buffalo calves. 18 buffalo calves having similar body weight with age of 16-18 months were distributed into two groups. Group – I (control) was fed on diet @ 3 percent dry matter on body weight containing 1.5% concentrate (Anmol wanda with CP 17.5% and ME 2.6 Mcal/Kg), 0.5% wheat straw and 1% fodder on dry matter basis while group – II (test) was fed on 1% of concentrate, wheat straw and fodder of body weight basis for each. Group feeding was practiced @ 3 percent during the 90 days of experimentation along with 10 days adjustment period. Fresh and clean water was made accessible during the whole duration of study. Body weights were measured at fortnightly basis and growth performance was worked out. Mean values of total growth of animals were  $82.7 \pm 2.4$  vs  $78.1 \pm 3.1$  Kg while daily growth rate were  $0.92 \pm 0.027$  vs  $0.87 \pm 0.035$  Kg for both groups. But statistically difference was non-significant. Statistically the difference among dry matter and crude protein digestibility were non-significant. Economically diet containing wheat straw mixed with 20% corn steep liquor had lower cost of production (18%). It was proved that 20% corn steep liquor can be mixed with wheat straw to improve its palatability, growth and digestibility without any adverse effect on health status.

**Keywords:** Buffalo calves, Total mixed ration, Growth rate, Corn steep liquor.

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### INTRODUCTION

Pakistan is deficient by 40% in forages and 80% in concentrate feed (Pasha, 1998). In current era, the demand of feed for animal is increasing day by day, therefore, a great pressure observed for new feed resources to meet the requirements. Some of the crop residues are used as feed for animals which have poor digestibility. High lignin content and low CP are counted in these crop residues, therefore, nutritive value are considered very poor as well as their intake is also low. Energy is limited due to lignocellulosic bonds (Sarwar *et al.*, 1994). Non-conventional feed resources are also considered a vital part to be utilized for animal feed. However, some of the problems as, low fermentable carbohydrates, low feeding value, poor protein contents, high lignification as well as mineral imbalance are badly associated with these resources (Sarwar *et al.*, 2004). Several physical, chemical and biochemical treatments to improve the nutritive value and utilization of fibrous

feed-stuffs have been developed but farmers are reluctant to adopt these methods.

For the provision of massive weight gain in young calves, the crop residues quality is taken at inadequate level. Therefore, various scientists recommended supplementation for energy source and protein to enhance the performance at adequate level. (Sarwar *et al.*, 2004). The functions can be enhanced through provision of direct supplementation of crude protein and fermentable carbohydrates. For poor quality crops residues, the provision of supplementation is considered cost effective and quick method which enhances nutritional worth.

Wheat straw is being used as dry roughages in animal feeding like TMR or mixed with rabi fodder to meet out the dry matter contents. Wheat straw is low palatable due to dryness and poor digestible due to lignocellulosic bonds. If this wheat straw is mixed or soaked with some fermentable energy sources like corn steep liquor, it will provide quick energy source to the animals because soaking of straw started swelling of cell

walls with the targets to make its crystalline structure more manageable to cellulolytic microbes. Furthermore, dryness and dustiness of feed is reduced by it as reported by (Maryum and Amjad, 2008).

With the new bio- based products and our need for renewable energy sources, researchers are looking at corn as a feed stock for other organic nutrients. Corn steep liquor is one of them. Two ingredients are obtained by wet corn milling plant to prepare this liquid which are condensed distiller soluble and condensed steep water. It has acidic pH. It is a high protein, high energy liquid ingredients consisting of the soluble protein of corn kernel which is removed by the steeping process and concentrate to high solids. It has pelleting properties and improves the palatability of feed (Gupta *et al.* 1990, Wagner *et. al.*, 1982, Talpada *et al.* 1987). It is a good source of vit. B and minerals. (Kelly, 2001). Work with fattening steers showed that with high roughages rations, corn steep liquor supported better animal performance in terms of increased weight gains and greater feed efficiency than when the ration was supplemented with equal calories from maize. It was also observed that lactic acid is an efficient source of energy for ruminants. Thus a project was designed to evaluate the effectiveness of corn steep liquor by the value addition of wheat straw and its performance on growth rate and economics in Nili Ravi buffalo growing calves.

## MATERIAL AND METHODS

**Mixing of corn steep liquor with wheat straw:** Mixing of corn steep liquor decreases dustiness and thus decreases opportunity of the animal to reject fibrous parts of crop residues. 20% level of corn steep liquor was mixed thoroughly with wheat straw to make it a uniform shape. The mixed material was dried over night to reduce the moisture. Final dried product was analyzed chemically.

**Feeding Trial:-**Eighteen male buffalo calves of similar age (16-18 months) were distributed into two equal groups (in each group nine calves were kept). For protein and energy, two diets were prepared with iso-nitrogenous and is-caloric by using NRC (2001) standards. Diet A comprised on 1.5% concentrate + 0.5% wheat straw +1% fodder on body weight basis and serve as control diet while diet B comprised on each 1% of concentrate, mixed wheat straw with 20% corn steep liquor and fodder composition of concentrate is given in table –1. 33% portion of ration of control group was replaced with the wheat straw mixed with 20% CSL or 33% contents of protein of concentrate were replaced with the same protein contents of mixed wheat straw. Group feeding

was practiced. Feed intake was adjusted at each body weights measured at fortnightly basis. At initial stage of the experiment and fortnight thereafter, the animals were weighed carefully and weight was documented. Grouping for animal and feed was done on randomly basis. To each group of animals, dry matter intakes @ 3% of body weight were offered. During whole experimental period, clean and fresh water was available round the clock to each animal in the shed. Total duration of the experiment was 100 days. Nutritional acceptances were provided to animals in first ten days and samples were collected in the remaining ninety days. Documentation was prepared carefully on daily basis for offered feed as well as for refusals. The growth rate of animals was computed by the differences of these two recorded body weights. Similarly, economics of both rations were also done by the methods of (AOAC, 1990) and statistical analysis was done by using T Test (Steel and Torrie, 1981).

In this study, a digestibility trial was carried out during the last week. Samples of fecal grab were collected continuously for four days after three hour interval in 24 hour period. The collected samples were dried at 55°C and after mixing and bulking, the same were analyzed for crude protein, dry matter (through the method used by AOAC (1990), acid detergent lignin, acid detergent fiber and neutral detergent fiber as per described method by (Van Soest *et al.*, 1991).

**Table 1. Composition of the ration.**

Ingredients	Percentage
Maize broken	13
Wheat bran	20
Rice Polishing	15
Cotton seed cake	10
Maize gluten meal 30%	15
Canola meal	05
Rape seed cake	07
Cane molasses	13
Mineral mixture	02
<b>Total</b>	<b>100</b>
CP	17.5
ME (Mcal/Kg)	2.6

## RESULTS AND DISCUSSION

High CSL was noted in mineral matter, ash content, crude protein and crude fiber during proximate analysis as shown in Table-2. The texture was improved highly by the use of supplementation of CSL in animal diets and dustiness of the compound was also reduced.

**Table-2. Chemical Composition of Corn Steep Liquor,**

Component	Dry Matter (%)	Protein (%)	Ash (%)	Nitrogen Free Extract (%)	Lactic Acid (%)	pH
Concentration	50.0	40.0	10.0	16.0	21.0	3.7

**Growth Performance:-** Mean values of total growth of animals during 90 days of experimental period were  $82.7 \pm 2.4$  vs  $78.1 \pm 3.1$  Kg while daily growth rate was  $0.92 \pm 0.027$  vs  $0.87 \pm 0.035$  Kg for the animals of both groups. Hence, animals of control group (group-A) showed higher weight gain on daily basis. But statistically difference was non-significant as the buffalo calves showed better weight gain which might have due to higher digestible nutrients intakes. In the present study, 33% share of crude protein contents of concentrate was successfully fortified with value added wheat straw with 20% corn steep liquor. This may be due to an associative effect between Corn Steep Liquor and wheat straw. Because CSL has the ability to trap into fibrous portion of the feed stuff and alter the nutrients of the diet, change the structure of fiber and improve the taste and flavor of diet. It was reported in the previous studies that in free grazing cattle and buffalo calves, enhancement was observed in weight gain which was due to the supplementation of CSL based mixture with low quality forages.

The current study extends its findings in accordance with that of Fayyaz *et al.*, 2005 who found non-significant differences in live weights of Sahiwal heifers fed on concentrates supplemented with 20% CSL in the ration. Also he observed no variation in rumen pH at different intervals. Allen Trenkle (1973) reported that finishing steers weighing 975 pounds were fed corn based finished diet containing 12% CSL for 84 days, and he added that feeding CSL did not affect the performance of Steers and carcass characteristics. Mirza and Mushtaq (2006) demonstrated that for growth and feed gain, 05% of the diet including CSL supplementation is beneficial and advantageous. Nasir *et al.* (2012) concluded that distillate part of ruminant's feed could be replaced successfully by CSL thereby in buffalo calves as decreasing cost of production. Tonny Scot, (1997) replaced dry rolled corn with corn steep liquor in the finishing diet of yearling Hereford steers and proved that 15% CSL added to the diet appears to be the most beneficial. Wardynsky (2012) made a comparison between dairy heifers by dividing them into two equal

groups. Tradition diet was given to the group A and corn stalk and wet distillers grain were provided to group B. For heifers fed with traditional diet, gain was higher (2.582 vs. 2.31). The results of the study showed the performance at acceptable level of supplemented heifers with corn stalk while 40% of reducing ration cost.

**Nutrient Digestibility:** In control group, dry matter digestibility were observed rarely higher than treated group but statistically difference was non-significant while values for crude protein were almost similar in both group and difference was non-significant. Feed intake was improved by supplementation of fermentable energy diet and nutrient digestibility could also be enhanced though it (Sarwar *et al.*, 2004). Nasir *et al.* (2012) performed a study and concluded that intake of better digestible nutrients can be associated with CSL diet for the improvement of body weight gain of buffalo calves. The present study, CSL was also replaced with diet which enhanced nutrient digestibility in buffaloes.

**Economics:** Economically the diet containing wheat straw mixed with 20% corn steep liquor had lower cost of production as compared to the control diet. Similarly the net profit gained was highest in the animals fed on the ration containing value added wheat straw with 20% CSL as compared to the animals fed on control diet. This picture shows that value added wheat straw in fattening ration (TMR) reduces the cost of production (18%). The results related to cost of production in the current study are also in agreement with that of Allen and Rebeiro (1999) who calculated that adding CSL at 10% of diet (dry matter) reduced feed cost (9%). While in another experiment, he concluded that the diet containing 12% CSL on DM basis had lower cost of production in finishing ration.

It is proved that 20% corn steep liquor can be mixed with wheat straw to improve its palatability and digestibility and successfully be incorporated in TMR to feed the buffalo calves to accelerate their growth performance without any adverse effect on health status.

**Table – III. Growth and digestible parameters of the experimental animals studied.**

Parameters	Group - I (control)	Group - II (treated)
Total growth (Kg)	$78.1 \pm 3.12$	$82.7 \pm 2.4$
Daily growth rate (Kg)	$0.87 \pm 0.35$	$0.92 \pm 0.027$
Dry matter digestibility (%)	$65.48 \pm 0.43$	$64.9 \pm 0.43$
Crude protein digestibility (%)	$74.5 \pm 1.50$	$74.2 \pm 1.55$

## REFERENCES

- Allen, T. (2002). Relative feeding value of wet corn steep liquor when fed to finishing cattle, 2002. Beef research report. Iowa State University. A.A. Leaflet R 1773.
- Allen, T. and C. Riberio, (1999). Evaluation of a mixture of corn steep liquor and distillers soluble as a replacement for corn and supplement in cattle finishing diets. Beef research report. Iowa State University A.S. Leaflet R 1630.
- AOAC, (1990). Official methods of analysis (15<sup>th</sup> Ed.). Association of Official Analytical Chemists. Arlington, Virginia, USA.
- Brown, W.F., J.D. Philips and D. B. Jones. (1987). Ammoniation or cane molasses supplementation of low quality forages. *J. Anim. Sci.* 64: 1205 – 1214.
- Fayyaz, A., M. Shakil and I. Ahmad (2005) Replacement of cotton seed meal with corn steep liquor in the ration of sahiwal heifers. *J. Anim. Plant. Sci.* 15(3-4): 76-78.
- Gomaa A. A. A. I. and A. A. El\_badawy. (2018). Effect of feeding Zaraibi male goats on rations containing different levels of corn steep liquor, as a source of protein, on growth performance and carcass quality. *Egyptian Journal of Sheep and Goats Sciences*, Article 2, 13(1), Page 1-14.
- Gupta, R.S., M.C. Desai, P.M. Talpada and P.C. Shukala (1990). Growth of crossbred calves. *Indian J. Anim. Nutri.* 7(4): 279-282.
- Kelly, S.D. (2001). Corn milling, processing and generation of co- products. Minnesota Nutrition conference. Minnesota corn grower Association. Technical symposium, Sep 11.
- Maryam and Amjed (2008). Effect of waer sprayed and soaked and soaked wheat straw on intake and digestion of rations supplemented with Molassed urea block VS Molassed block licking by cow calves. M.SC. (H) thesis Agri. Uni. Peshawar.
- Mirza, M.A and T. Mushtaq (2006) effect of supplementing different levels of corn steep liquor on the post -weaning growth performance of pak – karakul lambs. *Pakistan vet. J.*, 2006, 26(3): 135-137.
- Moghadam, P. Z., A. Azarfar and A. Azizi (2019). Effect of different dietary carbohydrate sources on *in vitro* utilization efficiency of corn steep liquor. *Iranian Journal of Anim. Sci.* 49(4) Page 469-479.
- Pasha, T.N. (1998). Feed resources for livestock and poultry in Punjab, Punjab, Pakistan. Germany agency for technical cooperation (GTZ), Livestock and Dairy Development Department, Government of the Punjab, Lahore.
- Qamar, M.S., M. Un-Nisa, M. Sarwar and Z. Ur-Rahman (2015). Influence of Varying Levels of Corn Steep Liquor on Nutrients Intake, Digestibility and Growth Response in Growing Buffalo Calves. *Journal of Animal and Poultry Sciences (JAPSC)*. 4(3): 39-48.
- Sarwar, M., M. A. Khan and M. Nisa (2004). Effect organic acids or fermentable carbohydrates on nitrogen fixation and chemical composition of urea treated wheat straw. *Asian – Aust. J. Anim. Sci.* 1: 98.
- Shahzad, F., M. Abdullah, A. S. Chaudhry, J. A. Bhatti, M. A. Jabbar, F. Ahmed, T. Mehmood, M. Asim, S. Ahmed, Z. Kamran, I. Irshad, and M. N. Tahir (2016). Effects of Varying Levels of Fungal (*Arachniotus* sp.) Treated Wheat Straw as an Ingredient of Total Mixed Ration on Growth Performance and Nutrient Digestibility in Nili Ravi Buffalo Calves. *Asian-Australas J Anim Sci.* 2016 Mar; 29(3): 359–364.
- Steel, R. G. D., J. H. Torrie and D. A. Dickey (1984). Principles and Procedures of Statistics. A Biometrical Approach (2<sup>nd</sup> Ed.)Mcgraw Hill Book Co. Inc. New York, USA.
- Talpada, P.M., M.C. Desai, H.B. Desai, Z.N. Patel and P.C. Shukal, (1987). Nutritive value of corn steep liquor. *Indian J. Anim. Nutr.* 4(2): 124-125.
- Tauqir, N. A., M. Sarwar, F. Ahmad, M.A. Tipu and I. Hussain (2012) Influence of substitution of concentrate with molasses and corn steep liquor on nutrient intake, weight gain and feed conversion efficiency of buffalo calves. *The journal of Animal and Plant Sciences*, 22(3 suppl.): 2012, Page: 296-300. ISSN: 1018-7081.
- Van S.P.J., H. B. Robertson and B.A. Lewis (1991). Method of dietary fiber and non-starch polysaccharides in relation to animal material. *J. Dairy Sci.* 74:3583.
- Wagnar, J.J., K.S., Lusby, W.W. Horn and J.J. Dvorak, (1982). Corn Steep Liquor and fermented ammoniated condensed whey as protein sources for lactating cows and yearly heifers grazing winter native range. [http://www. Osti. Gov/energy citahom/product](http://www.Osti.Gov/energy_citahom/product). Biblio.