



Influence of graded replacement of paddy straw with brewer's spent grain on rumen protozoa, enzyme profile and feed fermentation under *in vitro*

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Received: 27 July 2012; Accepted: 27 February 2013

ABSTRACT

The present study was conducted to assess effect of sun dried brewer's spent grain with soluble (DBSG) supplementation on rumen fermentation, enzyme profile, ciliate protozoal population and dry matter degradability in paddy straw based diet *in vitro*. Substrate (500 mg), for example paddy straw was gradually replaced by DBSG (00 mg DBSG + 500 mg of paddy straw, 125 mg DBSG + 375 mg paddy straw, 250 mg DBSG + 250 mg paddy straw, 375 mg DBSG + 125 mg paddy straw and 500 mg DBSG + 00 mg paddy straw) for this study. DBSG contained 96.8% OM, 19.7% CP, 72.8% NDF, 28.4% ADF, 22.9% cellulose and 5.2% lignin on DM basis. TVFA concentration and propionic acid production increased due to inclusion of DBSG in the incubation medium. The activities of polysaccharide degrading enzymes e.g., carboxy-methyl cellulase, xylanase and β -glucosidase decreased with supplementation of DBSG. However, activities of amylase showed the reverse trend. The number of total ciliate protozoa as well as holotrich and spirotrich protozoa increased with increasing level of DBSG. *In vitro* dry matter and organic matter digestibility of paddy straw/incubating substrate also improved with supplementation of DBSG. It is concluded from the study that supplementation of DBSG in paddy straw based diet improved rumen fermentation e.g., TVFA and propionic acid production under *in vitro* condition.

Key words: Brewer's spent grain, Ciliate protozoa, Enzyme, Feed degradability, Rumen fermentation

Brewer's spent grain or material left after grains fermentation from beer industry can be used in wet/dry form for feeding livestock (Dhiman *et al.* 2003). Dried brewer's spent grain @ 15% of diet DM is serve as protein source while, feeding at greater levels additionally serve as a source of non-forage fibre (Leupp *et al.* 2009). Due to ever increasing cost of cereal grain or oil cake, the use of brewer's spent grain offer ample opportunity to replace these items in the animal's diet for energy (Depenbusch *et al.* 2009, Luebbe *et al.* 2011) or protein (Ham *et al.* 1994, Liu *et al.* 2000) purpose. Moreover, brewer's spent grain contains live cells of yeast (*Saccharomyces cerevisiae*) which may serve as an effective source of probiotic to increase the utilization of nutrients (Pal *et al.* 2010). A large amount of brewer's spent grains with soluble are available in India, and production of this co-product is expected to grow increasingly in future. Scanty Indian literature is available on this topic. Chawla and Sikka (1985) reported that average daily gain and feed conversion efficiency of pigs become decreased when the

level of dried brewer's spent grain in the ration was raised beyond 15%. The growth performance of Black Bengal (*Capra hircus*) kids improved due to inclusion of dried brewer's spent grain in their diet (Pal *et al.* 2010). Therefore, this experiment was conducted to evaluate the effect of supplementation of sun dried brewer's spent grain with soluble on rumen fermentation, enzyme profile and ciliate protozoal population on paddy straw based diet *in vitro*.

MATERIALS AND METHODS

Collection and processing of brewer's spent grain:

Brewer's spent grains collected from a local distillery unit was sun-dried for 52 h to obtain dried brewer's spent grain with soluble (DBSG) having 9.2% moisture. Initial moisture content of brewer's spent grain with soluble (BSG) was 80.3%. After sun drying, DBSG were grind in a hammer mill and passed through 1 mm sieve. The grounds DBSG were stored in air-tight container for further use. Moisture content of DBSG at the time of storing and taking out for study was 8.6 and 8.9%, respectively.

In vitro feed degradability: Paddy straw was replaced by the dried brewer's spent grain (DBSG) @ 0 (G₁), 25 (G₂), 50 (G₃), 75 (G₄) and 100 (G₅)% and 0.5g substrate was weighed and taken in the 250 ml capacity conical flask. All the samples were taken hexa plicate along with 100 ml

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