International Journal of Science, Environment and Technology, Vol. 4, No 4, 2015, 1177 – 1180

ISSN 2278-3687 (O)
2277-663X (P)

CHEMICAL COMPOSITION AND *IN VITRO* DRY MATTER DIGESTIBILITY OF DRIED DISTILLERS GRAIN SOLUBLES

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Abstract: A study has been carried out to find out the chemical composition and *in vitro* fermentation characteristic of dried distillers grain soluble (DDGs). Six DDGs feeds samples were collected from different parts (feed mills) of Namakkal district. The samples were ground to pass through a 2-mm screen and then analysed for chemical analysis and in *vitro* dry matter digestibility. In the present study the Crude protein, Crude fibre, Ether extract, Total ash, Sand and silica content of DDGs are 47.95, 1.12, 1.19, 4.77 and 0.058% respectively. The calcium, phosphorous, magnesium and potassium content of DDGs were 0.16 %, 0.63%, 0.31% and 0.98% respectively. Similarly the trace mineral like zinc, copper and manganese are 23 ppm, 7.4 ppm and 26 ppm respectively. The traces of aflotoxinB1 (0.5 ppb) also noticed in the DDGs samples. *In vitro* DM digestibility of DDGs at 24 and 48 hrs was 38 and 42 % respectively. Hence, the present study showed that DDGs had relatively high protein content and *in vitro* DMD and thus have the potential to be good alternate feed source for livestock.
Keywords: Dried distillers grain, In vitro digestibility, proximate analysis, Nutritional Value.

Introduction

Due to tremendous hike in feed cost, Cattle producers today, however, rely on an abundance of alternative or by-product feeds to supplement their cattle. Alternative feeds may provide nutrients needed by cattle at a lower cost than traditional feeds. One such alternative feed for livestock is dried distillers grain solubles (DDGs) Distillers grains are by-products of the distilling industry and consist of distiller's grains plus the solubles of fermentation. Distiller's grains are identified by the type of grain from which they are made, for example, corn or milo distillers. Brewers and distillers grains are a good source of undegradable protein for ruminants. They are rich in protein, TDN, minerals and vitamins. The use dried distillers grain solubles in the nutrition of animals, especially cattle, has been investigated widely. (Kleinschmidt et al., 2005). Composition of DDGs has been of great interest to researchers in the area of animal science and especially to people in the feed industry as majority of it has

*Received June 29, 2015 * Published Aug 2, 2015 * www.ijset.net*

been sold as a feed ingredient for livestock. Hence present research had been initiated to study the chemical composition of DDGs and its in vitro dry matter degradability potential.

Materials and Methods

Sample collection

Six dried distillers' grain soluble (DDGs) feeds samples were collected from different parts (feed mills) of Namakkal district. The samples were ground to pass through a 2-mm screen and then analysed for chemical analysis and in *vitro* dry matter digestibility.

Chemical analysis

Dry matter (DM) was determined by drying the samples at 105 $^{\circ}$C overnight and ash by igniting the samples in a muffle furnace at 525 $^{\circ}$C for 8 h. Content of nitrogen (N) was measured by the Kjheldal method (AOAC 1990). The CP was calculated as N X 6.25 and other proximate analysis was done as per the AOAC (1990).

Mineral analysis

Minerals were estimated using AAS (Perkin Elmer model. 3110, 1994) following the procedure outlined in the cookbook.

In vitro dry matter digestibility (IVDMD)

Dry forage samples (0.5g) were subjected to a 24 and 48 h digestion period with McDougall's buffer/rumen fluid mixture in sealed plastics bottles followed by 24 and 48 h digestion with pepsin in weak acid (Tilley and Terry 1963). All incubations were carried out in triplicate. Three blank tubes (without sample) were used in each run.

IVDMD (%) = [(initial DM input - (Residue - Blank) / initial DM input)*100]

Simple correlation and regression analyses were used to establish the relationship between chemical composition and *in vitro* DMD and the results were analyzed statistically (Snedecor and Cochran, 1989).

Results and Discussion

Chemical composition and mineral profile

The chemical composition of DDGs was presented the Table 1. In the present study, The CP content of DDGs was as similar with the value reported by Urdl et al (2006) where Liu et al (2000) reported that the CP contents of DDGs reported between 27-35 %. Protein contained in the feed can be utilized by rumen microbes. However, the rumen undegradable protein (RUP) portion may by-pass the rumen and supply the small intestine with protein where it is digested and absorbed. On a dry matter basis, corn distillers grains contain approximately 30% crude protein, commonly ranging between 25 and 35%. Corn distillers grains are a good

source of rumen undegradable protein (approximately 50%), with wet being slightly higher than dry (Klopfenstein, 2001). Similarly, Adeniran *et al*. (2008) reported that the crude fibre content of DDGs was about 3.3%.

Table 1: Chemical composition of DDGS (on DMB)

Nutrients	**Percent (DMB)**
Crude protein	47.95
Crude fibre	1.12
Ether extract	1.19
Free fatty acid	0.18
Total ash	4.77
Sand and silica	0.058

The mineral profile of DDGs was presented the Table 2 and indicated that DDGs contain high levels of both phosphorus and sulphur (Klopfenstein, 2001). Although it is unlikely that these levels would contribute to the loss of any milk production or health problems, producers should be mindful of the importance of dealing with these minerals.

Table 2: mineral profile of DDGs

Sl.No	Minerals	Value
1.	Calcium (%)	0.16
2.	Phosphorus (%)	0.63
3.	Magnesium (%)	0.31
4.	Potassium (%)	0.98
5.	Sodium (%)	0.30
6	Chloride (%)	0.21
7	Zinc (ppm)	23
8	Cupper (ppm)	7.4
9	Manganese (ppm)	26

In vitro dry matter digestibility (IVDMD) studies

The dry matter degradability and rumen fermentation characteristics were listed in Table 4. The Dry matter degradability of 48h was consistent with (Klopfenstein, 2001). At 48 hours, the rumen ammonia and microbial production was lowered than 24 hours. This indicates that the strong correlation between rumen ammonia concentration and microbial protein synthesis.

Table 4: IVDMD and fermentation characteristics of DDGs

Parameter	**24 hours**	**48 hours**
IVDMD (%)	38	52
Rumen ammonia (%)	6.7	2.2
Total VFA (mmoles)	44.2	57.2
Microbial protein (mg/dl)	332	256

Conclusion

From the study, it can be concluded that DDGs had relatively high protein content and *in vitro* DMD and thus have the potential to be good alternate feed source for ruminant animals during the critical periods

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