

## Urea treated paddy straw: Effect on feed intake, digestibility, fermentable energy and milk production in cattle

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### Abstract

#### Keywords:

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Most of the small scale farmers in the developing countries like in India are cultivating the rice. Paddy straw is by-product of the rice production. Paddy straw was rich in lignin content and reduces the degradability by ruminal microorganisms in cattle. Different methods including physical, chemical and biological are available, to improve the paddy straw utilization as feed stuff to the cattle. Among the several methods, treating with urea is one of the commonest methods following in the field. To improve the quality of paddy straw by its availability of the crude protein, digestibility, rumen degradability and production of high milk yield treatment with urea is recommended. The present review about an overview of existing knowledge on urea treated paddy straw and its benefits as cattle feed.

### Introduction

Ruminants are depending on the year - round grazing or hand fed in the tropical regions in the world. Due to presence of the seasonal dry periods, availability of pasture reduced for feeding which leads to lowered digestible energy and nitrogen, less milk production (Reddy, 1996). Paddy straw is considered as the most abundant source of feed for the animals during the dry periods (Anshar *et al.*, 2015). Supplementation of the poor quality straw and decomposed hay leads to development of the digestive disturbances including alkaline indigestion in cattle (Reddy and Kumari, 2010). Physical, chemical and biological treatments are the recommended procedures to improve the quality of the paddy straw (Selim *et al.*, 2004). It is essential to supplement the high quality nitrogen supplementation when cattle were suffering with infectious diseases including haemoprotozoan diseases (Sivajothi *et al.*, 2014). When cattle are suffering with gastro intestinal functional abnormalities in association with other systemic diseases, it is recommended the high

nutritive value and easily digestible feed supplementation (Reddy *et al.*, 2014). Feeding of the paddy straw to the cattle had some limitations like low nitrogen content, the presence of lower carbohydrate content, limiting voluntary intake and reducing degradability by ruminal microorganisms (Rehrahie and Ledin, 2001, Trach *et al.*, 2001, Mesfin and Ktaw, 2010). The present review about an overview of existing knowledge on urea treated paddy straw and its benefits as cattle feed.

### Importance of Urea Treated Paddy Straw

Feeding of the plain paddy straw does not provide enough nutrients because of its relatively low nutritive value, protein levels (2 to 5%), high fiber and lignin contents (NDF > 50%) and low digestibility in the rumen (< 60%) (Wanapat *et al.*, 2009). The practical utility of plain paddy straw was reduced because of the low feed intake by the cattle and low digestibility by the ruminants (Males, 1987). Urea treated paddy straw found to be improving the digestibility, nitrogen content, cellulose and hemicellulose levels (Silva and

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Orskov, 1988). Initially to improve the quality of paddy straw application of the caustic soda was trailed (Lehmann, 1991). Khan *et al.* (1999) studied the urea pre-treatment of straw by addition of the urease to improve the quality. It was proposed that the low quality roughages utility can be improved by the treatment with nitrogen sources, chemical and physical treatment (McDonald *et al.*, 2002; Nguyen *et al.*, 2012). Among the available treatment protocols for the paddy straw, urea treatment may be the most suitable method for small - scale farmers improve the quality of straws at the field level (Akter *et al.*, 2012).

#### **Effect of Urea Treated Straw on Feed Intake**

It was recorded that, higher intake of feed was noticed in the cattle after feeding with 4 kg urea with 1 kg calcium hydroxide to the paddy straw (Leng, 1984). Dajayanegra *et al.* (1989) and Ghana *et al.*, (1993) reported both urea treatment and urea supplementation increased intake, a rate of digestion and digestibility of nutrients. Fadel, (2003) found that the treatment of urea and calcium hydroxide could slightly increase dry matter intake in dairy cows when compared with untreated rice straw. Ahmed *et al.* (2003) reported significantly higher dry matter intake in cattle feed with 4% urea treated straw.

#### **Effect of Urea Treated Straw on Digestibility**

Primary location of fiber digestion is rumen in cattle (Rai and Mudgal, 1988). It was proposed that feeding of urea as molasses blocks along with the paddy straw can improve the digestibility in ruminants (Leng, 1984). The proposed theory for improved digestibility due to as a result of increased straw degradability and better microbial activity, would cause a substantial improvement in digestibility and also involuntary intake (Fadel, 2003). Ahmed (2003) with that 4.0% urea + 4.0% soybean treated rice straw improved the co-efficient of digestibility of crude fiber. Wanapat *et al.* (2009) stated that urea treated paddy straw improve feed intake, digestibility and rumen ecology in cattle. Gunun (2013) explained the importance of the particle size of roughage to maintain the rumen ecosystem and it was associated with fiber digestibility and optimal pH for cellulolytic microorganisms.

#### **Effect of Urea Treated Straw on Nutrient Content**

Urea is one of the major chemical agents used to improve the nutritive value of cereal straws and other fibrous by-products (Ray *et al.*, 1989; Got *et al.*, 1991;

Tune *et al.*, 1991). After treating with urea, it causes breaking of the ester bonds between lignin, hemicelluloses and cellulose, and finally all the fiber becomes enlarged. Urea ammonization affects CW composition and improves the extent of rumen degradability in the ruminants (Mason *et al.*, 1988; Many chi *et al.*, 1992). Khan *et al.* (1999) stated that addition of urease sources increased the rate of urea hydrolysis and crude protein content of treated straw. The increases of DM, OM, CP, a NDF and ADF digestibility in urea-calcium hydroxide treated rice straw treatments (Trach *et al.*, 2001). Malek *et al.* (2008) reported that the value for NFE of urease enzyme - treated group was lower than untreated rice straw group. Increase in the VFA levels was a reflection of the increase in the rumen fermentation which finally results in increased OMD and NDF (Trach *et al.*, 2001). Midau *et al.* (2015) reported the results of the urea - treated paddy straw and plain paddy straw and stated that, urea treated paddy straw had a higher crude protein value (12.35%) than the untreated paddy straw (3.22%).

#### **Effect of urea treated straw on fermentable energy**

Concentrate supplementation for such low - quality roughages also increases the rumen fermentation due to the supply of readily fermentable energy. However, it has been reported that high concentration levels in the diet may reduce rumen fermentation and rumination time (Korsakov and Ryle, 1990). Urea treatment of basal diets provided more fermentable energy and nitrogen to the rumen microbes than plain paddy straw (Tune *et al.*, 1991). Gunun (2013) reported that chemical treatments enhanced the nutritive value of rice straw through increasing the number of accessible sites of microbial attachment on the surface of the particles, increasing fibrinolytic microbe quantity and improving rumen fermentation characteristics.

#### **Effect of Urea Treated Straw on Milk Production**

Initially, Prasad *et al.* (1998) proved that by addition of the urea, fat content and the solids not fat production was increased along with the high milk production. Wanapat *et al.* (2009) recorded the higher concentration of the fat and protein in urea treated cattle than the plain paddy straw treated group of cattle. Midau *et al.* (2015) found the increase in milk yield along with the 3.5% FCM in the cattle feed with urea-treated rice straw than the control group in their study.

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