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Pretreatment on Crop Residues to Improve Nutrient Availability to Livestock

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Abstract

An increase in grain production to fulfil the need of increasing human population leads to the generation of large quantities of crop residues. Due to the increase in livestock population, the gap between demand and supply of feed and fodder for livestock increases day by day. To bridge the demand and supply gap, it is necessary to efficiently utilize crop residues in animal ration. This is the known fact that these crop residues are rich in fibre and low in other nutrients; it needs to be processed. Different pre-treatment methods are used to treat the straw before the preparation of complete feeds for livestock. The commonly used pre-treatment methods are steam-explosion, alkali treatment, urea treatment, Ozone treatment and enzyme treatment. Pre-treatment of crop residues leads to improved enzymatic hydrolysis, delignification of crop residues and more glucose yield. The overall effect of pre-treatment on crop residue is that the increase in nutrient availability to livestock ultimately results in improved livestock performance.

Keywords: Crop residues, livestock, nutrient availability, pre-treatment

Introduction

In our country, the livestock and human population are increasing day by day, leading to heavy competition between human beings and animals for food grains. The demand and supply gap of feed and fodder for animals is increasing day by day, leading to underfeeding of animals and hampers livestock performance (Dikshit and Birthal, 2010). Hence, to fulfill the nutrient requirement of livestock, it is necessary to utilize crop residues in livestock ration. For efficient utilization of nutrients in crop residues for livestock pretreatment on crop residues is essential.

There are physical, chemical, biological and combined pre-treatment methods available for crop residues (Kamusoko *et al*., 2019). But commonly used pre-treatment

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methods are steam-explosion, alkali treatment, urea treatment, Ozone treatment and enzyme treatment.

Effects of pretreatment on straws

1. It breaks the lingo-cellulosic bond and improves the digestibility of straws
2. It enhances the availability of nutrients to animals
3. Delignification/Melting of lignin occurs due to pretreatment and this lignin acts as a binding material for the preparation of crop residue-based complete feed pellets.

Asghar *et al*., (2015) reported 81% delignification of wheat straw on 2.5% NaOH treatment. Whereas, Ben'ko *et al*., (2020) found 70% delignification of wheat straw on ozone pretreatment @ 7mmol/g. On pretreatment with exogenous enzymes, Ahmed *et al*., (2017) reported 58.5% delignification of wheat straw. Delignification leads to improvement of digestibility of straw.

1. **It gives a higher yield of glucose and hemicelluloses.**

Cha *et al*., (2014) reported 65.8% glucose yield on alkali pretreatment on sugarcane bagasse. However, 70% glucose yield was reported by Pascal *et al*., (2019) on Acid catalysed atmospheric Glycerol organosol pretreatment on sugarcane bagasse. On steam pretreatment on wheat straw, Yin *et al*., (2014) reported 60.1% glucose yield. Improvement in glucose yield leads to more milk yield and more milk lactose synthesis.

2. **Improved enzymatic hydrolysis**

Zheng *et al*., (2018) reported an increase in enzymatic hydrolysis by 87.2 % on 4% NaOH treatment on Wheat straw. Whereas,García-Cubero, (2008) found an increase in enzymatic hydrolysis by 88.06% & 57% on ozonolysis pretreatment on wheat straw and rye straw. On alkali pretreatment on sweet sorghum straw, Dong *et al*., (2019) reported an increase in enzymatic hydrolysis by 86.44%. Improved enzymatic hydrolysis of straw leads to more conversion of cellulose into fermentable sugars.

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