Effects of Treating Prosopis Juliflora Pods with Multi-Enzyme, with and Without Bacterial Cultures on In-Vitro Dry Matter Digestibility (IVDMD), Fermentation Kinetics and Performance of Growing Pigs

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Research Article

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Abstract

This study was conducted to determine the effects of treating *Prosopis juliflora* pods with multi-enzyme and bacterial cultures on *in-vitro* dry matter digestibility (IVDMD), fermentation kinetics and performance of growing pigs. Experiment one consisted of a pepsin-pancreatine hydrolysis method to simulate *in-vitro*, the pig digestive system and was followed by *in-vitro* gas production to assess fermentation kinetics. Samples of ground *Prosopis* pod meal (GPPM) were allocated to four treatments with three replicates each. Treatments included GPPM treated with multi-enzyme (Natuzyme®) (T1); Untreated (GPPM) (T2); GPPM fermented with (*Lactobacillus plantarum* MTD1 Ecosyl ®) (T3) and GPPM treated using natural fermentation (T4). The second experiment assessed the performance of pigs fed the best treatment from experiment 1. Thirty Landrace x Large white crosses of 20 ± 2 Kg were allotted to five treatments with six pigs each (replicates). The dietary treatments were PC -0% GPPM + Enzyme; NC – 0% GPPM and 0% Enzyme; D1–10% GPPM + Enzyme; D2- 20% GPPM + Enzyme; and D3- 30% GPPM + Enzyme. The completely randomized block design was used for both experiments. Enzyme treatment (T1) and T3 improved the IVDMD of the GPPM compared to T2 by 3.68% and 1.2% respectively ($p < 0.05$). Cumulative gas was highest and Tmax lowest for T1 but significantly different only to T4 ($p < 0.05$). Average daily gain and intake was highest for pigs fed GPPM up to 10% (PC, D1). Feed conversion ratio increased with the level of GPPM in the diet. Results suggest *Prosopis juliflora* pods treated with enzymes can be added in pig diets up to 30%.

Introduction

The animal feed industry faces the challenge of the increased price of cereals and oilseeds that are in high demand for human consumption and bioenergy production, especially in emerging markets (de Vries et al. 2012). These feed resources are critical for pig nutrition since pigs cannot efficiently utilize fibrous feed materials. In developing countries, specifically in Kenya, mainly smallholders with limited resources practice pig farming (Kagira et al. 2010; Kambashi et al. 2014). They face the challenge of the high cost of conventional feed and often resort to the use of locally available feed resources. A survey in Kenya reported that only 30% of pig farmers use commercial feeds while the remaining included some form of alternative feed material in their feeding regime (Mbuthia et al. 2014). Mature prosopis pods from *Prosopis juliflora* tree is such an alternative feed ingredient in Kenya (Kingori et al. 2011).

Prosopis is an invasive multipurpose tree species widely distributed within the arid and semi-arid areas of Kenya. Prosopis pods have been evaluated by several authors and were found to be of good nutritional quality for both ruminants and non-ruminants (Odero-Waitituh et al. 2016; Manhique et al. 2017). The energy content of the pods 12.8 MJ/Kg DM, is higher than most cereal-based milling by-products (Maize germ and wheat bran) with about 11 MJ/Kg DM and slightly lesser than maize at 13.8 MJ/Kg DM (NRC 2012; Odero-Waitituh et al. 2016).However, the pods contain high levels of plant cell wall components that lower the efficiency of nutrients utilization by non-ruminants because they lack endogenous fiber digestive enzymes (de Vries et al. 2012). Relative to maize, *Prosopis juliflora* pods contain 69.5%, 53.5% and 97% more cellulose, hemicellulose and lignin content, respectively. In poultry, the high fibre content of prosopis pod meal contributes to reduction in the apparent ileal digestibility and the apparent metabolizable energy relative to maize (Al-Marzooqi et al. 2015). In pigs, poor growth rates and feed intake were reported when prosopis pod meal replaced 30% maize soybean mixture due to the effects of high fibre (Pinheiroer et al. 1993).