1 INTRODUCTION

Background

Feed cost is a major cost burden in developing the livestock industry especially in developing countries because most of the diets are based on cereal grains and oil meals. This phenomenon encouraged and motivates nutritionists to explore for cheaper alternative high-energy feed ingredient from agro-industrial by-products (AIPD) and non competitive with human. These unutilised resources are plentiful and generated predominantly by the highly developed and organised palm oil industry. Indonesia and Malaysia both produces about eighty one percent (81%) of world oil palms production (MPOB 2008). Palm kernel cake (PKC) is a by product from the extraction of palm oil kernel (expeller/solvent) can have major influence on reducing the production cost. Zahari and Alimon (2006) concluded that PKC as a high energy and cost effective feed ingredient that can be utilized in formulations ration for livestock feeding.

The proximate analysis of PKC shows that it can be classified as energy feed with its metabolisable energy (ME) value 10.5 to 11MJ kg⁻¹ for ruminant (Alimon 2006). Chemical component of PKC is much similar to corn gluten or rice bran (Adesehinwa 2007). However shell content of PKC could as high as 10%, which contributes a great deal to its high crude fibre content (Alimon 2006). The cell wall component which is more than 60% of PKC consisting of mainly insoluble mannose based polysaccharides mannan 58%, cellulose 12% and xylan 4% (Jaafar and Javis 1992). The usage of palm kernel cake has its limit due to high in crude fiber (especially lignin) and very low palatability. Typically with the increase of 1% in crude fiber could bring a 1% decrease in digestibility for ruminants and a 2% decrease for pigs (Aderolu et al. 2002). The poor digestibility of PKC observed were primarily due to the presence of non-starch polysaccharides (NSP), which were reported to be the product of fermentation as well as part of fungal cell wall material (Iluyemi et al. 2010). The presence of these soluble NSPs may have leads to the observed ‘gummy’ consistency of diets.
Under the feeding of low quality agricultural residues, supply animal’s rumen microbes with the necessary nutrients needed allow the animal to maximize the usage of the low quality feed (Fadel et al. 2004). By manipulating rumen digestion system through the addition of direct feed microbial (DFM) and a fibrolytic enzyme in ruminant rations which could enhance cellulose digestion and improves the performance of the animal is gain interest in recent years (Salama et al. 2002, Haddad et al. 2005). Feeding yeast culture to dairy cows on concentrates diet could increased dry matter intake (DMI) and neutral detergent fiber (NDF) digestion (Fadel et al. 2007) decreased lactic acid production and milk yield (Fortina et al. 2011). Several work done by Erasmus et al (2005) suggested that feeding yeast products may be most beneficial to dairy cows during late gestation and early lactation when these effects of yeast cultures might be most valuable. Saccharomyces cerevisiae has caused beneficial changes inactivity and numbers of rumen microbes.

The approach usage of fibrolytic enzymes in the treatment of feedstuffs is to enhance their quality and digestibility. Feeding of exogenous enzymes in ruminants was previously an unacceptable practice, because it was assumed that the proteolytic activity in the rumen ecosystem would rapidly inactivate unprotected enzyme feed additives (Kung 1996). Improving the performance of enzyme supplements requires a thorough understanding of the structure and composition of the feedstuffs and of the digestive activities required for optimal nutrient utilization.

Rumen liquor was one source of supplemental material cheap alternative and can easily be used as a source of plant cell wall polymer degrading enzymes (Moharrery and Das 2001). The rumen ecosystem represents a virtually untapped resource of novel enzymes and opportunities to define the process of feed and fiber degradation. The effect of enzymes may also be attributed to the degradation of anti-nutritional compounds that have deleterious effects on nutrient absorption and that promote intestinal disturbances by pathogenic enteric microorganisms. The rumen is just one of many sources of enzymes is need to be explored.
Problems Statement

The low digestibility of PKC is attributed to the high level of non starch polysaccharides (NSPs) found in the cell wall materials. These NSP impair the digestibility and utilization of nutrients either by direct encapsulation of the nutrients or by increasing the viscosity of the intestinal content thereby reducing the rate of hydrolysis and absorption of nutrients in the diet. The NSP composition of PKC consisted mainly of mannans (major NSP), cellulose and xylans. Recently works concluded that inclusion level of PKC in diets (>35% PKC) in the rations decreased the digestibility of DM, protein and fibrous fractions and also decreased the protozoal populations (Chanjula et al. 2010).

Applied biotechnology and feed industries currently offer exogenous enzymes as feed additives for enhancing the nutritive value of animal diets. Studies about adding enzymes preparation to diets for ruminant still limited. Much of the variability can be attributed to factor such as production techniques, enzyme activity, mode of enzyme action and application techniques and portion of the diet (forage:concentrate) to which the enzyme is applied and differences in the physiological status of the test animals (Beauchemin et al. 2000).

The manipulation the microbial ecosystem of the rumen in order to improve the production efficiency by addition of direct feed microbial which could enhance feed digestion, to improve the performance of animals to boosts the health status of animals. Addition of yeasts in ration could enhance fiber digestion and producing nutrients that stimulate growth of rumen cellulolytic bacteria (Dawson et al. 1990) which are responsible for the bulk of fiber digestion.

The inclusion of exogenous enzymes and yeasts culture in animal nutrition hopefully has a positive effect that improved NSPs degradation which can increase the energy concentration and the release of NSPs-trapped nutrients (Sheppy 2001). This may contribute to low cost productions in ruminant systems using poor quality agriculture industries by products as major components replacing the much expensive cereal grain and protein plant ingredient.
Objective

The objectives of this research were to determine the nutritive value and digestibility of diets containing palm kernel cake (PKC) with and without enzyme and yeasts culture addition in goat. This information could provide a better understanding the use of enzyme in enrichment of PKC nutritive value and influence of yeasts in dietary supplementary on performance of goats.

Experimental Benefits

The outcome from this experimental was to explore the advantage of addition feed additives such enzymes and yeasts in utilized low quality agro-industry by product (PKC) by improvement the nutrition value which could be replaced more expensive ingredient.

Hypothesis

The use of enzymes and yeasts culture could increase the nutritive value and enhance feed digestibility, feed intake, rumen fermentation and weight gain of goat fed diet containing PKC.

Scope and limitation of the study

This study focuses on addition of feed additives in basal diets for growing male Feral x Local crossbreed goats. The experiment was done in the Pusat
Pembiakan Kambing (PPK) farm where Feral Local crossbred growing goats were selected among the farm animals (Bongawan, Papar district, Sabah, Malaysia) to carry out this study. The concentrate used in this study was supplied to the farm from Feed Mill, Department of Veterinary Services and Animal Industry, Sabah Malaysia. The local yeasts was purchased from Local Trader (Sabah, Malaysia), it contains *Saccharomyces cerevisiae* $1.5 \times 10^{10}$ cfu/g. The rumen liquor was obtained from abattoir at the Sabah Meat Technology Centre (SMTC) Sabah, Malaysia.