I. INTRODUCTION

In animal nutrition, evaluation of diets based on digestibility and fermentation are conducted conventionally by in-vivo trials. These experiments often meet with technical difficulties and ethical questions. Therefore, in vitro models which can mimic gastrointestinal digestion and fermentation processes are attempted as an alternative to the in vivo studies (Peeters et al., 1998). In vitro techniques not only offer advantages of being relatively simple, time saving, economical, producing repeatable estimates but they are less laborious compared to animal experiments besides being ethically superior. One such in vitro fermentation method is in vitro gas production technique, which exploits the relationship between degradation and fermentative gas production to evaluate the nutritional parameters of foodstuffs.

Several different methodologies have been proposed for the gas production technique, each varying in its complexity, limitations and benefits. Although the gas production technique has been used exclusively with ruminants, it may also be of value for nutritive evaluation of foods for man and other monogastric animals (Coles et al., 2005). The benefits of the technique include being able to run large batches simultaneously at low cost, the ability to measure fermentation kinetics of soluble as well as insoluble fractions of food and facilitation of relative comparisons among different foodstuffs. However, these in vitro techniques of evaluation of diets need to be validated and justified by in vivo studies.

In monogastric animals like dogs, one of the factors which influence the health status is the microbial fermentation in the hindgut (Williams et al., 2005). The large intestine of dogs comprises a complex microbial ecosystem. In a healthy status, the diet and hindgut
microbes are the vital factors in maintenance of dynamic equilibrium of this ecosystem and a disturbance in any of these factors can lead to imbalance in hindgut health (Savage, 1977 and Conway, 1995).

Literature on the microbiota of different parts of the gut, dynamics and metabolic potential of microbial populations in the upper gut are very limited (Mentula et al., 2005). Fermentation is primarily a colonic event with the major microbes including aerobic and anaerobic species such as Bacteroides, Bifidobacteria, Lactobacilli, Clostridia, Gram positive cocci and Coliforms (Greetham et al., 2002). This discovery has prompted further investigation into determining both the beneficial and detrimental effects of these bacteria and their relative importance to small intestinal function. Hindgut microbes and fermentation have beneficial effects like competitive exclusion of potentially pathogenic organisms, energy source for the colonic mucosa, gut motility, vitamin production and maintenance of gut immunity (Ewing and Cole, 1994). On the other hand, excess fermentation and microflora in the hindgut have the negative effects such as competition for calories and essential nutrients, flatulence problem and their ability to damage the mucosa leading to various bowel disorders. Several investigators have documented the overgrowth of bacteria causing damage in the small intestine of German shepherds (Batt et al., 1983 and Williard et al., 1994).

Dogs do not rely on fermentation as a major strategy for digestion of nutrients supplied in their diets. Hindgut absorption of short chain fatty acids can serve only two per cent of the maintenance energy requirement of dogs unlike 10-31 per cent in case of pigs (Stevens and Hume, 1998). The proteolytic fermentation in the hindgut can negatively affect the performance of animal and health due to the formation of excess gas (flatulence) and
potentially toxic end products such as biogenic amines, phenolic components, ammonia, and volatile sulphur components (Cone et al., 2005). An excess of ammonia can cause diarrhoea in young animals and can disrupt development of mucosa.

In the recent past, there has been increased interest in the use of dietary procedures targeted towards improved gastrointestinal health. The role of intestinal microflora in nutrient utilization could play a pivotal role in diet formulation. A means of evaluating this is to determine the fermentation potential of fecal microflora (Sunvold, 1995a). To understand the impact of intestinal microflora on health status of the host and to evaluate the effect of different diets, quantification of bacterial populations and qualitative knowledge of the structure of the bacterial community in the intestinal tract is essential. Furthermore, such knowledge can be applied to the development of new probiotic and prebiotic products. The major constraint in understanding the intestinal microbiota in its natural habitat is the difficulty in obtaining samples from the intestine due to ethical reasons. Therefore most of the studies on the intestinal microbiota have been done using fecal samples although the recoverability of intestinal microbiota from feces has not been fully analysed.

Contemplating these facts, the present study was taken up with the following objectives.

1. To assess the possibility of using gas production technique to evaluate canine diets
2. To assess the changes in hindgut microbial population of adult dogs fed different diets