CHAPTER I

INTRODUCTION AND AIM

The problem for Thai dairy industry is a low milk production for supply Thai population demand. Fresh milk demanding is approximately 1,600,000 tons per year, but Thai dairy farming has capable to supply only 842,111 tons per year (OAE, 2004). A low milk yield of crossbred dairy cow by approximately 10-11 kg/d was lower than those of dairy cattle in temperate zone, 20-25 kg/d of milk yield (Chaiyabutr et al., 2000). The problems for a low milk yield in crossbred dairy cattle are multifactor. The quantity of milk production is not only one problem in Thai dairy industry but the quality and physiochemical properties of milk are also considered. The quality of milk generally involve many factors such as breed, age, stage of lactation, season, nutrition, feeding, milking interval, disease, and management (Kennelly, 2000).

The addition of dietary mineral is a factor which would influence milk yield and milk compositions. Minerals are the organic elements found in all living things. Although found in small amounts, minerals are essential for the utilization of energy and protein, they are required for life. Sodium (Na) is one of the essential mineral. It is the major cation (positively charged ion) in the extracellular fluid (ECF). It plays a variety of fundamental roles within the body, a large role in fluid balance, with different variations of Na determining the shift of water by osmosis from one area of the body to another; i.e. the cellular control of water distribution. Sodium, along with chloride (Cl^-) and bicarbonate (HCO_3^-), Na is important for the proper regulation of the acid-base balance of the body. As an active transport mechanism in the form of Na^+/K^- ATPase, Na is essential for the passage of metabolic materials through cell walls. Along with potassium (K), is responsible for balancing the response of nerves to stimulation, travel of nerve impulses to muscles, and muscle contraction (McDowell, 1995).

Several research studies concerning Na supplementation in lactating cows have shown that an increase in Na content in diet (as NaCl, $NaHCO_3$ or Na_2CO_3 form) can affect to increase in the productivity of milk yield as well as milk compositions (Clive et al., 2000; Tucker, 1992; Belisbasakis and Triantos, 1991). Sodium carbonate (Na_2CO_3) is a strongly alkaline in aqueous solution and it has powerful neutralizing properties. Moreover, it can improve feed intake (especially forage), increase rumen fluid pH, fluid dilution rate, digestibility of dietary nutrients, acetate:propionate ratio, and the rate of passage of fluid from the rumen, and body fluids. These effects optimize metabolic functions for milk production in dairy cows and often increase milk yield, milk fat percentage, or milk protein percentage (Belibasakis and Triantos, 1991). In addition, the Na content in roughage is very low from 0.01-0.15%, while dietary Na requirement of lactating cow is 0.2-0.6% (NRC, 2001), and few studies are available in vivo studies with Na_2CO_3 alone in dairy industry in Thailand, which Na_2CO_3 could be the Na source in lactating dietary. However, a few research studies in Na dietary for dairy farming are limited. Thus, a study on the effect of Na dietary is interested to study its role in increasing milk yield and improving milk compositions.

The objective was to study the effects of dietary Na_2CO_3 supplementation on milk production, milk compositions, the digestibility of nutrients, plasma, urinary, and fecal electrolytes in crossbreed Friesian cows during mid lactation.