TO STUDY THE ASSOCIATION BETWEEN SCC AND BACTERIA NUMBERS, AND MILK COMPOSITION IN FARM BULK MILK SUPPLIED TO TUI MILK PRODUCTS COMPANY FOR 1992/93 SEASON.

A thesis presented in partial fulfilment of the requirements for the degree of Master of Agircultural Science in Animal Science at Massey University, Palmerston North New Zealand.

JOSEPH OSEI NTIM

1995

ABSTRACT

The association between bulk milk SCC and bacteria numbers and milk composition were studied using data containing test records of 1200 farms which supplied bulk milk to TUI Milk Company Limited, for 1992/93 season. Three data sets were created, (1) data set A (N = 4623) with all measurements recorded for each herd for the same milk sample; (2) data B (N = 30 120) with all measurements of BMSCC and milk composition recorded for each herd within a 10 day period but not necessarily on the same sample of bulk milk; and (3) data set C (N = 33 800) with all measurements of bulk milk bacteria numbers and milk composition recorded for each herd within a 10 day period but not necessarily on the same sample of bulk milk. Correlation was used to determine the association between bulk milk SCC and bacteria numbers and milk composition. Multiple regression analysis was also carried to determine the association between bacteria numbers (dependent variable) and SCC and milk composition for early lactation and whole lactation. The results showed the overall average of the mean BMSCC of 280 000 cells/ml of all the farms studied. Approximately 85 % of the farms supplied bulk milk with SCC <250 000 cells/ml, while 1 % of the farms supplied bulk milk with SCC >500 000 cells/ml. Both bulk milk SCC and bacteria numbers were higher in early and late parts of lactation. Highly significant but low positive correlations occurred between the mean bulk milk SCC and bacteria number in early ($r = 0.24$; $r^2 = 0.06$; $P<0.001$) and whole lactation ($r = 0.15$; $r^2 = 0.02$; $P<0.001$). Thus 2 to 6 % of the variation observed in bacteria count was accounted for by variation in bulk milk SCC. The mean fat %, protein % and total solids % increased from mid-lactation to the end of lactation. In contrast, the mean lactose % showed a decrease as the lactation progressed. On the average for the whole lactation, low positive correlations occurred between the mean bulk milk SCC and fat % ($r = 0.18$), protein % ($r = 0.26$) and total solids % ($r = 0.15$). However, a moderate but highly significant negative correlation occurred between bulk milk SCC and lactose % ($r = -0.43$; $P<0.001$).

In conclusion the overall low average BMSCC suggests that good quality bulk milk was supplied to the company, which also meets the EC standards. Significant low correlation between BMSCC and bacteria numbers suggests that mastitis bacteria were only a small but significant contributor to the high bacteria count in the bulk milk particularly in early lactation, with dirty milking machines or poor cooling being the most likely major contributor. Finally, lactose % was more sensitive to mastitis effective than fat %, protein % and total solids % in the bulk milk.

ACKNOWLEDGMENT

I gratefully acknowledge Prof. C. W. Holmes and Prof. D.D.S McKenzie, my two supervisors for their excellent supervision, undertstanding, invaluable advice, constructive criticism and endless patience throughout my stidies.

My gratitude and appreciation are also extended to Dr Patrick Morel, of Monogastric Research Centre, for the use of his computer to store my data when I exceeded my quota on the network, and also for guidance with the statistical procedure.

I also wish to express my sincere thanks to the following members of staff of Tui Milk Products Company, the Milk Services Manager, Mr John Allen and Charlie Usmar of Milk Quality Section for their expert advice on data and especially Mr Andrew Devenport, who assisted with data collection from the database.

My regards also go to my brothers Michael and Asher, now resident in Australia, who have given both financial and moral support throughout my studies.

Finally, to my wife, Portia and children - Priscilla, Francis and Richard for their support and patience throughout my studies.

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CHAPTER ONE

INTRODUCTION

Universally there is an increasing demand for high quality milk, free from cellular contamination or with low cell count. This is attributed to (a) public health concern that a sample of milk contaminated with somatic cells carries with it images of diseased udders and (b) in part due to lower product yields and inflated processing cost to the manufacturer. Despite the fact that it is not likely that mastitis pathogens will have survived pasteurisation, there is a public feeling that milk should be clean at the source -farm level. In recent times, the demands of buyers have increased, which include specified somatic cell counts. For example, the European Economic Community (EEC) somatic cell counts standards for raw cows milk for the manufacture of milk based products have been set at < 500,000 cells/ml since the beginning of 1994 (Frank, 1994). Thus all countries wishing to export dairy milk products to the community will have to show that their standards measure up to those required within the EC. This is a challenge to which the New Zealand dairy industry attaches utmost importance since about 85 % of its total milk products is exported (NZDB, 1994). It is therefore imperative that New Zealand dairy farmers supply the dairy factories with raw milk of high quality with low somatic cell counts for the manufacture of finest milk products to meet the high standard requirements of the export market (SAMM Plan, 1995).

Primarily, milk Somatic Cell Counts (SCC) are being used in the diagnosis of subclinical forms of bovine mastitis, which is part of a greater disease complex -mastitis as a whole (IDF, 1975; Fetrow, 1984; Bramley, 1991). An infection of mastitis in the bovine udder is associated with a commensurate increase in somatic cells to fight the causative pathogens (Schalm, 1977; Bramley, 1992). Bovine mastitis and somatic cell counts (SCC) have therefore been associated with decreased milk yield (Janzen, 1970; Hoare, 1982; Deluyker et al, 1993) and changes in milk composition (Wheelock et al., 1966; Janzen, 1970; Schalm

et al., 1971; Kitchen et al., 1981; Munro et al., 1984), which in turn constitute an economic loss to the dairy farmer (Boothe, 1989; Harmon, 1993; Holdaway, 1993). Mastitis costs about $14,000 annually due to on farm increased costs and decreased milk sold in the average New Zealand herd (Holdaway, 1993). In addition problems with manufacturing properties and product defects have been observed for most dairy products made from mastitic milk (Mitchell et al., 1985). Regular monitoring of the number of somatic cells in farm bulk milk at both farm and factory levels has therefore become a regular practice in the New Zealand dairy industry. Bulk milk somatic cell count (BMSCC) is increasingly becoming a key parameter in determining raw milk quality (Frank, 1994). It is now being used by some manufacturing companies as one of the measurement factors for milk payments to farmers in New Zealand. Furthermore BMSCC has permitted the adoption of regulatory programmes such as the 5-Point Plan worldwide (Bramley, 1992) and the SAMM Plan in New Zealand (The SAMM Plan, 1995) to identify mastitis status in a herd and its control. In addition, it is possible for mastitis causing organisms to increase the bacterial count of the farm bulk milk to such an extent that the count exceeds the dairy company's bacterial standards for finest milk. This may attract a penalty in monetary terms by the dairy companies.

The objectives of this work were to:

- study the association between SCC and bacteria quality and milk composition - fat, protein and lactose concentrations in farm bulk milk supplied to the Tui Milk Products Company for 1992/93 season; and

- assess the importance of mastitis in the herd as a cause of failure by the herd's milk to meet the bacterial quality standards.