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SENSORY EVALUATION OF
NEW ZEALAND COMMERCIAL WHOLE MILK POWDERS

A Thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Food Technology at Massey University

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ABSTRACT

Whole milk powder is a multi-million dollar export earner for New Zealand. Over recent years, there has been a change in emphasis for whole milk powder from a commodity to a consumer product. This has made it increasingly important to understand its sensory properties which are essential to ultimate consumer acceptance.

A sensory profile for New Zealand whole milk powders was established in a systematic fashion through group discussions using a trained panel. The final profile included thirty-two attributes to describe the appearance, aroma, flavour and texture of both powders and reconstituted milks.

Three different sensory scales were used in association with the profile throughout one dairying season. These were a 0-10 linear scale, a semi-structured linear scale and magnitude estimation scaling. A comparison was made of these three scales according to usage factors and their sensitivity to differences between samples. The semi-structured linear scale was the easiest scale to use but was not very sensitive to sample differences. Magnitude estimation was not sensitive to sample differences and there were problems associated with its usage. The 0-10 linear scale was easy to use and sensitive to sample differences.

Relevant sensory data from one complete dairying season were compared with data from instrumental measurements of colour and texture made on both powders and reconstituted milks. Reflectance measurements made using a Hunterlab D25 colorimeter and calculated indices of the particle size distribution were the only measurements which related closely to sensory properties of whole milk powders.
The effect of seasonal changes in the sensory properties of whole milk powders was studied over two dairying seasons. Highly significant seasonal changes occurred in physical properties of whole milk powders, such as colour. In the aroma and flavour of both powders and reconstituted milks, the most significant seasonal changes were in the sweet, buttery and cooked/caramelised notes. Changes were greatest at the beginning and end of the dairying season.

The effects of certain processing variables on the sensory properties of whole milk powders were also studied. Processing variables which changed the physical structure of the powder were found to have a highly significant effect on colour, free-flowing properties and particle size. Addition of vitamins and minerals had a highly significant effect on the aroma and flavour of both powders and reconstituted milks. This was confirmed by data from experimental powders containing controlled levels of vitamins and iron which were made at the New Zealand Dairy Research Institute. Powders containing vitamins and iron were characterized as 'lactone-like', 'vitaminized' and 'oxidised'. Changes in the aroma and flavour characteristics were much greater in instantized powders. Some of these effects were thought to be associated with oxidation of soybean lecithin in these particular powders.

Using a simplified version of the profiling method established in this project, it should be possible to match products to market requirements far more effectively than the present single score grading system.
I would like to express my deepest appreciation to my supervisors, Dr. Allan Anderson, Dr. Mary Earle and Dr. Wayne Sanderson for their continuous encouragement, assistance and support throughout the course of this thesis. Between them, they kept me on the straight and narrow during the three years of this project.

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Finally, I would like to express my gratitude to Dr. Peter Robertson for allowing me to carry out this project and to the New Zealand Dairy Research Institute for their financial support.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xvii</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>ix</td>
</tr>
<tr>
<td>CHAPTER I - INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>CHAPTER II - REVIEW OF SENSORY EVALUATION LITERATURE</td>
<td>8</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>8</td>
</tr>
<tr>
<td>2. DESCRIPTIVE SENSORY ANALYSIS</td>
<td>8</td>
</tr>
<tr>
<td>3. CATEGORY SCALING</td>
<td>10</td>
</tr>
<tr>
<td>3.1 Method</td>
<td>10</td>
</tr>
<tr>
<td>3.2 Advantages</td>
<td>11</td>
</tr>
<tr>
<td>3.3 Disadvantages</td>
<td>12</td>
</tr>
<tr>
<td>4. SEMI-STRUCTURED LINEAR SCALE</td>
<td>14</td>
</tr>
<tr>
<td>4.1 Method</td>
<td>14</td>
</tr>
<tr>
<td>4.2 Advantages</td>
<td>15</td>
</tr>
<tr>
<td>4.3 Disadvantages</td>
<td>16</td>
</tr>
<tr>
<td>5. MAGNITUDE ESTIMATION SCALING</td>
<td>16</td>
</tr>
<tr>
<td>5.1 Method</td>
<td>16</td>
</tr>
<tr>
<td>5.2 Advantages</td>
<td>20</td>
</tr>
<tr>
<td>5.3 Disadvantages</td>
<td>20</td>
</tr>
<tr>
<td>6. SUMMARY AND CONCLUSIONS</td>
<td>21</td>
</tr>
<tr>
<td>CHAPTER III - METHODS</td>
<td>23</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>23</td>
</tr>
<tr>
<td>2. SAMPLE PROCESSING AND COLLECTION</td>
<td>24</td>
</tr>
<tr>
<td>2.1 Background to Processing of Milk Powders</td>
<td>24</td>
</tr>
<tr>
<td>2.2 Sample Collection and Reception</td>
<td>26</td>
</tr>
</tbody>
</table>
3. SENSOR Y MEASUREMENTS 28

3.1 Introduction 28

3.2 Preparation of Samples for Sensory Evaluation 28
  3.2.1 Principles of Sample Preparation for Sensory Evaluation 28
  3.2.2 Preparation of Powders for Colour Evaluation 29
  3.2.3 Preparation of Powders for Texture and Aroma Evaluation 29
  3.2.4 Reconstitution of Milks for Aroma and Flavour Evaluation 29

3.3 Serving Procedures for Sensory Evaluation 30
  3.3.1 Background to Serving Procedures 30
  3.3.2 Serving Procedures used in Present Project 30

3.4 Testing Environment for Sensory Evaluation 32
  3.4.1 Background to Testing Environment for Sensory Evaluation 32
  3.4.2 Testing Environment used for Present Project 33

4. OBJECTIVE MEASUREMENTS 33

4.1 Colour Measurements 35
  4.1.1 Background to Reflectance Measurements of Colour 35
  4.1.2 Method for Reflectance Measurements of Colour 36
  4.1.3 Background to Spectrophotometric Measurements of Colour 37
  4.1.4 Method for Spectrophotometric Measurements of Colour 38

4.2 Particle Size Distribution Measurements 39
  4.2.1 Background to Particle Size Distribution Measurements 39
  4.2.2 Method for Particle Size Distribution Measurements 40

4.3 Viscosity Measurements 41
  4.3.1 Background to Viscosity Measurements 41
  4.3.2 Viscosity Measurements using Capillary Viscometer 43
  4.3.3 Viscosity Measurements using Cone and Plate Viscometer 44
### CHAPTER VI COMPARISON OF SENSORY AND OBJECTIVE DATA

1. **INTRODUCTION**

2. **BACKGROUND TO COMPARISON OF SENSORY AND OBJECTIVE MEASUREMENTS**
   - 2.1 Appearance
   - 2.2 Viscosity
   - 2.3 Relationships between Objective and Subjective Measurements

3. **COMPARISON OF SENSORY AND OBJECTIVE MEASUREMENTS FOR PARTICLE SIZE**
   - 3.1 Relationships between Sieve Analysis Data and Sensory Estimates of Particle Size in the Powders
   - 3.2 Relationships between Indices of Particle Size Distribution and Sensory Estimates of Particle Size in Whole Milk Powders

4. **COMPARISON OF SENSORY AND OBJECTIVE MEASUREMENTS FOR FREE-FLOWING PROPERTIES IN WHOLE MILK POWDERS**
   - 4.1 Relationships between Sieve Analysis Data and Sensory Estimates of Free-Flowing Properties in Whole Milk Powders
   - 4.2 Relationships between Indices of Particle Size Distribution and Sensory Estimates of Free-Flowing Properties in Whole Milk Powders

5. **COMPARISON OF SENSORY AND OBJECTIVE MEASUREMENTS FOR COLOUR**
   - 5.1 Relationships between Total Colour and Sensory Estimates of Colour in the Powders
   - 5.2 Relationships between Reflectance Measurements and Sensory Estimates of Powder Colour
   - 5.3 Discussion
6. COMPARISON OF SENSORY AND OBJECTIVE MEASUREMENTS FOR VISCOSITY
   6.1 Correlation of Sensory Estimates of Viscosity with Capillary Viscometer Measurements
   6.2 Correlation of Sensory Estimates of Viscosity with Ferranti-Shirley Viscometer Measurements
   6.3 Discussion

7. CONCLUSIONS

CHAPTER VII SEASONAL EFFECTS ON SENSORY PROPERTIES OF WHOLE MILK POWDERS

1. INTRODUCTION

2. BACKGROUND TO 1979/80 AND 1980/81 DAIRYING SEASONS

3. METHODS
   3.1 Sampling Methods
   3.2 Method of Statistical Analysis

4. SENSORY PROPERTIES UNAFFECTED BY SEASONAL CHANGES

5. SEASONAL EFFECTS ON PHYSICAL PROPERTIES OF MILK POWDERS
   5.1 Colour - Sensory Data
   5.2 Colour - Hunterlab 'Yellowness Index'
   5.3 Viscosity
   5.4 Astringency

6. SEASONAL EFFECTS ON THE AROMA OF THE WHOLE MILK POWDERS
   6.1 Seasonal Effects on 'Basic' Aroma Characteristics in the Whole Milk Powders
   6.2 Seasonal Effects on 'Other' Aroma Characteristics in the Whole Milk Powders

7. SEASONAL EFFECTS ON THE AROMA OF THE RECONSTITUTED MILKS
   7.1 Seasonal Effects on 'Basic' Aroma Characteristics of the Reconstituted Milks
7.2 Seasonal Effects on 'Other' Aroma Characteristics in the Reconstituted Milks 179

8. SEASONAL EFFECTS ON THE FLAVOUR OF THE REconstituted Milks 182
   8.1 Seasonal Effects on the 'Basic' Characteristics in the Flavour of the Reconstituted Milks 182
   8.2 Seasonal Effects on 'Other' Characteristics in the Flavour of the Reconstituted Milks 185

9. DISCUSSION AND CONCLUSIONS 189

CHAPTER VIII EFFECT OF CERTAIN PROCESSING VARIABLES ON SENSORY PROPERTIES OF WHOLE MILK POWDERS 194
   1. INTRODUCTION 194
   2. METHODS 195
      2.1 Sampling Methods 195
      2.2 Methods of Statistical Analysis 196
   3. EFFECT OF CERTAIN PROCESSING VARIABLES ON THE PHYSICAL PROPERTIES OF WHOLE MILK POWDERS 198
      3.1 Colour 198
      3.2 Free-flowing Properties 199
      3.3 Particle Size 200
   4. EFFECT OF CERTAIN PROCESSING VARIABLES ON THE AROMA AND FLAVOUR OF WHOLE MILK POWDERS 201
      4.1 Aroma of Powder 201
      4.2 Aroma of the Reconstituted Milk 204
      4.3 Flavour of the Reconstituted Milk 209
   5. DISCUSSION AND CONCLUSIONS 215

CHAPTER IX EFFECT OF VITAMIN AND IRON ADDITION ON SENSORY PROPERTIES OF WHOLE MILK POWDERS 220
   1. INTRODUCTION 220
   2. BACKGROUND TO EXPERIMENTAL WORK 221
3. METHODS
   3.1 Experimental Design
   3.2 Processing of Experimental Powders
   3.3 Methods of Statistical Analysis

4. EFFECTS OF VITAMIN AND IRON ADDITION ON THE SENSORY PROPERTIES OF WHOLE MILK POWDERS
   4.1 Effect of Vitamin Addition
   4.2 Effect of Iron Addition
   4.3 Effect of Position of Addition
   4.4 Effect of Powder Type
   4.5 Iron x Position of Addition Interaction
   4.6 Iron x Powder Type Interactions
   4.7 Position of Addition x Powder Type Interactions

5. DISCUSSION AND CONCLUSIONS

CHAPTER X DISCUSSION AND CONCLUSIONS

REFERENCES

APPENDICES 1-38
APPENDICES 39-101
APPENDICES 102-152
APPENDICES 153-182

Fiche 1
Fiche 2
Fiche 3
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Summary of terms for milk powders (Session 1)</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>Summary of terms for milk powders (Session 2)</td>
<td>71</td>
</tr>
<tr>
<td>3</td>
<td>Summary of terms for milk powders (Session 3)</td>
<td>72</td>
</tr>
<tr>
<td>4</td>
<td>Summary of terms (Session 4)</td>
<td>74</td>
</tr>
<tr>
<td>5</td>
<td>Questionnaire used during first dairying season</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>Questionnaire used during second dairying season</td>
<td>79</td>
</tr>
<tr>
<td>7</td>
<td>Comparison of monthly means for colour measurements (instrumental and sensory) made on whole milk powders.</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>Comparison of monthly means for viscosity measurements (instrumental and sensory) made on reconstituted milks.</td>
<td>93</td>
</tr>
<tr>
<td>9</td>
<td>Significant factors in the analyses of variance carried out on data from the 0-10 linear scale.</td>
<td>98</td>
</tr>
<tr>
<td>10</td>
<td>Significant factors in the analyses of variance carried out on data from the semi-structured linear scale.</td>
<td>99</td>
</tr>
<tr>
<td>11</td>
<td>Significant factors in the analyses of variance carried out on data from magnitude estimation scaling.</td>
<td>100</td>
</tr>
<tr>
<td>12</td>
<td>Summary of analyses of variance carried out on colour data (untransformed and transformed) from five sensory sessions for all three sensory scales.</td>
<td>103</td>
</tr>
<tr>
<td>13</td>
<td>Summary of analyses of variance carried out on sweetness (aroma of the powder) data (untransformed and transformed) from five sensory sessions for all three sensory scales.</td>
<td>104</td>
</tr>
<tr>
<td>14</td>
<td>Summary of analyses of variance carried out on sweetness (aroma of the milk) data (untransformed and transformed) from five sensory sessions for all three sensory scales.</td>
<td>105</td>
</tr>
<tr>
<td>15</td>
<td>Summary of analyses of variance carried out on sweetness (flavour of the milk) data (untransformed and transformed) from five sensory sessions for all three sensory scales.</td>
<td>106</td>
</tr>
</tbody>
</table>
16: Summary of analyses of variance carried out on viscosity data (untransformed and transformed) from five sensory sessions for all three sensory scales. 107

17: Summary of correlation coefficients for direct correlations between sensory scales. 113

18: Comparison of three sensory scales used to evaluate whole milk powders during the first dairying season. 119

19: Results of direct correlation between the sensory estimates of particle size and data from individual sieve measurements made on both agglomerated and non-agglomerated whole milk powders. 126

20: Results of direct correlations between sensory estimates of particle size and calculated indices of particle size distribution in whole milk powders. 130

21: Results of the direct correlations between sensory estimates of free-flowing properties in whole milk powders and data from individual sieve measurements made on both agglomerated and non-agglomerated powders. 132

22: Results of direct correlations between sensory estimates of free-flowing properties and calculated indices of particle size distribution in whole milk powders. 134

23: Monthly means for total colour measurements and sensory estimates of colour made on whole milk powders. 138

24: Results of direct correlations between the sensory estimates of colour in whole milk powders and Hunterlab reflectance measurements. 140

25: Results of direct correlations between sensory estimates of viscosity in reconstituted samples and instrumental measurements of viscosity made using a Ferranti-Shirley cone and plate viscometer. 146

26: Monthly means from the 1979/80 and 1980/81 seasons for colour in whole milk powders. 162

27: Monthly means for the 1979/80 season for the Hunterlab 'Yellowness Index' in the whole milk powders. 164
28: Monthly means from the 1979/80 and 1980/81 seasons for viscosity in reconstituted milks. 165
29: Monthly means from the 1979/80 and 1980/81 seasons for astringency in reconstituted milks. 167
30: Fortnightly means from the 1980/81 early season data for astringency in reconstituted milks. 169
31: Monthly means from the 1979/80 and 1980/81 seasons for the sweet, buttery and cooked/caramelised notes in the aroma of whole milk powders. 169
32: Fortnightly means from 1980/81 early season data for the sweet note in the aroma of whole milk powders. 171
33: Monthly means from the 1979/80 and 1980/81 seasons for the 'lactone-like', 'oxidised' and 'age-related' notes in the aroma of whole milk powders. 172
34: Monthly means from the 1979/80 and 1980/81 seasons for the 'taint' characteristics in the aroma of whole milk powders. 173
35: Monthly means from the 1979/80 season for the 'taint' characteristic in the aroma of non-vitaminized and vitaminized whole milk powders. 173
36: Fortnightly means for early season data from the 1980/81 season for the 'taint' characteristic in the aroma of whole milk powders. 174
37: Monthly means from the 1980/81 season for the 'vitaminized' characteristic in the aroma of whole milk powders. 175
38: Monthly means from the 1979/80 and 1980/81 seasons for the sweet, buttery and cooked/caramelised notes in the aroma of the reconstituted milks. 176
39: Monthly means from the 1979/80 season for the sweet, buttery and cooked/caramelised notes in the aroma of non-vitaminized and vitaminized reconstituted milks. 177
40: Fortnightly means from the 1980/81 late seasonal data for the sweet note in the aroma of the reconstituted milks. 178
41: Monthly means from the 1979/80 and 1980/81 seasons for the 'oxidised' note in the aroma of the reconstituted milks.

42: Monthly means from the 1979/80 season for the 'oxidised' note in the aroma of non-vitaminized and vitaminized reconstituted milks.

43: Monthly means from the 1979/80 and 1980/81 seasons for the 'feedy' note in the aroma of the reconstituted milks.

44: Monthly means from the 1979/80 and 1980/81 seasons for the 'lactone-like' note in the aroma of the reconstituted milks.

45: Monthly means from the 1979/80 and 1980/81 seasons for the sweet, creamy and cooked/caramelised notes in the flavour of the reconstituted milks.

46: Monthly means from the 1979/80 season for the sweet, creamy and cooked/caramelised notes in the flavour of non-vitaminized and vitaminized reconstituted milks.

47: Fortnightly means from the 1980/81 late season data for the sweet note in the flavour of the reconstituted milks.

48: Monthly means from the 1979/80 and 1980/81 season for the 'feedy' note in the flavour of the reconstituted milks.

49: Fortnightly means from the 1980/81 early season data for the 'feedy' note in the flavour of the reconstituted milks.

50: Monthly means from the 1979/80 and 1980/81 seasons for the 'taint', 'vitaminized', 'oxidised' and 'age-related' flavours in the reconstituted milks.

51: Fortnightly means from 1980/81 early and late season data for the 'oxidised', 'vitaminized' and 'age-related' flavours in the reconstituted milks.

52: Major whole milk powder types processed by participating factories during the 1979/80 and 1980/81 dairying season.

53: Whole milk powders tested during the 1979/80 and 1980/81 seasons indicating fat content and powders which are fortified with vitamin and iron.
54: Factors and levels for experimental work on addition of vitamins and iron to whole milk powders.

55: Significant factors in the analyses of variance made on data from the experimental powders containing controlled levels of vitamins and iron.
LIST OF FIGURES

1: Photograph of the New Zealand Dairy Research Institute sensory panel room. 34

2: Sensory estimation of colour made using a 0-10 linear scale, semi-structured linear scale and magnitude estimation scaling plotted against Yellowness Index measurements made using a Hunterlab D25 colorimeter. 111

3: Sensory estimates of colour made using a 0-10 linear scale, a semi-structured linear scale and magnitude estimation scaling plotted against one another. 115

4: Sensory estimates of particle size made using a 0-10 linear scale, a semi-structured linear scale and magnitude estimation scaling plotted against one another. 116

5: Sensory estimates of butteriness in the aroma of the reconstituted milks made using a 0-10 linear scale, a semi-structured linear scale and magnitude estimation scaling plotted against one another. 117
LIST OF APPENDICES

1: Questionnaire used during first dairying season (semi-structured linear scale). 255.

2: Questionnaire used during first dairying season (magnitude estimation scaling). 257.

3: Results of analyses of variance made on data (sensory and instrumental) from the 1979/80 and 1980/81 seasons for colour in whole milk powders. 259.

4: Results of analyses of variance made on sensory data from the 1979/80 season for free-flowing properties and particle size in whole milk powders. 260.

5: Results of analyses of variance made on sensory data from the 1979/80 season for viscosity in reconstituted milks. 261.

6: Results of analyses of variance made on sensory data from 1980/81 season for viscosity in reconstituted milks. 262.

7: Results of analyses of variance made on sensory data from the 1979/80 season for astringency in reconstituted milks. 263.

8: Results of analyses of variance made on sensory data from the 1980/81 season for astringency in reconstituted milks. 264.

9: Results of analyses of variance made on sensory data from the 1979/80 season for the sweet, buttery and cooked/caramelised notes in the aroma of whole milk powders. 265.

10: Results of analyses of variance made on sensory data from the non-vitaminized and vitaminized powders tested during the 1979/80 season for the sweet, buttery and cooked/caramelised notes in the aroma of whole milk powders. 266.

11: Results of analyses of variance made on sensory data from the 1980/81 season for the sweet, buttery and cooked/caramelised notes in the aroma of whole milk powders. 268.

12: Results of analyses of variance made on early and late season sensory data from the 1980/81 season for the sweet and cooked/caramelised notes in the aroma of whole milk powders. 269.
13: Results of analyses of variance made on sensory data from the 1979/80 season for the lactone-like, oxidised, feedy, taint and age-related notes in the aroma of whole milk powders. 270.

14: Results of analyses of variance made on sensory data from the non-vitaminized and vitaminized powders tested during the 1979/80 season for the lactone-like, oxidised, feedy, taint and age-related notes in the aroma of whole milk powders. 271.

15: Results of analyses of variance made on sensory data from the 1980/81 season for the lactone-like, oxidised, feedy, vitaminized, taint and age-related notes in the aroma of whole milk powders. 273.

16: Results of analyses of variance made on early and late season sensory data from the 1980/81 season for the vitaminized and taint notes in the aroma of whole milk powders. 275.

17: Results of analyses of variance made on sensory data from the 1979/80 season for the sweet, buttery and cooked/caramelised notes in the aroma of the reconstituted milks. 276.

18: Results of analyses of variance made on sensory data from the non-vitaminized and vitaminized powders tested during the 1979/80 season for the sweet, buttery and cooked/caramelised notes in the aroma of the reconstituted milks. 277.

19: Results of analyses of variance made on sensory data from the 1980/81 season for the sweet, buttery and cooked/caramelised notes in the aroma of the reconstituted milks. 279.

20: Results of analyses of variance made on early and late season sensory data from the 1980/81 season for the sweet and buttery notes in the aroma of the reconstituted milks. 280.

21: Results of analyses of variance made on sensory data from the 1979/80 season for the lactone-like, oxidised, feedy, taint and age-related notes in the aroma of the reconstituted milks. 281.

22: Results of analyses of variance made on sensory data from the non-vitaminized and vitaminized powders testing during the 1979/80 season for the oxidised and feedy notes in the aroma of the reconstituted milks. 282.
23: Results of analyses of variance made on sensory data from the 1980/81 season for the lactone-like oxidised, feedy, vitaminized, taint and age-related notes in the aroma of the reconstituted milks.

24: Results of analyses of variance made on early and late season sensory data for the lactone-like note in the aroma of the reconstituted milks.

25: Results of analyses of variance made on sensory data from the 1979/80 season for the sweet, creamy and cooked/caramelised notes in the flavour of reconstituted milks.

26: Results of analyses of variance made on sensory data from non-vitaminized and vitaminized powders tested during the 1979/80 season for the sweet, creamy and cooked/caramelised notes in the flavour of the reconstituted milks.

27: Results of analyses of variance made on sensory data from the 1980/81 season for the sweet, creamy and cooked/caramelised notes in the flavour of the reconstituted milks.

28: Results of analyses of variance made on early and late season sensory data from the 1980/81 season for the sweet and creamy notes in the flavour of the reconstituted milks.

29: Results of analyses of variance on sensory data from the 1979/80 season for the lactone-like, oxidised, feedy, taint and age-related notes in the flavour of the reconstituted milks.

30: Results of analyses of variance made on sensory data from the non-vitaminized and vitaminized powders tested during the 1979/80 season for the taint note in the flavour of the reconstituted milks.

31: Results of analyses of variance made on sensory data from the 1980/81 season for the lactone-like, oxidised, feedy, vitaminized, taint and age-related notes in the flavour of the reconstituted milks.

32: Results of analyses of variance made on early and late season sensory data from the 1980/81 season for the oxidised, feedy, vitaminized and age-related notes in the flavour of the reconstituted milks.
33: Results of analyses of variance made on sensory data from the experimental powders containing controlled levels of vitamins and iron for the sweet, buttery and cooked/caramelised notes in the aroma of the powders.

34: Results of analyses of variance made on sensory data from the experimental powders containing controlled levels of vitamins and iron for the lactone-like, oxidised, feedy, vitaminized, taint and age-related notes in the aroma of the powders.

35: Results of analyses of variance made on sensory data from the experimental powders containing controlled levels of vitamins and iron for the sweet, buttery and cooked/caramelised notes in the aroma of the reconstituted milks.

36: Results of analyses of variance made on sensory data from the experimental powders containing controlled levels of vitamins and iron for the lactone-like, oxidised, feedy, vitaminized, taint and age-related notes in the aroma of the reconstituted milks.

37: Results of analyses of variance made on sensory data from the experimental powders containing controlled levels of vitamins and iron for the sweet, creamy and cooked/caramelised notes in the flavour of the reconstituted milks.

38: Results of analyses of variance made on sensory data from the experimental powders containing controlled levels of vitamins and iron for the lactone-like, oxidised, feedy, vitaminized, taint and age-related notes in the flavour of the reconstituted milks.