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THE CARCASS COMPOSITION AND MEAT QUALITY
OF MALE FALLOW DEER

A Thesis presented in partial fulfilment of the requirements for
the degree of
Master of Agricultural Science at
Massey University

Julie Elizabeth McCall (née Gregson)

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ABSTRACT

Fallow deer (*Dama dama*) are rapidly gaining in popularity in New Zealand as a farmed species for venison production. Subjective observations suggest that venison from fallow deer up to 2 years of age has the desirable "leaness" characteristic. The main objective of this study was to investigate relationships between carcass weight (20-40 kg), age (13, 17 and 25 months), season of slaughter (summer vs. early winter) and aspects of carcass quality in male fallow deer.

Groups of male fallow deer raised on pasture near Te Puke (8 animals per group) were slaughtered at approximately 13 months (mid January), 17 months (late May), and 25 months of age (mid January). Average liveweights and carcass weights at slaughter were 43 and 25 kg at 13 months (M13), 47 and 28 kg at 17 months (M17), and 60 and 36 kg at 25 months of age (M25). Dressing-out percentage increased from 58.6 to 61.8% over the liveweight range of 41 to 66 kg.

The pattern of tissue growth with increasing liveweight was similar to that exhibited by other meat-producing ruminants. Allometric growth coefficients for the four dissected components relative to carcass weight were: muscle, 0.85; bone, 0.62; intermuscular fat, 1.61 and subcutaneous fat, 2.85.

Percentage total fat in the carcass was 7.8% in M13, 9.4% in M17 and 12.3% in M25 bucks. Low fat contents were accompanied by a high percentage of muscle in the carcass, 74.3% in M13, 71.5% in M17, 70.1% in M25, and hence high muscle to bone ratios (mean = 5.5).

The mean proportion of the carcass in each commercial cut was neck, 12.6%; flank, 15.4%; shoulder, 17.8%; saddle, 15.5% and haunch, 39.4%. Allometric growth coefficients for the 5 commercial
cuts relative to side weight were neck, 1.02; flap, 1.33; shoulder, 0.87; saddle, 1.04 and haunch, 0.91.

With increasing carcass weight minor relative redistribution of muscle, fat and bone across the carcass cuts was detected. The decrease in the relative proportion of the carcass in the primal haunch cut was due solely to a decrease in the proportion of bone in the cut. The allometric growth coefficient of bone in the haunch relative to total side bone was 0.76. The saddle was the major site for subcutaneous fat deposition with increasing carcass weight. The allometric growth coefficient of subcutaneous fat in the saddle relative to total side subcutaneous fat was 1.26. The flank was the major site for intermuscular fat deposition with an allometric growth coefficient of 1.29 relative to total side intermuscular fat.

There were no differences in the proportions of the total dissected tissues between group M17 (slaughtered in early winter) and groups M13 and M25 (slaughtered in summer) other than could be explained by differences in carcass weight. However, the proportion of total muscle weight in some individually weighed haunch and neck muscles were consistently lowest and highest respectively in the M17 group.

The chemical composition of the dissected tissues and some individual muscles was determined. The percentage water in the muscle tissue of the M17 group was lower and the percentage protein higher than in groups M13 and M25. The lipid percentage of the fat depots was low (subcutaneous, mean = 58%; intermuscular, mean = 47%).

Carcass weight explained 81% of the variation in carcass fat. Fat-depth 'C' and kidney fat weight explained a further 10.3 and 11.3% respectively, of the total carcass fat variation.
Meat quality characteristics measured were colour, ultimate pH, tenderness and water-holding capacity.

The major meat quality differences were between group M17, and groups M13 and M25. Meat colour was darker and water-holding capacity greater in Groups M13 and M25. This was attributed primarily to differences in conditions at slaughter.

Warner-Bratzler shear (tenderness) values averaged 3.73 kg and 4.68 kg for the mm. longissimus and semimembranosus respectively. These values were lower than those reported for sheep and cattle.
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TABLE OF CONTENTS

<p>| ACKNOWLEDGEMENTS                             | v       |
| LIST OF TABLES                              | xi      |
| LIST OF FIGURES                             | xvi     |
| CHAPTER 1 : INTRODUCTION                    | 1       |
| CHAPTER 2 : REVIEW OF LITERATURE            | 4       |
| 1. Introduction                             | 4       |
| 2. Patterns of Liveweight Growth            | 4       |
| 2.1 Introduction                            | 4       |
| 2.2 General Pattern of Liveweight Growth    | 4       |
| 2.3 Liveweight Growth Patterns in Deer      | 5       |
| 3. Patterns of Tissue Growth                | 7       |
| 3.1 Introduction                            | 7       |
| 3.2 Patterns of Tissue Growth in Domestic Animals | 8     |
| 3.2.1 Muscle, fat and bone                 | 8       |
| 3.2.2 Body organs                          | 9       |
| 3.3 Factors Influencing Tissue Growth Patterns | 10    |
| 3.3.1 Age and weight                       | 10      |
| 3.3.2 Breed                                | 10      |
| 3.3.3 Sex                                  | 12      |
| 3.3.4 Nutrition                            | 12      |
| 4. Differential Growth within tissues       | 13      |
| 4.1 Introduction                            | 13      |
| 4.2 Muscle Weight Distribution             | 14      |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3 Factors influencing Muscle Weight Distribution</td>
<td>14</td>
</tr>
<tr>
<td>4.4 Bone Weight Distribution</td>
<td>16</td>
</tr>
<tr>
<td>4.5 Factors Influencing Bone Weight Distribution</td>
<td>16</td>
</tr>
<tr>
<td>4.6 Fat Weight Distribution</td>
<td>17</td>
</tr>
<tr>
<td>4.7 Factors Influencing Fat Weight Distribution</td>
<td>18</td>
</tr>
<tr>
<td>5. Tissue Growth Patterns in Deer</td>
<td>19</td>
</tr>
<tr>
<td>6. Mechanisms for Seasonal Liveweight and Tissue Growth Patterns in Deer</td>
<td>20</td>
</tr>
<tr>
<td>7. Meat Quality</td>
<td>22</td>
</tr>
<tr>
<td>7.1 Introduction</td>
<td>22</td>
</tr>
<tr>
<td>7.2 Meat Tenderness</td>
<td>23</td>
</tr>
<tr>
<td>7.3 Colour</td>
<td>27</td>
</tr>
<tr>
<td>7.4 Water-Holding Capacity</td>
<td>28</td>
</tr>
<tr>
<td>7.5 Ultimate pH</td>
<td>28</td>
</tr>
<tr>
<td>CHAPTER 3 : EXPERIMENTAL</td>
<td>30</td>
</tr>
<tr>
<td>1. Experimental Design</td>
<td>30</td>
</tr>
<tr>
<td>2. Slaughter procedures</td>
<td>30</td>
</tr>
<tr>
<td>2.1 Slaughter House Procedure (January)</td>
<td>30</td>
</tr>
<tr>
<td>2.2 On-Farm Slaughter Procedure (May)</td>
<td>31</td>
</tr>
<tr>
<td>2.3 Body Components Measured at Slaughter</td>
<td>32</td>
</tr>
<tr>
<td>3. Dissection Procedure</td>
<td>32</td>
</tr>
<tr>
<td>3.1 Subcutaneous Fat</td>
<td>32</td>
</tr>
<tr>
<td>3.2 Intermuscular Fat</td>
<td>34</td>
</tr>
<tr>
<td>3.3 Kidney Fat</td>
<td>34</td>
</tr>
<tr>
<td>3.4 Muscle</td>
<td>34</td>
</tr>
<tr>
<td>3.5 Bone</td>
<td>35</td>
</tr>
<tr>
<td>3.6 Scrap</td>
<td>36</td>
</tr>
<tr>
<td>3.7 Measurements Made During Dissection</td>
<td>36</td>
</tr>
</tbody>
</table>
4. Water, Lipid, Ash and Protein Determination
   4.1 Tissue Preparation
   4.2 Water Determination
   4.3 Lipid Determination
   4.4 Ash Determination
   4.5 Protein Determination

5. Meat Quality Assessment
   5.1 General
   5.2 Meat Tenderness Measurement
   5.3 Muscle pH Measurement
   5.4 Water-Holding Capacity Measurement
   5.5 Muscle Colour Measurement

6. Data Presentation and Statistical Methods

CHAPTER 4 : RESULTS

1. Liveweight, Carcass Weight and Carcass Dimensions
   1.1 Relationships Between Liveweight and Carcass Weight
   1.2 Carcass Linear Measurements

2. Carcass Composition
   2.1 Carcass Dissectible Components
   2.2 Carcass Chemical Components
   2.3 Commercial Carcass Cuts

3. Non-Carcass Body Components

4. Relative Muscle Growth
   4.1 Carcass Cuts and Some Individual Muscles
   4.2 Eye Muscle Area
   4.3 Chemical Composition

5. Relative Bone Growth
   5.1 Carcass Cuts and Some Individual Bones
5.2 Bone dimensions 67
5.3 Chemical Composition 71
6. Relative Fat Growth 73
6.1 Carcass Cuts Total Fat 73
6.2 Subcutaneous and Intermuscular Fat 75
6.3 Relationships Between Back-Fat Depth and Carcass Fatness 80
6.4 Chemical Composition 81
7. Analysis by Season of Slaughter 83
8. Meat Quality 86
8.1 General 86
8.2 Slaughter Treatment/Season of Slaughter Analysis 89
8.3 Relationships Amongst Measurements of Meat Quality 90
8.4 Further Subjective Observations of Meat Quality 91
9. Prediction of Physical Carcass Composition 92
9.1 Carcass Component Weights as Predictors 92
9.2 Carcass Linear Measurements as Predictors 95

CHAPTER 5 : DISCUSSION 97
1. Introduction 97
2. Dressing-Out Percentage 98
  2.1 Carcass Weight Loss on Cooling 99
  2.2 Growth of Non-Carcass Body Components 99
3. Carcass Dissectible Components 99
4. Carcass Chemical Components 104
5. Commercial Carcass Cuts 105
6. Relative Muscle Growth and Proportions 107
7. Relative Bone Growth and Proportions 112
8. Relative Fat Growth and Proportions 113
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1 Back-Fat Depth 'C'</td>
<td>116</td>
</tr>
<tr>
<td>9. Seasonal Effects on Carcass Composition</td>
<td>117</td>
</tr>
<tr>
<td>10. Meat Quality</td>
<td>119</td>
</tr>
<tr>
<td>10.1 Effect of Season/Slaughter Practice on Meat Quality</td>
<td>119</td>
</tr>
<tr>
<td>10.2 Effect of Animal Age/Carcass Weight on Meat Quality</td>
<td>120</td>
</tr>
<tr>
<td>10.3 Correlation Between Meat Quality Measurements</td>
<td>121</td>
</tr>
<tr>
<td>10.4 Comparative Aspects of Meat Quality</td>
<td>121</td>
</tr>
<tr>
<td>11. Prediction of Carcass Composition</td>
<td>122</td>
</tr>
<tr>
<td>12. Conclusions</td>
<td>123</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>127</td>
</tr>
</tbody>
</table>
LIST OF TABLES

3.1 Description of non-carcass components. ........................................ 33
3.2 Description of carcass linear measurements. .................................... 34
3.3 Individually weighed muscles, bones, or combinations of bones. .......... 35
3.4 Tissue mincing procedures. .............................................................. 37
4.1 Animal age, liveweight, carcass weight and dressing-out percentage for the three age groups. .................................................. 44
4.2 Carcass linear measurements for groups M13 and M25. ......................... 45
4.3 Allometric growth coefficients and the growth impetus of carcass linear measurements relative to carcass weight and length for animals in groups M13 and M25. .................................................. 46
4.4 The main carcass tissue components, for the three age groups expressed as percentages of carcass weight. .................................................. 47
4.5 Linear regression analyses and allometric growth coefficients for the main carcass tissue components relative to carcass weight. .................. 49
4.6 Linear regression analyses and allometric growth coefficients for the weight of carcass bone and muscle tissue relative to the weight of carcass bone plus muscle. .................................................. 50
4.7 Carcass chemical components, for the three age groups expressed as a percentage of side tissue weight. .................................................. 51
4.8 Linear regression analyses and allometric growth coefficients of the carcass chemical components relative to side weight.

4.9 Weight of side cuts expressed as a percentage of side weight for the three groups.

4.10 Allometric growth coefficients of the side cuts relative to side weight.

4.11 The weight of non-carcass body components for the three age groups.

4.12 The weight of the non-carcass body components for the three age groups expressed as a percentage of empty body weight.

4.13 Linear regression analyses and allometric growth coefficients of the non-carcass body components relative to empty body weight.

4.14 The weight of total side muscle, muscle in side cuts, and individually recorded muscles for the three age groups.

4.15 The weight of the side cuts muscle and individually recorded muscles for the three age groups expressed as a percentage of total side muscle weight.

4.16 The allometric growth coefficients and growth impetus classes of muscle of the carcass cuts and individual muscles relative to total side muscle weight.
4.17 Chemical composition of muscle tissue for the three age groups expressed as a percentage total side muscle together with allometric growth coefficients and growth impetus classes of the chemical components relative to total side muscle weight.

4.18 The chemical components of the individual muscles within age group, expressed as percentages of each muscle's weight.

4.19 The weight of side bone, cut bone and individually recorded bones for the three age groups.

4.20 The weight of the side cuts bone and individually recorded recorded bones for each age group expressed as a percentage of total side bone weight, together with allometric growth coefficients and growth impetus of bones relative to total side bone weight.

4.21 Bone dimensions for the three age groups and allometric growth coefficients and growth impetus of these bone dimensions relative to carcass length for groups M13 and M25.

4.22 Chemical composition of bone tissue for the age groups expressed as a percentage of total side bone and the growth coefficients and growth impetus of the chemical components relative to total side bone.

4.23 The weight of total fat in each of the side cuts.
4.24 Weight of total fat in side cuts for each age group expressed as a percentage of total side fat together with allometric growth coefficients.

4.25 The weight of subcutaneous and intermuscular fat in each of the side cuts and the total side, for the age groups.

4.26 The weight of subcutaneous and intermuscular fat in the side cuts and total side for the age groups expressed as a percentage of total side fat together with allometric growth coefficients.

4.27 The weights of subcutaneous and intermuscular fat within each cut expressed as percentages of total side subcutaneous and intermuscular fat respectively within the three age groups, together with allometric growth coefficients.

4.28 Fat depth 'C' for the slaughter groups and allometric growth coefficients and growth impetus of fat depth 'C' relative to total subcutaneous fat, total fat and carcass weight.

4.29 Chemical composition of subcutaneous and intermuscular fat expressed as a percentage of total side subcutaneous and intermuscular fat respectively. And the allometric growth coefficients and growth impetus classes for the chemical components relative to total side subcutaneous and intermuscular fat respectively.

4.30 Coefficients for the 'season' covariate \(b_2\) when paired with side muscle weight \(b_1\) in individual muscle weight analyses.
4.31 Coefficients for the 'season' covariate \( b_2 \) in the chemical composition of carcass tissues, individual muscles and total side carcass analyses when paired with appropriate independent variables \( (b_1) \).

4.32 Means of meat quality characteristics of \textit{m. longissimus} and \textit{m. semimembranosus} for the three age groups.

4.33 Simple correlations between measurements of meat quality on the \textit{mm. longissimus} and \textit{semimembranosus} pooled between age groups.

4.34 Simple correlation coefficients between the weights of predictor variables and carcass muscle, fat and bone weight.

4.35 Percentage variation in carcass composition accounted for by carcass weight on its own and the increase when paired with various side measurements in multiple regression equations.
LIST OF FIGURES

2.1 Growth curves for a representative male of *Odocoileus hemionus hemionus* (adapted from Wood et al., 1962). 6

2.2 Schematic representation of tissue growth patterns relative to carcass weight (adapted from Berg and Walters, 1983). 9

3.1 Dissected cuts in carcass separated down mid-line. 31

4.1 The relationship between carcass weight and liveweight for the 24 male fallow deer. 43

5.1 Relationships between carcass fat percentage and carcass weight, and muscle to bone ratio and carcass weight for male fallow deer. 101
Chapter 1

INTRODUCTION

Exports of New Zealand feral venison began in 1958 as a by-product of culling operations to control noxious animals (Clouston, 1974). Deer farming was legalised between 1967 and 1969 and during the 1980's it has increased greatly.

Early venison exports were largely to West Germany where venison is a traditional game meat. More recently markets have also been established in Australia, Asia and the United States. Ante-mortem and post mortem inspection certification for farmed venison has given access to a number of these new markets.

Venison is known for its lean qualities and it compares very favourably in this regard with other farmed red-meat-producing species.

The fallow deer (*Dama dama*) is the second most numerous farmed deer species in New Zealand, following behind the red deer (*Cervus elaphus*). In 1984 approximately 14 000 fallow does and 7000 fallow bucks were being farmed (Agricultural Stats, 1984).

Several reasons exist for fallow deer being less popular than red deer. The first, and probably the most important reason, is that the fallow feral populations, from which all farmed stock were initially captured, are smaller and less widespread across the country than those of red deer. A second reason is that fallow velvet is of low value. Finally behavioural characteristics of the fallow deer can make them more difficult to manage under farming practice. A further more recently documented disadvantage of fallow has been their poorer
reproductive performance (Asher & Gregson, 1983). This may also have been a source of discrimination against the species. However, a number of farmers have chosen fallow deer in preference to red for reasons such as the lower cost per breeding stock unit and the convenience of nearby feral populations.

The Australian restaurant trade, a large export market for New Zealand venison, now buys largely fallow venison in preference to red on the grounds of its higher eating quality and the greater versatility of the smaller cuts. The smaller mature weight of fallow deer (about 35% that of red deer) may also be an advantage in certain farming environments, for example hill country or in wet environments where pasture damage readily occurs. This suggests considerable potential for the farming of the species.

Apart from the subjective assessments of consumers very little information is available on meat quality aspects of fallow deer. There is also little information on growth of the main carcass tissue components relative to age, liveweight or season of slaughter in fallow bucks. Such information would be useful to the industry in determining desirable carcass weight ranges and times for slaughter to achieve a high quality product with minimum carcass fat.

The main objective of this study was to investigate the effect of carcass weight (20-40 kg), age (13, 17 and 25 months) and season of slaughter (summer vs. early winter) on aspects of carcass and meat quality in male fallow deer.

The specific aspects of carcass and meat quality considered were:

1. Dressing-out percentage, and tissue (muscle, fat, bone) and chemical (water, lipid, ash, protein) composition;

2. Tissue distribution between the commercial venison cuts;
(3) Meat quality characteristics including tenderness, colour, water-
holding capacity and pH of muscle tissue.

A secondary objective was to quantify the growth of other
variables such as organ weights and m. longissimus areas in an attempt
to provide some base data for the species. In addition the use of
simple measurements to predict carcass composition was examined.