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Association among pasture-level variables and grazing dairy cow responses to supplementary feeds

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Caitlyn Marie Poole

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Abstract

The milk production response to additional feed (i.e., supplement) is dependent on the relative feed deficit (RFD) of the cow. We hypothesized that the relative feed deficit could be defined by post-grazing residual (PGR), with a greater PGR indicating less of a relative feed deficit. We undertook a computerized literature review, utilising key words associated with grazing systems and supplementary feed. Approximately 70 published manuscripts were reviewed. Only those that satisfied predetermined inclusion criteria were retained. A meta-analysis was undertaken across all the studies using random coefficient regression fitted as a mixed-model. In total, we collated data from 26 experiments and 90 treatments, wherein pasture-level variables, supplementary feed variables, and milk production were reported. Due to a lack of reporting of standard errors, two analyses were undertaken; one where responses were weighted against the reciprocal of the standard error of the mean, and one where they were not. On average, pasture DM intake declined (-0.28 kg/kg supplement DM; $P = 0.001$) and milk, fat, and protein increased ($P < 0.001$) 0.65 kg, 20g, and 30g/kg supplement DM, respectively. For every kg DM supplement consumed, PGR height and mass increased by 1.4 mm and 42 kg DM/ha. These results were similar in the non-weighted analysis. Associated with every 10 mm increase in PGR height in the control treatment, marginal milk response declined ($P < 0.05$) by 55 ± 21.6 g. The association between PGR height and pasture DMI at zero supplementary feed intake (i.e., unsupplemented group in experiment) on the PGR and pasture DMI responses to supplementary feed, were however, inconsistent in the weighted and non-weighted analysis. These results will enable farmers to use the change in PGR when feeding supplements, to estimate likely marginal milk production response to supplementary feeds. These results are associations only and need to be tested in controlled, interventionist, experiments. Due the number of variables affecting MR, we cannot conclude that anything is causative.

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Table of Contents

Abstract i

Acknowledgments iii

List of Figures ii

List of Tables v

List of Abbreviations viii

Chapter 1 General Introduction 1

Chapter 2 Literature Review 5

2.1 Introduction 5

2.2 Pasture-based systems 7

2.3 Feed demand drivers 9

2.3.1 Stocking rate 9

2.3.2 Calving date 12

2.3.3 Calving spread 13

2.4 Drivers of feed supply 13

2.4.1 Average pasture mass at calving 13

2.4.2 Pasture growth rates 14

2.4.3 Grazing management 15

2.4.4 Summary 15

2.5 Grazing management principles 16

2.5.1 Quality 16

2.5.2 Grazing interval 18

2.5.3 Grazing intensity 21

2.5.4 Grazing management and pasture yield 22

2.5.5 Grazing management and milk production 22

2.5.6 Summary 23

2.6 Pasture as a nutrient source for grazing dairy cows 24

2.6.1 Dry matter intake 26

2.6.2 Carbohydrates 27

2.6.2.1 Fermentation of carboyhydrates 29

2.6.3 Summary 31

2.7 Supplementary feeds 32

2.7.1 Responses to supplementary feeds. 32

2.7.2 Pasture substitution 34

2.8 Relative feed deficit 36

2.8.1 Pasture allowance 37

2.8.2 Effects of season of year and/or stage of lactation on the RFD, SbR and MR to supplementary feeds 38
2.8.3 Pasture quality 40
1.1.1 Genetic merit 40
2.8.4 The effect of RFD on MR to supplementary feeds 40
2.8.5 Quantifying the relative feed deficit 42
2.9 Conclusions 43
2.10 Thesis objectives 44
2.11 Hypothesis 44

Chapter 3 Materials and methods 45
3.1 Database construction 45
3.1.1 Literature review and data entry 45
3.1.2 Data filtering 46
3.2 Calculations and data standardization 48
3.2.1 Fat corrected milk 48
3.2.2 Substitution rate 49
3.2.3 Pasture DMI 49
3.2.4 Standard errors. 49
3.3 Statistical analysis 50
3.3.1 Overall average marginal response to supplement 50
3.3.2 Associations between the marginal response to supplement and unsupplemented (control group) milk production , pasture DMI and post-grazing residual 52

Chapter 4 Results 54
4.1 Milk production responses to supplement 54
4.2 Stage of lactation affected the DMI and milk production responses to supplement ... 58
4.3 Effect of milk production and pasture DMI of the control group on milk production and pasture DMI responses to supplementary feeds 62
4.4 Association between supplementary feeding and post-grazing residual height and mass 68
4.5 Average marginal post-grazing residual responses to supplementary feeds at different stages of lactation 71
4.6 Association between pasture DMI of the control group and the post-grazing residual responses to supplement 73
4.7 Interaction between the post-grazing residual pasture height and mass in the control group and the change in post-grazing residual height and mass in response to supplement ... 73
4.8 Association between unsupplemented post-grazing residual and the pasture DMI and milk production responses to supplement 76

Chapter 5 Discussion 80
5.1 Thesis novelty and main results 80
5.2 Associations among supplementary feed use and pasture-level variables 81
5.2.1 Associations between supplementary feed DMI, substitution rate, and post-grazing residual height and mass 81

5.2.2 Associations among the relative feed deficit and the substitution rate and post-grazing residual height and mass responses to supplements 84

5.3 Associations among supplementary feed use and milk production variables 88

5.3.1 Milk yield 88

5.3.2 Milk composition 90

5.3.3 The association between milk production and pasture DMI in the unsupplemented cows (control group) and the milk production responses to supplement 92

5.3.4 The association between post-grazing residual height and mass in the pastures being grazed by unsupplemented cows (i.e., control group) and the milk production responses to supplement 93

5.3.5 The effect of stage of lactation on pasture DMI and milk production responses to supplement DMI 94

Chapter 6 Conclusions 97

Chapter 7 Limitations 100

References 104

Appendices 121

Appendix 1: Summary of experiments included in the analyses of marginal responses of grazing cows to supplementary feed 121

List of Figures

Figure 1.1 Farmgate milk production costs in selected countries 2006-2012.USD/litre (O'Mahony, 2014). 2

Figure 1.2: Operating expenses $ per kilogram of milksolids (DairyNZ, 2017). 3

Figure 2.1: The association between the percentage of the cow's annual diet that is grazed pasture and the cost of milk production (Dillon et al., 2005). 5

Figure 2.2. a) Temporal pattern of daily pasture supply and herd demand and b) Proportion of the herd at different stages of SOL. Adapted from (Roche et al. 2017) 8

Figure 2.3: Seasonal closed system (i.e. where supplements are not purchased) and where pasture is conserved during periods of surplus and fed during times of deficit. Adapted from Figure 2.2a (Roche et al. 2017). 11

Figure 2.4: Seasonal 'open' dairy farming system (i.e. where supplements are purchased). The herd demand exceeds the supply of pasture for most of the year, and therefore supplements must be fed to fill the deficit. Adapted from Figure 2.2a (Roche et al. 2017) 12

Figure 2.5: Seasonal changes in the nutritive value of well-managed ryegrass/clover pastures (Holmes et al., 2002) 17

Figure 2.6: Regrowth of a ryegrass tiller following defoliation (Donaghy 1998) 18

Figure 2.7: Change in pasture mass and plant energy reserves during the re-growth cycle of perennial ryegrass (McCarthy et al., 2015) 19

Figure 2.8: Regrowth to 3-leaf stage (36 days) when plants were previously defoliated once at 3 leaves (▼), once at 1 leaf and once at 2 leaf (▽) or 3 times at 1 leaf (●) per tiller (Donaghy and Fulkerson 1997) 20

Figure 2.9: The main components of pasture (McDonald et al., 2011). 24

Figure 2.10: Relationships between pasture allowance and dry matter intake by cows grazing irrigated ryegrass-white clover (♦), high mass paspalum-dominant (□) and medium mass paspalum-dominant (Δ) pastures (Wales et al., 1998). 27

Figure 2.11: Carbohydrate classifications (Moran, 2005). 28

Figure 2.12: Pathways of carbohydrate metabolism in the rumen (van Soest, 1994). 30

Figure 2.13: Schematic to depict the short-and longer-term responses to 1 kg of high-quality supplement DM offered/cow (Roche et al., 2017). 33

Figure 2.14: Relationship between MR and SbR by grazing cows supplemented with concentrate on studies evaluating the effect of pasture allowance (● Bargo el al., 2002; □ Robaina et al., 1998; ■ Stockdale 1999a). 35

Figure 2.15: The effect of the decline in milksolids (MS) yield of the unsupplemented cows that occurred as restricted feeding was imposed (as a measure of the relative feed deficit) on the immediate MS response to supplementary feeds. Immediate marginal response (g MS/MJME) = 2.02 (±0.26) + 0.006 (±0.0009) reduction in MS yield (g/cow/day); Adjusted R^2=0.44; r.s.d. = 1.38 (Penno, 2002). 42

Figure 3.1: Figure to show the change in 4% FCM yield (kg) with increasing supplement DMI. The overall marginal 4% FCM response (non-weighted) generated from the analyses is the average slope of all the lines in this figure. 51

Figure 5.1: Simplified model to depict the effect of supplementary feed on neuroendocrine factors and the impact this has on pasture DMI. Adapted from Seeley and Schwartz (1997). 83

Figure 5.2: Effect of pasture intake at zero concentrate intake (Pasture Intake; kg DM/cow.day/100 kg liveweight) on the pasture substitution rate of cows offered concentrates for Grainger and Matthews 1989 (Δ), Meijs and Hoekstra 1984 (○), Stockdale and Trigg 1985 (□), Stakelum a (◊), 1986b (▲), 1986c (●). The equation of the line is: SbR = -0.445 + 0.315 (± 0.057)PI (Variance accounted for = 63.5%; r.s.d = 0.129; c.v. = 34.7%; n=18; Grainger & Matthews, 1989). 85

Figure 5.3: Schematic to depict the short-term response to 1 kg of high-quality supplement DM offered/cow. Source: Adapted from Holmes and Roche (2007). [1]Effect of grain supplements on the NDF digestibility of pasture (Doyle et al., 2005). 89

Figure 5.5: Relation between dry matter (DM) and the digestible energy (DE) of the feed ingested. Source: (van Soest, 1994) 95

Figure 6.1: An example of how post-grazing residual mass may be used to predict marginal milk production responses to supplement. This is based on the response functions from my analyses;[1]0.64 kg 4% FCM/cow/day is the average marginal response generated from my analyses [2]1500 kg DM/ha is the recommended as being the optimal compromise between the requirements of the plant and the requirements of the animal (Ganche et al., 2013; Roche et al., 2017)..... 99

List of Tables

Table 2.1: Nutrient requirement[1] and supply for cows of 550 or 650 kg live weight, producing 25 or 35 kg of milk. Adapted from (Kolver, 2003)..... 25

Table 2.2: Mean annual nutrient composition of a pasture diet and TMR diet (Kolver et al., 2000). 29

Table 2.3: A comparison of marginal milk production response to supplementary feeds reported from experiments with early, mid and late lactation cows published since 1979 (Penno 2002). 39

Table 3.1: Example of the rationale behind exclusion of experiments and treatments within studies, from the dataset..... 47

Table 3.2: Example of the division of a study into Treatment Groups that were then analysed to determine the marginal responses to supplementary feeds. In this example, the Treatment Groups differ by pasture allowance..... 50

Table 4.1: Average marginal dry matter intake (DMI) and milk production responses to supplement DMI in grazing dairy cows. Results are from a non-weighted analyses[1] of 83 treatments from 26 studies conducted between 1985 and 2008 and under a range of management conditions[2]..... 55

Table 4.2: Average marginal dry matter intake (DMI) and milk production responses to supplement DMI in grazing dairy cows. Results are from a weighted analyses[1] of 72 treatments in 22 studies conducted between 1985 and 2008 and under a range of management conditions[2]. 57

Table 4.3: Average marginal dry matter intake (DMI) and milk production responses of grazing dairy cows to supplement DMI at different stages of lactation. Results from a non-weighted analyses[1] of 26 studies conducted between 1985 and 2008 and under a range of management conditions[2]..... 59

Table 4.4: Average marginal dry matter intake (DMI) and milk production responses of grazing dairy cows, to supplement DMI at different stages of lactation. Results from a weighted analyses[1] of 26 studies conducted between 1985 and 2008, under a range of management conditions[2] 61

Table 4.5: The effect of milk production and pasture DMI of the control group (unsupplemented group) on milk production and pasture DMI responses to supplementary feeds. Results are from a non-weighted analyses[1] of 83 treatments from 26 studies conducted between 1985 and 2008 and under a range of management conditions[2]. 64

Table 4.6: The effect of milk production and pasture DMI of the control group (unsupplemented group) on milk production and pasture DMI responses to supplementary feeds. Results are from a weighted analyses[1] of 72 treatments in 22 studies conducted between 1985 and 2008 and under a range of management conditions[2]..... 67

Table 4.7: Average marginal post-grazing residual responses to supplement DMI in grazing dairy cows from a non-weighted analyses[1] of 67 treatments in 19 studies conducted between 1985 and 2008, under a range of management conditions[2]. 69

Table 4.8: Average marginal post-grazing residual responses to supplement DMI in grazing dairy cows from a weighted analyses[1] of 42 treatments in 14 studies conducted between 1995 and 2008, under a range of management conditions[2]..... 70

Table 4.9: Average marginal post-grazing residual responses to supplement DMI at different stages of lactation. Results from a non-weighted analyses[1] of 19 studies conducted between 1985 and 2008, under a range of management conditions[2]..... 72

Table 4.10: Average marginal post-grazing residual responses to supplement DMI at different stages of lactation. Results from a weighted analyses[1] of 19 studies conducted between 1985 and 2008, under a range of management conditions[2]. 72

Table 4.11: The effect of the post-grazing residual of the control group (unsupplemented group) on post-grazing residual responses to supplementary feeds. Results are from a non-weighted analyses[1] of 67 treatments in 19 studies conducted between 1985 and 2008, under a range of management conditions[2]. 74

Table 4.12: The effect of the post-grazing residual of the control group (unsupplemented group) on post-grazing residual responses to supplementary feeds. Results are from a weighted analyses[1] of 42 treatments in 14 studies conducted between 1995 and 2008, under a range of management conditions[2]..... 75

Table 4.13: The effect of the post-grazing residual of the control group (unsupplemented group) on pasture dry matter intake and milk production responses to supplementary feeds. Results are from a non-weighted analyses[1] of 67 treatments in 19 studies conducted between 1985 and 2008, under a range of management conditions[2]. 77

Table 4.14: The effect of the post-grazing residual of the control group (unsupplemented group) on pasture dry matter intake and milk production responses to supplementary feeds. Results are from a weighted analyses[1] of 42 treatments in 14 studies conducted between 1995 and 2008, under a range of management conditions[2]..... 79

Table 20: A comparison of key learnings from the study and common industry practices in New Zealand..... 98

List of Abbreviations

BW	Body weight
CSR	Comparative stocking rate
CNCPS	Cornell Net Carbohydrate and Protein System
DE	Digestible energy
DM	Dry matter
DMI	Dry matter intake
FCM	Fat corrected milk
GDP	Gross domestic product
ME	Metabolisable energy
MS	Milksolids
MR	Marginal response
NDF	Neutral detergent fibre
NSC	Non-structural carbohydrates
NZ	New Zealand
PA	Pasture allowance
PGR	Post grazing residual
RFD	Relative feed deficit
SbR	Substitution rate
SOL	Stage of lactation
SR	Stocking rate
TMR	Total mixed ration
VFA	Volatile fatty acids
WSC	Water soluble carbohydrates