

ASSESSMENT OF PRIOR GRAZING EXPERIENCES ON ADAPTATION  
TO PASTURE AND PERFORMANCE OF DAIRY HEIFERS AS LACTATING COWS

By

Fernanda Lopes

A thesis submitted in the partial fulfillment of the requirement for the degree of

MASTER OF SCIENCE

(Dairy Science)

at the

UNIVERSITY OF WISCONSIN – MADISON

2010

## ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my major Professor and adviser, Dr. David Combs, for all that he has done for me. Thanks for trust and accepting me as a master's student in your research group and have taught me how to go farther. I also would like to thank Dr. Combs to help my dream to become true. I really appreciate his mentorship, support and understanding during all these years. I also want to extend my gratitude to Prof. Patrick Hoffman and Dr. Victor Cabrera for serving on my committee.

I would like to thank Dr. Kenneth Albrecht for the opportunity to come to USA as an intern and work with his research group. I really appreciate the patience and support that Dr. Albrecht and Ed Bures had with me when I came here without speaking English. I also want to thank Dr. Albrecht's group for all the friendship and knowledge acquired during two years working together.

My deepest appreciation and gratitude also goes to Dr. Hoffman, Wayne Coblenz, Nancy Esser and the staff from the University of Wisconsin's Integrated Dairy Research and USDA facility in Marshfield. Thanks so much for all your help to conduct this research. My thanks also go to the staff at the Dairy Research Facility at Arlington and special Sandy Trower for taking such good care of the cows.

I have to thank Sandy Bertics for help in order the supplies and adviser in the lab procedures and also all my colleagues from the 9 floor for the good conversation and help.

My special thanks goes to my ex and actual roommates; special people that made my life here much easier and happy. Thanks you for all the late conversations, always coming up with good advices and a cold beer.

Also, I want to acknowledge my boyfriends Joe Grams, whose love and continued support enabled me to overcome the frustrations which occurred in the process of writing this thesis. Thank you very much!

I express my appreciation to DATCP and Dr. David Combs for having believed in me and for their financial support.

## **DEDICATION**

I would like to dedicate this achievement to my Mom (Lúcia) that is my sources of encouragements, my example of motivation, strength and love. I also want to dedicate it to my dad (Nilton), my sister (Flavia) and my brother (Filipe) who are always cheering and believing in my decisions.

This achievement will be not possible without my uncle (Tomio) and aunt (Alzira). They are the one that taught me to never give up, they are the person that showed me that does not matter where you come from, what really matter in life is who you are and what you want, because in the end we are the size of our dreams!

**We got it!!!**

## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS.....</b>	<b>ii</b>
<b>DEDICATION.....</b>	<b>iv</b>
<b>LIST OF TABLES.....</b>	<b>vii</b>
<b>LIST OF FIGURES.....</b>	<b>ix</b>
<b>CHAPTER I: Review of Literature.....</b>	<b>1</b>
Introduction.....	2
Grazing behavior correlated with factors that affect animal production.....	3
Sward structure and density.....	5
Amount and type of supplement fed.....	7
Pasture quality and yield.....	8
Early Dietary experienced and animal behavior.....	8
Global positioning system (GPS) to monitor animal activities.....	13
Adaptation period in grazing study.....	16
References.....	19
<b>CHAPTER II: Assessment of Prior Grazing Experiences on Adaptation to Pasture and Performance of Dairy Heifers.....</b>	<b>32</b>
Abstract.....	33
Introduction.....	35
Materials and Methods.....	36
Experimental design, animals and treatments.....	36
Pasture.....	38
Year 1 (2008): Exposure to pasture.....	39
Year 2 (2009): Influence of prior grazing experience.....	40

Year 3 (2010): Influence of prior grazing experience on milk production..	40
Animal Behavior Measurements .....	42
Milk production.....	43
Statistical analyses.....	43
Results and Discussion.....	44
Forage and concentrate composition.....	44
Year (2008): Exposure to pasture.....	45
Year 2 (2009): Heifers grazing behavior and growth performance .....	46
Year 3 (2010): Influence of prior grazing experience on milk production and animal activity.....	50
Animal activity.....	50
Milk production and composition.....	53
General discussion and conclusion.....	54
Implication.....	58
References.....	60

## LIST OF TABLES

### CHAPTER I: Review of Literature

**Table 1.** Effect of supplementation on grazing time (GT), biting rate (BR), and bite mass (BM) of dairy cows (Bargo et al., 2003).

**Table 2.** Animal grazing activities recorded by different methods.

### CHAPTER II: Assessment of Prior Grazing Experiences on Adaptation to Pasture and Performance of Dairy Heifers

**Table 1.** Treatment scheme.

**Table 2.** Pasture and supplementation composition.

**Table 3.** Effect of prior grazing experience on grazing activity and forage DM available per heifer per day on selected days, yr-2 (2009).

**Table 4.** Distance (km) walked by each treatment on selected days of experiment, yr-2 (2009).

**Table 5.** Effect of prior grazing experience on grazing activity and forage DM available per heifer per day on selected days, yr-3 (2010).

**Table 6.** Distance (km) walked for each treatment on selected days of experiment, yr-3 (2010).

**Table 7.** Milk production by treatment on selected days of experiment, yr-3 (2010).

**Table 8.** Average of milk production and milk composition for each treatment in 61 d of experiment, yr-3 (2010).



## LIST OF FIGURES

### CHAPTER I: Review of Literature

- Figure 1.** Effect of sward surface height on bite mass by lactating cows (Gibb et al., 1996).
- Figure 2.** Effect of bite mass on bite rate by lactating dairy cows (Gibb et al., 1996).
- Figure 3.** Effect of sward surface height on short-term intake rate by lactating dairy cows (Gibb et al., 1996).
- Figure 4.** Effect of sward surface height and constraint on short-term intake rate on time spent grazing (G), idling (I) and ruminating (R) by lactating dairy cows (Gibb et al., 1996).
- Figure 5.** Effect of sward surface height on bite mass in sward of high ■ , medium □ , and low □ density (Mayne et al., 2000).
- Figure 6.** Relationship between grazing behavior of dairy cows and quality and quantity of pasture occurred over the four fortnights (Hancock, 1954).
- Figure 7.** Schematic representation of effective and cognitive processes in diet selection.
- Figure 8.** Hourly activity for grazing ■ , resting □ , and walking □ , of cattle carrying a backpack GPS and grazing communal land in Chikal west Niger. Data are yearly average based on manual observation (a) or resulting from classification of GPS-derived parameters by discriminant analysis (b) of 30 cattle itineraries.

## **CHAPTER II: Assessment of Prior Grazing Experiences on Adaptation to Pasture and Performance of Dairy Heifers**

**Figure 1.** Temperature ( $^{\circ}\text{C}$ ) and relative humidity (%) recorded on the same experiment days that was recorded the animal behavior in 2009 (a) and 2010 (b).

**Figure 2.** Marshfield -WI, pasture layout (North  $\uparrow$ ) (a) 4 ha were divided in 8 paddocks for the grazing period in 2008. (b) 7 ha were divided in 12 paddocks for the grazing period in 2009.

**Figure 3.** Arlington-WI, pasture layout ( East) 14 ha were divided in 32 paddocks for the grazing period in 2010.

**Figure 4.** Distance (km) walked by each treatment on selected days of experiment, yr-2 (2009).

**Figure 5.** Heifer movements in the pastures recorded during 9 h/d (0700 to 1600). Left sides of the pictures are T1 and right side is T3. (a) day 1, (b) day 2, (c) day 3, (d) day 4 and (e) day 5.

**Figure 6.** Distance (km) walked by each treatment on selected days (8 h/day) of experiment on yr-3 (2010).

**Figure 7.** Cow movement in the pastures recorded during 8 h on day 1. (a) T1, (b) T2, (c) T3, (d) T4.

**Figure 8.** Cow movement in the pastures recorded during 8 h on day 2. (a) T1, (b) T2, (c) T3, (d) T4.

**Figure 9.** Cow movement in the pastures recorded during 8 h on day 4. (a) T1, (b) T2, (c) T3, (d) T4.

**Figure 10.** Cow movement in the pastures recorded during 8 h on day 30. (a) T1, (b) T2, (c) T3, (d) T4.