



Alfalfa response to simulated short duration grazing  
by Michael Shaun Townsend

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in  
Agronomy  
Montana State University  
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**Abstract:**

Alfalfa is the most important cultivated forage in the world. Livestock utilizing alfalfa for hay or pasture are provided with an exceptional balance of vitamins, proteins, and minerals. Alfalfa has been evaluated for use as a pasture crop, however, little is known about its response to Short Duration Grazing (SDG). Short duration grazing is a grazing system where existing rangeland or pasture are subdivided into many smaller paddocks. Livestock are allowed to graze a paddock for a short time period and then rotated to the next paddock. As a result, forage is utilized more efficiently than with other systems. The objective of this study was to evaluate various simulated SDG treatments on alfalfa yield, stand persistence, plant vigor, root carbohydrate response, and forage quality.

In 1986, a 2 x 3 x 3 factorial study was initiated at Bozeman and Kalispell, Montana to evaluate two cultivars ('Spredor II' and 'Maxim'), three harvest frequencies (8, 16, and 32 day harvest intervals), and three harvest intensities (33%, 50% and 67% top growth removal). Three control treatments (prebud, prebloom and 10% bloom) and a graduated treatment (GRAD) were also included.

Forage yields were highest for treatments with less severe harvest pressure. Treatments cut frequently generally were less vigorous than other treatments. Carbohydrate levels in mid-August were lowest for treatments cut frequently during the season. Later in the fall, differences in carbohydrate levels among treatments were negligible. Even though some treatments were harvested more than 24 times in two years, very little stand loss occurred during the study. Treatments had little effect on root diameters. Forage quality was high for treatments cut frequently. As rest between harvests increased, forage quality declined.

Short duration grazing shows promise for use on alfalfa in Montana. More research is needed, particularly grazing trials with livestock, and an evaluation of alfalfa in mixes with forage grasses for use with SDG.

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES . . . . .	ix
LIST OF FIGURES . . . . .	xvii
ABSTRACT . . . . .	xxi
1. INTRODUCTION . . . . .	1
2. LITERATURE REVIEW . . . . .	2
History . . . . .	2
Alfalfa Management . . . . .	4
Carbohydrate Reserves . . . . .	7
Fall Management . . . . .	9
Forage Quality . . . . .	11
Grazing . . . . .	13
3. ALFALFA YIELD AND VIGOR IN RESPONSE TO INTENSITY AND FREQUENCY OF DEFOLIATION . . .	17
Materials and Methods . . . . .	17
Bozeman . . . . .	17
1986 . . . . .	17
1987 . . . . .	19
1988 . . . . .	20
1989 . . . . .	21
Kalispell . . . . .	22
1986 . . . . .	22
1987 . . . . .	22
1988 . . . . .	23
1989 . . . . .	23
Results and Discussion . . . . .	23
Forage Production . . . . .	23
Bozeman Seasonal Yields . . . . .	23
Bozeman Total Yields . . . . .	28
Kalispell Seasonal Yields . . . . .	32
Kalispell Total Yields . . . . .	34

TABLE OF CONTENTS - Continued

	<u>Page</u>
Alfalfa Vigor . . . . .	38
Bozeman Residual Harvest Effects .	38
Kalispell Residual Harvest Effects	40
Plant Heights . . . . .	45
Bozeman Plant Heights . . . . .	45
Kalispell Plant Heights . . . . .	47
4. STAND PERSISTENCE AND ROOT RESPONSE TO FREQUENCY AND INTENSITY OF DEFOLIATION . . .	52
Materials and Methods . . . . .	52
Bozeman . . . . .	52
Kalispell . . . . .	54
Results and Discussion . . . . .	54
Total Nonstructural Carbohydrates . .	54
Bozeman . . . . .	54
Kalispell . . . . .	60
Occupancy . . . . .	63
Bozeman . . . . .	63
Kalispell . . . . .	68
Root Diameters . . . . .	70
Bozeman . . . . .	70
Kalispell . . . . .	73
5. ALFALFA FORAGE QUALITY IN RESPONSE TO FREQUENCY AND INTENSITY OF DEFOLIATION . . .	80
Materials and Methods . . . . .	80
Bozeman . . . . .	80
Kalispell . . . . .	80
Results and Discussion . . . . .	81
Seasonal Acid Detergent Fiber . . . .	81
Total Acid Detergent Fiber . . . . .	84
Seasonal Neutral Detergent Fiber . . .	87
Total Neutral Detergent Fiber . . . .	90

TABLE OF CONTENTS - Continued

	<u>Page</u>
Seasonal Protein . . . . .	92
Total Protein . . . . .	94
Seasonal <i>In Vitro</i> Digestible Dry Matter . . . . .	95
Total <i>In Vitro</i> Digestible Dry Matter .	97
6. SUMMARY AND CONCLUSIONS . . . . .	100
LITERATURE CITED . . . . .	105
APPENDICES . . . . .	112
Appendix A Harvest Dates . . . . .	113
Appendix B Temperature Data . . . . .	116
Appendix C Statistical Data . . . . .	118
Appendix D Analyzing Total Non-Structural Carbohydrates . . . . .	147

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Harvest schedule of two alfalfa cultivars at Bozeman and Kalispell, Montana, 1987-1989. . . . .	18
2. Seasonal dry matter forage production of Spredor II and Maxim alfalfa at Bozeman as affected by harvest treatments. . . . .	24
3. Total dry matter forage production of Spredor II and Maxim alfalfa at Bozeman as affected by harvest treatments. . . . .	29
4. Fall dry matter forage production of Spredor II and Maxim alfalfa at Bozeman as affected by harvest treatments. . . . .	30
5. Seasonal dry matter forage production for Spredor II and Maxim alfalfa at Kalispell in 1988 as affected by harvest treatments. . . . .	33
6. Total dry matter forage production for Spredor II and Maxim alfalfa at Kalispell in 1988 as affected by harvest treatments. . . . .	35
7. Fall dry matter forage production for Spredor II and Maxim alfalfa at Kalispell in 1988 as affected by harvest treatments. . . . .	36
8. Effect of previous years harvest treatments on Maxim alfalfa yield at Bozeman in 1989. . . . .	39
9. Effect of previous harvesting on Maxim alfalfa yield for harvest frequency at Bozeman in 1989. . . . .	39
10. Effect of previous years treatments on Spredor II alfalfa yield at Kalispell in 1989. . . . .	41
11. Effect of previous years treatments on Maxim alfalfa yield at Kalispell in 1989. . . . .	41

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
12. Effect of previous harvesting on alfalfa yields for cultivars at Kalispell in 1989. . .	42
13. Bozeman spring plant heights as affected by control treatments and harvest frequency and intensity. . . . .	45
14. Plant heights for cultivars at Bozeman in 1989. . . . .	47
15. Alfalfa plant heights at Kalispell as affected by harvest treatments. . . . .	48
16. Spredor II alfalfa plant height as affected by harvest frequency and intensity at Kalispell in May 1988. . . . .	49
17. Total Nonstructural Carbohydrate as affected by cultivars, harvest frequency and intensity at Bozeman. . . . .	59
18. Total Nonstructural Carbohydrate as affected by cultivars, harvest frequency and intensity at Kalispell in October 1988. . . . .	64
19. Maxim alfalfa occupancy in 1988 as affected by harvest treatments at Bozeman. . . . .	65
20. Occupancy factor level means for cultivars at Bozeman in September 1989. . . . .	68
21. Maxim alfalfa occupancy as affected by harvest treatments at Kalispell in 1989. . . . .	69
22. Maxim alfalfa root diameters as affected by harvest treatments at Bozeman in October 1988. . . . .	70
23. Spredor II alfalfa root diameters as affected by harvest treatments at Bozeman in August 1989. . . . .	71

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
24. Root Diameters as affected by harvest frequency at Bozeman in October 1988. . . .	72
25. Spredor II root diameters as affected by harvest frequency and intensity at Bozeman in August 1989. . . . .	73
26. Maxim alfalfa root diameters as affected by harvest treatments at Kalispell in August 1988. . . . .	74
27. Spredor II alfalfa root diameters as affected by harvest treatments at Kalispell in October 1988. . . . .	74
28. Maxim alfalfa root diameters as affected by harvest treatments at Kalispell in October 1988. . . . .	75
29. Root diameters as affected by cultivars, harvest frequency and intensity at Kalispell in August 1988. . . . .	76
30. Root diameters as affected by cultivars, harvest frequency and intensity at Kalispell in October 1988. . . . .	76
31. Mean Neutral Detergent Fiber concentration for cultivars for seasonal harvesting (May - Aug.) at Bozeman in 1988. . . . .	89
32. Mean Neutral Detergent Fiber concentration as affected by cultivars and harvest frequency for total harvesting (May - Oct.) at Bozeman in 1988. . . . .	91
33. Mean Protein concentration as affected by cultivars, harvest frequency and intensity for seasonal harvesting (May - Aug.) at Bozeman in 1988. . . . .	93
34. Mean Protein concentration as affected by cultivars, harvest frequency and intensity for total harvesting (May - Oct.) at Bozeman in 1988. . . . .	95

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
35. Mean <i>In Vitro</i> Digestible Dry Matter concentration as affected by cultivars, harvest frequency and intensity for seasonal harvesting (May - Aug.) at Bozeman in 1988. . . . .	97
36. Mean <i>In Vitro</i> Digestible Dry Matter concentration as affected by cultivars, harvest frequency and intensity for total harvesting (May - Oct.) at Bozeman in 1988. . . . .	98
37. Harvest dates for factorial treatments at Bozeman and Kalispell in 1988. . . . .	114
38. Harvest dates for Spredor II factorial treatments at Bozeman, Mt. in 1989. . . . .	114
39. Harvest dates for control treatments at Bozeman and Kalispell in 1988. . . . .	115
40. Harvest dates for Spredor II control treatments at Bozeman in 1989. . . . .	115
41. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II alfalfa forage yields at Bozeman as affected by harvest treatments. . . . .	119
42. Mean Squares (MS) and Degrees of Freedom (DF) for Maxim alfalfa forage yields at Bozeman as affected by harvest treatments. . . . .	119
43. Mean Squares (MS) and Degrees of Freedom (DF) for Bozeman forage yields as affected by cultivars, harvest frequency and intensity in 1988. . . . .	120
44. Mean Squares (MS) and Degrees of Freedom (DF) for Bozeman Spredor II forage yields as affected by harvest frequency and intensity in 1989. . . . .	120

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
45. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II and Maxim alfalfa forage yields at Kalispell as affected by harvest treatments in 1988. . . . .	121
46. Mean Squares (MS) and Degrees of Freedom (DF) for Kalispell forage yields as affected by harvest frequency and intensity in 1988. . . . .	122
47. Mean Squares (MS) and Degrees of Freedom (DF) for residual Maxim alfalfa forage yields as affected by harvest treatments at Bozeman in 1989. . . . .	122
48. Mean Squares (MS) and Degrees of Freedom (DF) for residual Maxim alfalfa forage yields as affected by harvest frequency and intensity at Bozeman in 1989. . . . .	123
49. Mean Squares (MS) and Degrees of Freedom (DF) for residual Spredor II forage yields as affected by harvest treatments at Kalispell in 1989. . . . .	123
50. Mean Squares (MS) and Degrees of Freedom (DF) for residual Maxim alfalfa forage yields as affected by harvest treatments at Kalispell in 1989. . . . .	124
51. Mean Squares (MS) and Degrees of Freedom (DF) for residual alfalfa forage yields as affected by cultivars, harvest frequency and intensity at Kalispell in 1989. . . . .	124
52. Mean Squares (MS) and Degrees of Freedom (DF) for May plant heights as affected by harvest treatments at Bozeman. . . . .	125
53. Mean Squares (MS) and Degrees of Freedom (DF) for May plant heights as affected by cultivars, harvest frequency and intensity at Bozeman. . . . .	125

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
54. Mean Squares (MS) and Degrees of Freedom (DF) for May plant heights as affected by harvest treatments at Kalispell. . . . .	126
55. Mean Squares (MS) and Degrees of Freedom (DF) for May plant heights as affected by harvest treatments at Kalispell. . . . .	127
56. Mean Squares (MS) and Degrees of Freedom (DF) for TNC as affected by harvest treatments at Bozeman. . . . .	128
57. Mean Squares (MS) and Degrees of Freedom (DF) for TNC as affected by cultivars, harvest frequency and intensity at Bozeman.	129
58. Mean Squares (MS) and Degrees of Freedom (DF) for TNC as affected by harvest treatments at Kalispell. . . . .	129
59. Mean Squares (MS) and Degrees of Freedom (DF) for TNC as affected by cultivars, harvest frequency and intensity at Kalispell. . . . .	130
60. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II occupancy counts as affected by harvest treatments at Bozeman. . . . .	130
61. Mean Squares (MS) and Degrees of Freedom (DF) for Maxim occupancy counts as affected by harvest treatments at Bozeman. . . . .	131
62. Mean Squares (MS) and Degrees of Freedom (DF) for occupancy counts as affected by cultivars, harvest frequency and intensity at Bozeman. . . . .	131
63. Mean Squares (MS) and Degrees of Freedom (DF) for Kalispell occupancy as affected by harvest treatments. . . . .	132

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
64. Mean Squares (MS) and Degrees of Freedom (DF) for Kalispell occupancy as affected by cultivars, harvest frequency and intensity. . . . .	133
65. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II root diameters as affected by harvest treatments at Bozeman in 1988. . . . .	133
66. Mean Squares (MS) and Degrees of Freedom (DF) for Maxim root diameters as affected by harvest treatments at Bozeman in 1988. . . . .	134
67. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II root diameters as affected by harvest treatments at Bozeman in 1989. . . . .	134
68. Mean Squares (MS) and Degrees of Freedom (DF) for root diameters as affected by cultivars, harvest frequency and intensity at Bozeman in 1988. . . . .	135
69. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II root diameters as affected by harvest frequency and intensity at Bozeman in 1989. . . . .	136
70. Mean Squares (MS) and Degrees of Freedom (DF) for Spredor II root diameters as affected by harvest treatments at Kalispell in 1988. . . . .	136
71. Mean Squares (MS) and Degrees of Freedom (DF) for Maxim root diameters as affected by harvest treatments at Kalispell in 1988. . . . .	137
72. Mean Squares (MS) and Degrees of Freedom (DF) for root diameters as affected by cultivars, harvest frequency and intensity at Kalispell in 1988. . . . .	138

LIST OF TABLES - Continued

<u>Table</u>	<u>Page</u>
73. Mean Squares (MS) and Degrees of Freedom (DF) for mean ADF concentration as affected by harvest treatments in 1988 for Spredor II and Maxim alfalfa at Bozeman. . .	139
74. Mean Squares (MS) and Degrees of Freedom (DF) for mean ADF concentration as affected by cultivars, harvest frequency and intensity at Bozeman in 1988. . . . .	140
75. Mean Squares (MS) and Degrees of Freedom (DF) for mean NDF concentration as affected by harvest treatments in 1988 for Spredor II and Maxim alfalfa at Bozeman. . .	141
76. Mean Squares (MS) and Degrees of Freedom (DF) for mean NDF concentration as affected by cultivars, harvest frequency and intensity at Bozeman in 1988. . . . .	142
77. Mean Squares (MS) and Degrees of Freedom (DF) for mean protein concentration as affected by harvest treatments in 1988 for Spredor II and Maxim alfalfa at Bozeman. . .	143
78. Mean Squares (MS) and Degrees of Freedom (DF) for mean protein concentration as affected by cultivars, harvest frequency and intensity at Bozeman in 1988. . . . .	144
79. Mean Squares (MS) and Degrees of Freedom (DF) for mean IVDDM concentration as affected by harvest treatments in 1988 for Spredor II alfalfa at Bozeman. . . . .	145
80. Mean Squares (MS) and Degrees of Freedom (DF) for mean IVDDM concentration as affected by cultivars, harvest frequency and intensity at Bozeman in 1988. . . . .	146
81. Procedure used to analyze total nonstructural carbohydrates from alfalfa root tissue. . . . .	148

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Alfalfa seasonal forage yield as affected by harvest frequency and intensity in 1988 at Bozeman. . . . .	25
2. Alfalfa seasonal forage yield as affected by cultivars and harvest frequency in 1988 at Bozeman. . . . .	26
3. Alfalfa seasonal forage yield as affected by cultivars and harvest intensity in 1988 at Bozeman. . . . .	27
4. Spredor II alfalfa seasonal yield as affected by harvest frequency and intensity at Bozeman in 1989. . . . .	28
5. Alfalfa total yield as affected by harvest frequency and intensity in 1988 at Bozeman.	31
6. Spredor II alfalfa total yield as affected by harvest frequency and intensity at Bozeman in 1989. . . . .	32
7. Alfalfa seasonal forage yield as affected by harvest frequency and intensity in 1988 at Kalispell. . . . .	33
8. Alfalfa total forage yield as affected by harvest frequency and intensity in 1988 at Kalispell. . . . .	36
9. Alfalfa total forage yield as affected by cultivars and harvest intensity in 1988 at Kalispell. . . . .	37
10. Alfalfa yields on July 27, 1989 as affected by 1988 harvest frequency and intensity at Kalispell. . . . .	42
11. Alfalfa yields on Sept. 14, 1989 as affected by 1988 harvest frequency and intensity at Kalispell. . . . .	43

LIST OF FIGURES - Continued

<u>Figure</u>	<u>Page</u>
12. Total alfalfa yields in 1989 as affected by 1988 harvest frequency and intensity at Kalispell. . . . .	44
13. Maxim alfalfa plant heights in May 1988 as affected by harvest frequency and intensity at Bozeman. . . . .	46
14. Alfalfa plant heights in May 1989 as affected by cultivars and harvest intensity at Kalispell. . . . .	50
15. Alfalfa plant heights in May 1989 as affected by cultivars and harvest frequency at Kalispell. . . . .	50
16. Spredor II alfalfa Total Nonstructural Carbohydrate in August and October 1988 as affected by harvest treatments at Bozeman. . . . .	55
17. Maxim alfalfa Total Nonstructural Carbohydrate in August and October 1988 as affected by harvest treatments at Bozeman. . . . .	56
18. Spredor II alfalfa Total Nonstructural Carbohydrate in August and September 1989 as affected by harvest treatments at Bozeman. . . . .	57
19. Spredor II alfalfa Total Nonstructural Carbohydrate in August and October 1988 as affected by harvest treatments at Kalispell. . . . .	61
20. Maxim alfalfa Total Nonstructural Carbohydrate in August and October 1988 as affected by harvest treatments at Kalispell. . . . .	62
21. Alfalfa TNC in August 1988 as affected by harvest frequency and intensity at Kalispell. . . . .	63

LIST OF FIGURES - Continued

<u>Figure</u>	<u>Page</u>
22. Maxim alfalfa occupancy as affected by harvest frequency and intensity at Bozeman in May 1988. . . . .	66
23. Alfalfa occupancy in October 1988 as affected by cultivars and harvest intensity at Bozeman. . . . .	67
24. Root diameters at 20 cm as affected by cultivars and harvest intensity at Bozeman in October 1988. . . . .	72
25. Root diameters at 5 cm as affected by cultivars and harvest intensity at Kalispell in August 1988. . . . .	77
26. Root diameters at 20 cm as affected by cultivars and harvest intensity at Kalispell in August 1988. . . . .	78
27. Mean root diameters in August 1988 as affected by cultivars and harvest intensity at Kalispell. . . . .	78
28. Root diameters at 20 cm as affected by cultivars and harvest frequency at Kalispell in October 1988. . . . .	79
29. Spredor II and Maxim alfalfa mean seasonal ADF concentration as affected by harvest frequency and intensity at Bozeman in 1988. . . . .	82
30. Alfalfa mean seasonal ADF concentration as affected by cultivars and harvest frequency at Bozeman in 1988. . . . .	83
31. Alfalfa mean seasonal ADF concentration as affected by harvest frequency and intensity at Bozeman in 1988. . . . .	84
32. Spredor II alfalfa total ADF concentration as affected by harvest treatments at Bozeman in 1988. . . . .	85

LIST OF FIGURES - Continued

<u>Figures</u>	<u>Page</u>
33. Alfalfa mean total ADF concentration as affected by harvest frequency and intensity at Bozeman in 1988. . . . .	86
34. Alfalfa total ADF concentration as affected by cultivars and harvest frequency at Bozeman in 1988. . . . .	87
35. Spredor II and Maxim alfalfa mean seasonal NDF concentration as affected by harvest treatments at Bozeman in 1988. . . . .	88
36. Alfalfa mean seasonal NDF concentration as affected by harvest frequency and intensity at Bozeman in 1988. . . . .	89
37. Spredor II alfalfa mean total NDF concentration as affected by harvest treatments at Bozeman in 1988. . . . .	90
38. Spredor II and Maxim alfalfa mean seasonal protein concentration as affected by harvest treatments at Bozeman in 1988. . . . .	92
39. Spredor II and Maxim alfalfa mean total protein concentration as affected by harvest treatments at Bozeman in 1988. . . . .	94
40. Spredor II alfalfa mean seasonal IVDDM concentration as affected by harvest treatments at Bozeman in 1988. . . . .	96
41. Spredor II alfalfa mean total IVDDM concentration as affected by harvest treatments at Bozeman in 1988. . . . .	98
42. Autumn maximum and minimum air temperature at Bozeman in 1988. . . . .	117
43. Autumn maximum and minimum air temperature at Bozeman in 1989. . . . .	117

## ABSTRACT

Alfalfa is the most important cultivated forage in the world. Livestock utilizing alfalfa for hay or pasture are provided with an exceptional balance of vitamins, proteins, and minerals. Alfalfa has been evaluated for use as a pasture crop, however, little is known about its response to Short Duration Grazing (SDG). Short duration grazing is a grazing system where existing rangeland or pasture are subdivided into many smaller paddocks. Livestock are allowed to graze a paddock for a short time period and then rotated to the next paddock. As a result, forage is utilized more efficiently than with other systems. The objective of this study was to evaluate various simulated SDG treatments on alfalfa yield, stand persistence, plant vigor, root carbohydrate response, and forage quality.

In 1986, a 2 x 3 x 3 factorial study was initiated at Bozeman and Kalispell, Montana to evaluate two cultivars ('Spredor II' and 'Maxim'), three harvest frequencies (8, 16, and 32 day harvest intervals), and three harvest intensities (33%, 50% and 67% top growth removal). Three control treatments (prebud, prebloom and 10% bloom) and a graduated treatment (GRAD) were also included.

Forage yields were highest for treatments with less severe harvest pressure. Treatments cut frequently generally were less vigorous than other treatments. Carbohydrate levels in mid-August were lowest for treatments cut frequently during the season. Later in the fall, differences in carbohydrate levels among treatments were negligible. Even though some treatments were harvested more than 24 times in two years, very little stand loss occurred during the study. Treatments had little effect on root diameters. Forage quality was high for treatments cut frequently. As rest between harvests increased, forage quality declined.

Short duration grazing shows promise for use on alfalfa in Montana. More research is needed, particularly grazing trials with livestock, and an evaluation of alfalfa in mixes with forage grasses for use with SDG.

## CHAPTER 1

## INTRODUCTION

Alfalfa (Medicago sativa L.) is the most important cultivated forage crop in the world. It provides livestock with an excellent balance of vitamins, protein and minerals.

Although, alfalfa has been extensively evaluated for use as hay and as a pasture crop, most grazing research on the species has centered around its use with continuous and rotational grazing. The effects of other grazing management methods on alfalfa have yet to be evaluated. Short Duration Grazing (SDG) has been evaluated with many grass species, but alfalfa response to SDG has not been reported.

The objective of this study was to evaluate the effect of various simulated SDG treatments on alfalfa yield, stand persistence, vigor, root carbohydrate response and forage quality.

## CHAPTER 2

## LITERATURE REVIEW

History

Alfalfa is grown on 35 million ha worldwide - a third of which (11 mil ha) is in the United States (Hill, 1987; Ivanov 1980). Alfalfa is grown in all 50 states, a distinction shared by few other crops. Livestock utilizing alfalfa as hay or pasture are provided with an exceptional balance of protein, vitamins, and minerals. For these reasons, alfalfa is often referred to as "the queen of the forage crops" (Michaud et al., 1988; Sinskaya, 1961; Smoliak, 1985).

It is believed that alfalfa had its origins in Iran as well as Asia minor, Transcaucasia, and the highlands of Turkmenistan (Bolton et al., 1972; Hill, 1987; Ivanov, 1980; Michaud et al., 1988). Sinskaya (1961) indicated that a second center of origin for alfalfa was central Asia. She stated: "the very behavior of central Asiatic alfalfas under conditions of the European part of the Union (USSR), where they are extraordinarily subject to 'degeneration' and to fungal diseases, suggests that they are of a different phylogenetic origin than the alfalfas of the anterior Asian and European climates".

The earliest known reference to alfalfa is from Turkey about 1300 BC (Bolton et al., 1972; Hill, 1987; Ivanov,

1980; Michaud et al., 1988). Apparently alfalfa was spread rapidly from its origins by advancing armies and explorers. Greek armies brought alfalfa back from battles in the Middle East in 479 BC and soon its value as horse fodder was reported (Hill, 1987). Writings by Aristophanes (440-380 BC), Aristotle (384-322 BC) and others either mentioned or discussed alfalfa at length (Bolton, 1962; Bolton et al., 1972; Ivanov, 1980; Michaud et al., 1988). The Romans obtained alfalfa from the Greeks and spread it throughout the Mediterranean region (Hill, 1987). The Romans apparently garnered a substantial amount of knowledge on alfalfa. Varro, Strabo, Pliny the Elder, and others wrote about alfalfa cultivation including seeding rates, harvesting, and crop usage (Bolton, 1962; Bolton et al., 1972; Hill, 1987; Ivanov, 1980).

Alfalfa was introduced into North America when the Spaniards invaded Mexico and Peru (Barnes and Sheaffer, 1985; Bolton, 1962; Bolton et al., 1972; Hill, 1987; Ivanov, 1980; Michaud et al., 1988; Sinskaya, 1961). From there alfalfa spread rapidly into Texas, Arizona, New Mexico, and finally California during the gold rush (Barnes and Sheaffer, 1985; Bolton, 1962; Bolton et al., 1972; Hill, 1987; Ivanov, 1980). Although still a major source of germplasm for the western states, this introduction lacked sufficient winterhardiness for harsh northern winters. A German immigrant, Wendelin Grimm, brought a packet of



































































































































































































































































































