

A REVIEW OF ALFALFA VARIETY PERFORMANCE AT THE DREC'S MANNING RANCH

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RESEARCH SUMMARY

Selecting alfalfa (*Medicago sativa*) varieties for southwest North Dakota conditions is difficult at best since moisture and the short growing season are often most limiting on yields. Dry matter yields from 23 different alfalfa varieties grown at the Dickinson Research Extension Center - Manning Ranch were compared under dryland conditions. No significant differences in dry matter yield were detected at the 5% level of significance. Total yield over the four seasons that alfalfa was harvested from the 1995 seeding was 10 tons per acre for Blazer XL and Ranger and decreased to 7.81 tons per acre for Ladak 65. Combined two year, 1997 and 1998, mean dry matter yields of alfalfa with the fall dormancy rating of 1 was 3.91 tons per acre; for alfalfa with a fall dormancy rating of 2, combined two year mean yield was 4.82 tons per acre; for alfalfa varieties with a fall dormancy rating of 3 the combined two year mean yield was 4.61 tons per acre; and for alfalfa varieties with a fall dormancy rating of 4, the combined two year mean yield was 4.13 tons per acre. Producers selecting alfalfa varieties for production need to consider selecting alfalfa varieties based on total yield over the life of the stand, dormancy rating, ability to recover after first cutting or when favorable moisture conditions return to produce additional cuttings, and disease resistance. The level of management provided will also have a great affect on yield and quality.

INTRODUCTION

In 1997, North Dakota producers in counties south and west of the Missouri River produced alfalfa hay on 769,000 acres with an average yield of 1.23 tons per acre (North Dakota Agricultural Statistics, 1998). Producers know that

establishment costs provide the greatest share of expense in growing hay. In southwest North Dakota, the projected direct and indirect cost for establishment using a oat hay cover crop was \$103 per acre (Swenson and Haugen, 1997). Many producers grow Ladak 65 or Vernal because they want winter hardiness and seed costs are about \$20.00 per acre less than proprietary varieties. Little information is available on performance of these new varieties under a limited water environment such as that which is found in southwestern North Dakota.

MATERIALS AND METHODS

Representatives from Cenex, Northrup King, Agri-Pro, Interstate, Pioneer, and Cargill provided varieties that they thought to be adapted to western North Dakota in 1995 ([Table 1](#)) (Certified Alfalfa Seed Council, 1996). In addition to commercial varieties seeded in 1995, three public varieties were included. In 1996, DeKalb, Keltgen Seed, and Northrup King provided seed of additional varieties ([Table 1](#)). Varieties were seeded in a randomized complete block design to evaluate potential difference in dry matter yield. Vernal, a public variety which is commonly grown, was used as a check variety in both plantings.

Plots were seeded into standing oat stubble that had been hayed the preceding year. Glyphosate (Roundup) was applied as a "burn down" herbicide to control early season weed growth prior to direct seeding with a John Deere 750 no-till drill. Forty pounds of 18-46-0 was placed with the seed.

One cutting of the 1995 seeding was made each year in 1995 and 1996. The 1996 seeding was bulk harvested in 1996 and only an average yield for the entire planting is reported. In 1997 two cuttings were made and in 1998 three cuttings were made of both the 1995 and 1996 establishments. A flail forage plot harvester was used to cut samples from a measured area in each plot. Samples were then oven dried to determine the percent dry matter, dry matter weight, and yield.

Growing season precipitation was measured at the Manning Ranch headquarters. Stored soil water was estimated on April 14, 1998 using the Paul Brown probe method. The first cutting for 1998 was made when alfalfa plants were in 20% bloom, wilting, dropping leaves and going into dormancy due to the lack of stored soil water and precipitation. Shortly after harvest of the first cutting made on June 4 rain stimulated regrowth. A total of 8.09 inches of rain fell between first cutting and second cutting. Between the second cutting and the third cutting 4.6 inches fell.

The third cutting was harvested when plants were 20 to 40% in bloom and wilting due to lack of moisture.

RESULTS AND DISCUSSION

The 1995 entries produced a total mean yield of 3.00, 1.76, 1.90, and 2.41 tons per acre in 1995, 1996, 1997, and 1998 respectively. Over the four year production span of this trial the average yield was 2.27 tons per acre per year. The 1996 entries produced a total mean yield of 1.00 (not shown in table), 2.11, and 1.87 tons per acre in 1996, 1997, and 1998 respectively. Over the three year production span of this trial average yield was 1.66 tons per acre.

No significant differences between varieties were detected at the 5% level for all cuttings made ([Table 2](#)). Yield of first cutting alfalfa was affected by below normal precipitation in April and May in 1997 and again in 1998.

The year to year variation in yields can primarily be attributed to water available to the crop. In 1995 the field received 17.69 inches of precipitation. The following years growing season precipitation was 7.71, 13.54, and 14.60 for 1996, 1997, and 1998. Stored soil moisture was estimated to average 3 inches at the beginning of the 1998 growing season.

A combined analysis of the 1997 and 1998 harvest of both the 1995 and 1996 establishments showed that those varieties which have a fall dormancy rating of 1 produced dry matter yields of 3.91 tons per acre over this two year period ([Figure 1](#)). Those varieties with a dormancy rating of 2 produced a mean dry matter yield of 4.82 tons per acre. Varieties with a dormancy rating of 3 produced a mean dry matter yield of 4.61 tons per acre and those varieties with a fall dormancy rating of 4 produced a dry matter yield of 4.13 tons per acre. The mean dry matter yields for the 1997-98 first cutting totals were 1.08, 0.92, 1.25, and 1.07 tons per acre for alfalfa varieties with dormancy ratings of 1, 2, 3, and 4 respectively ([Figure 2](#)). The mean dry matter yields for the 1997-98 second cutting was 2.43, 2.66, 2.69, and 2.50 tons per acre for alfalfa varieties with dormancy ratings of 1, 2, 3, and 4 respectively ([Figure 3](#)).

Producers strive for low cost, high yielding, high quality alfalfa. Annual yields are important but it is the yield over the total years of the life of the stand that determines the actual profitability of the crop. Total yield of the 1995 seeding for the four years that this stand has produced ranges from 10 tons per acre for Blazer XL and Ranger to 7.8 tons

per acre for Ladak 65. If hay produced is worth \$65 per ton then the additional \$143 per acre could pay for the additional expense of improved proprietary seed with high yield potential under dryland conditions of southwest North Dakota and superior pests resistance.

The cost of stand establishment amounts to 27% of the total expense for an alfalfa field with a life expectancy of five years. Fields with less than four to six plants per square foot may result in low yielding poor quality hay. Weeds can easily invade thin stands creating problems for the current crop and future crops.

Dry, cold winters in southwest North Dakota can injure alfalfa varieties that have poor winter hardiness. Alfalfa varieties with poor winter hardiness will need to be replaced often thus driving up production expenses. Fall dormancy is a major component of winter hardiness. Dormancy refers to a variety's tendency to cease growth in the fall as days shorten and temperatures cool. Varieties such as Ladak grow less in the fall than varieties such as Ranger because Ladak goes dormant sooner than Ranger. Plants that are winter dormant are much less susceptible to cold temperatures and winter kill. Less-dormant varieties that begin growth early in the spring may be hit by early spring frosts that can damage the yield and quality of the first cutting. In some years alfalfa stands may be damaged when dormancy is broken by unseasonably warm weather followed by freezing conditions. Ladak 65 and Spreador III, both with a dormancy rating of 1 and Pioneer 5364 and 5454, both with a dormancy rating of 4, had a combined two year yield of 1.05 to 1.11 tons per acre. Sterling, Vernal and MG 2000, all with a dormancy rating of 2 had two year first cutting yields of 1.39 to 1.45 tons per acre. Blazer XL, Ranger, and DK120, all with the dormancy rating of 3, produced first cutting two year yields of 1.47 to 1.75 tons per acre.

In 1997 and again in 1998 plant regrowth did not occur until after a substantial rainfall of 0.5 inches or more occurred. Rapid regrowth when conditions are favorable is important. Varieties which produced 2.5 tons or more of second cutting hay over the two year period in this demonstration were Spreador III, Vernal, 5262, Sterling, MG2000, Blazer XL, Ranger and 5364.

Disease has not been a consideration in North Dakota for selection of alfalfa varieties nor have they been a problem at the Manning location. However with recent confirmation of fusarium wilt in alfalfa in North Dakota, producers should consider varieties with resistance or high resistance to this disease. Ladak 65 and Vernal are susceptible to moderately resistant to this disease. Blazer XL, Sterling, Cenex 740, and Cenex MG 2000 are a few of the varieties

grown in this demonstration that are known to have resistance to high resistance to fusarium wilt. Alfalfa variety ratings for disease and pest resistance are listed in [Table 1](#).

SUMMARY

Alfalfa varieties should be selected with sufficient dormancy to assure winter survival and prevent premature spring growth. However, varieties should not be so dormant that valuable growing days are lost in spring and fall. Total yield over a period of time should be considered. Rapid recovery and regrowth when favorable conditions exist is important in areas such as southwest North Dakota where water is limiting. Other factors such as disease and cultural mismanagement should also be considered when selecting alfalfa varieties.

LITERATURE CITED

Certified Alfalfa Seed Council. 1996. Fall dormancy and pest resistance ratings for alfalfa varieties 1996/97 edition. Certified Alfalfa Seed Council, Davis CA.

North Dakota Agriculture Statistics Services. 1998. North Dakota agriculture statistics 1998. Ag Statistics No, 67. NDSU, Fargo, ND.

Swenson, A. and R. Haugen. 1997. Oat hay crop and alfalfa seeding. p 24 *In* Projected 1998 crop budgets, south west North Dakota. Section VI, Region 4. NDSU Extension Service, Fargo, ND.

Table 1. Fall dormancy and pest resistance ratings for selected alfalfa varieties grown at the Dickinson Research Extension Center - Manning Ranch, North Dakota.												
Variety	Company	FD	Bw	Vw	Fw	An	PRR	SAA	PA	SN	APH	NRKN
120	DeKalb	3	HR	-	R	LR	R		R			

5262	Pioneer Hi-Bred	2	HR	LR	MR		R	R	R	MR		
5364	Pioneer Hi-Bred	4	R	MR	R	MR	MR	HR	HR	R		
5454	Pioneer Hi-Bred	4	R	MR	HR	HR	HR	R	R	MR	LR	
Allegiance	Keltgen Seed/Lynks Seed	3	R	R	R	HR	R	R	R	R		
Avalanche +z	America's Alfalfa	2	HR	HR	HR	HR	HR		R	MR	R	
Blazer XL	Cenex/Land O'Lakes	3	R	R	HR	HR	HR	HR	R	R	R	
Cenex 740	Cenex/Land O' Lakes	3	R	R	R	R						
Cenex MG 200	Cenex/Land O' Lakes	2	1	LR	2	3						
Crown II	Cargill	3	HR	R	HR	HR						
Cut/Graze	Agri-Pro	3	R	LR	HR	MR	R		R	MR	R	
Defiant	AgriPro	2	HR	HR	HR	R	HR		R	MR	R	

DK 127	DeKalb	3	HR	R	R	HR	HR	HR	HR	R	HR	R
Ladak 65	Public	1	MR	S	S	S	-					
LegenDairy	Cenex/Land O'Lakes	2.5	HR	HR	HR	HR	HR					
NK 919 Rangeland	Northrup King	BLEND										
NK 919-10	Northrup King	BLEND										
Proof	Keltgen Seed	3	HR	R	HR	HR	HR	R	R		R	
Rainier	Northrup King	3	HR	R	HR	HR	HR	HR	HR	R	HR	R
Ranger	Public	3										
Spreador III	Northrup King	1	HR	MR	HR	R	MR	S	MR	MR	S	
Sterling	Cargill	2	HR	R	HR	HR	HR	R	R		R	
Vernal	Public	2	R		MR							MR

FD = Fall Dormancy	An = Anthracnose Race 1	SN = Stem Nematode
Bw = Bacterial Wilt	PRR = Phytophthora Root Rot	APH = Aphanomyces Root Rot Rate 1
Vw = Verticillium Wilt	SAA = Spotted Alfalfa Aphid	NRKN = Northern Root Knot Nematode
Fw = Fusarium Wilt	PA = Pea Aphid	

Fall dormancy ratings			
Check Variety	Rating	Check Variety	Rating
Norsman	1	Saranac	4
Vernal	2	Dupuits	5
Ranger	3		

Pest resistance ratings	
% Resistance plants	Resistance class
0-5	Susceptible (S)

6-14	Low Resistance (LR)
15-30	Moderate Resistance (MR)
31-50	Resistance (R)
> 50	High Resistance (HR)

Table 2. 1995-1998 dry matter yields of alfalfa varieties at the Dickinson Research Extension Center - Manning Ranch, Manning, North Dakota.

Entry	1995	1996	1997			1998				Total Tons To Date
			8/28 ¹	6/20 ¹	6/10 ¹	7/25 ¹	Total	6/4 ¹	7/17 ¹	
Blazer XL	3.35	1.78	0.71	1.41	2.12	0.96	1.20	0.62	2.78	10.03
Ranger	3.08	1.82	0.58	1.61	2.19	1.17	1.16	0.60	2.93	10.02
Vernal	3.35	1.83	0.42	1.41	1.83	0.99	1.21	0.73	2.93	9.94
5262	3.08	2.09	0.33	1.61	1.94	0.67	1.23	0.56	2.46	9.57
5364	3.40	1.80	0.50	1.50	2.00	0.53	1.19	0.62	2.34	9.54
740	3.60	1.72	0.45	1.44	1.89	0.64	0.97	0.68	2.29	9.50
Spreador III	3.81	1.59	0.32	1.63	1.95	0.78	1.05	0.31	2.14	9.49
Sterling	3.02	1.76	0.52	1.74	2.26	0.93	1.01	0.39	2.33	9.37
MG 2000	3.04	1.56	0.38	1.47	1.85	1.01	1.09	0.47	2.57	9.02
NK919 Rangeland	2.49	1.64	0.57	1.50	2.07	0.91	1.14	0.61	2.66	8.86
Defiant	2.71	1.69	0.49	1.58	2.07	0.63	0.89	0.69	2.21	8.68

NK919-10	2.49	1.71	0.37	1.45	1.82	0.78	1.19	0.67	2.64	8.66
Crown II	3.07	1.75	0.35	1.28	1.63	0.71	0.95	0.54	2.20	8.65
Cut/Graze	2.68	1.95	0.29	1.40	1.69	0.64	1.03	0.47	2.14	8.46
LegenDairy	2.71	1.85	0.30	1.34	1.64	0.62	1.08	0.49	2.19	8.39
Avalanche +Z	2.76	1.63	0.40	1.37	1.77	0.55	0.87	0.57	1.99	8.15
Ladak	2.41	1.68	0.29	1.27	1.56	0.76	0.91	0.49	2.16	7.81
Mean	3.00	1.76	0.43	1.47	1.90	0.78	1.07	0.56	2.41	9.07
LSD _{.05}	---	NS	NS	NS	NS	NS	NS	NS	NS	
CV%	---	13.0	38.5	12.6	15.3	58.3	16.2	31.5	24.1	
1996 Planting										
120			0.94	1.49	2.43	0.53	0.90	0.55	1.98	4.41
Vernal			0.87	1.38	2.25	0.57	0.90	0.51	1.98	4.23
Proof			0.81	1.31	2.12	0.43	0.82	0.64	1.89	4.01
Rainier			0.84	1.28	2.12	0.41	1.05	0.42	1.88	4.00
5454			0.83	1.25	2.08	0.28	1.06	0.50	1.84	3.92
Allegiance			0.71	1.23	1.94	0.46	0.94	0.48	1.88	3.82
DK 127			0.65	1.16	1.81	0.40	0.67	0.58	1.65	3.46
Mean			0.81	1.30	2.11	0.44	0.91	0.59	1.87	3.98
LSD _{.05}			NS	NS	NS	0.16	NS	NS	NS	
CV%			14.0	9.3	11.7	20.3	17.0	38.5	16.3	
¹ Harvest date.										

Figure 1. Total yield of alfalfa grown at the Dickinson Research Extension Center - Manning Ranch, Manning, ND for the years 1997 through 1998.

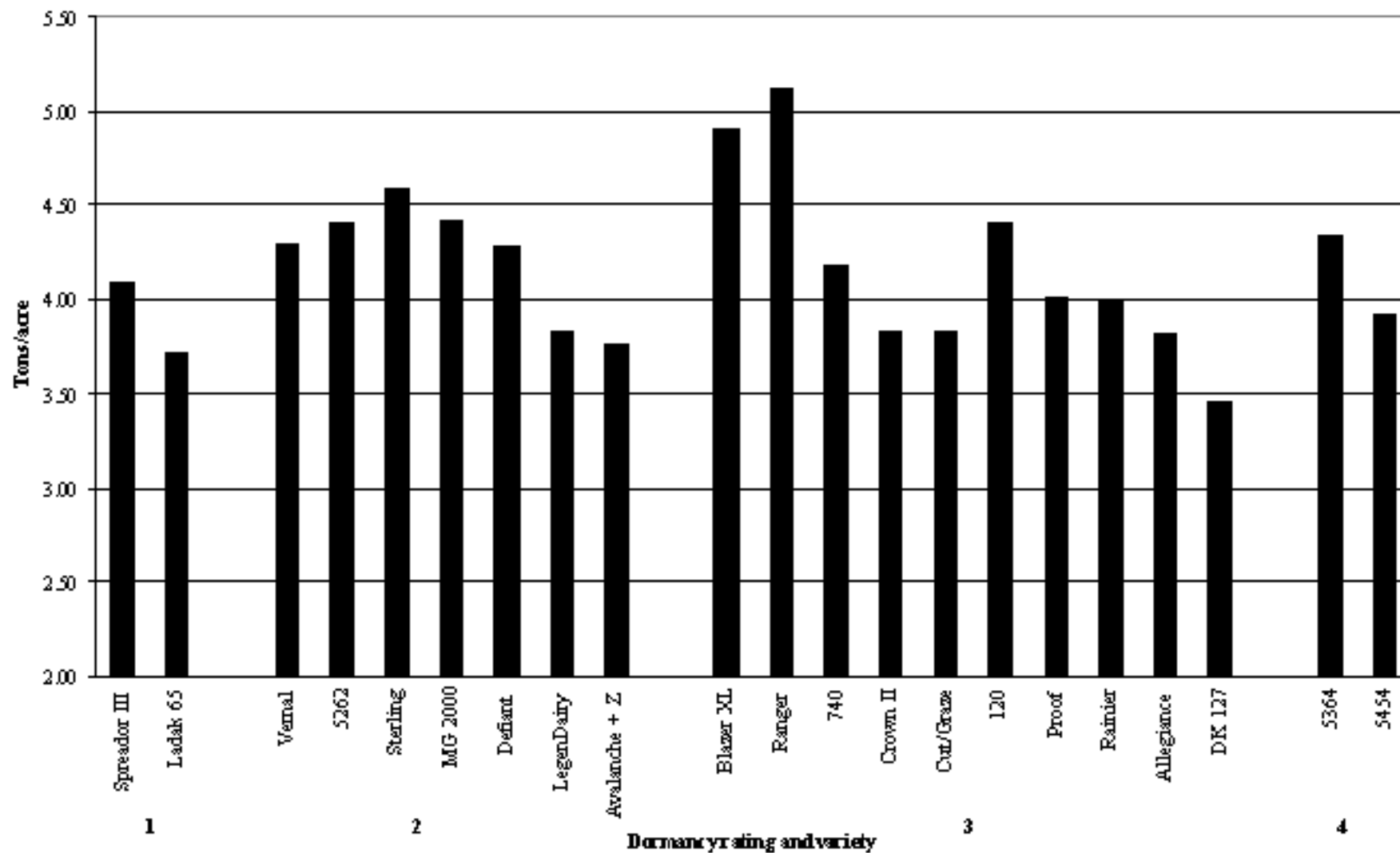


Figure 2. Total first cutting of alfalfa grown at the Dickinson Research Extension Center - Manning Ranch, Manning, ND for the years 1997 through 1998.

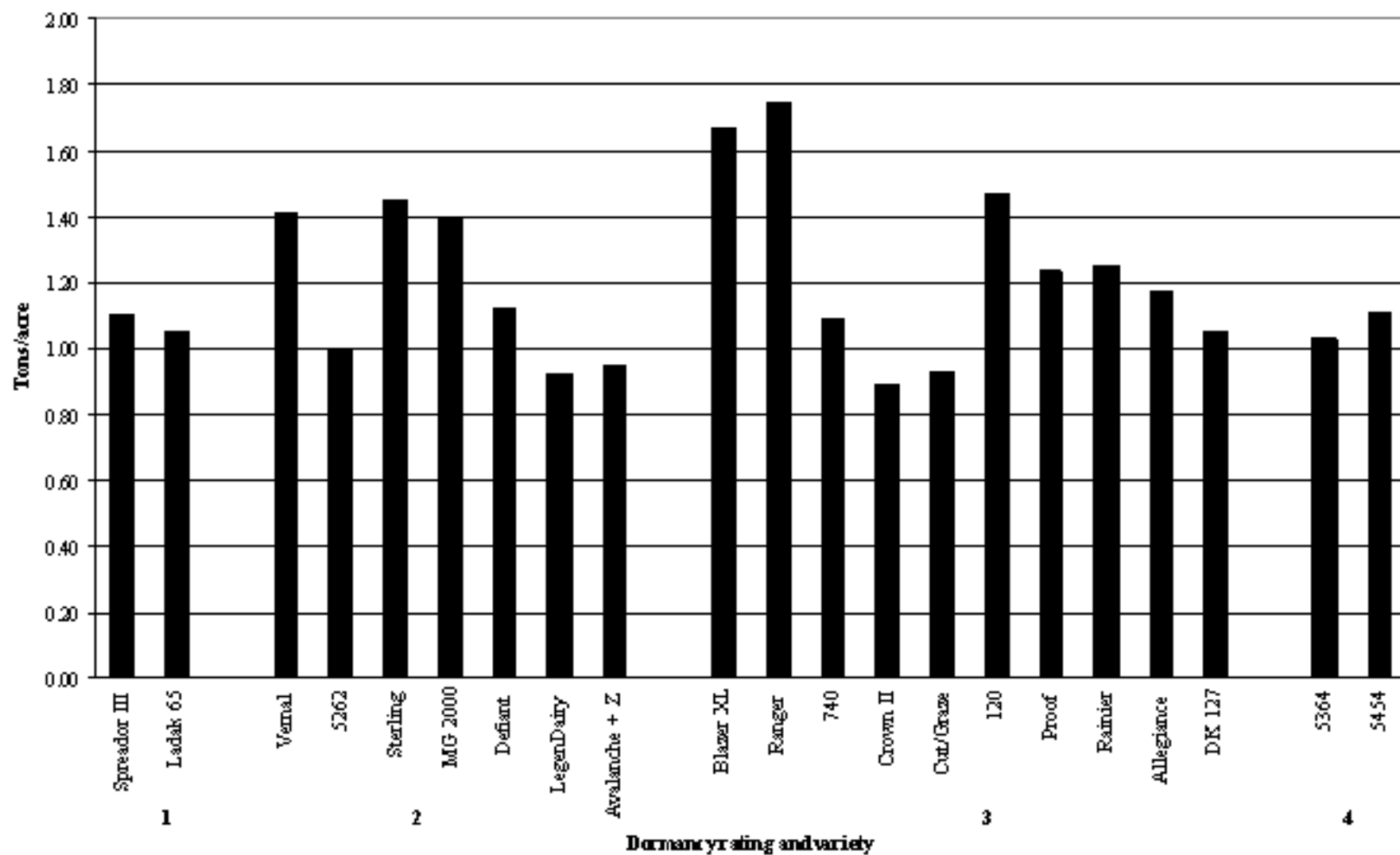
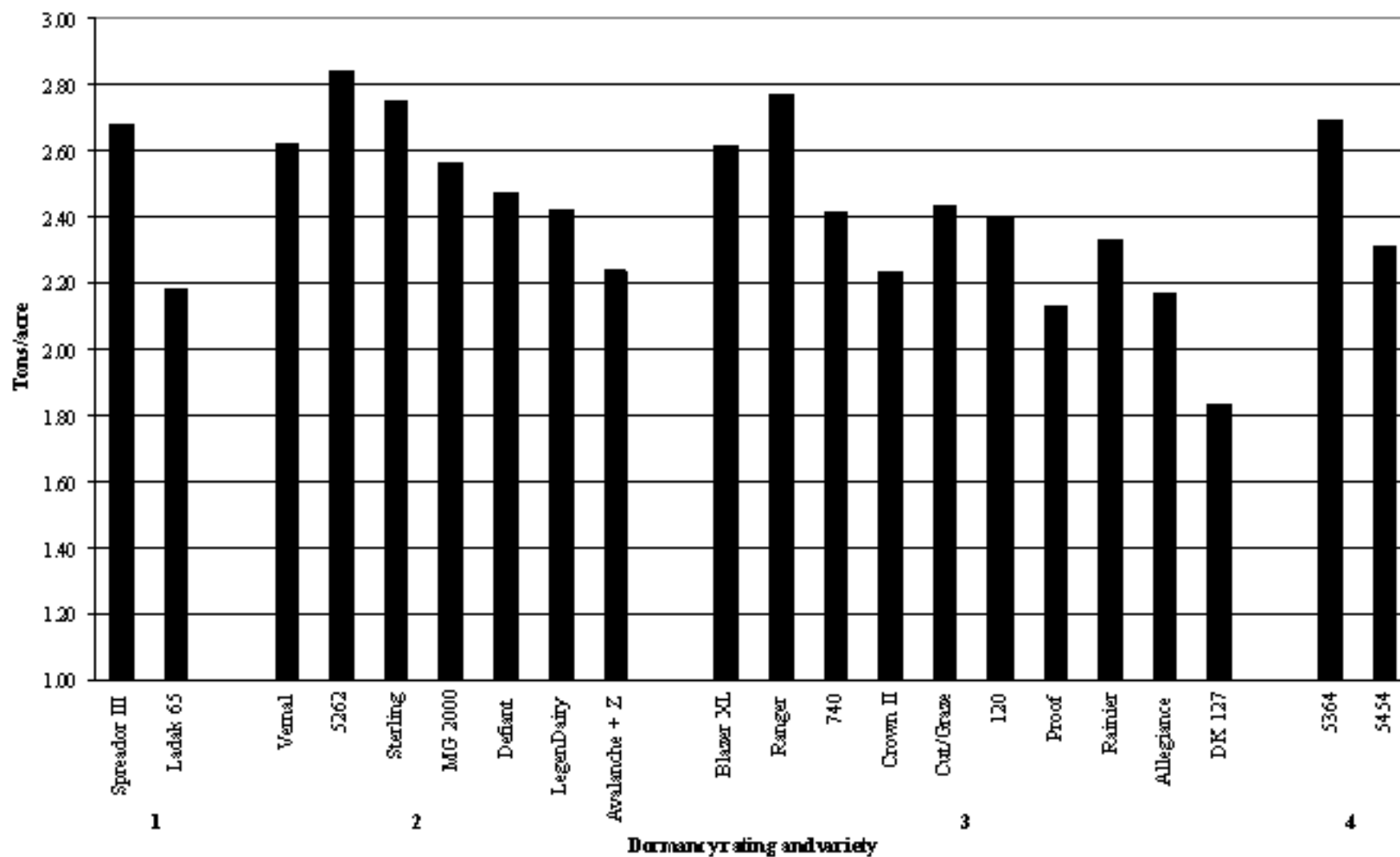


Figure 3. Total second cutting yield of alfalfa grown at the Dickinson Research Extension Center - Manning Ranch, Manning, ND for the years 1997 through 1998.



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