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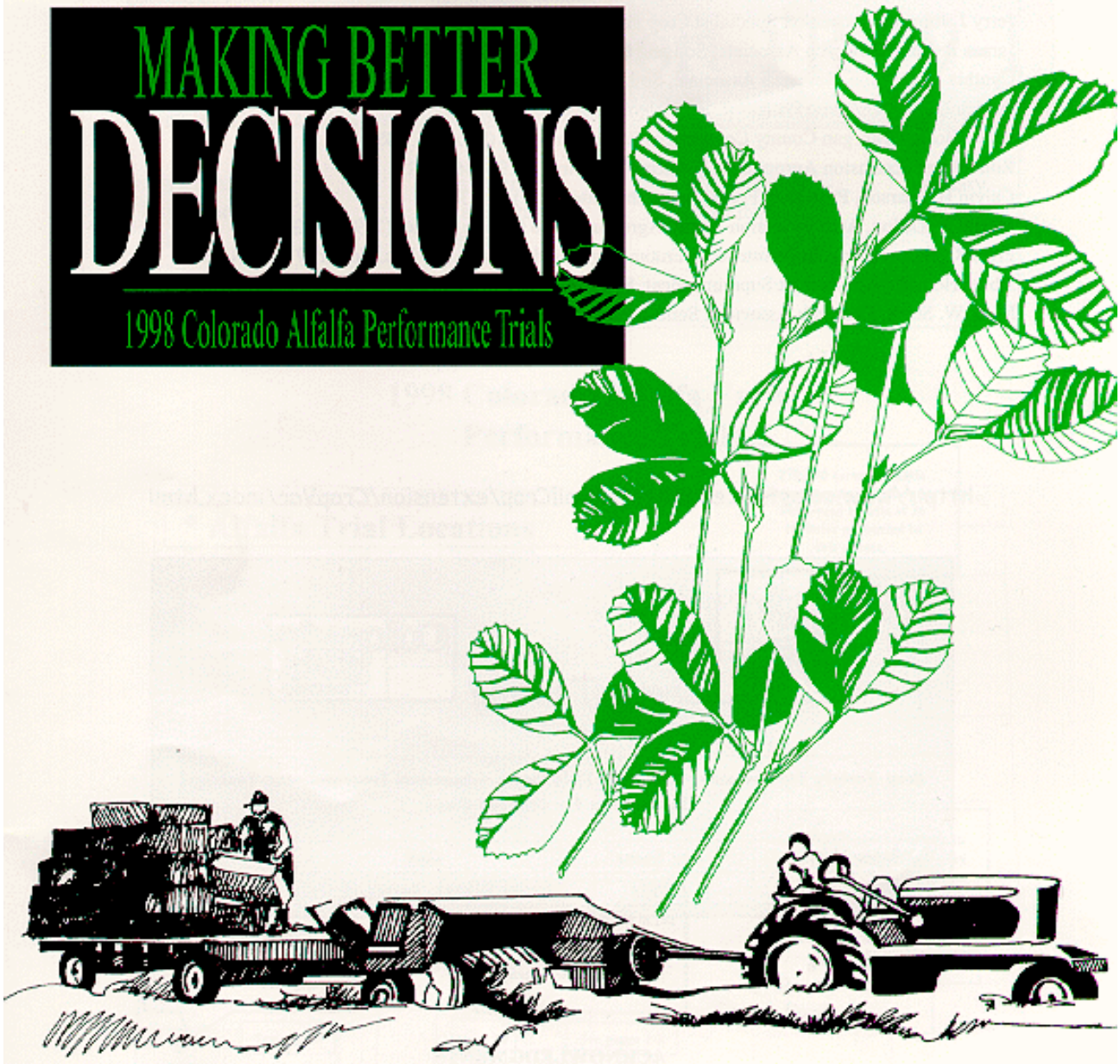
1998 Colorado Alfalfa Performance Trials



Agricultural Experiment Station

Colorado State University

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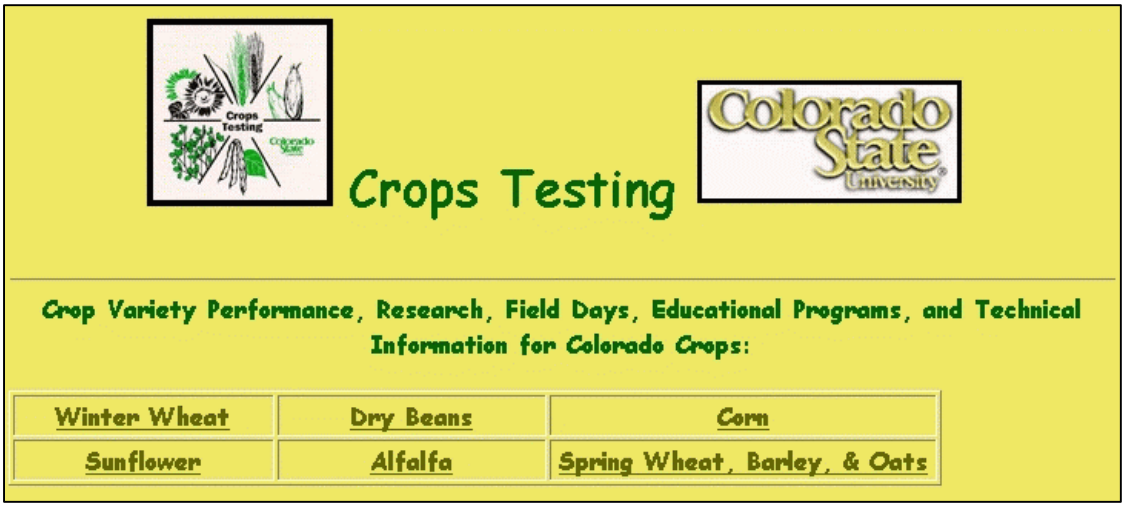

ACKNOWLEDGMENTS

The authors wish to express their gratitude to Martin Smits and the Colorado State University Research Centers who generously contributed the use of their land, equipment, and time to conduct these trials for the good of all Colorado alfalfa producers: Center - San Luis Valley Research Center; Fruita - Fruita Research Center; Rocky Ford - Arkansas Valley Research Center; Yellow Jacket - Southwestern Colorado Research Center.

Technical Report TR 99-1

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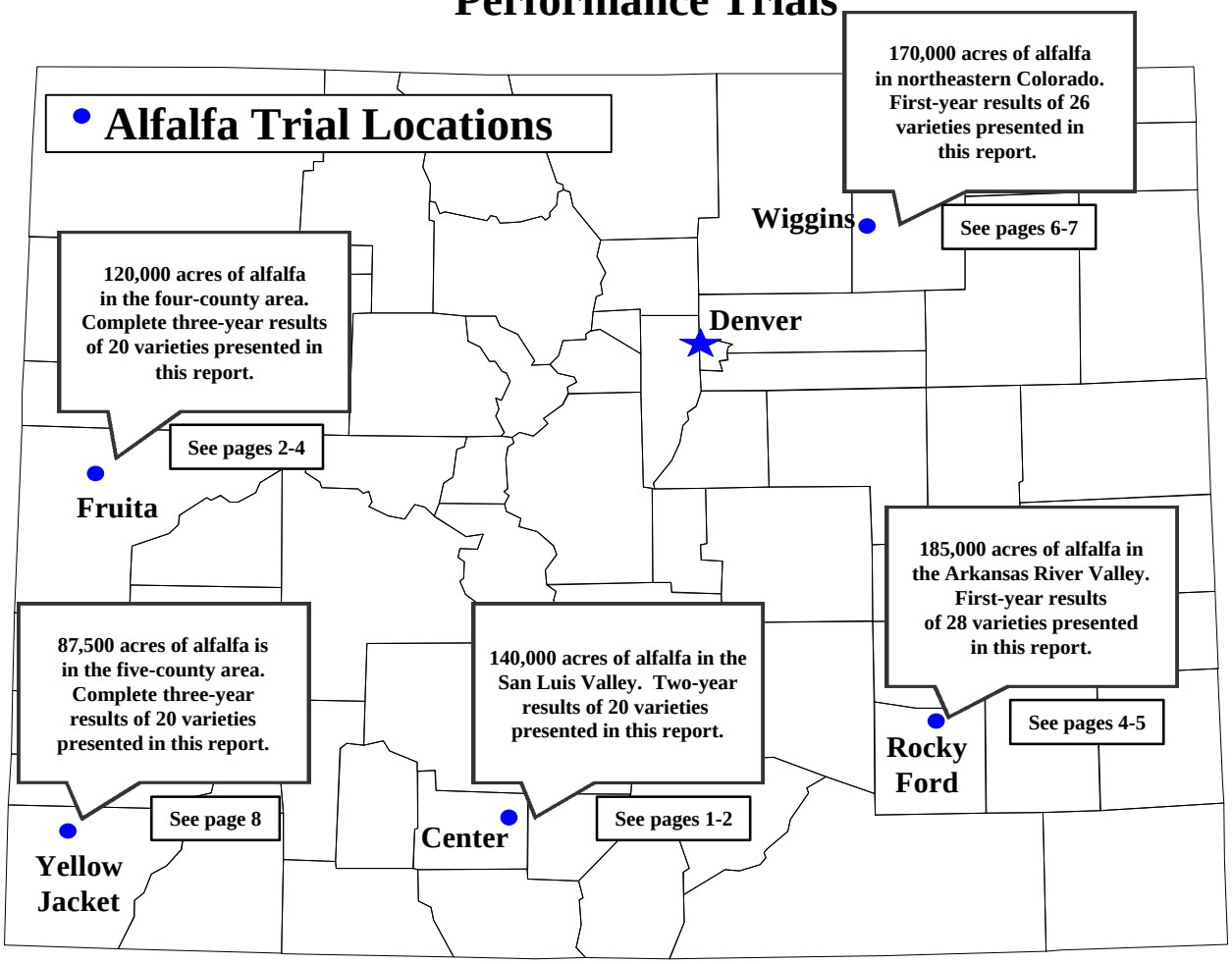
1998 Colorado Alfalfa Variety Performance Trials



1998 COLORADO ALFALFA PERFORMANCE TRIALS

Introduction

Colorado alfalfa producers annually cut 850,000 acres valued at over $280 million. To help hay producers make better alfalfa variety decisions, Colorado State University researchers evaluate alfalfa varieties at multiple locations. The objective of these trials is to provide Colorado hay producers with reliable and unbiased alfalfa variety information obtained from local trials. Participation by the seed companies in the state trials is completely voluntary. Commercial alfalfa seed companies are given the opportunity to enter one or more varieties at any location. Reference to commercial companies or varieties is made with the understanding that no discrimination is intended and no endorsement is implied by Colorado State University.

A randomized complete block design with four replications was used for each of the five alfalfa variety trials conducted in Colorado in 1998. Information on date of planting, fertilization and herbicide or insecticide applications made during the cropping year is provided at the bottom of each table of trial results. Hay yields were calculated on an air-dry basis. The least significant difference (LSD) and coefficient of variation (CV) are reported for the total annual yield.

San Luis Valley Alfalfa Variety Trial at Center

Merlin A. Dillon

Alfalfa is the most valuable crop besides potatoes in the San Luis Valley. Results from the alfalfa variety trial here are applicable to other high mountain areas of Colorado. The San Luis Valley is a large, flat intermountain valley surrounded by snow-capped mountains. The elevation of 7600 feet makes for a cool, short growing season. The average precipitation is only 7-9 inches. The average frost-free period is 88 days; from June 10 to September 6. Growers generally use a 3-cut system. Winterhardiness and persistence are important variety selection factors; as well as yield and pest resistance.

Colorado's high altitude alfalfa acreage is over 180,000 acres. San Luis Valley growers harvest about 140,000 acres annually. Alfalfa stands in the San Luis Valley usually last 5-7 years which means about 23,000 acres are seeded each year. About half of the acreage is sprinkler irrigated under center pivots and the remainder is flood irrigated. The average yield for the area is about 3.5 tons/acre; however, the typical center pivot yields approach 5 to 5.5 tons/acre.

Researcher comments on the variety trial

The 1998 season was slightly warmer than average; this usually results in better yields. The first cutting was slightly earlier than normal (June 18) and most growers baled without rain. Rain showers began in late July; however, rain damage for second cutting was much less than for the 1997 season. The third cutting of the trial was exceptionally early (Sept 4). There were no significant differences in yields this year; therefore, individual cutting yields are not presented. Cutting yield averages were 2.0, 1.7, and 1.3 tons/acre, respectively. The season total was 5.0 tons/acre. These yields are typical for the area. As usual, Ranger (old check variety) yielded among the lowest. The advantage of newer varieties is usually 0.7 tons/acre, which is more than enough to pay the higher seed cost of newer varieties.

Researcher

Merlin A. Dillon, Area Agronomy Extension Agent, has conducted alfalfa trials in the San Luis Valley for 16 years. Raised on a dryland farm in southeast Colorado (Baca County), Merlin received a B.S. in Agronomy from Panhandle State University in Goodwell, Oklahoma, and an M.S. in Agronomy from Colorado State University. Merlin worked for Kansas State University, as an irrigated farm consultant, and as an independent fertilizer applicator prior to joining the San Luis Valley Research Center in 1982. Research has included small grain variety trials (wheat, barley, and oats) as well as work on quinoa, canola, cucumbers, and sunflowers.

Forage yields of 20 alfalfa varieties at San Luis Valley Research Center in 1997-98[1]

Variety	Brand/Source	1998 Total	1997 Total	2-yr Total
			tons/acre[2]	
Class	Union Seed Co.	5.1	6.5	11.5
Extend	Grassland West	5.2	6.3	11.3
Pinnacle	Arkansas Valley Seed	5.0	6.3	11.2
ZN 9450	ABI Alfalfa	5.1	6.1	11.0
ABI 9142	ABI Alfalfa	5.1	6.1	11.0
Rainier	Northrup King	5.0	6.1	11.0
Vernal	USDA WI-AES	5.2	5.9	10.9
Innovator+Z	America's Alfalfa	5.0	6.1	10.9
Depend+EV	Agripro Seeds Inc.	5.0	5.9	10.8
AmerGraze 401+Z	America's Alfalfa	5.0	5.9	10.8
Alfaleaf II	Plains Alfalfa Assoc.	5.0	6.0	10.8
WL 325HQ	W-L Research	5.1	5.8	10.8
DK 127	DeKalb Genetics	4.8	6.1	10.7
Webfoot MPR	Great Lakes Hybrids	4.5	6.2	10.7
DK 122	DeKalb Genetics	4.6	6.0	10.4
Affinity+Z	America's Alfalfa	5.0	5.3	10.4
ZG 9543	ABI Alfalfa	5.1	5.2	10.3
WL 324	W-L Research	4.9	5.3	10.2
WL 252HQ	W-L Research	4.7	5.1	9.8
Ranger	USDA NE-AES	4.5	4.9	9.4
Average		**5.0**	5.9	10.7
CV%		8.4	6.1	6.3
$LSD_{(0.05)}$		NS	0.50	0.96

[1]Trial conducted on the San Luis Valley Research Center at Center, CO; seeded 8/2/96.
[2]Yields calculated on an air-dry basis.
Elevation 7600 feet. Average annual precipitation, 7-9 inches. Average frost-free days - 88 days (June 10 - September 6)
Fertilizer: 104 lbs P_2O_5/acre plus 22 lbs N/acre broadcast.
Soil series: Norte gravelly sandy loam.

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Fruita Alfalfa Variety Trial at Fruita

Calvin H. Pearson

Alfalfa is produced on nearly 120,000 acres in the four western Colorado counties of Mesa, Montrose, Delta, and Garfield. Alfalfa is grown on more acres in these counties than any other crop.

Alfalfa is produced under a wide range of environmental and management conditions in western Colorado. Much of the production is in low valley areas, but alfalfa is also grown at elevations of 7,000 feet and higher. It is not uncommon for alfalfa to be at elevations where fields are adjacent to the forest. In addition to elevation, there are many other conditions and situations in which alfalfa is grown in western Colorado. These include growing seasons, irrigation water availability, diseases, weeds, insect pests, erosions, slope, soil type, soil fertility-just to

name a few. There is also a wide range of grower knowledge and experience related to alfalfa production. Grower experience and knowledge range from the full-time farmer/rancher who has produced alfalfa for many years to the part-time producer who is just getting started and has virtually no knowledge or experience in agriculture. Because of this diversity, the management imposed on alfalfa also varies greatly. This diversity in growing conditions and grower experience in western Colorado creates an important need for local alfalfa production information and technical support. Personnel from the Agricultural Experiment Station and Cooperative Extension are working hard to meet the diverse needs of alfalfa producers in western Colorado.

Researcher comments on the variety trial

The 1998 growing season was largely favorable for hay producers in western Colorado. Localized storms and rain showers during 1998 made haymaking a challenge for many growers, but this situation was no different from what growers have come to expect in other years. With good management and a little good fortune many growers in western Colorado produced some very high-quality hay in 1998.

The alfalfa variety performance test at Fruita was planted in spring, 1996. The varieties were evaluated during 1996, 1997, and 1998. Performance testing for this trial ends with this report.

Yield data in 1998 were collected from four cuttings. Harvest of each cutting in this trial went smoothly and on schedule during 1998. Total yield averaged across all varieties was 8.2 tons/acre and ranged from a high of 8.8 tons/acre for WL133 to a low of 7.3 tons/acre for Ladak. The 3-yr total yield averaged across all varieties was 20.5 tons/acre and ranged from a high of 21.7 tons/acre for Shamrock to a low of 17.6 tons/acre for Ladak. Many of the varieties during the three years of testing exhibited excellent yield performance.

During 1998 alfalfa seed and breeding companies were solicited for entries to be included in a new alfalfa performance trial to be planted at Fruita. Eighteen entries were submitted (Archer, Archer II, ABI 350, Baralfa54, DK134, DK140, DK142, Garst 6420, Innovator+Z, Millennia, Reno, TMF Multiplier II, TMF 421, WL232HQ, WL325HQ, ZX9451, and Pinnacle, Ranger and Ladak were included as public checks) from the companies and new test plots were planted on August 27, 1998. Testing of these varieties will be conducted during 1999, 2000, and 2001.

Researcher

Dr. Calvin H. Pearson is Professor of Soil and Crop Sciences at Colorado State University. He has been an employee of the Colorado Agricultural Experiment Station for 15 years at the Fruita Research Center, which is located in western Colorado near Grand Junction. He grew up on a furrow-irrigated, row-crop farm in southern Idaho. Dr. Pearson received a Junior College Degree from Ricks College, B.S. degree from Brigham Young University, M.S. degree from Oklahoma State University, and a Ph.D. from Oregon State University.

His research program focuses on topics related to sustainable crop production and soil management systems on furrow-irrigated cropland in the arid west with crops of interest being corn, alfalfa, pasture grasses and legumes, wheat, barley, oats, dry beans, and new and alternate crops. Research is also conducted on cultural practices, products, and inputs that affect crop production.

Calvin has authored or coauthored numerous publications and has co-invented a forage plot harvester and a conservation tillage grain drill for furrow-irrigated conditions. He served as associate editor for *Agronomy Journal*, an international scientific journal, for several years and currently serves as a technical editor for the *Journal*.

Forage yields of 20 alfalfa varieties at Fruita Research Center in 1996-98[1]

Variety	Brand/Source	1st Cut May 27	2nd Cut July 8	3rd Cut Aug. 18	4th Cut Sep. 22	1998 Total	1997 Total	1996 Total	3-yr[2] Total
		tons/acre[3]							
Shamrock	Sharp Bros. Seed Co.	3.06	2.36	1.77	1.21	8.40	7.86	5.44	21.70
WL 323	Germain's	3.10	2.43	1.77	1.30	8.61	8.09	4.89	21.59
Stamina	Allied Seed	3.08	2.45	1.80	1.33	8.66	7.96	4.89	21.51
W 133	Germain's	3.10	2.46	1.90	1.35	8.82	7.54	4.86	21.21
Loco	Allen Reid	3.05	2.57	1.78	1.32	8.72	7.53	4.90	21.15
DK 127	DeKalb Genetics Corp.	2.88	2.35	1.92	1.24	8.40	7.54	4.87	20.81
WL325HQ	Germain's/W-L Research, Inc.	2.86	2.57	1.72	1.24	8.39	7.36	4.91	20.67
Sure	Cenex/Land 'O Lakes	2.68	2.20	1.78	1.21	7.87	7.84	4.94	20.64
Spartan	Allied Seed	2.91	2.49	1.83	1.37	8.60	7.33	4.70	20.64
ABI9352	ABI-Alfalfa	2.54	2.55	1.74	1.28	8.12	7.46	4.93	20.51
Innovator+Z	America's Alfalfa	2.60	2.22	1.95	1.24	8.02	7.58	4.88	20.49
ABI 9345A	ABI-Alfalfa	2.41	2.50	1.87	1.30	8.08	7.26	5.10	20.44
Alfaleaf II	Sharp Bros. Seed/Plains Alfalfa	2.74	2.43	1.73	1.26	8.17	7.49	4.77	20.43
Evergreen	Arkansas Valley Seed Co.	2.64	2.41	1.75	1.26	8.06	7.30	5.05	20.41
Treasure	Seekamp Seed Co.	2.68	2.22	1.81	1.20	7.91	7.47	4.79	20.17
WL 252HQ	Germain's	2.72	2.27	1.90	1.20	8.08	7.26	4.78	20.12
WL 324	Germain's/W-L Research, Inc.	2.66	2.14	1.66	1.22	7.68	7.57	4.76	20.01
Ranger	USDA NE-AES	2.80	2.28	1.71	1.23	8.03	6.89	4.82	19.74
Lahontan	USDA NV-AES	2.80	2.50	1.79	1.32	8.40	6.40	4.48	19.28
Ladak		2.58	2.05	1.56	1.07	7.26	6.41	3.98	17.65
Average		**2.80**	**2.37**	**1.79**	**1.26**	**8.21**	**7.41**	**4.84**	**20.46**
CV%						5.59	7.64	9.14	5.35
$LSD_{(0.05)}$						0.65	0.80	0.63	1.55

[1]Trial conducted on the Fruita Research Center at Fruita, CO; seeded 5/1/96.
[2]Table is arranged by decreasing, 3-yr total yield.
[3]Yields calculated on an air-dry basis.
Elevation 4510 feet. Average annual precipitation is 8.4 inches. Average frost-free days - 181.
Last spring frost - April 19, 1998; First fall frost - October 18, 1998; 1998 frost-free days - 182 days (28 °F base).
Fertilizer: 123 lbs P_2O_5/acre plus 48 lbs N/acre broadcast as 18-46-0 on April 25, 1996.
Applied Sencor at 1 lb/acre on February 3, 1998 for weed control.
Soil series: Youngston clay loam.

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Arkansas Valley Alfalfa Variety Trial at Rocky Ford

Frank C. Schweissing

Researcher comments on the variety trial

This was the first harvest season for this trial established in the fall of 1997. The trial was irrigated prior to the first cutting and after each of the four cuttings. Rainfall from April through October was 12.0 inches compared to the long term average of 9.7 inches. While not as wet as last year, substantially higher than average precipitation occurred in July and August. The average yield (5.36 tons) was not as high as we expect and may be due, in part, to severe storms including heavy snowfall within two months of establishment.

Researcher

Dr. Frank C. Schweissing, Superintendent-Entomologist, has conducted alfalfa trials at the Arkansas Valley Research Center (AVRC) for 30 years. He received his B.S. and M.S. in Entomology from Colorado State University and his Ph.D. in Entomology from Kansas State University. He began working at the AVRC in 1961 as an entomologist and became Superintendent in 1980. His major research efforts have been with the insect and mite pests of alfalfa, corn, sorghum, and onions.

Forage yields of 28 alfalfa varieties at the Arkansas Valley Research Center in 1998[1]

Variety	Brand/Source	1st Cut June 3	2nd Cut July 9	3rd Cut Aug. 18	4th Cut Oct. 9	1998 Total
				tons/acre[2]		
WS 210*	W-L Research	1.68	1.54	1.35	1.29	5.86
WL 324	Germain's	1.67	1.57	1.40	1.10	5.74
DK 143	DeKalb Genetics Corp.	1.70	1.57	1.29	1.11	5.67
Depend + EV	Agripro Seeds Inc.	1.69	1.44	1.41	1.06	5.60
3L104*	Novartis	1.58	1.54	1.32	1.13	5.57
ZC 9651*	ABI Alfalfa	1.65	1.50	1.29	1.12	5.56
Cimarron 3i	Great Plains Research	1.67	1.47	1.23	1.17	5.54
Millennia	Union Seed Co.	1.52	1.57	1.29	1.10	5.48
ZX 9352*	ABI Alfalfa	1.53	1.51	1.31	1.11	5.46
Affinity +Z	America's Alfalfas	1.70	1.46	1.31	0.97	5.44
TMF Multi-plier II	Mycogen Seeds	1.60	1.50	1.28	1.06	5.44
Innovator + Z	America's Alfalfas	1.61	1.50	1.29	1.03	5.43
5454	Pioneer Hi-Bred	1.57	1.52	1.32	1.02	5.43
Big Horn	Cargill Hybrid Seeds	1.54	1.53	1.23	1.11	5.41
631	Garst Seed Co.	1.51	1.54	1.32	1.01	5.38
Pinnacle	Arkansas Valley Seed	1.59	1.50	1.21	1.05	5.35
DK 142	DeKalb Genetics Corp.	1.57	1.52	1.18	1.07	5.34
630	Garst Seed Co.	1.42	1.55	1.29	1.08	5.34
ZC 9650*	ABI Alfalfa	1.54	1.55	1.30	0.91	5.30
Haygrazer	Great Plains Research	1.59	1.46	1.18	1.06	5.29
WL 325HQ	Germain's	1.51	1.49	1.28	0.97	5.25
DK 127	DeKalb Genetics Corp.	1.54	1.52	1.19	0.99	5.24
Archer	America's Alfalfas	1.46	1.44	1.24	1.10	5.24
Leaf Master	Union Seed Co.	1.27	1.42	1.26	1.29	5.24
Lahontan	USDA NV-AES	1.48	1.48	1.22	0.95	5.13
6L271*	Arkansas Valley Seed	1.27	1.39	1.26	1.15	5.07
Ranger	USDA NE-AES	1.35	1.37	1.10	0.89	4.71
Vernal	USDA WI-AES	1.20	1.32	1.13	0.86	4.51
Average		**1.54**	**1.49**	**1.27**	**1.06**	**5.36**
CV%						4.12
$LSD_{(0.05)}$						0.31

[1]Trial conducted on the Arkansas Valley Research Center at Rocky Ford, CO; planted 8/29/97.
[2]Yields calculated on oven-dry basis.
*Indicates experimental entry
Elevation 4178 feet. Average annual precipitation 11.77 inches. Average frost-free days-158
Last spring frost-April 30 1998; First fall frost-October 18, 1998; 1998 frost-free days-171
Fertilizer: 150 lbs P_2O_5/acre plus 31 lbs N/acre prior to planting
Soil series: Rocky Ford silty clay loam

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Northeastern Colorado Alfalfa Variety Trial at Wiggins

Jerry Johnson and Bruce Bosley

Importance of alfalfa in northeastern Colorado

Twenty counties of northeastern and east-central Colorado that might draw information from the Wiggins trial for making better variety decisions produce about half of Colorado's alfalfa hay. This twenty-county area has about 290,000 acres of irrigated alfalfa and about 160,000 acres of dryland alfalfa with annual hay production valued over $130 million.

Researcher comments on the variety trial

The trial is on the Martin Smits farm, west of Wiggins, in the NW 1/4 of Section 5, T 3N, R 60W. Established with a cover crop of winter wheat and triticale in fall 1997, excellent stands of alfalfa and cover crop were observed in the spring of 1998. The fast-growing grass cover crop dominated first cutting vegetation so no attempt was made to harvest the individual plots. Cover crop vegetation persisted in the regrowth vegetation and efforts to eliminate the grass competition led to the loss of the second cutting as well. The remaining two cuttings were promising, yielding an average total of 3.6 tons/acre. Even though we regret losing the information for two cuttings, we are pleased with the alfalfa stands in the trial and anticipate good and complete variety information in the coming years.

Researchers

Jerry Johnson has been conducting variety trials since 1977. He grew up in Othello, Washington and raised alfalfa on the family farm. He was in the Peace Corps and obtained his B.S. from U.C. Davis before returning to West Africa to work for 12 years in agronomy research and extension. He obtained his M.S. and Ph.D. (plant breeding) from Washington State University where he studied the use of on-farm testing for promoting variety adoption.

Bruce Bosley is the Morgan County Cooperative Extension Director/Agronomist. He has worked in Extension for 11 years and served as the education outreach coordinator on the Colorado Hay Days management committee from 1988 through 1991. He was an independent crop consultant for five years in the mid 80's. He obtained his M.S. at Colorado State University (crops horticulture).

Forage yields of 26 alfalfa varieties at Wiggins in 1998[1]

Variety	Brand/Source	3rd Cut Aug. 5	4th Cut Sep. 9	1998 Total
		tons/acre[2]		
Alfaleaf II	Sharp Bros. Seed Co.	2.08	1.78	3.87
Total + Z	ABI Alfalfa	2.03	1.80	3.83
Pinnacle	Arkansas Valley Seeds	1.88	1.92	3.80
Tahoe	Novartis Seeds	2.03	1.71	3.75
Legacy	Grassland West Company	2.02	1.70	3.72
Complete	Arrow Seed Co.	2.05	1.67	3.72
Pioneer brand 5396	Pioneer Hi-Bred Int'l, Inc.	2.18	1.53	3.71
Big Horn	Cargill Hybrid Seeds	2.16	1.53	3.69
Excalibur II	Allied Seed	1.95	1.73	3.69
Spartan	Allied Seed	2.08	1.60	3.67
Evergreen-2	Arkansas Valley Seeds	2.02	1.61	3.63
Shamrock	Sharp Bros. Seed Co.	2.00	1.60	3.61
Magnum III	Dairyland Seed Company	1.88	1.71	3.59
DEKALB DK127	DEKALB Genetic's Corp.	2.03	1.56	3.59
Innovator+Z	America's Alfalfa	1.91	1.67	3.58
Reno	Novartis Seeds	2.01	1.57	3.58
DEKALB DK142	DEKALB Genetic's Corp.	2.02	1.56	3.58
TMF Multi-plier II	Mycogen Seeds	2.05	1.50	3.56
Webfoot MPR	Great Lakes Hybrids	2.00	1.55	3.55
WL 325HQ	W-L Research, Inc.	1.90	1.65	3.54
Pioneer brand 5312	Pioneer Hi-Bred Int'l, Inc.	2.07	1.46	3.52
AmeriGraze 401 + Z	ABI Alfalfa	1.97	1.53	3.50
Garst Seed 631	Garst Seeds	1.89	1.57	3.45
Depend+EV	Agripro Seed, Inc.	1.82	1.54	3.36
Garst Seed 630	Garst Seeds	1.73	1.59	3.32
Alpha 2001	Great Lakes Hybrids	1.74	1.43	3.17
Average		**1.98**	**1.62**	**3.60**
CV%				9.4
$LSD_{(0.05)}$				0.5

[1]Trial conducted on the Martin Smits farm (NW 1/4 of Section 4, T 3N, R 60W), seeded 9/3/97.
[2]Yields calculated on oven-dry basis and adjusted to 14% moisture.
Elevation: 4750 ft.
Soil series: Valent loamy sand with some bijou loamy sand characteristics

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Southwestern Alfalfa Variety Trial at Yellow Jacket

Abdel Berrada

Researcher comments on the variety trial

The alfalfa variety trial was planted on May 15, 1996. The 1998 growing season featured cool temperatures early in the year that resulted in excellent first cutting hay quality. Overall the 1998 growing season was dry but rain in late July caused harvest problems for some growers.

Researcher

Dr. Abdel Berrada, a native of Morocco, has been conducting field trials for 21 years. He earned a Ph.D. degree in Agronomy in 1983 from the University of Nebraska. Dr. Berrada has had research responsibilities with the Moroccan National Agricultural Research Institute, Purdue University, Servi-Tech, and the University of Nebraska. He has been the Superintendent of Colorado State University's Southwestern Colorado Research Center since October of 1993, has led crop variety testing at the center, and has been the principal investigator on multiple research projects concerning soil, crop, and water management.

Forage yields of 20 alfalfa varieties at Southwestern Colorado Research Center in 1996-98[1]

Variety	Brand/Source	1st Cut June 12	2nd Cut July 30	3rd Cut Sep. 10	1998 Total	1997 Total	1996 Total	3-yr Total
					tons/acre[2]			
Blazer XL	Sharp Bros. Seed Co.	3.18	2.36	1.61	7.15	7.95	3.68	18.78
330	Union Seed Co.	3.37	2.51	1.66	7.54	7.78	3.33	18.65
5472	Pioneer Hi-Bred Int'l.	3.24	2.61	1.72	7.57	7.34	3.28	18.19
Rushmore	Novartis	3.46	2.40	1.58	7.44	7.48	3.17	18.09
Sterling	Cargill Hybrid Seeds	3.04	2.35	1.63	7.02	7.46	3.61	18.09
Reward	Drussel Seed & Supply	3.42	2.41	1.76	7.59	7.09	3.37	18.05
5454	Pioneer Hi-Bred Int'l.	3.28	2.49	1.72	7.49	7.26	3.24	17.99
ZX 9345	ABI Alfalfa	3.12	2.36	1.61	7.09	7.35	3.48	17.92
WL 323	W-L Research, Inc.	3.14	2.35	1.55	7.04	7.57	3.20	17.81
Evergreen	Arkansas Valley Seed	2.84	2.45	1.71	7.00	7.16	3.53	17.69
Innovator+Z	ABI Alfalfa	3.27	2.29	1.56	7.12	7.17	3.36	17.65
Affinity+Z	ABI Alfalfa	3.11	2.27	1.52	6.90	7.29	3.31	17.50
AlfaLeaf II	Cal/West Seeds	3.31	2.31	1.53	7.15	7.26	3.06	17.47
Archer	ABI Alfalfa	3.00	2.32	1.69	7.01	7.15	3.22	17.38
Vernema	Southwest Seed, Inc.	3.14	2.30	1.53	6.97	7.08	3.21	17.26
WL 325	W-L Research, Inc.	3.22	2.25	1.61	7.08	6.86	3.03	16.97
DK 127	DeKalb Genetics Corp.	3.26	2.33	1.46	7.05	6.89	2.95	16.89
Depend+EV	ABI Alfalfa	3.16	2.14	1.49	6.79	6.99	3.11	16.89
WL 252HQ	W-L Research, Inc.	3.05	2.23	1.56	6.84	6.90	3.08	16.82
Ranger	Arkansas Valley Seed	3.27	2.04	1.46	6.77	6.71	2.93	16.41
Average		3.19	2.34	1.60	7.13	7.24	3.26	17.62
CV%					5.56	6.20	7.00	5.41
$LSD_{(0.05)}$					0.32	0.63	0.44	1.35

[1]Trial conducted on the Southwestern Colorado Research Center at Yellow Jacket CO; seeded 5/15/96.
[2]Yields were calculated on an oven-dry basis.
[3]NS, not significant.
Elevation 6950 feet. Average annual precipitation 15.9 inches. Average frost-free days - 120 days.
Fertilizer: 65 lbs P_2O_5/acre plus 67 lbs K_2O/acre broadcast as 0-45-0 and 0-0-60 on May 2, 1996.
50 lbs P_2O_5/acre broadcast as 0-45-0 on November 2, 1997.
Soil series: Wetherill silty clay loam.

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Does Alfalfa Benefit from Boron?

Jessica Davis, Abdel Berrada, and Ron Meyer

Alfalfa requires high amounts of boron (B) for optimum yield production. Often B is present in the soil or the irrigation water at concentrations which meet the crop needs. The purpose of this study is to evaluate the impact of additional B fertilizer on alfalfa yields.

We selected two locations where we thought a B response was likely. Both locations have sandy, low organic matter soils with low soil B levels (< 0.1 ppm), and young stands (1-2 years since establishment). The two locations are near Yellow Jacket in the southwest part of CO and near Wray in the northeast part. We applied five B application rates (0, 0.5, 1.0, 2.0, and 4.0 lb B/acre) as Solubor before the first irrigation. The 4 lb/acre rate was split to avoid burning, and the second half was applied after the first irrigation. Treatments were replicated in a randomized complete block design. The Yellow Jacket study started in 1997, Wray started in 1998, and we plan to continue this study through 1999.

There was no significant difference ($p<0.05$) in yield for any individual cutting or total harvest for any of the three site-years (Tables 1, 2, 3). Therefore, the B fertilizer applied did not increase alfalfa yields even in these locations where soil B levels are low.

Table 1. Yield results (tons/acre) from Yellow Jacket trial in 1997.

B Rate (lb/acre)	First Cutting	Second Cutting	Third Cutting	Total
0	3.00	2.31	1.44	6.75
0.5	2.73	2.37	1.44	6.54
1.0	2.85	2.33	1.40	6.58
2.0	2.74	2.37	1.44	6.55
4.0	2.92	2.32	1.49	6.73

Table 2. Yield results (tons/acre) from Yellow Jacket trial in 1998.

B Rate (lb/acre)	First Cutting	Second Cutting	Third Cutting	Total
0	2.50	1.95	1.28	5.73
0.5	2.58	1.94	1.31	5.83
1.0	2.54	1.94	1.25	5.73
2.0	2.53	1.94	1.30	5.77
4.0	2.55	1.93	1.34	5.82

Table 3. Yield results (tons/acre) from Wray trial in 1998.

B Rate (lb/acre)	First Cutting	Second Cutting	Third Cutting	Fourth Cutting	Total
0	1.74	1.59	1.30	1.63	6.26
0.5	1.91	1.52	1.32	1.62	6.37
1.0	1.85	1.54	1.26	1.45	6.10
2.0	1.77	1.50	1.24	1.60	6.11
4.0	1.84	1.60	1.19	1.58	6.21

Why didn't we see a yield response in these experiments? Irrigation water can carry considerable amounts of B during a growing season. A study of 92 wells in the South Platte Basin showed that the average B concentration was 0.52 ppm, with a range from 0.03 to 2.30 ppm. If we assume that alfalfa's consumptive use is 30-36 inches of water per year, the average irrigation water (0.52 ppm) would provide between 3.5-4.2 lb B/year, thus meeting the B requirement for alfalfa. Boron concentration in irrigation water as low as 0.3 ppm would still supply at least 2 lbs B/year.

Therefore, consider B fertilizer application if you have sandy, low organic matter soils with low

soil B levels (< 0.1 ppm), young stands (1-2 years since establishment), and irrigation water B levels < 0.3 ppm. If all of these are true, B fertilization might pay off. If you don't have these conditions, B fertilization probably will not increase alfalfa yield.

Using Fall Dormancy and Winterhardiness Ratings to Select Alfalfa Varieties

Merlin A. Dillon

Fall dormancy ratings used to be the best available indicator for winterhardiness. Plants with low dormancy ratings went dormant early and tended to survive winters better than plants that went dormant later. However, alfalfa breeders in the 1980's intentionally selected plants with atypical relationships between dormancy and winterhardiness. They were looking for varieties that continued fall growth but still survived harsh winters. Varieties are now available with these characteristics. High altitude alfalfa growers should select varieties with good winterhardiness and low fall dormancy. For obtaining three cuttings per year under high altitude conditions, varieties should have fall dormancy ratings of two or greater. Other varietal characteristics like disease and insect resistance are also important in variety selection.

Pasture Grass and Forage Legume Performance in Western Colorado

Calvin H. Pearson

Three pasture grass and forage legume performance trials have been established in western Colorado. They are located at Fruita and the Fruita Research Center, at Meeker at the Plant Materials Center, and at Hotchkiss at the Rogers Mesa Research Center. Sixteen pasture grass species have been evaluated for four years at Fruita. Fifty grasses and legumes and various mixtures have been evacuated at Meeker for two years, and data have been collected for one cutting (fall 1998) at Hotchkiss for the same fifty entries as at Meeker. You can obtain the results of these trials on the web at *http://www.colostate.edu/Depts/SoilCrop/extension/CropVar/alfalfa/alfalfa1.html*.

Methods of Weed Control for Alfalfa

#	A dense, vigorous stand	#	Companion crops
#	Proper irrigation	#	Weed-free seed
#	Adequate soil fertility	#	Weed control before planting
#	Crop rotation	#	Mowing
#	Adapted varieties	#	Mob grazing
#	Good soil drainage	#	Burning/flaming
#	Pest control	#	Herbicides
#	Site selection	#	Biological
#	Cultivation	#	Smother crops
#	Flooding	#	Herbicide-resistant varieties
#	Residue management	#	Planting time and methods

Alfalfa Caterpillar

Frank C. Schweissing

- Order - Lepidoptera
- Family - Pieridae
- Scientific Name - *Colias eurytheme* Boisduval

Problem

This insect pest is primarily a pest of alfalfa and usually, but not always, occurs during the latter part of the growing season. In our state it is a sporadic problem. The larvae (green worms with a white stripe on each side) cause the damage by eating the leaves and are capable of completely defoliating new stands of fall planted alfalfa. Growers can be aware of the possibility of an infestation by this pest when they see large numbers of the sulphur-yellow butterflies, with black margins on their upper wings, flying in the fields while depositing their eggs.

Life Cycle

- Generations - Probably 2-4 per year. All life stages are present at the same time.
- Eggs - butterflies lay eggs singly on the alfalfa leaves, from 200 to 300 per female. They are white and hatch in 3-7 days.
- Larvae - feed on the alfalfa and grow to 1 1/2" in 12-15 days.
- Pupae - larvae attach themselves to alfalfa stems and change to pale green pupae. It lasts from 5 to 7 days and is also the overwintering stage although summer migration of adults from more southern areas may account for most of our population.
- Adults - the pupa transforms to a butterfly. Life cycle completion requires from 26 to 65 days depending on the temperature.

Management

This pest, most of the time, can be managed in established stands by cutting the alfalfa, before it is severely damaged, removing the hay and irrigating as soon as possible. This exposes the worms to water, heat, birds and a number of insect parasites which can quickly eliminate this pest. They are also highly susceptible to diseases caused by viruses and bacteria.

If the alfalfa is very small or a new stand, it may be impractical to use the above practice and require direct intervention with a chemical or Bt compound. A spray with *Bacillus thuringiensis* would be preferable because it would not affect the parasites of this pest. Consult the High Plains Integrated Pest Management Guide for Colorado, Western Nebraska and Wyoming Bulletin 564A for recommended insecticides and economic thresholds.

Entry Forms for 1999 Trials

Entry forms for new 1999 trials at San Luis Valley Research Center at Center and Southwestern Colorado Research Center at Yellow Jacket may be obtained from the Department of Soil and Crop Sciences, Colorado State University, Cynthia Johnson, C-4 Plant Science Building, Fort Collins, CO 80523-1170; Telephone (970) 491-1914; Fax (970) 491-2758; or e-mail *cjohnson@.agsci.colostate.edu*

Additional Copy Request

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