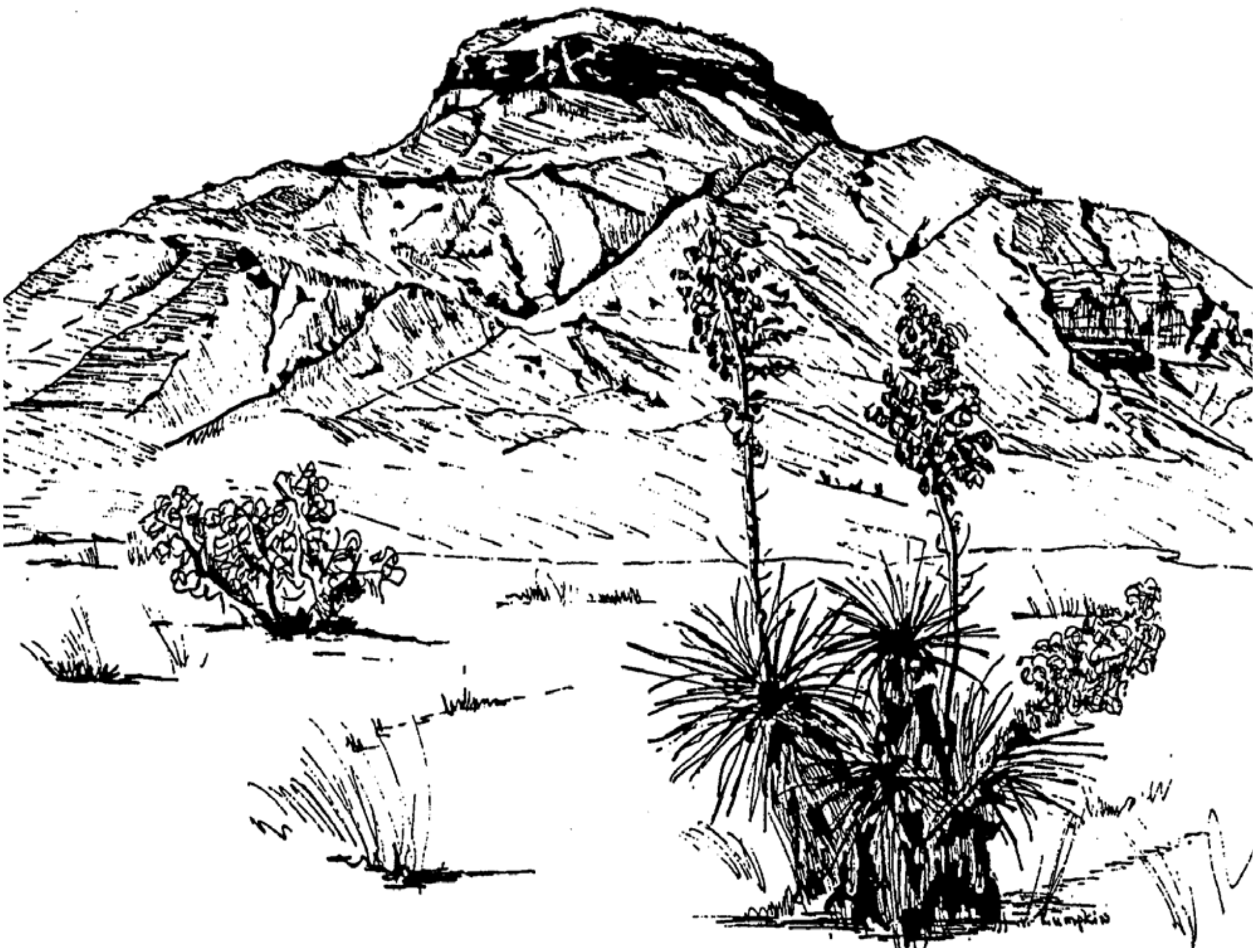
2004
ANNUAL
PROGRESS REPORT



AGRICULTURAL SCIENCE CENTER AT TUCUMCARI
6502 QUAY ROAD AM.5
TUCUMCARI, NEW MEXICO

NOTICE TO USERS OF THIS REPORT

This report has been prepared as an aid to the Science Center staff in analyzing the results of the various research projects during the past year and for recording data for future reference. This is not a formal Agricultural Experiment Station Report of research results.

Information in this report represents from only one year's research. The reader is cautioned against drawing conclusions or making recommendations as a result of data in this report. In many instances data in this report represents only one of several years' results that will constitute the final formal report. It should be pointed out, however, the staff members have made every effort to check the accuracy of the data presented.

This report was not prepared as a formal release, therefore, none of the data are authorized for release or publication, without the written prior approval of the New Mexico Agricultural Experiment Station.

Dr. LeRoy Daugherty, Associate Dean and Associate Director
Agricultural Experiment Station

2004
Annual Progress Report
New Mexico State University
Agricultural Science Center at Tucumcari
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Tucumcari, NM 88401-9661

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Acknowledgements

Several individuals and companies donated products and services to the Agricultural Science Center at Tucumcari during 2004. Appreciation is expressed to the following persons and organizations for their contributions.

Tucumcari Area Agricultural Advisory Committee Members

Mr. Donnie Bidegain
Mr. Phillip Box
Mr. Will Cantrell
Mr. Donald Carter
Mr. Wayne Cunningham
Mr. Paul Estrada, Vice Chariman
Mr. David Foote
Mr. Herman Lopez
Mr. Robert Lopez, Chairman
Mr. Dale Mitchell
Mr. Clyde Moon
Mr. Jim Norris
Mr. Jim Sours
Mr. Elmer Schuster
Mr. Pete Tatschl
Mr. Leo Thrasher

Mr. Don Curnutt Time and expertise to measure structural movement
Tucumcari, NM .... of the foundation of the Conference Room

Delta and Pineland Company – Tom Speed
Lubbock, TX.. Cotton seed

Michael Whitesides
Tucumcari, NM ....Sharpened mill grinder blades

Introduction

The New Mexico State University Agricultural Science Center at Tucumcari is located three miles northeast of Tucumcari on U.S. Highway 54. The center consists of 464 acres with 170.9 acres having Arch Hurley Conservancy District water rights. Approximately 130 acres are under cultivation. The remaining acreage is divided among rangeland, farmstead, roads, ditches and idle land.

For the second year in a row, irrigation water from the Arch Hurley Conservancy District (AHCD) was unavailable in 2004. There have been past years where water allocations and deliveries were minimal, but 2003 and 2004 are the only years in which no water was allocated or delivered. The most recent diversion from Conchas Lake was on June 2, 2002. On that date, the lake level was 4161.54 ft. At the end of 2003, the lake level was 4160.15 ft and on December 31, 2004, the lake level had risen to only 4172.77 ft, even without withdrawals by AHCD.

Even though irrigation water was unavailable at the Agricultural Science Center at Tucumcari in 2004, center personnel were able to conduct a number of research projects. Results from those projects are presented in the following sections. To make results available to a wider audience, an electronic copy of this report is available on the Center's web page at http://tucumcarisc.nmsu.edu.

Center Events and Activities

Personnel at the Agricultural Science Center at Tucumcari hosted or participated in a variety of activities in 2004.

The 43rd Annual Tucumcari Bull Test ended with the Performance Tested Bull and Heifer Sale at the center on March 16, 2004. The 63 bulls completing the test gained an average of 3.61 pound per day. Six breeds and 11 cooperators were represented in the bull test. A heifer development program was conducted in conjunction with the bull test in 2003-2004. Eighteen heifers, representing 3 breeds and 3 cooperators, were represented in the heifer development program. The 44th Annual Bull Test began on October 18, 2004 with the delivery of 39 bulls and 11 heifers to the test facility. The bulls represent five breeds and 8 cooperators and the heifers represent 3 breeds and 3 cooperators. The 2004 Performance Tested Bull and Heifer Sale will be conducted on March 18, 2004. Information on the bull and heifer tests is available through the NMSU Cooperative Extension Service's "Bull Session" publication and from Dr. Ron Parker, the test director. Members of the New Mexico Beef Cattle Performance Association held meetings at the center on March 2, June 8 and December 7, 2004.

A Field Day was not hosted by the center in 2004. Since the center was unable to conduct any irrigated crop or pasture research, it was decided to forgo the annual event for a second year.

The Agricultural Science Center at Tucumcari continued to assist the Quay County Boll Weevil Control District with its activities in 2004. The center also provided support for the district's boll weevil scouting program.

Personnel

There were significant changes in farm crew at the Agricultural Science Center at Tucumcari in 2004. Larry Perkins began work as a Farm Superintendent on January 30, 2004. Brad Griggs' employment was changed from temporary to regular full- time on March 16, 2004. Lloyd D. Ashcraft resigned his employment on March 22, 2004. Herman J. Lopez was hired as a Farm/Ranch Laborer II on June 8, 2004 and resigned his position on August 17, 2004. Calvin D. Henson was hired as a Farm/Ranch Laborer II on November 1, 2004.

Dr. Mark Marsalis began work as and Extension Agronomist at the Agricultural Science Center at Clovis on September 1, 2004. Mark has shared responsibilities at Clovis and Tucumcari.
Jay Nemrow began work as a Computer Specialist with the NMSU Cooperative Extension Service on December 1, 2004. Jay has responsibilities for servicing the computer needs of 17 county extension offices and the agricultural science centers in northeastern New Mexico. Jay is housed at the Agricultural Science Center at Tucumcari.

There were two temporary employees at the Center in 2004. These employees, their job titles, and dates of employment are given below:

Name	Job Title	Dates of Employment
Brad Griggs	Farm/Ranch Laborer II	01/01/04-03/15/04
Connie Stubblefield	Project Aide II	01/01/04-12/31/04

Lora Harris worked at the center in summer 2004 as an intern with the USDA funded "Enhancing Learning through Research" grant program. Lora worked on an internship project under the supervision of Dr. Mark Renz, Extension Weed Specialist.

Several College of Agriculture and Home Economics personnel from other locations worked cooperatively with staff at the Tucumcari Center in 2004. These individuals included: Tom Bagwell, Cynda Clary, Paul Defoor, Mike English, Robert Flynn, Steve Guldan, John Harrington, Janet Irwin, Bernd Leinauer, Mark Marsalis, Mick O'Neill, Ron Parker, Chris Pierce, Naveen Puppala, Ian Ray, Mark Renz, Jason Sawyer, Aaron Scott, Carol Sutherland, D.C. Thompson, Milt Thomas, Dawn VanLeeuwen, Pete Walden and Dereck Walker.

Individuals, from outside the NMSU College of Agriculture and Home Economics, who worked cooperatively with center staff in 2004 were: Jerry Michels (Texas Agricultural Experiment Station, Bushland, TX) and Carl Patrick (Texas Cooperative Extension Service, Amarillo, TX).

Buildings and Facilities

Several building and facility improvements were made in 2004. Hardwood floors in the Superintendent's residence were sanded and refinished in April. The process of replacing the cabinets in the residence laundry room was completed in 2004 and the vinyl flooring in the kitchen and laundry room was replaced. The residence was re-shingled with 3-tab asphalt shingles in October 2004.

Gates to the irrigated pasture trial, along the Arch Hurley Conservancy District right-of-way, were reconstructed in fall 2004.

Structural reinforcements were added to the northeast corner of the conference room basement in an effort to alleviate further cracking of the foundation at the northeast corner of the building.

New carpet and baseboards were installed in the office building in October 2004.

Landscaping

Since its establishment in 1912, thousands of trees and shrubs have been planted at the center. Information on landscape activities is reported in the Annual Report series to provide an historical accounting of their success or failure.

A number of mature trees were lost in 2004 due to drought conditions and the lack of water for irrigation purposes. Sixteen trees have been removed: six poplars, six elms, one mulberry, two golden honey locusts and one Osage orange.

Irrigation Water

As discussed in the opening section of this report, irrigation water from the AHCD was unavailable in 2004. The annual AHCD assessment for 2004 was $6.00 per water right acre.

Advisory Committee

The Advisory Committee to the Agricultural Science Center at Tucumcari met once in 2004. A report of activities in the College of Agriculture and Home Economics was delivered by Dr. LeRoy Daugherty, Associate Dean and Associate Director of the Agricultural Experiment Station. The committee's membership list was updated. Ongoing projects at the Center were reviewed. Producer concerns and ideas for research projects were discussed.

At the request of the advisory committee, center staff prepared a legislative enhancement funding request in 2004. The initiative requested a recurring budget of $305,000 to add faculty positions in the areas of "Irrigation Management" and "Range Ecology", along with support staff and operational funds. A $424,000 capital outlay request was also prepared. The capital outlay request included funds for irrigation development, the purchase of research equipment and for facility improvements.

Rex Kirksey and Robert Lopez, the advisory committee chairman, attended the New Mexico Extension Support Council meeting in Las Cruces on May 5 and 6, 2004. . Robert is the Agricultural Science Center alternate representative to the Support Council's executive committee.

Publications

Refereed Journal Articles

Kirksey, R.E., C.M. Bishop, P.L. Cooksey, and J. Irwin. 2004. "New Mexico 2003 Grain Sorghum – Variety Trial Results – Clovis." Online: *Crop Manage.* http://www.plantmanagementnetwork.org/sub/cm/trials/2003/sorghum/Kirksey.xls. (February 2004).

Lauriault, L.M., and R.E. Kirksey. 2004. "Yield and Nutritive Value of Irrigated Winter Cereal Forage Grass-Legume Intercrops in the Southern High Plains, USA." *Agron. J.* 96:352-358.

Harrington, J.T., M.W. Loveall, and R.E. Kirksey. 2004. "Establishment and Early Growth of Dryland Plantings of Arizona Cypress in New Mexico, USA." *Agroforestry Systems*. 63:183-192.

Capitan, B.M., C.R. Krehbiel, R.E. Kirksey, L.M. Lauriault, G.C. Duff, and G.B. Donart. 2004. "Effect of Winter and Summer Forage Type on Pasture and Feedlot Performance and Carcass Characteristics by Beef Steers." *Prof. Anim. Sci*. 20:225-236.

Research Reports

Kirksey, R.E., L.M. Lauriault, P.L. Cooksey, G.J. Arguello, J.L. Robbins and M.L. Mead, and L.D. Ashcraft, Jr. 2004. *2003 Annual Progress Report*. NM Agric. Exp. Stn., Agric. Sci. Ctr. at Tucumcari. Online: http://spectre.nmsu.edu/dept/docs/tuc/2003%20Annual%20Report.pdf. (Posted: February 2004; 47 pp.).

Lauriault, L.M., I.M. Ray, C.A. Pierce, D.A. McWilliams, L.M. English, R.P. Flynn, S.J. Guldan and M.K. O'Neill. 2004. *The 2004 New Mexico Alfalfa Variety Test Report*. New Mexico St. Univ. Agric. Exp. Stn., Las Cruces. Unnumbered. Online: http://www.cahe.nmsu.edu/pubs/research/agronomy/var04.pdf. (Posted December 2004; 21 pp.).

Bean, B. (R.E. Kirksey – contributor). 2004. *2004 Wheat Variety Trials Conducted in the Texas and New Mexico High Plains.* TX Coop. Ext. Serv. Texas A&M Univ. System. Online: http://www.texaswheat.org/docs/twpa/Wheat%20Variety%20Trial%20Summaary.pdf. (Posted: December 2004).

Morgan, G., B. Bean, and J.Rudd. (R.E. Kirksey – contributor). 2004. *2004 Wheat Variety Trials for Texas*. TX Coop. Ext. Serv. Texas A&M Univ. System. Online: http://www.texaswheat.org/dics/twpa/Variety%20Trials.pdf. (Posted: December 2004).

Kirksey, R.E. 2004. "From the Field." *The Leading Object*. NMSU College of Agric. and Home Econ. 18:1-2.

Kirksey, R.E., R.P. Flynn, M.K. O'Neill, L.M. Lauriault, D.A. McWilliams, and L.M. English. 2004. *New Mexico 2003 Corn and Sorghum Performance Tests.* NMSU Agric. Exp. Stn. Las Cruces. Unnumbered. Online: http://spectre.nmsu.edu/dept/docs/tuc/2003_corn_sorghum_perf.pdf. (Posted: February 2004. 56pp.).

Cooperative Extension Service Publications

Lauriault, L.M., D. C. Thompson, J.B. Pierce, G.J. Michels, and W.V. Hamilton. 2004. *Managing Aceria Malherbae Gall Mites for Control of Field Bindweed*. NMSU Coop. Ext. Ser., Las Cruces. Circular 600. Online: www.cahe.nmsu.edu/pubs/_circulars/CR%20600.pdf. (Posted September 2004, 14pp).

Presentations

Kirksey, R.E. "Water Wise Crop Research." Legislative Enhancement Initiative Funding Request Presentation to Economic and Rural Development and Telecommunications Legislative Committee. Santa Fe, NM. November 20, 2004.

Lauriault, L.M. "Dual-purpose Peanuts." Peanut Field Day. NMSU Agricultural Science Center at Clovis. September 2, 2004.

Lauriault, L.M. "Forage Research at the Agricultural Science Center at Clovis." Field Day. NMSU Agricultural Science Center at Clovis. August 3, 2004.

Lauriault, L.M. "Alfalfa Varieties and Management in the Four Corners." Field Day. NMSU Agricultural Science Center at Farmington. July 30, 2004.

Lauriault, L.M. "Biological Control of Field Bindweed with a Microscopic Mite." Mini Field Day. Curry County (NM) Cooperative Extension Service. Broadview, NM. June 10, 2004.

Lauriault, L.M. "An IPM Approach to Field Bindweed Control." Quay County Agricultural and Home Economics Seminar. Quay County Cooperative Extension Service. Tucumcari, NM. January 22, 2004.

Other

As part of the USDA's "Enhancing Learning Through Research" summer internship program, Lora Harris worked on internship project under the supervision of Mark Renz, Extension Weed Specialist.

Grant proposal activity

Grant proposal activity in 2004 included the following:

A proposal was submitted to the Southern Regional Integrated Pest Management section of the USDA-CREES, entitled, "Integrated Field Bindweed Management in Semi-arid Climates," for $100,000 per year for two years was not funded. Project collaborators were Jerry Michels, Brent Bean, Carl Patrick, Mark Renz, and Leonard Lauriault.

"Corn and Sorghum Variety Testing Program." This fee-testing program generated $28,280 in grant-in-aid payments in 2004. Rex Kirksey is the project coordinator. The Agricultural Science Center at Tucumcari received $2,200.

"The New Mexico Alfalfa Variety Testing Program." This fee-testing program generated $9,616 in grant-in-aid payments in 2004. Leonard Lauriault is the statewide coordinator. An administrative fee totaling $180.00 was received by the Agricultural Science Center at Tucumcari.

"Cotton Cultivar Testing Program." This fee-testing trial generated $1875 in grant-in-aid payments in 2004. Rex Kirksey was project investigator. (The fees were refunded because the trial was not planted due to unavailability of irrigation water.)

"Forage Sorghum and Sorghum x Sudangrass (Combined) Tests." This fee testing trial generated $1500.00 in fees. "Grain Sorghum Test" generated $3,925.00 in fees. Leonard Lauriault was project investigator for these projects.

Other activities and honors by Center personnel in 2004 included:

Rex Kirksey

- Member, Soil and Water Conservation Society
  Regional Representative, New Mexico Chapter
- Chairman, Summer 2004 New Mexico Chapter Meeting
- Member, Research Center Administrator's Society
- Member, Association for Arid Lands Studies
- Member, Rocky Mountain Farmers Union

Leonard Lauriault

- Began transferring the following Safety Officer responsibilities to Larry Perkins:
  - Development and implementation of workplace safety program
  - Review and dissemination of safety related information
  - Conducting employee trainings regarding Worker Protection Standard, pest certification (NMDA approved) and Institutional Animal Care and Use Certification (NMSU approved).
  - Coordinated center pesticide applications and maintained pesticide application records and inventory
- Maintained New Mexico Public Certified Pesticide Applicator's License for Agricultural Plant and Insect Pests, Turf & Ornamental Plant & Insect Pests, and Research & Demonstration categories
- Coordinator, New Mexico State University statewide alfalfa variety testing program
- Member, American Society of Agronomy
- Member, American Forage and Grassland Council
- Member, New Mexico Hay Association

Larry Perkins

- Assumed duties as Farm Superintendent and Safety Office, February 2004.
- Vice-Chairman of Canadian River Soil and Water Conservation District
- Vice-Chairman of Arch Hurley Conservancy District Board of Directors
- Chairman of Ellano Estacado Resource Conservation Development Council
- Member of New Mexico Crop Improvement Association (Past President)

Annual Weather Summary

The first documented weather observations in the Tucumcari area were from a weather station near the Post Office in the town of Tucumcari. That station was operational from December 1904 through February 1913. The Agricultural Science Center at Tucumcari began recording daily precipitation in January 1912. Air temperatures were first recorded on May 26 of that year. The weather station at the center has remained in continuous operation since its establishment in 1912. An updated historical summary of weather observations at the Agricultural Science Center at Tucumcari was published as an Agricultural Experiment Station Research Report in early 2003. That report contains summary information relative to weather conditions at the center through 2002 and is available from the Agricultural Science Center office or online at: www.cahe.nmsu.edu/pubs/research/weather_climate/RR751.pdf.

In addition to precipitation and temperature records, the center has maintained records on wind movement since 1918. Above ground pan evaporation has been measured since 1953. Maximum and minimum soil temperatures, at a four-inch depth, have been recorded since 1977. Maximum and minimum water temperatures in the evaporation pan were first recorded in 1981.

Total precipitation for 2004 was 21.93 inches, 5.63 inches more than the long-term average of 16.30 inches (Table 1). Above average amounts of precipitation were recorded in six months of 2004 (February, March, April, September, October and November). Precipitation totals for April and September exceeded the long-term average by more than 2 inches. October and November precipitation totals exceeded the long-term average by more than 1 inch. Record high and low amounts of precipitation, by month, are shown in Table 2. No precipitation records were set in 2004.

The mean maximum temperature for 2004 was 73ºF which matched the long-term average (Table 3). Mean monthly maximum temperatures were above normal for the months of January, March, May, June and December. Mean minimum temperature for 2004 was 45ºF which also matched the long-term average of 45ºF. Mean monthly minimum temperatures were above normal for the months of January, March, May, September, October and December. The mean annual temperature for 2004 was 60ºF which was 1ºF above the long-term average.

The lowest recorded temperature in 2004, 0ºF, was recorded on December 24. The highest temperature, 105ºF, was recorded on June 16. Highest and lowest recorded temperatures and mean temperature extremes are shown in Table 4. The daily maximum temperature of 89 ºF on March 20 was the only record-breaking maximum daily temperature to be recorded in 2004.. No record minimum temperatures were recorded for 2004

The last spring temperature of 32ºF in 2004 was recorded on April 24 (Table 5). The first temperature of 32ºF in fall was recorded on November 11. Normal last spring and first fall freeze dates are April 19 and November 6, respectively. The 2004 growing season was 192 days, 4 days longer than the long-term average of 189 days. The longest and shortest growing seasons on record are 222 and 136 days, which were recorded in 1989 and 1945, respectively.

The last snowfall in spring was recorded on February 25, 2004. The first snowfall in winter 2004 was recorded on December 9. Total snowfall in 2004 was 10.1 inches. The last snowfall in spring has occurred as late as May 18 in 1935 and 1980. The first snowfall in winter has been recorded as early as October 8, in 1970. Summaries of pan evaporation and wind run at the center are shown in Table 6.

Table 1. Summary of monthly precipitation amounts (inches) recorded at the NMSU Agricultural Science Center at Tucumcari, 1905-2004.

Month	2004	2003	2002	2001	2000	Average 1905-2004
January	0.07	0.07	0.01	0.54	0.67	0.37
February	0.59	0.64	0.59	0.64	0.16	0.48
March	0.94	1.25	1.25	0.32	2.65	0.75
April	3.73	0.69	0.69	0.53	0.10	1.16
May	0.29	1.88	1.88	0.65	2.82	2.03
June	1.87	3.99	3.99	0.67	1.76	1.96
July	2.27	0.53	0.53	4.38	0.67	2.66
August	2.75	4.26	4.26	0.72	2.83	2.76
September	3.98	0.30	0.30	4.00	0.19	1.54
October	2.78	0.96	0.96	1.20	0.15	1.32
November	2.27	0.91	0.91	1.49	1.57	0.69
December	0.39	0.22	0.22	0.73	0.24	0.59
Total	21.93	15.70	15.59	15.87	13.81	16.30

Table 2. Highest and lowest monthly precipitation amounts recorded at the NMSU Agricultural Science Center at Tucumcari, 1905-2004.

Month	Maximum (inches)	Year	Minimum (inches)	Year
January	1.68	1999	0.00	1967
February	2.40	1912	0.00	2000
March	3.69	1919	0.00	1966
April	4.89	1997	0.00	1996
May	8.72	1921	0.00	1927
June	6.39	1919	0.00	1947
July	11.28	1950	0.24	1987
August	8.38	1933	0.12	1951
September	7.23	1941	0.00	1948
October	7.51	1923	0.00	1975
November	4.00	1905	0.00	1989
December	4.27	1959	0.00	1933
April - September Growing Season	25.70	1919	4.65	1934
Annual	34.96	1941	6.13	1934

Note: Where minimum records are shared by more than one year, only the most recent year is listed.

Table 3. Summary of mean monthly temperatures at the NMSU Agricultural Science Center at Tucumcari, 1905-2004.

Date	2004	2003	2002	2001	2000	Average 1905-2004
	……..……..Mean Maximum Temperature (°F)…………………..					
January	57	58	55	46	60	55
February	53	55	56	59	66	55
March	68	67	63	59	67	66
April	70	77	78	78	76	72
May	87	85	86	81	89	84
June	93	87	96	92	90	92
July	92	98	94	99	97	93
August	89	94	95	93	98	90 *
September	85	84	84	88	92	85 *
October	73	79	69	77	72	74 **
November	56	63	59	65	54	59 **
December	55	59	52	56	50	54 *
Annual	73	76	74	74	76	73 **
	……..……..Mean Minimum Temperature (°F)…………………..					
January	27	27	26	24	28	26
February	25	28	26	30	32	26
March	40	36	31	35	36	37
April	43	42	46	47	45	43
May	55	55	53	52	56	53
June	60	59	66	61	62	60
July	64	69	66	69	67	65
August	61	67	66	65	68	62
September	58	57	58	57	59	57
October	46	49	44	45	47	45 *
November	34	36	34	39	29	34 *
December	28	28	28	28	22	27
Annual	45	46	45	46	46	45 *
	……....…………...Mean Temperature (°F)………………………..					
January	42	43	41	35	44	40
February	39	41	41	44	49	41
March	54	51	47	47	51	52
April	57	61	60	63	61	58
May	77	70	69	66	72	72
June	77	73	81	77	76	76
July	78	84	80	84	82	79
August	75	80	81	79	83	76 *
September	72	70	71	73	75	71 *
October	60	64	56	61	59	60 **
November	45	49	47	52	41	46 **
December	42	43	40	42	36	41 *
Annual	60	61	60	60	61	59 **

Note: *Indicates 1 year of missing data
**Indicates 2 years of missing data

Table 4. Highest and lowest recorded temperatures and mean temperatures, by month, at the NMSU Agricultural Science Center at Tucumcari, 1905-2004.

	Record Extremes (1913-2004)				Mean Extremes (1905-2004)			
Month	Highest Temp (°F)	Year	Lowest Temp (°F)	Year	Highest Max (°F)	Year	Lowest Min (°F)	Year
January	80	1974	-22	1963	62	1969	12	1963
February	83	2002	-16	1933	67	1976	17	1929
March	92	1989	-3	1948	75	1974	24	1965
April	97	1989	12	1920	81	1972	37	1983
May	103	2000	25	1917	90	1996	46	1983
June	109	1990	37	1919	99	1990	55	1983
July	107	1995	52	1995	99	2001	61	1967
August	107	1994	49	1988	98	2000	57	1965
September	104	1995	30	1970	92	2000	51	1965
October	97	2000	12	1993	82	1979	40	1976
November	87	1980	-2	1976	71	1999	26	1929
December	82	1980	-18	1918	66	1980	17	1983
Annual					77	1977	41	1963

Note: Where records are shared by more than one year, only the most recent year is listed.

Table 5. Summary of last spring and first fall temperature of 32°F and 28°F and growing season at the NMSU Agricultural Science Center at Tucumcari, 1913-2004.

	2004	2003	2002	2001	2000	Average 1913-2004	Record Extremes Earliest	Year	Latest	Year
32°F or less										
Last in Spring	24-Apr	8-Apr	4-Apr	12-Apr	16-Apr	19-Apr	24-Mar	1943	15-May	1945
First in Fall	2-Nov	26-Oct	30-Oct	13-Oct	25-Sep	6-Nov	17-Sep	1965	19-Nov	1989
Growing Season (Days)	192	201	209	184	162	189	136	1945	222	1989
28°F or less (Killing Frost)										
Last in Spring	6-Mar	8-Apr	3-Apr	16-Mar	22-Mar	5-Apr	6-Mar	1935	6-May	1917
First in Fall	3-Nov	26-Oct	6-Nov	27-Nov	7-Nov	8-Oct	8-Oct	1970	27-Nov	2001*
Number of Killing Frost Free Days	241	201	217	256	230	229	169	1917	256	2001

Table 6. Summary of pan evaporation and wind run at the NMSU Agricultural Science Center at Tucumcari, 1913-2004.

	Pan Evaporation				Wind Run	
	2004		1953 - 2004		2004	1918-2004
Month	Total	Daily Average	Monthly Average	Daily Average	Daily Average	Daily Average
	……inches……				mph	mph
April	8.85	0.30	9.69	0.32	4.1	4.8
May	15.39	0.50	13.79	0.44	4.9	4.9
June	14.32	0.48	13.85	0.46	4.2	4.4
July	12.18	0.39	12.76	0.41	3.2	3.5
August	11.84	0.38	11.34	0.37	3.4	3.4
September	10.90	0.36	9.00	0.30	3.7	3.7
	73.48	0.40	69.74	0.38	3.92	4.12

Operational Revenues and Expenditures

The Agricultural Science Center at Tucumcari received $50,412 in operational funds in FY2003-2004 (Table 7). This funding has remained stable for many years. Carry-over funds form the previous years totaled $47,056, down $29,590 due to the purchase of a 2003 Chevrolet Silverado pick-up, a lap-top computer and a Hustler riding mower in the previous fiscal year.

The center received $1,878 as compensation for gain by heifers used in grazing trials. This amount was up $591.00 from the previous year. The center billed itself $14,749 for vehicle and equipment use, based on established mileage rates and hourly use charges for vehicles, tractors and other equipment.

A total of $2,439 was obtained for forage testing from the Nitrate Elimination Company. The center serves as a sub-contractor for a USDA grant "Nitrate Toxicity Test Kit Screening". The cotton fee-testing program generated $1,500 in revenue but all of that amount was refunded to cooperating companies since the trial was not planted. The corn and sorghum testing program generated $2,200 in revenue.

The center's operational expenditures in fiscal year 2003-2004 totaled $74,550 (Table 7). The largest expenditure was Tractor/Vehicle Use in the amount of $14,749. Although Tractor/Vehicle Use shows up in the expenditure category of Table 7, it is also a revenue source for the Tractor and Vehicle Account (1-3-50014). Tractor and Vehicle Use charges were $7,496 more than the year before. This increase was due in part from Rex Kirksey being the Superintendent of the Agricultural Science Center at Tucumcari and the Acting Superintendent of the Agricultural Science Center at Clovis which required travel to and from Clovis 2 to 3 times weekly. With the exception of Tractor/Vehicle Use, Temporary Salaries in the amount of $9,232 was the largest expenditure category, an increase of $4,777 from the previous year. The majority of temporary wages were for employment of temporary farm/ranch laborers for periods when regular full-time employees were not working.

Expenditures for Non-office Supplies totaled $5,015 in FY2003-2004, which was $1,187 less that the previous year. Expenditures for Tires and Batteries were down almost $1,700. Major maintenance expenditures included repairing the well and remodeling of the laundry room of the Superintendent's residence. Equipment maintenance increased by $431 over the previous year. Expenditures for utilities in FY2003-2004 were up from the previous year. Electricity costs increased by $513, the cost for natural gas service decreased by $269, and telephone costs decreased $208.

Major purchases for FY2003-2004 were: Dell laptop computer, Rodenator Pro (gopher machine), and Trimble GPS System (Table 8).

Table 7. Approximate operational revenues and expenditures, by account, NMSU Agricultural Science Center at Tucumcari, Fiscal Year 2003-2004

Item	Physical Plant ' 01-3- '42109	Forage Mgmt. '01-3- '42438	Pasture Gain '01-3- '42710	Tractor & Equip. ' 01-3- '50014	Managing Change '01-3- '42537	Field Day '01-5- '28915	Forage Testing '01-5- '28959	Cotton 01-5- 28969	Corn & Sorghum '01-5- '28976	Station Sales '01-3- '42058	Renewal & Repl. '01-8- '87298	All Account Total
Revenue												
Appropriation	32,412	9,000			9,000							50,412
2002-2003 Carryover			4,190	5,236		1,439	12,407	4,578	3,002	6,174	10,028	47,056
Sales/Transfer In	8,603	760	1,868							646		11,877
Transfer Out				-15,000								-15,000
Vehicle/Tractor Use				15,105								15,105
Suppl & Grants										4,574		4,574
TOTAL REVENUE	41,015	9,760	6,058	5,341	9,000	1,439	12,407	4,578	3,002	11,394	10,028	114,024
Expenditures												
Personnel												
Temporary Salary	8,969	264										9,232
Travel												
In-state Travel	1,275	707			100		264					2,346
Out of State Travel	109	525					719					1,352
Auto & Tractor Supplies												
Supplies		64		296								360
Tires & Batteries				496								496
Fuel, Oil, & Lube	128	18		2,600								2,746
General Supplies												
Office	2,817	71	97									2,985
Non-office	2,905	752	1,118	36	106					100		5,015
Janitorial	305	4										309
Vet Supplies	6											6
Feed & Seed	296		368									664
Pest Control Supplies	97											97
Herbicides	617							189				806
Insecticides	22											22
Fertilizer		245			297							541
Food Products	13											13
Business Meals	138											138
Books	92											92
Periodicals	56	16										72
Small Tools & Equip.												
Furn/Equip. < $500	1,554		171		183							1,908
Tools < $500	694											694

Table 7. (continued).

Item	Physical Plant ' 01-3- '42109	Forage Mgmt. '01-3- '42438	Pasture Gain '01-3- '42710	Tractor & Equip. ' 01-3- '50014	Managing Change '01-3- '42537	Field Day '01-5- '28915	Forage Testing '01-5- '28959	Cotton '01-5- 28969	Corn & Sorghum '01-5- '28976	Station Sales '01-3- '42058	Renewal & Repl. '01-8- '87298	All Account Total
Supplies for Repairs												
Bldg. Repair/Parts	1,761											1,761
Plumbing Supplies/Repair	208				333							541
Equip. Repair/Parts	388	170		717	167							1,440
Veh. Repair/Parts				293								293
Electric Repair/Parts	92											92
Services												
Postage	582	217										800
Cellular Phone	552				17							569
Telephone	2,267	66										2,333
Internet Service	300	156			172							627
Advertising	257											257
Printing/Reproduction		759										759
Hardware/Equip. Rental	45				159							204
Electrician	801											801
Bldg. Maint./Repair												
Equip. Maintenance	920	336			336							1,591
Equipment Repair	121		369	136								626
Vehicle/Tractor Repair												
Utilities												
Electricity	4,121											4,121
Natural Gas	1,255											1,255
Other Services												
Dues & Fees	343	628	47		50		320	495				1,883
Farm/Ranch Services												
Lab Analysis		268			146							414
Tractor/Vehicle Usage	6,989	3,504			2,671				1,199	387		14,749
Irrigation		488			263							750
Freight	158	37	31	15	21							261
Computer Services/Software	151	25			77					22		275
Equipment Purchases												
Equip.> $500		470	1,528		3,953					2,303		8,253
TOTAL EXPENDITURES	41,402	9,787	3,728	4,588	9,048	0	1,302	684	1,199	2,811	0	74,550
ENDING BALANCE	-387	-27	2,330	753	-48	1,439	11,105	3,894	1,804	8,583	10,028	39,474

Table 8. Listing of major purchases, NMSU Agricultural Science Center at Tucumcari, Fiscal Year 2003-2004

Item Description	Account	Amount	Total
Dell GX270 Computer, 2.6 Ghz, 40 GB drive, 256 MB ram, 48X CD-	01-3-42058	$1,202.97	$1,202.97
Rodenator Pro (device designed to control burrowing animals	01-3-42537	$470.00	
such as gophers)	01-3-42438	$470.00	$940.00
Trimble Navigation Geo TX 512 MB (TFT) system;	01-3-42537	$3,482.70	
Terra Sync Professional with GPS Pathfinder Office Software	01-3-42058	$1,099.80	
	01-3-42710	$1,527.50	$6,110.00
Grand Total			$8,252.97

Stocking Density Effects on Irrigated Predominantly Blue Grama Pastures and Animal Performance

Investigator(s):

L.M. Lauriault, J.E. Sawyer, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

To determine the effect of stocking density of yearling heifers grazing irrigated blue grama on animal gains and feedlot performance and pasture productivity and persistence.

Materials and Methods:

Field history and pasture development are described in the 2001 Annual Report of the Agricultural Science Center at Tucumcari. Results for the initial years of this study are reported in the 2002 and 2003 Annual Reports. The pastures were not fertilized in 2003, no pesticides were applied, and there were no irrigations.

On May 28, 2004, 45 crossbred beef heifers were received from the Clayton Livestock Research Center and placed on pasture containing a combination of warm and cool-season grasses. On July 15, the heifers were weighed and sorted into treatment groups of light, medium, and heavy stocking densities (1, 1.67, or 2.33 hd/acre, respectively) and placed on blue grama pastures at the rate of 3-, 5-, or 7-head per pasture. Treatment groups were randomly assigned to pastures within each of the three pasture replicates. Grazing of the heavy stocking density treatment was terminated on August 12. Heifers in the medium and light stocking treatments continued to graze until a comparable number of head days of grazing had been applied to each pasture (August 23 and September 18, for the medium and light stocking densities, respectively). Animal weights were recorded at the beginning of the trial and on the date that each grazing treatment was terminated. All weights were recorded after an approximate 16-hour fast without food or water. While on trial, heifers received an ad libitum Hi-Pro #3767 “Beef Cattle Wheat Pasture Supplement” containing 3.53 lb/ton of monensin. Mineral consumption during the trial averaged 1.8 oz hd^{-1} d^{-1}, which was within the labeled rate of 1-4 oz hd^{-1} d^{-1}. No other mineral supplements were provided.

On July 14, 21 and 28, and August 4 and 11, the forage within a 12 x 40 in. quadrat was hand-clipped to ground level at three uniformly spaced locations in each pasture. Otherwise, each pasture was sampled by treatment when the animals were removed, 28 and 56 days afterwards, and after soil temperatures reached a 5-day average of 36ºF (December 1, 2004). On each sampling date, samples were taken from the same general area of the pastures. Placement of the quadrat was such that a representative cross-section of the furrow-bed continuum was obtained. Each sample was separated into grama, other grass, and forbs during clipping. Each component was placed in a separate bag and dried for 48 hr at 150°F to determine dry matter (DM) mass of each component within the sample. Total DM mass of each sample was calculated as the sum of the masses of grama and other grass because forbs were inconsistently distributed in pastures and across the season and contributed little to total DM. Pasture averages were calculated and subjected to statistical analysis.

Results and Discussion:

As in 2003, when grazing took place during the same time period, no differences existed between stocking density treatments for total forage mass, and there was no difference across the season, although there was a general linear decline in total forage mass (Figure 1). Also, similarly to 2003, there was no difference in regrowth between treatments either in duration (28 or 56 days) or when samplings were on approximately the same calendar date, and there was no increase in yield during the regrowth period by any treatment Figure 2.

Grazing took place during the same time period as 2003 and initial forage mass was similar across years (~2200 lb ac^{-1} on 9 July 2003 vs. ~2500 lb ac^{-1} on 14 July 2004). As in 2003, it is thought that stocking density was not great enough on any treatment to give the same results in forage variables that were observed in 2002. Unlike 2003, there was no difference in average daily gain. There was, however, a difference in total gain during the first 28 days of grazing (52, 81, and 95 lb ac^{-1} for the 1, 1.67, or 2.33 hd ac^{-1} treatments, respectively; $LSD_{0.05}$ = 19 lb ac^{-1}), but there was no difference in season total gain ac^{-1}. Still, the ranking among treatments was similar to 2003 with the high density treatment producing the least total gain ac^{-1} (121, 99, and 95 lb ac^{-1} for the 1, 1.67, or 2.33 hd/acre treatments, respectively).

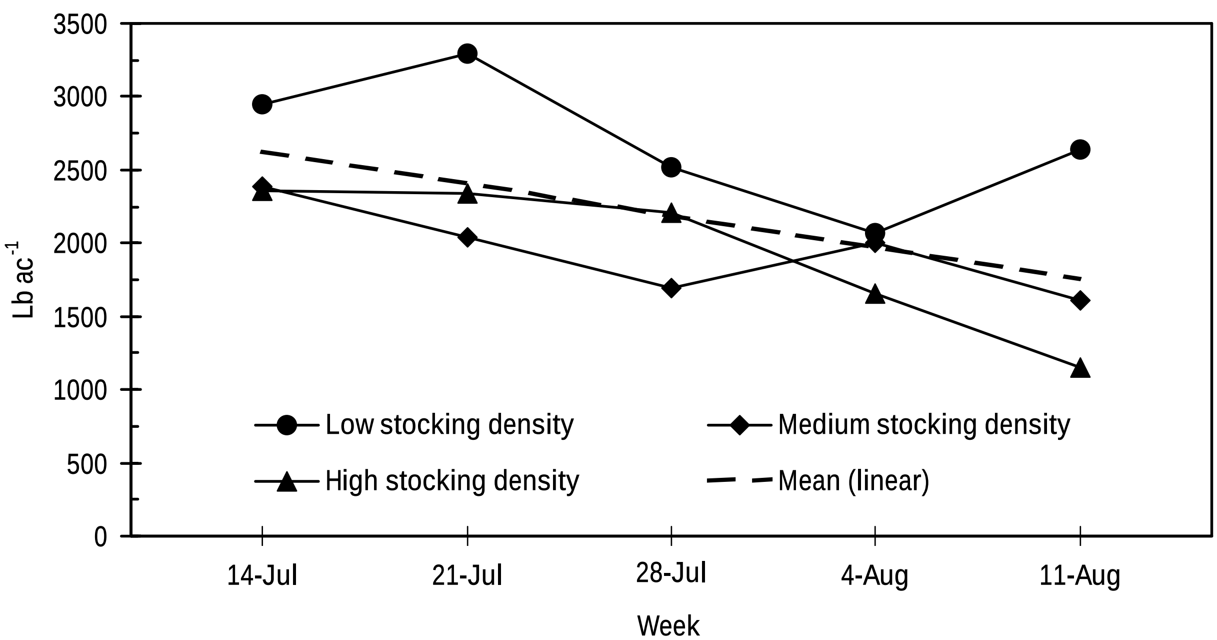

Figure 1. Total forage mass of predominantly blue grama pastures at different stocking densities measured weekly at the NMSU Agricultural Science Center at Tucumcari in 2004. Low, medium and high stocking densities were 1.00, 1.67, and 2.33 hd ac^{-1}, respectively.

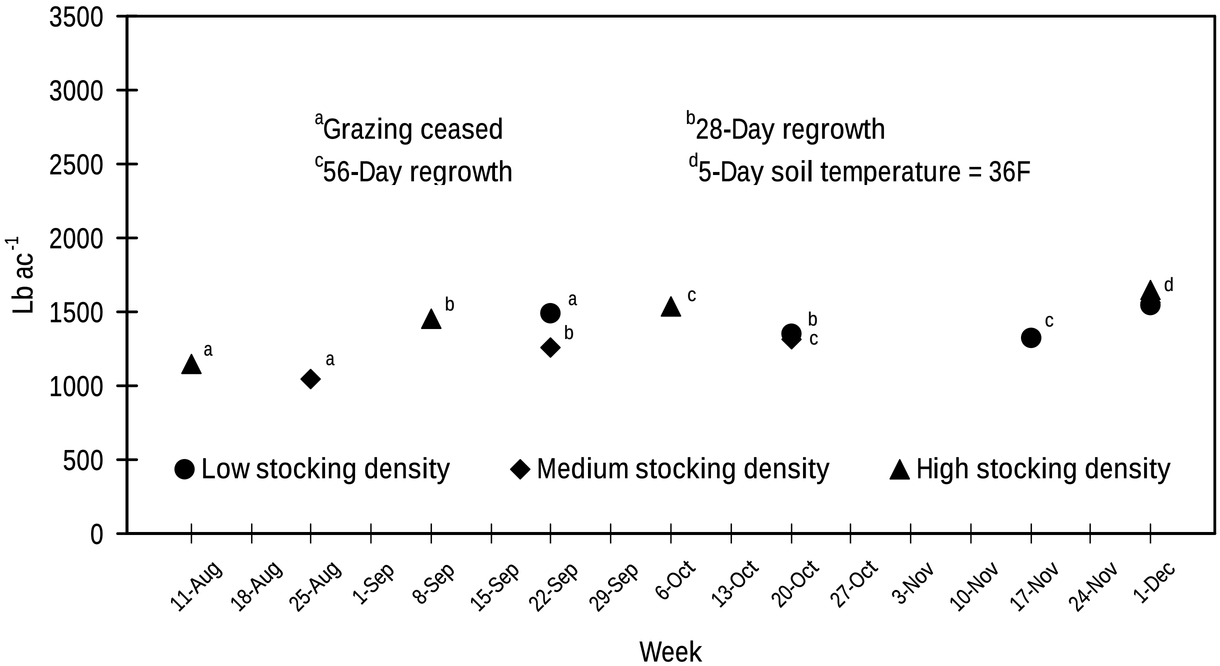

Figure 2. Regrowth of predominantly blue grama pastures that had been grazed at different stocking densities at the NMSU Agricultural Science Center at Tucumcari in 2004. Low, medium and high stocking densities were 1.00, 1.67, and 2.33 hd ac^{-1}, respectively. Grazing duration was adjusted to accommodate an equal number of head days of grazing during the season.

Development of Brangus Yearling Heifers and Cows

Investigator(s):

R.E. Kirksey, Milton Thomas (Animal and Range Sciences), L.M. Lauriault, M.L. Mead, L.F. Perkins, B. Griggs, and P. Cooksey

Objectives:

To provide a location for the development of Brangus yearling heifers and cows from the NMSU College Ranch due to limited forage availability at that location.

Materials and Methods:

Eight yearling heifers, ten cows, one bull, and 9 calves were received from the NMSU College Ranch on May 27, 2004. The heifers and cows are part of the herd development program managed by Dr. Milton Thomas. All females had been artificially inseminated prior to their delivery to Tucumcari and were placed with the bull only after their arrival at Tucumcari. The Brangus herd was moved through a variety of pastures and pasture types while at Tucumcari. The bull was removed from the herd on August 2 and returned to the NMSU College Ranch. While at Tucumcari, the heifers were provided free-choice access to white salt and 12:12 Ca:P mineral block and no other supplement. The cows and heifers were pregnancy checked on September 24, 2004. One of the yearling heifers was open and was shipped back to the college ranch along with all of the calves. The remaining cows and heifers were shipped to the main campus at Las Cruces on November 15, 2004. All animals (except the bull) were weighed upon arrival at the center and on the date of shipment from the center.

Results and Discussion:

Upon arrival at Tucumcari on May 27, average body weights for the cows, yearling heifers, and calves were 864, 745, and 271 lb, respectively. On September 24, average body weights had increased to 1042, 964, and 571 lb, resulting in daily gains of 1.49, 1.83 and 2.50 lb. for the cows, yearling heifers and calves, respectively. From September 24 to November 15, the cows gained an additional 89 lb and the yearling heifers gained 98 lb, for daily rates of gain of 1.68 and 1.85 lb, respectively. Seasonal gain by all animals, excluding the herd bull, totaled 6,806 lb.

Performance of Selected Summer Annual Forages as Monocultures and Intercrops

Investigator(s):

L.M. Lauriault, R.E. Kirksey, L.F. Perkins, B. Griggs, M.L. Mead, and P.L. Cooksey.

Objective:

To evaluate yield and nutritive value of selected sorghum forages as monocultures and intercropped with legumes for harvested feed.

Materials and Methods:

The test was a split-plot with 4 randomized complete blocks in which sorghum forage was the whole plot (PS210BMR, a photoperiod-sensitive sorghum x sudangrass hybrid, and BMR100, a single-cut forage sorghum) and legume intercrop treatment was the subplot (monoculture sorghum forage and sorghum forage mixed with cowpea, lablab, soybean, and tepary bean). Each sorghum forage-legume intercrop treatment combination appeared twice in each block because two harvest dates were anticipated as a strip whole plot. For the harvest date treatment, an early harvest was to be taken when the BMR100 reached the late milk/early dough stage, which had been in late August in other studies, and a late harvest was to be taken in late September when the PS210BMR initiated heading, which had been in late September. Because of low precipitation in May and June, emergence was delayed until approximately July 1. Heading by both BMR100 and PS210BMR were delayed such that the BMR100 was in the late milk/early dough stage at nearly the same time that PS21BMR headed. Thus, there was only one harvest date with each treatment replicated 8 times.

The soil was Canez fine sandy loam. Fertilizer (91-104 lb N-P_2O_5 ac^{-1}) was applied pre-plant and incorporated, as was Dual (2 pt ac^{-1}). Plots were sown May 14, 2004, into a conventional tilled flat seedbed using a disk drill (6-inch drill spacing) fitted with a seed-metering cone. Each plot was 7.5 x 15 ft. The seeding rate for grasses was 15 lb ac^{-1}. All legumes were sown at 30 lb ac^{-1}. Seed for intercrop components were combined and sown in the same operation. Grass seed was treated with a herbicide antidote (Concep III) to protect against the pre-emergent herbicide.

Standing forage was harvested October 26, using a John Deere Model 10 forage chopper, leaving 3-inch stubble. Chopped material from individual plots was collected in a garbage can and immediately weighed. Prior to dumping the garbage can, a sample from each plot was placed in a labeled paper bag and sealed in a plastic bag. Immediately after harvesting was complete, these samples were weighed, removed from the paper bag, dried at 150°F for 48 hours, and reweighed to determine dry matter percentage and to convert field weights to dry matter yield. These same samples were later re-dried, ground to pass through a 1 mm screen, and submitted to Ward Laboratories (Kearney, NE) for NIRS analysis of nutritive value components.

Dry matter yield and forage nutritive value data were analyzed using SAS PROC MIXED procedures to determine if differences ($P \leq 0.05$) existed between sorghum forage, among legume intercrop treatments, and the sorghum forage x legume intercrop treatment interaction. Rep was considered random. Least Squares Means were separated using the PDIFF option and, when appropriate, a protected Least Significant Difference (LSD) was generated using the standard error of the difference between two varieties calculated by PROC MIXED and the published t-value.

Results and Discussion:

Yield and nutritive value data and results of statistical analysis for the main effects of sorghum forage and legume intercrop treatment are presented in Table 9. Differences occurred between BMR100 and PS210BMR for all measured variables, except percentage legume in standing forage. Higher dry matter yields for PS210BMR than for BMR100 were likely due to that variety's longer vegetative growing season, also indicated by its lower dry matter percentage and higher crude protein (CP) at harvest (Table 9). Higher CP for PS210BMR also could be related to dilution by grain in BMR100. Lower neutral detergent fiber (NDF) and higher net energy for lactation (NE_L) for BMR100 than for PS210BMR were likely due to dilution of fiber components by grain production in BMR100 as well.

The legume intercrop treatment effect (Table 9) was significant for percentage legume in standing forage, in which sorghum forage-lablab bean had greater legume percentage than the other treatments. Additionally, NDF was different among legume intercrop treatments, with sorghum forage-lablab bean intercrops having the lowest NDF.

Table 9. The effect of sorghum forage and legume intercrop treatment on yield and nutritive value components of sorghum-legume forages at the NMSU Agricultural Science Center at Tucumcari in 2004.

Treatment	Dry matter yield tons/acre	Dry matter %	Legume %	CP %	NDF %	NE_L mcal/lb
Sorghum forage[1]						
BMR100	1.55	23.08	2.55	11.49	51	0.696
PS210BMR	1.75	20.39	2.90	13.99	52	0.674
Prob > F[2]	0.0095	0.0001	0.4695	0.0001	0.0307	0.0001
Legume intercrop treatment[3]						
None	1.65	21.49	0.00[b]	12.39	52[b]	0.684
Cowpea	1.66	21.98	0.06[b]	12.99	51[c]	0.686
Lablab	1.74	21.65	13.44a	13.14	50[d]	0.692
Soybean	1.48	21.01	0.00[b]	12.58	52[b]	0.687
Tepary	1.72	22.54	0.13[b]	12.62	53[a]	0.679
Prob > F	0.1919	0.5488	0.0001	0.4336	0.0036	0.1992
$LSD_{0.05}$[4]	Ns	Ns	1.52	Ns	1	Ns

CP, NDF, and NE_L signify crude protein, neutral detergent fiber, and net energy for lactation, respectively.
[1]Data are the means of four reps and five legume intercrop treatments.
[2]Prob > F is the probability of declaring a difference when one actually does not exist. That is, with a probability of $P < 0.0095$, we are 99.05% certain that the yields are different.
[3]Data are the means of four reps and two sorghum forages.
[4]$LSD_{0.05}$ stands for the least significant difference at the 95% probability. If the difference between two numbers within a column is equal to or greater than the LSD, there is a 95% certainty that they are different.
Ns means not significant at the 95% probability level.

The sorghum forage x legume intercrop treatment interaction was not significant for any variable.

Use of an Alfalfa-Sainfoin Mixture for Bloat Abatement and to Improve Seasonal Distribution of Sainfoin Forage Production

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

To determine the feasibility of using alfalfa to increase season-long productivity of sainfoin pastures and to use sainfoin to reduce the incidence of bloat in alfalfa pastures. Information from the 2003 growing season also is included in this report.

Materials and Methods:

A test was sown August 30, 2001, into conventional tilled seedbeds formed into beds on 3-foot centers for furrow irrigation. The soil type was Canez fine sandy loam with moderate to high pre-plant soil test levels of P, K, & B in the surface 6 inches. Treatments included: monoculture alfalfa (15 lb seed ac^{-1}), monoculture sainfoin (35 lb seed ac^{-1}), and alfalfa-sainfoin (5 and 30 lb seed ac^{-1} alfalfa and sainfoin, respectively). A disk drill fitted with a seed-metering cone was used for planting drilled treatments. The test is a 3 x 3 modified Latin Square originating from a 12 x 12 Latin Square. Each plot is 15 ft x 6 ft (2 beds) all of which was harvested. There is a 3-ft skip between plots to serve as a border.

On May 10, 2004, 22-104-00 lb N-P_2O_5-K ac^{-1} was broadcast over the entire test area. The test was not irrigated in 2004.

Percentage stand of each sown species was rated on March 30, 2004. No yield data were collected in 2004. Percentage stand data were subjected to SAS procedures for tests of significance.

Results and Discussion

Unavailability of irrigation water after 2001 likely limited the competitive ability of the sainfoin in this study and led to nearly complete stand loss of sainfoin by spring 2004 with no differences between treatments (<3% stand). Additionally, percent stand of the monoculture alfalfa had declined to approximately 30%, again with no differences among treatments, so the trial was terminated.

The Effect of Supplemental Nitrogen and Glysophate Sainfoin Production

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

To compare performance of two sainfoin cultivars, to evaluate the level of glyphosate resistance in those sainfoin varieties, and the effect of nitrogen applications on sainfoin yield.

Materials and Methods:

A test was sown August 30, 2001, into conventional tilled seedbeds formed into beds on 3-foot centers for furrow irrigation. The soil type was Canez fine sandy loam with moderate to high pre-plant soil test levels of P, K, & B in the surface 6 inches. There was a factorial treatment arrangement that included: sainfoin varieties ReMont and ReNuMex; glyphosate (10 gpa, 2.5%) applied after recovery from harvest; and nitrogen (20 lb/ac as granulated urea) applied to each growth cycle. A disk drill fitted with a seed-metering cone was used for planting drilled treatments. The test is a 3 x 3 modified Latin Square originating from a 12 x 12 Latin Square. Each plot is 15 ft x 6 ft (2 beds) all of which was harvested. There is a 3-ft skip between plots to serve as a border.

On May 10, 22-104-00 lb N-P_2O_5-K ac^{-1} was broadcast over the entire test area. Because irrigation water was not available, the test was not irrigated in 2004.

Percentage stand of sainfoin was rated on March 30. No treatments were applied in 2004 and no yield measurements were taken.

Results and Discussion:

The unavailability of irrigation water since spring 2001 led to nearly complete stand loss by March 2004 so the test was terminated.

Use of Alfalfa as an Economic Companion Crop to Establishment of Kura Clover

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

To determine the feasibility of using alfalfa to recover land costs during the establishment phase of kura clover.

Materials and Methods:

Tests were sown September 14, 1999 and September 5, 2000 into conventional tilled seedbeds formed into beds on 3-foot centers for furrow irrigation. The soil type was Quay fine sandy loam with moderate to high pre-plant soil test levels of P, K, & B as well as 550 ppm Na in the surface 6 inches. Treatments included: alfalfa, broadcast; alfalfa, drilled; kura clover, broadcast; kura clover, drilled; alfalfa-kura clover, in alternate drill rows; alfalfa-kura clover, broadcast together; alfalfa-kura clover, drilled together; alfalfa, broadcast-kura clover, drilled; and alfalfa, drilled-kura clover, broadcast. A disk drill fitted with a seed-metering cone was used for planting drilled treatments. Broadcast and alternate drill treatments were hand-sown and raked-in to improve seed-soil contact. The seeding rate for monocultures was 20 lb ac^{-1} and half that rate for each species in mixtures.

Each test is an 8 x 4 Youden Square with 4 reps of each treatment except monoculture alfalfa of which there are two reps each of the broadcast and drilled treatments. Each plot is 6 ft (2 beds) x 17 ft all of which was harvested. There is a 3-foot skip between plots to serve as a border.

On May 10, 22-104-00 N-P_2O_5-K ac^{-1} was broadcast over the entire test area. Because irrigation water was not available, the tests were not irrigated in 2004.

Percentage ground cover of each sown species was rated on October 25. Standing alfalfa forage was removed without measurement on May 18, June 15, July 22, August 25, and October 26. Ground cover data were subjected to SAS procedures for tests of significance.

Results and Discussion:

Percentage ground cover data for both tests are presented in Table 10. Although percentage ground cover of kura clover in both studies had increased from 2001 to 2003, little change occurred from 2003 to 2004. Very little change has occurred in percentage stand of alfalfa over the years. Data collection will be similar in both tests and is expected to continue indefinitely. Hopefully, yield data collection can resume soon with the availability of irrigation water.

Table 10. Percentage ground cover of alfalfa and kura clover measured in 2004 of alfalfa-kura clover mixtures sown in 1999 and 2000, at the NMSU Agricultural Science Center at Tucumcari.

	1999 Planting		2000 Planting	
Treatment	Alfalfa	Kura clover	Alfalfa	Kura clover
Alfalfa, broadcast	95.00	0.00	82.50	0.00
Alfalfa, drilled	100.00	0.00	87.50	0.00
Kura clover, broadcast	0.00	26.25	0.00	25.25
Kura clover, drilled	0.00	46.25	0.00	25.00
Alfalfa-Kura clover, in alternate drills	78.75	5.00	62.50	15.00
Alfalfa-Kura clover, broadcast together	92.50	0.00	83.75	0.50
Alfalfa-Kura clover drilled together	100.00	0.00	87.50	0.25
Alfalfa, drilled-Kura clover broadcast	100.00	0.00	81.25	0.00
Alfalfa, broadcast-Kura clover drilled	85.00	3.25	82.50	0.25
Mean	60.31	8.28	69.21	10.09
Prob > F	0.0001	0.0019	0.0001	0.0001
LSD (0.05)	11.62	14.71	6.02	14.78

†The probability that there is not a difference between the treatment means in that column within a test. A significance of 0.0001 indicates that we can the 99.99% certain that a difference truly exists. Generally, we accept differences as being significant at the 95% level (Prob. > F = 0.0500).
‡Treatment means in the same column within tests that differ by the LSD (0.05) are significantly different from each other.

The Effect of Seeding Rate on Percentage Stand and Yield of Furrow-Irrigated Alfalfa

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

To determine if increasing the seeding rate of alfalfa gives an increase in yield.

Materials and Methods:

A test was sown August 30, 2001, into conventional tilled seedbeds formed into beds on 3-foot centers for furrow irrigation. The soil type was Canez fine sandy loam with moderate to high pre-plant soil test levels of P, K, & B in the surface 6 inches. Treatments included monoculture Dona Ana alfalfa sown at 15 and 30 lb/ac. A disk drill fitted with a seed-metering cone was used for planting drilled treatments. The test is a 3 x 3 modified Latin Square originating from a 12 x 12 Latin Square. Each plot is 15 ft x 6 ft (2 beds) all of which was harvested. There is a 3-ft skip between plots to serve as a border.

On May 10, 22-104-00 lb N-P_2O_5-K ac^{-1} was broadcast over the entire test area. Because irrigation water was not available, the test was not irrigated in 2004.

Percentage stand of alfalfa was rated March 30, but no yield data were collected in 2004. Percentage stand data were subjected to SAS procedures for tests of significance.

Results and Discussion:

As in the past, there was no difference between treatments in percentage stand in 2004. This test will be continued to hopefully collect more yield data once the drought ends.

Performance of Alfalfa Cultivars at Tucumcari in 2004

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, B. Griggs, M.L. Mead, and L.F. Perkins

Objective(s):

To evaluate the performance of alfalfa varieties submitted by proprietors in the Tucumcari Irrigation Project.

Materials and Methods:

Tests were managed under an intensive harvest regime to optimize yield in a hay production system. Traditional yield trials were sown in 1999 and 2001. Both tests were Randomized Complete Block designs with 4 replications; each plot was 6 ft (2-36" furrow beds) x 15'. Soil types were Canez and Quay fine sandy loams. The fields were conventionally tilled and formed into 36-inch beds for furrow irrigation. The planting rate was 20 lb seed product/acre sown with a disk drill fitted with a seed-metering cone. Seed not pre-inoculated was treated with *Rhizobium*. Planting dates are given in Tables 11 and 12. Fertilizer (22-104-0 N-P_2O_5-K/acre) was uniformly applied to each test on 10 May 2004. Tests were not irrigated in 2004 and had not been since 2002. On each harvest date (shown in the tables), plots were harvested to 3 inches using a John Deere Model 10 forage chopper. Fresh weights were measured in the field. A subsample of the harvested material from each plot was collected, weighed, and dried at 70^{o}C for 48 hr to determine dry matter concentration (DM), which was used to convert plot fresh weights to dry matter tons per acre.

Results and Discussion:

Yield data were subjected to SAS procedures for tests of significance and means separation and are presented in Tables 11 and 12. Yields of the 1999 test were lower in 2004 compared to 2003. This was likely due to much lower yields in June (2.54 tons/acre in June 2003 compared to 0.41 tons/acre in June 2004) caused largely by low precipitation in May and June 2004 (Table 11). Varieties that were the best performers under rain fed conditions (2003-2004) also yielded well under irrigation (2000-2001).

A report giving results from statewide testing in 2004 and previous years is available from the Agricultural Science Center at Tucumcari, New Mexico, from Cooperative Extension Service offices, or Online at http://cahe.nmsu.edu/pubs/research/agronomy/var04.pdf. This publication also provides more information about selecting an alfalfa variety.

Table 11. Dry matter yields (tons/acre) of alfalfa varieties sown September 14, 1999, at the NMSU Agricultural Science Center at Tucumcari and scheduled to be furrow-irrigated once per cutting but only on May 15 in 2002 and not at all since then due to water shortages.

Variety	2000 Total	2001 Total	2002 Total	2003 Total	2004 Harvests May 18	Jun 15	Jul 22	Aug 25	Oct 26	2004 Total	5-yr Average
Wilson	4.27*	8.96*	9.21**	7.61**	1.69*	0.77**	1.21**	1.42*	0.47*	5.54**	7.12**
NM9D11A-	4.44*	9.85*	8.62*	6.93*	1.50*	0.74*	1.20*	1.56**	0.50**	5.49*	7.07*
Archer II	3.95*	9.72*	8.25*	6.61*	1.64*	0.48*	0.86	1.43*	0.31	4.73*	6.65*
NC+605	4.48**	9.47*	8.59*	6.42*	1.53*	0.45*	0.68	1.29*	0.31	4.25	6.64*
Magna 601	3.80*	9.54*	8.86*	6.26	1.54*	0.50*	0.79	1.28*	0.39	4.49	6.59*
Rio Grande	4.11*	9.92**	8.33*	5.83	1.27	0.42*	0.67	1.26*	0.32	3.94	6.43*
5681	4.25*	9.67*	8.09*	6.08	1.44*	0.35	0.56	1.04	0.27	3.66	6.35*
Dona Ana	3.34	9.04*	8.56*	6.19	1.57*	0.52*	0.83	1.24*	0.34	4.50	6.32*
54Q53	2.95	8.99*	8.23*	6.59*	1.43*	0.56*	0.83	1.32*	0.33	4.46	6.24
WL 327	3.30	9.35*	7.97*	6.01	1.60*	0.37*	0.66	1.14	0.36	4.12	6.15
ZX9362	4.06*	9.36	8.20*	5.97	1.16	0.24	0.47	0.91	0.24	3.01	6.12
WL 442	4.01*	8.39	7.98*	6.09	1.12	0.51*	0.80	1.25*	0.36	4.04	6.10
SD Common	2.40	9.04*	8.12*	6.30	1.72**	0.41*	0.85	1.26*	0.33	4.56	6.08
Sutter	3.01	9.14	7.96*	5.74	1.50*	0.47*	0.81	1.28*	0.38	4.44	6.06
NM Common	3.22	9.16*	7.68	5.97	1.50*	0.46*	0.69	1.16	0.32	4.13	6.03
Cimarron 3i	3.09	8.91*	8.53*	5.46	1.41*	0.32	0.57	1.09	0.32	3.70	5.94
6420	2.72	9.10*	7.98*	6.23	1.35*	0.32	0.53	1.13	0.27	3.60	5.92
Dagger+EV	3.03	9.14*	7.65	5.52	1.39*	0.39*	0.74	1.27*	0.33	4.12	5.89
Ram	3.49*	8.95*	7.95*	5.13	1.55*	0.26	0.47	1.09	0.34	3.70	5.84
Abilene+Z	3.33	9.28*	7.83	5.22	1.13	0.43*	0.38	0.89	0.23	3.07	5.75
6550	2.75	8.80*	7.44	5.78	1.33	0.37*	0.51	0.98	0.20	3.38	5.63
DK 142	2.81	8.74*	7.79	5.45	1.29	0.23	0.42	0.91	0.17	3.01	5.56
Magnum V	2.78	8.92*	7.34	5.26	1.24	0.21	0.42	1.05	0.18	3.10	5.48
ABT 400SCL	2.88	8.54	7.24	5.09	1.24	0.29	0.43	1.00	0.20	3.15	5.38
GH 766	2.75	8.38	6.93	4.82	1.26	0.36	0.56	1.25*	0.21	3.63	5.30
ABT 350	2.92	8.17	7.36	5.08	1.23	0.26	0.42	0.79	0.19	2.88	5.28
PGI 4372	1.70	7.98	6.62	5.79	1.51*	0.44*	0.72	1.22	0.20	4.08	5.23
GH 750	2.29	8.57	7.12	4.91	1.15	0.26	0.42	0.98	0.15	2.95	5.17
Mean	3.29	9.04	7.94	5.87	1.40	0.41	0.66	1.16	0.29	3.92	6.01
LSD (0.05)	1.04	1.04	1.29	1.28	0.38	0.23	0.31	0.33	0.11	1.04	0.88
CV%	22.39	8.17	11.51	15.54	19.30	40.05	33.58	20.05	27.81	19.01	23.30

Yield data from previous years may be different than that presented in other publications due to a difference in statistical analysis methods.
2000 Harvest dates: Jun 21, Jul 20, Aug 17, Sep 11, and Nov 2.
2001 Harvest dates: May 10, Jun 11, Jul 9, Aug 7, Sep 10, and Oct 29.
2002 Harvest dates: May 9, Jun 4, Jul 9, Aug 6, Sep 18, and Oct 29.
2003 Harvest dates: May 27, Jun 30, Jul 29, Sep 3, and Oct 30.
**Highest numerical value in the column.
*Not significantly different from the highest numerical value in the column based on the 5% LSD.
LSD (0.05) stands for the Least Significant Difference at the 5% level. If the difference between two numbers within a column is equal to or greater than the LSD, it is 95% certain that they are different.
NS means that there were no significant differences between varieties within that column at the 5% level.

Table 12. Dry matter yields (tons/acre) of alfalfa varieties sown August 30, 2001, at the NMSU Agricultural Science Center at Tucumcari and scheduled to be furrow-irrigated once per cutting, but only on May 15 in 2002 and not at all since then due to water shortages.

Variety	2002 Total	2003 Total	May 18,2004	2004 Total	3-yr Average
Magna 601	3.91**	0.62*	0.43*	0.43*	1.66**
Wilson	3.85*	0.65*	0.37*	0.37*	1.62*
Tango	3.61*	0.71**	0.45*	0.45*	1.59*
HybriGreen 41	3.90*	0.42*	0.45*	0.45*	1.59*
NM9D11A-PAR	3.80*	0.63*	0.33*	0.33*	1.59*
NM Common	3.69*	0.61*	0.42*	0.42*	1.57*
Express	3.67*	0.40*	0.56**	0.56**	1.54*
Jade II	3.69*	0.57*	0.36*	0.36*	1.54*
RSC 681	3.76*	0.43*	0.43*	0.43*	1.54*
Archer	3.78*	0.49*	0.33*	0.33*	1.53*
HybriForce 400	3.61*	0.56*	0.32*	0.32*	1.50*
African Common	3.56*	0.60*	0.31*	0.31*	1.49*
Forecast 1001	3.43*	0.56*	0.41*	0.41*	1.47*
HayGrazer	3.54*	0.47*	0.34*	0.34*	1.45*
Dona Ana	3.46*	0.35*	0.53*	0.53*	1.45*
AmeriStand 403T	3.37*	0.43*	0.44*	0.44*	1.41*
Select	3.29*	0.51*	0.43*	0.43*	1.41*
WR9801	3.29*	0.39*	0.28*	0.28*	1.32*
Mean	3.62	0.52	0.40	0.40	1.52
LSD (0.05)	NS	NS	NS	NS	NS
CV%	7.97	38.45	25.75	25.75	14.15

Yield data from previous years may be different than that presented in other publications due to a difference in statistical analysis methods.
2002 Harvest dates: Jun 5, Jul 9, and Aug 6.
2003 Harvest date: Jun 12.
**Highest numerical value in the column.
*Not significantly different from the highest numerical value in the column based on the 5% LSD.
LSD (0.05) stands for the Least Significant Difference at the 5% level. If the difference between two numbers within a column is equal to or greater than the LSD, it is 95% certain that they are different.
NS means that there were no significant differences between varieties within that column at the 5% level.

Stripper Cotton Variety/Cultivar Performance for the High Plains of Eastern New Mexico and West Texas

Investigator(s):

R.E. Kirksey, L.M. Lauriault, R. Flynn (NMSU Agricultural Science Center at Artesia), L.F. Perkins, M.L. Mead, B. Griggs, and P. Cooksey

Objective:

Evaluate the performance of stripper cotton varieties/cultivars for the high plains of eastern New Mexico and West Texas.

Materials and Methods:

Due to the unavailability of water for irrigation in 2004, entries were solicited for a dryland stripper cotton trial at the Agricultural Science Center at Tucumcari. The trial included fifteen entries from three companies. Fertilizer (81 lb N ac^{-1} and 96 lb S ac^{-1}) and Treflan (2 pt ac^{-1}) were applied pre-planting. The soil test phosphorus level was high (42 ppm weak Bray). Plots were 12 ft (4 - 36 in rows) x 25 ft with 5 ft alleys between plots. The trial was planted on May 12, 2004 into a dry seedbed. The seeding rate for all entries was 70,600 seed per acre.

Results and Discussion:

No yield data were collected in 2004 since stand establishment and plant development were poor due to limited precipitation from late April through mid-June. Total precipitation from April 14 to June 26 was 0.77 inches and there was no precipitation from May 16 through June 19. In addition to the low precipitation, there were five days in early June with temperatures of 100 ºF and above.

Plant counts on July 22 revealed plant populations were 16% of the seeded rates. Since any yield data that would have been collected from the trial would not be an accurate representation of a variety's actual yield potential, the test was destroyed.

As per the terms of the fee-test program, one-half of the paid entry fees were refunded. Companies and cultivars entered in the 2004 performance trial were:

All-Tex Seed Inc.: AT005,
All-Tex Seed Inc.: AT201 RR,
All-Tex Seed Inc.: Excess RR,
Bayer Crop Science: FM5035LL
Bayer Crop Science: FM5045BR,
Bayer Crop Science: FM958LL,
Bayer Crop Science: FM960BR,
Bayer Crop Science: FM960RR,
Bayer Crop Science: FMX2031LL,
Delta and Pine Land Co.: DP432RR,
Delta and Pine Land Co.: DP434RR,
Delta and Pine Land Co.: DP444BG/RR,
Delta and Pine Land Co.: PM2145 RR,
Delta and Pine Land Co.: PM2266RR, and
Delta and Pine Land Co.: PM2280BG/RR.

Performance of Dryland Sorghum x Sudangrass Hybrids and Forage Sorghum Varieties

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead.

Objective:

To evaluate dry matter yield of sorghum x sudangrass hybrids and forage sorghum varieties submitted for testing in the New Mexico Corn and Sorghum Performance Trials.

Materials and Methods:

The test was sown May 20, 2004, into a conventional tilled flat seedbed, which was dry at planting. The soil was Canez fine sandy loam. Fertilizer (97-104-0 lb N-P_2O_5-K_2O ac^{-1}) was applied pre-plant and incorporated, as was Aatrex (2.5 lb ac^{-1}). Plots were sown with a disk drill (8-inch row spacing) equipped with a seed-metering cone and leaving a 5 ft skip between plots. The seeding rate was 10 lb ac^{-1} for all entries. Each plot was 5.33 x 15 ft all of which was to be harvested. There were four replications. No precipitation occurred until June 19 when a series of light showers promoted germination. Dry weather again occurred with high winds leading to desiccation. Plots were rated for percentage stand on August 24, 2004 and destroyed for cover crop planting.

Results and Discussion:

Table 13 shows varieties entered in the test. Percentage ground cover ranged from 4 to 14% (data not shown) with no differences between types (forage sorghum or sorghum x sudangrass hybrid, P = 0.4462) or varieties (P = 0.5329).

Table 13. Forage sorghum and sorghum x sudangrass hybrids entered in a dryland test at the NMSU Agricultural Science Center at Tucumcari, 2004.

Company	Variety	Forage type
UAP Southwest (Dyna-Gro Seed)	Dixie Lee	Forage sorghum
Seed Resource	FS515HQ	Forage sorghum
Seed Resource	FS555	Forage sorghum
Sorghum Partners, Inc.	SS405	Forage sorghum
Sorghum Partners, Inc.	1990	Forage sorghum
Sorghum Partners, Inc.	NK300	Forage sorghum
Sorghum Partners, Inc.	Sordan headless	Sorghum x sudangrass
UAP Southwest (Dyna-Gro Seed)	Danny Boy	Sorghum x sudangrass
Seed Resource	PS210BMR	Sorghum x sudangrass
Seed Resource	Forage King	Sorghum x sudangrass
Sorghum Partners, Inc.	Sordan-79	Sorghum x sudangrass
Seed Resource	SS200BMR	Sorghum x sudangrass

Performance of Grain Sorghum Varieties Managed Under Dryland

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead.

Objective:

To evaluate grain yield components of grain sorghum varieties submitted for testing in the New Mexico Corn and Sorghum Performance Trials.

Materials and Methods:

A test was sown May 13, 2004, into an untilled seedbed having 36-inch beds for furrow irrigation still formed from the previous year when the same crop was grown but not irrigated. The soil was Canez fine sandy loam. Fertilizer (97-104-0 lb N-P_2O_5-K_2O ac^{-1}) was surface applied pre-plant. Plots were planted using a Buffalo lister planter with a seed-metering cone on each planting unit at a seeding rate of 3 lb ac^{-1}. Seed was placed approximately 6 inches below the bed tops into moist soil, but only 1 to 2 inches below the surface after packing. Each plot was 6 x 36 ft (2- 36" furrow beds) with a 5 ft skip between plots. Aatrex (2.5 lb ac^{-1}) and Gramoxone Max (2 pt ac^{-1}) were broadcast immediately post-planting. The test was a randomized complete block with four replications.

Because of insufficient soil moisture during the growing season (Table 1) and non-uniform stands, grain yields were not measurable. So, on October 11, 2004, the most uniform section of a single row within each plot was hand-harvested to 2 inches to measure forage yield as an alternative to grain harvest. Percentage stand, date of initial heading, date of 50% bloom, and dry matter forage yield were subjected to SAS means separation procedures (least significant differences) to test for varietal differences.

Results and Discussion:

Varieties included in the test and results of statistical analyses are listed in Table 14. Although planted into moist soil, germination and emergence was delayed, likely leading to the non-uniform stands. Initiation of reproduction occurred during a dry period and differences in date of first heading and 50% bloom can be related to the time elapsed since the most recent precipitation [August 20 = 99 days after planting (DAP)]. Not all plots achieved 50% bloom so the number of replicates included in the analysis for date to 50% bloom is shown in parenthesis in Table 15. At least one head of all varieties produced mature seed by October 1. Thus, if precipitation had been adequate to promote flowering and grain filling, the growing season was long enough for a grain harvest from all varieties.

Generally, forage yield also was somewhat related to achieving 50% bloom. Although forage yield is low in this test, differences among varieties will likely be consistent under circumstances promoting higher forage yields, but still not measurable grain yields. Because all varieties produced mature grain, it is quite possible that the lower grain yields would provide enough energy for ensiling if the grain were uniformly distributed throughout the stand. Otherwise, hay harvest still is possible if weather permits.

Table 14. Forage yield and other variables measured on dryland grain sorghum varieties at the NMSU Agricultural Science Center at Tucumcari, 2004.

Variety	Stand, %	Date of first heading, DAP	Date of 50% bloom, DAP	Forage yield, t/a
NK7655	54	124	0 (4)	1.00
NK6641	48	114	125 (3)	0.71
NK6673	39	118	128 (4)	0.68
SR251	46	117	131 (3)	0.66
SR255C	36	113	133 (3)	0.60
NK5418	60	112	127 (1)	0.59
K35-Y5	41	114	126 (4)	0.53
Mean	46	116	128 (22)	0.68
LSD, 0.05	Ns	7	8	0.42

DAP = Days after planting (13 May 2004).
LSD, 0.05 = Least significant difference. If the difference between any two values in a column is greater than the LSD, we are 95% certain that they are truly different.
Ns = Not significantly different based on the LSD, 0.05.

Performance of Kenaf Under Dryland

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, C. Henson, and M.L. Mead

Objective(s):

Evaluate yield of kenaf under dryland in eastern New Mexico at the request of the Greater Tucumcari Economic Development Corporation.

Materials and Methods:

A test was planted May 14, 2004, into a minimally tilled seedbed that had been formed into 36-inch beds for furrow irrigation in 2003, but not planted in that year. The soil test phosphorus level was high (42 ppm weak Bray) due to fertilization the previous year. Fertilizer (81 lb N ac^{-1} and 96 lb S ac^{-1}) and Treflan (2 pt ac^{-1}) were applied pre-planting and incorporated. Kenaf varieties, 'Dowling,' 'Everglades 41,' 'Gregg,' and 'Tainung 2' were planted (6 seed ft^{-1}) using a Buffalo Flexi-planter fitted with cone seed distributors and listers set to remove the soil surface layer and place seed 0.75 inches into moist soil, which was approximately 4 inches below the original surface of the bed tops. Individual plots were 36 ft x 4 beds. Borders (18 ft) were located at the north and south ends of the test and there was a 4-ft skip between plots. The test was a 4 x 4 Latin Square. No irrigations were applied.

Uneven emergence occurred after planting, followed by more germination after precipitation occurring in late June and early July. Therefore, 8.2 ft of a single row in each plot was flagged for measurement of kenaf yield from early and late emergence to simulate early (mid-May) and late (1 July) planting. Naturally defoliated standing stems were harvested January 18, 2005, using a Gehl Model FH188 harvester, leaving 5-inch stubble. Chopped stem material from individual plots was collected in mesh bags and weighed. A sample from each plot was taken and weighed, dried at 150°F for 72 hours, and reweighed to determine dry matter percentage and to convert field weights to dry matter yield. These samples were later submitted to Vision Paper, Albuquerque, NM, for qualitative fiber analysis.

Quantitative data (percentage moisture at harvest and dry matter yield) were analyzed using SAS PROC MIXED procedures to determine the effects of emergence date and variety and their interaction. Least Squares Means were separated using the PDIFF option and, when appropriate, a protected Least Significant Difference (LSD) was generated using the standard error of the difference between two varieties calculated by PROC MIXED and the published t-value.

Results and Discussion:

There was a difference ($P < 0.0417$) in harvest moisture between emergence dates (11% vs. 9% moisture at harvest for the early and late emergence dates, respectively). Dry matter yield also was different ($P < 0.0001$) with the early emerging plots yielding nearly 4 times the late emerging plots (3,125 vs. 830 lb ac^{-1}, for the early and late emergence dates, respectively). Because of this great difference and the lack of any emergence date x variety interaction, only varietal data (dry matter percentage and yield) from the early emerging plots will be discussed.

No differences existed ($P > 0.05$) for percentage moisture at harvest (11, 12, 10, and 11% for Dowling, Everglades 41, Gregg, and Tainung 2, respectively). Dry matter yield also was not different among varieties in this study (3,505, 3,231, 2,269, and 3,495 lb ac^{-1} for Dowling, Everglades 41, Gregg, and Tainung 2, respectively). The lack of any significant yield difference between Gregg and the other varieties is likely related to high experimental variability (standard error of the difference between two varieties was 1118, with 6 degrees of freedom). High experimental variability can be common in dryland trials, especially if soil moisture is not uniform. Repetition of this trial in 2005 could reduce the variability as could testing at other locations.

Qualitative fiber analysis indicated a high percentage of bast fiber, which is the more valuable component, compared to core fiber. High bast fiber is generally related to plant density; but in the present case it could be due to low soil moisture availability. The material was not finely chopped, however, and, thus, retting was not as easy as is preferred. This is likely related to a machine adjustment and will be changed before further testing.

Performance of Grain and Forage Sorghum Planted in Different Seedbed Locations and Managed Under Dryland for Forage

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead.

Objective:

To evaluate the effect of planting location on forage dry matter production of sorghum forages.

Materials and Methods:

A test was sown May 14, 2004, into an untilled seedbed having 36-inch beds for furrow irrigation still formed from the previous year when a grain sorghum crop was grown but not irrigated. The soil was Canez fine sandy loam. Fertilizer (97-104-0 lb N-P_2O_5-K_2O ac^{-1}) was surface applied pre-plant. Grain sorghum (SR251, 3 lb ac^{-1}) and forage sorghum (BMR100, 5 lb ac^{-1}) were planted using a 4-row Buffalo lister planter. Planting depth was set to place seed near the top of soil moisture. Bed top treatments for both forage types were planted first, after which the planter was reset to plant in furrows. In each case, seed was placed approximately 6 inches below the original soil surface, but only 1 to 2 inches below the surface after packing. Each plot was 15 x 75 ft (5- 36" furrow beds) to allow for transition from beds to furrows within a planted row. Seed of both sorghum varieties had been treated with Concep III. Dual (2 pt ac^{-1}) and Gramoxone Max (2 pt ac^{-1}) were broadcast immediately post-planting. The test was a randomized complete block with four replications.

Because of low precipitation early in the growing season (Table 1) stands were not uniform. So, on October 11, 2004, the most uniform section of a single row within each plot was hand-harvested to 2
inches to measure forage yield. Forage dry matter yield data were subjected to SAS MIXED tests of significance for varietals and seedbed location differences and their interaction. Replicates were considered random as were all effects including that component.

Results and Discussion:

Forage sorghum produced higher forage yields than grain sorghum (0.74 vs. 0.56 ton ac^{-1} for forage and grain sorghum, respectively, $P < 0.0283$). There was no effect due to seedbed planting location ($P < 0.5755$) and no interaction between sorghum variety and seedbed planting location ($P < 0.4794$).

Performance of Dryland Sorghum x Sudangrass Hybrids at Different Planting Dates

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

Evaluate yield of sorghum x sudangrass hybrids planted on different dates under dryland.

Materials and Methods:

A test was planted into a conventionally tilled flat seedbed. Fertilizer (91 lb N ac^{-1} and 104 lb P ac^{-1}) and Dual (2 pt ac^{-1}) were applied pre-planting and incorporated. Planting date (May 20, June 9, June 30, and July 21) was the whole plot. Subplots were sorghum x sudangrass hybrids, 'BMR100' and 'PS210BMR.' Plots were planted using a drill fitted with a cone seed distributor and drills set on 10-inch centers. The seeding rate was 10 lb seed ac^{-1}. Individual plots were 15 x 7.5 ft, of which the center 15 x 5 ft was to be harvested. Borders of the same size as plots surrounded the test and there was a 5-ft skip between plots. The test was a randomized complete block with 4 replicates. No irrigations were applied.

Standing forage was harvested October 26, using a John Deere Model 10 forage chopper, leaving 3-inch stubble. Chopped material from individual plots was collected in a garbage can and immediately weighed. Prior to dumping the garbage can, a sample from each plot was placed in a labeled paper bag and sealed in a plastic bag. Immediately after harvesting was complete these samples were weighed, removed from the paper bag, dried at 150°F for 48 hours, and reweighed to determine dry matter percentage and to convert field weights to dry matter yield.

Dry matter yield data was analyzed using SAS PROC GLM procedures to determine the effects of planting date and variety and their interaction. When the F-test was significant, means were separated by protected least significant difference.

Results and Discussion:

There was no difference ($P < 0.8569$) in dry matter yield between sorghum x sudangrass varieties (1.32 and 1.31 tons ac^{-1} for BMR100 and PS210BMR, respectively). There was a difference across planting dates (1.21, 1.33, 1.56, 1.16 tons ac^{-1} for May 20, June 9, June 30, and July 21 respectively, $LSD_{0.05}$ = 0.21 tons ac^{-1}) that was likely related to timing of precipitation and the lateness of planting on July 21. Monthly precipitation for 2004 at the Agricultural Science Center at Tucumcari is given in Table 1. Low precipitation in May and early June delayed emergence of the first two planting dates and likely reduced plant vigor that could not be overcome by average to very high precipitation from July to October. Late June precipitation (1.70 inches of the month's total) provided optimum soil moisture for germination, emergence and early growth of the June 30 planting, which was sustained by continued precipitation that also promoted germination and early growth of the July 21 planting. As temperatures cooled later in the growing season (Table 5), growth of the sorghum forages would have slowed such that the late July planting could not maximize utilization of available soil moisture.

Producers planting dryland sorghum forages should consider delaying planting until as late as the end of June until sufficient soil moisture is available to promote germination. There is likely a yield sacrifice to earlier planting if the seedbed is dry seedbed and precipitation does not occur within 7 days. Planting later than the end of June is likely to have a negative effect on yield.

Performance of Alfalfa Varieties of Different Fall Dormancies Under Different Winter Irrigation Regimes

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, C. Henson, and M.L. Mead

Objective(s):

To measure persistence of alfalfa cultivars from different fall dormancy categories after an extended period of drought and to determine a baseline for future use of the test area in an alfalfa renovation study.

Materials and Methods:

The test is a split-split plot in a randomized complete block design with 4 replications where winter irrigation regime (irrigated once for each cutting or that plus supplemental irrigations from Nov.-Mar.) is the main plot, fall dormancy category (2 to 9) is the sub-plot and cultivar within fall dormancy category (Viking 1, DK127, Garst645, Rainier, Jade II, Landmark, Archer, Baralfa54, Tahoe, Wilson, Dona Ana, Helena 7000, 13 R Supreme, WL525HQ, Salado, and WL612) is the sub-sub-plot. Sub-sub-plots are arranged in a square, but grouped in rows by adjacent fall dormancy ratings (2 & 3, 4 & 5, 6 & 7, 8 & 9); each sub-sub-plot was 6 (2- 36" beds) x 18 ft. The soil type is Canez fine sandy loam. Plots were sown using a disk drill fitted with a seed-metering cone on Apr. 30, 1997, into a conventional tilled seedbed formed into beds for furrow irrigation. All seed was treated with *Rhizobium* and planted at 20 lb ac^{-1}.

Since 2001 the test area had been unmanaged, receiving no pest control or fertilizer applications or irrigation. Swathing and baling occurred as needed to remove top-growth, approximately once each year (2002 to 2004), during the spring. On October 25, 2004 plots were rated for stand percentage.

Statistical analysis:

Percentage stand ratings were subjected to SAS procedures for tests of significance ($P<0.05$) for irrigation treatment, fall dormancy category, variety within fall dormancy category, and the interactions between irrigation and both fall dormancy category and variety within fall dormancy category.

Results and Discussion:

There was no difference ($P<0.8475$) in stand percentage between irrigation treatments. Fall dormancy categories 2 through 8 were all different ($P<0.0001$) from fall dormancy category 9 (66, 68, 74, 66, 63, 66, 64, and 24% for FD = 2 to 9, respectively; $LSD_{0.05} = 14$). This difference is likely due to a cowpea aphid infestation in 2001 that was concentrated on the fall dormancy 9 varieties, which had broken dormancy. Other varieties were effectively protected from the attack by continued dormancy and an insecticide application across the entire test that controlled the cowpea aphids.

There also was a difference in variety within fall dormancy category limited to the fall dormancy 8 varieties, such that 13 R Supreme had higher percentage stand than WL525HQ (73 vs. 56% for 13 R Supreme and WL525HQ, respectively, $P<0.0134$).

It is anticipated that this test area will be divided into 2 replicates of four treatments (8 whole plots) superimposed on previous irrigation treatment whole plots for use in an alfalfa renovation study to be planted in late summer 2006, if irrigation water is available.

Bindweed Mite Research and Educational Projects and Distributors in New Mexico and Elsewhere

Investigator(s):

L.M. Lauriault, M. Renz, D.C. Thompson, L.F. Perkins, B. Griggs, C. Henson, M.L. Mead, R.E. Kirksey, and P.L. Cooksey

Objective(s):

The purpose of this project is to educate agricultural and non-agricultural sectors about using the *Aceria malherbae* gall mite for control of field bindweed (*Convolvulus arvensis*) and to distribute it throughout New Mexico. Work continues to determine the limits of the mite's adaptation in semiarid environments and management schemes to enhance bindweed control through a combination of biological, chemical and cultural practices.

Research projects:

Study 1.

A project was initiated in June 2004 to evaluate the effect of herbicide applications on mite-infested bindweed, mite populations and intraplant mite migration. Herbicide treatments, applied June 3, were carfentrazone [0.31 lb active ingredient (ai) ac^{-1} + 0.25% v/v nonionic surfactant (NIS)], glyphosate [3 lb acid equivalent (ae) ac^{-1} + 0.50% v/v NIS], and untreated control. Spray solution for both herbicide treatments was applied at 30 gpa. Plots were 10 x 30 ft and there were 4 replications in a randomized complete block design. Three soil core samples (8-inch diameter x 15 inches) were taken from each plot on June 3 (immediately prior to the herbicide application), June 9 & 17, and July 27. The soil corer was placed such that a bindweed crown was at the center. Prior to coring, crowns within the core area (50.27 in^2) were counted and the top-growth removed. After coring, roots greater than an approximately specified diameter (measured later in another study) were recovered from the 0-3 inch, 3-6 inch, and 6-12 inch depths, by hand separation in the field. All top-growth and root samples were placed in sealable plastic containers, which were filled with 70% alcohol for future laboratory mite counts. Once in the lab, each sample was vigorously shaken and washed with additional alcohol. Rinsate was collected and filtered through medium flow, black filter paper. All mites found on the filter paper were counted by scanning the surface using a 40X dissecting scope. After plant samples had been washed, plant material was dried for 48 hours at 150°F and weighed.

Study 2.

Another project to measure the effect of mite infestation on root characteristics and carbohydrate concentrations before and after winter was started October 21, 2004 when ten cores were taken as previously described. Five of the cores were taken from an area known to be infested with mites and each included at least one crown with top-growth having evidence of mite infestation. The other five cores were taken from a different area, which did not show evidence of infestation. Crowns were counted and top-growth preserved as described above to verify the presence or absence of mites and population levels. Cores from the 0- to 12-inch depth were bagged as a single sample in the field and taken to the lab for root recovery. Roots greater than the same specified diameter mentioned above were recovered by washing the soil away. Once rinsed, diameters of the largest and smallest roots were measured and the samples dried for 48 hours at 150°F. Subsequently, these samples were submitted to Ward Laboratories (Kearney, NE) for carbohydrate analysis by NIRS, which returned values for other components as well.

Study 3.
A third project to determine the effect of seasonal environmental changes on intra-plant migration from top-growth to the roots began September 27, 2004. Top-growth from a different crown showing mite damage was taken each week for the remainder of 2004 and until mite damage is evident in spring 2005. Prior to freeze down, several infested crowns were marked for sampling when no living top-growth was present. When there as no living top-growth, dead plant material attached to the crown and litter near the crown was collected. Top-growth samples were preserved in alcohol using the same procedure described for the other projects.

Results:

No data are available from Studies 1 and 3 as of publication of this Annual Report. Preliminary data from Study 2 are presented in Table 15. Diameter of the narrowest roots collected did not differ between infested and non-infested field bindweed, averaging 0.87 mm, which is the same approximate diameter used in Study 1. Since these roots were collected, a different root washing technique was developed that retains nearly all roots. This technique will be used in the future, negating the need to measure narrowest root diameter for Study 2. Only roots greater than this same approximate diameter will continue to be collected for Study 1.

Table 15. Root characteristics of infested (*Aceria malherbae*) and non-infested[1] field bindweed at the NMSU Agricultural Science Center at Tucumcari, NM, fall 2004.

Type	NFC %	CP %	ADF %	NDF %	TDN %	Ca %	P %	K %	Mg %	Crowns per core (50.27 in^2)	Root wt. g	Root diameter Widest mm	Root diameter Narrowest mm
Non-infested	56	10.0	22	26	77	1.09	0.25	2.38	0.29	2.80	3.20	4.82	0.82
Infested	49	16.9	22	26	77	1.06	0.25	2.06	0.38	1.20	1.78	3.84	0.91
Mean	53	13.5	22	26	77	1.04	0.25	2.22	0.34	2.00	2.49	4.33	0.87
Prob > F[2]	0.0434	0.0001	0.9290	0.8706	0.9195	0.6744	0.6586	0.0017	0.0031	0.0883	0.2212	0.1741	0.3199

[1]Infestation was estimated by visual observation of the presence or absence of mite damage to leaves. Laboratory analysis will be used for verification. NFC, CP, ADF, NDF, TDN, CA, P, K, and MG signify non-fiber carbohydrates, crude protein, acid detergent fiber, neutral detergent fiber, total digestible nutrients, calcium, phosphorus, potassium, and magnesium, respectively, all expressed as a percentage of dry matter.

[2]Prob > F is the probability of declaring a difference when one actually does not exist. That is, with a probability of P < 0.0434, it is 95.66% certain that the NFC is different between types.

Mite infestation decreased non-fiber carbohydrates (NFC) and potassium (K) and increased crude protein (CP) and magnesium (Mg) without affecting other components (Table 14). Crowns per core, root weight, and widest root diameter may also be affected by mite infestation, but not significantly in this data. It is anticipated that the new root washing technique will give a more accurate measurement of root weight. High NFC, CP, and total digestible nutrients (TDN) and low acid detergent fiber (ADF) and neutral detergent fiber (NDF) Indicate that field bindweed roots have excellent nutritive value (Table 14). The calcium (Ca) to phosphorus (P) ratio also is within the acceptable range for ruminants, but high for nonruminants. At these root weights, only 687 lb ac^{-1} of dry matter was available; thus, bindweed roots could not serve as the only source of feed. Any supplemental feed should encourage use of the bindweed roots as the primary feed until depleted.

For feed use, mechanisms must be developed to extract roots and deposit them at the surface for animal access. This also will likely help with control or eradication of the field bindweed. Before that endeavor is undertaken, animal acceptability needs to be assessed. If root extraction and animal use are determined to be a valuable means of field bindweed control, they might be used once or twice during the fallow period, after wheat harvest in a grain sorghum-wheat-fallow rotation. Tillage of chemically untreated bindweed while it is actively growing will increase available feed quantity and possibly nutritive value.

In a study unrelated to these projects, evidence of mite infestation was observed on field bindweed after applications of Plateau herbicide to tall wheatgrass (project described elsewhere in this Annual Report), indicating that Plateau is likely not toxic to the mites.

A proposal for a multi-state (Texas and New Mexico) grant sponsored by CREEES/WRIPMCGP, entitled, ‘Effectiveness of integrating control methods with *Aceria malherbae* to improve long-term management of field bindweed.’ was submitted in late 2004. Collaborators on the grant included Mark Renz (NMSU Extension Weed Specialist), Dave Thompson (NMSU Entomologist), Jerry Michels (Entomologist, TAES, Bushland), and Leonard Lauriault (Forage Agronomist, NMSU Agricultural Science Center at Tucumcari). The project focus was management of the mite in wheat-milo-fallow rotations with total funding estimated at $42,000 for 2006-2008.

Educational projects:

Presentations were made in 2004 at the Quay County Agriculture and Home Economics Seminar (January 22) and at a Mini Field Day near Broadview sponsored by the Curry County Cooperative Extension Service (June 10).

New Mexico State University Cooperative Extension Circular 600, Managing *Aceria malherbae* gall mites for control of field bindweed, which describes management of the mite, was published in September 2004. This publication also includes a Zoomerang survey to receive feedback about successes or failures by mite users. The survey, developed by Dr. Wendy Hamilton, Head of the Department of Program Development and Accountability, also is available Online at the Agricultural Science Center at Tucumcari website. In another publication [Rodriguez-Navarro, S, G. Torres-Martinez, and J. Olivares-Orozco. 2004. Biological control of field bindweed (*Convolvulus arvensis* L.) using *Aceria malherbae* (Acari: Eriophyidae) in Mexico. Internat. J. Acarol. 30:153-155], the Agricultural Science Center was acknowledged as the source of mites for the first introduction into Mexico.

Distribution:

In 2004, 33 individuals requested the mites, including one each from Arizona, California, Colorado, Texas, Washington State, and the United Kingdom. Twenty-five individuals received the mites or were referred to a closer source. Requests from Colorado, Texas, and Washington State were referred to programs or researchers in their home state. California still does not permit distribution of the mite. The request from the United Kingdom was referred to a source in Switzerland. An APHIS permit was applied for to distribute mites into Arizona. All indications are that it will be approved by APHIS and the Arizona Department of Agriculture. First time distributions to Grant, Luna, and Socorro counties in New Mexico were made by referral.

Use of BASF's Plateau Herbicide for Seedhead Suppression and Field Sandbur Control in Tall Wheatgrass

Investigator(s):

L.M. Lauriault, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead

Objective(s):

To determine the safety and efficacy of BASF's Plateau (Ammonium salt of imazapic, 23.6% a.i.) herbicide for seedhead suppression and field sandbur control in tall wheatgrass. The goal of this project, if successful, is to acquire labeling of Plateau herbicide for use on 'Jose' tall wheatgrass pastures.

Materials and Methods:

Monoculture tall wheatgrass was established in 1997 as part of a grazing trial. Prior to seeding the land was prepared for irrigation with raised beds and furrows on 40-inch centers. The preliminary phase of the project was to apply treatments to tall wheatgrass that would normally be irrigated. Water for irrigation in this area is delivered from a lake via canal. Due to recent drought, no irrigation was available; however, areas of the tall wheatgrass were sub-irrigated and supported some tall wheatgrass growth. Two of the four areas were predicted to have a high infestation of field sandbur, based on plant remnants, including seed, on the soil surface from previous years. The area having the most promise was used for the preliminary phase with treatments applied to one test in 2003 and another test in 2004.

Individual plots were approximately 50 ft of a single bed. Nonionic surfactant (0.25% v/v = 1 qt/100 gal) was used. Treatments (shown in Table 16 for 2003 and Table 17 for 2004) were applied using a solo backpack sprayer equipped with a four-nozzle boom. Spray solutions (approximating 25 gpa) were applied to wet the leaves only. There were 4 replicates in a randomized complete block design. On 1 September 2004, a 12 x 40-inch quadrat placed in a uniform area of each plot of both tests, in the center of the bed top, was used for seedhead counts. Sandbur infestation ratings (0 = no plants present; 5 = solid stand) also were taken on that date in a portion of the test known to be heavily infested. No forage was removed in 2004.

Results and Discussion:

Seedhead number and sandbur rating data are presented in Table 16 for the 2003 test. No significant differences were observed in the 2003 test for seedhead number or sandbur infestation, indicating a possible lack of residual effect. No differences in seedhead number had been observed in 2003 because of the lateness of the first application. However, it was anticipated that a late summer application of 4 oz ac $^{-1}$ could provide control in the following spring. The low number of seedheads even in control plots might be due to lack of irrigation. The absence of irrigation in 2003 and 2004 to promote tall wheatgrass growth also might have affected the efficacy of the herbicide in controlling seedhead production in 2004.

A slight difference ($P < 0.10$) was observed for seedhead number in the 2004 test (Table 17.) such that all treated plots had much lower seedhead production. Additionally, sandbur infestation, while low in all plots, likely due to drought, was significantly lower in the treated plots than in untreated control plots. As in 2003, it was observed that tall wheatgrass growth on plots receiving multiple applications was stunted and not as dark green as grass on those plots that were treated only once or not at all.

Table 16. The effect of Plateau herbicide applied in 2003 on seedhead production and the presence of field sandbur in unirrigated tall wheatgrass at the NMSU Agricultural Science Center at Tucumcari in 2004.

Treatment	Seedhead number[1]	Sandbur rating[2]
Untreated control	5.50	2.00
2 oz., applied 30 May 2003	0.75	1.75
4 oz., applied 30 May 2003	2.50	1.50
6 oz., applied 30 May 2003	4.75	1.00
8 oz., applied 30 May 2003	4.50	2.25
10 oz., applied 30 May 2003	4.75	1.00
12 oz., applied 30 May 2003	2.00	2.25
2 oz., applied 30 May, 27 June, 25 July, 29 Aug., and 26 Sep. 2003	4.00	0.75
3 oz., applied 30 May, 9 July, 18 Aug., and 26 Sep. 2003	1.50	1.75
4 oz., applied 30 May, 25 July, and 26 Sep. 2003	2.50	2.00
6 oz., applied 30 May and 18 Aug. 2003	3.50	2.50
Mean	3.30	1.70
Prob. > F	0.9058	0.3563
LSD (0.05, unprotected)	6.60	1.55
LSD (0.10, unprotected)	5.48	1.29

[1]Seedheads were counted within a 12” x 40” quadrat.
[2]Sandbur infestation was rated on a scale of 0 = none to 5 = 100% ground cover.

Table 17. The effect of Plateau herbicide applied in 2004 on seedhead production and the presence of field sandbur in unirrigated tall wheatgrass at the NMSU Agricultural Science Center at Tucumcari in 2004.

Treatment	Seedhead number	Sandbur rating
Untreated control	4.00	1.00
2 oz., applied 14 April, 17 May, 16 June, 19 July, 17 Aug., and 16 Sep. 2004	0.00	0.25
3 oz., applied 14 April, 6 June, 26 July, 17 Aug., and 16 Sep. 2004	0.00	0.00
3 oz., applied 17 May, 25 June, 19 July, 9 Aug., and 16 Sep. 2004	0.00	0.00
4 oz., applied 14 April, 16 June, and 17 Aug. 2004	0.00	0.00
4 oz., applied 14 April, 16 June, and 16 Sep. 2004	0.00	0.00
4 oz., applied 17 May, 19 July, and 16 Sep. 2004	0.00	0.00
6 oz., applied 14 April and 19 July 2004	0.50	0.50
Mean	0.56	0.22
Prob. > F	0.1019	0.3199
LSD (0.05), unprotected	2.90	0.96
LSD (0.10), unprotected	2.40	0.79

These data are preliminary. Seedhead and sandbur measurements will be taken in 2005 to see if the September 2004 application had any effect. Continued research is needed to fully explore the value of Plateau herbicide for seedhead suppression and sandbur control in tall wheatgrass pastures. In another preliminary trial, sandbur plants with mature seed were treated with 2 oz Plateau/ac to determine if the herbicide has any effect on seed germination. Those plots will be rated in 2005 as well.

On another note, it was observed that field bindweed plants infested with *Aceria malherbae* gall mites in the test area continued to exhibit symptoms of infestation after application of Plateau. Thus, use of Plateau herbicide will likely have no negative effect on IPM measures using the bindweed mite for control of field bindweed.

Readers are cautioned that Plateau herbicide is not currently labeled for use on tall wheatgrass. Its use in this trial was conducted under a Research and Demonstration Pesticide Applicator's License and the herbicide's use for the purposes described in this article are currently not legal under Federal law.

Development of a Program to Screen Forage Crops for High Nitrates in Eastern New Mexico

Investigator(s):

L.M. Lauriault, G.P. Walden, R.E. Kirksey, P.L. Cooksey, L.F. Perkins, B. Griggs, and M.L. Mead.

Objective(s):

The purpose of this project, which is in its very early stages, is to set up a program that would enable New Mexico State University County Cooperative Extension Service Offices to screen forage crops, mainly sorghums, for high nitrate concentrations.

Background:

Forages high in nitrates must be used properly to prevent loss of productivity or life when fed to livestock. This technique is a screening tool that can help forage producers and feeders determine which forages are at risk for high nitrates. Whenever the presence of nitrates is indicated, quantitative laboratory analysis should be used to determine the actual concentration on which management decisions should be based. The literature cited at the end of this article provides detailed information about how to lessen the likelihood of toxic nitrate levels as well as how to use forages found to have high levels.

Program Description:

Materials and methods for sample preparation and analysis also are derived from the literature listed below. A reagent consisting of 0.1 g Diphenylamine salt dissolved in 30 ml 36 N sulfuric acid will be used for screening nitrates in forages in either standing forage or hay. Enough material for test kits was acquired to eventually provide a test kit with 30 ml reagent to each county in the Eastern District of the New Mexico State University Cooperative Extension Service. One lot of the reagent was prepared for initial use in Quay County.

To screen prior to harvest or grazing, the field should be divided into areas of similar productivity and landscape. Divide each area into 12 to 15 sections and collect the bottom third of one stem from each section. Cut stems 2 to 3 inches above the soil surface. Split each stem and place one drop of reagent every 2 inches. Rapid development of a deep blue color in a matter of seconds indicates the presence of nitrates. Grazing intensity or harvest height can be adjusted to avoid lower portions of stems when nitrates are indicated.

This technique also can be used to screen forages already in the swath or bale using sampling techniques recommended by New Mexico State University (Guide A-328) and the analysis technique described in Guide B-807. It is best, however, to sample before harvest to determine if harvest height can be adjusted.

Initial Impact:

Two sorghum x sudangrass dry hay samples from the same field, each including 10 stems, were submitted by a local producer for screening. One of the samples was from round bales still in the field and the other was from stems remaining on the ground. For one sample, one stem indicated the presence of nitrates while two stems from the other sample tested negative.

The value of this technique to producers already has been locally recognized. A student at Tucumcari Middle School who chose to use it as a Science Fair project was awarded Best of Show in her class. Her display included a demonstration with locally grown sorghum x sudangrass standing forage and hay showing positive and negative test results for each type of forage.

Literature:

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Provin, T.L., and J.L. Pitt. 2003. Nitrates and prussic acid in forages: Sampling, testing and management strategies. -5433. Texas A & M Univ. Coop. Ext. Ser. College Station.

Observations Regarding Use of the Rodenator Pro Device for Eradication of Gophers

Investigator(s):

L.M. Lauriault, B. Griggs, M.L. Mead, C. Henson, L.F. Perkins, P.L. Cooksey, and R.E. Kirksey.

Materials and Methods:

Meyer Industries (P.O. Box 39, Midvale, ID 83645) waived half the retail value of a Rodenator Pro device for use in this project. The Rodenator Pro device injects a mixture of propane and oxygen into burrows for a pre-selected time period (5 to 90 seconds is recommended) then is ignited, causing an explosion to destroy the burrow and kill the gopher by concussion.

Other gopher control measures used at this location have included trapping, manual baiting with strychnine-laced grain sorghum, manual burrow treatment with zinc phosphide tablets, and mechanical baiting with a tractor-mounted burrow-builder.

Observations and Discussion:

Control techniques were used under differing conditions throughout the 2004 growing season and rendered the following observations. Use of poison grain, either by manual treatment or with the burrow-builder, was the best technique for regular treatment of large areas. Zinc phosphide also was effective; however, soil moisture variability appears to effect efficacy. Neither of these products (poison grain and zinc phosphide) were as effective as using the Rodenator Pro device or traps, which are likely most valuable for clean-up operations because of labor, equipment, and other materials costs. Manual treatment with poison grain or zinc phosphide and the Rodenator Pro device is likely the best choice in areas requiring minimal soil disturbance. Trapping requires a larger hole to be dug than the Rodenator Pro device and the burrow-builder requires large equipment in addition to significant soil disturbance.

An advantage of trapping is in knowing that a gopher was killed. Several attempts were made to recover gophers after using the Rodenator Pro device. This was time-consuming and disappointing because, in many cases, it appeared that the gopher had eluded demise either by escaping the area altogether or by sealing off the burrow area to be treated. One gopher carcass was found that had been removed from a treated burrow by another animal; however, its condition was such that the cause of death could not be determined.

Destruction of the burrow with the Rodenator Pro device varied under soil moisture conditions such that it was much better when used in dry soils compared to moist soils of the same texture class (fine sandy loam). Construction of burrows with the burrow-builder was a concern because when gophers migrate into new areas, they will use established burrows they encounter rather than build new ones. It also was thought that once the grain was consumed, the mechanically constructed burrows needed to be destroyed so as to not encourage re-infestation of an area. It was later observed; however, that these burrows would naturally cave in over time in sandy soils.

Under local soil and moisture conditions, longer time periods of gas injection were needed to cause burrow destruction when using the Rodenator Pro device. Three to four minutes of injection were needed for dry soils with increasing time required as soil moisture increases. It was concluded that burrow destruction was important for two reasons. First, soil eruption at the surface indicated the degree of destruction suggesting zones for subsequent blasts to maximize burrow destruction, minimizing future gopher migration. Second, if the gopher was not killed, it was much easier to determine where burrows were being repaired or replaced for re-treatment.

Since gophers often develop massive burrow systems, selection of the area to be treated with the Rodenator Pro device was critical to keep costs low. Thus, it is recommended that existing mounds be smoothed, and areas watched for new activity. When the decision is made to treat an area because of current gopher activity, injecting and detonating in as close proximity as possible to the activity is appropriate. The procedure does, however, need to be far enough away from the activity to not disturb the gopher and cause it to leave the area. It appears as though gophers can move very rapidly, digging new burrows as they go and sealing the burrow behind themselves as a defensive mechanism. After treatment, mounds and other disturbed soil should be smoothed and the area watched for several days for new gopher activity.

Observations about using the Rodenator Pro device will continue for gopher control and possibly other invasive burrowing animal species as well.

Assessing Establishment Rates and Winter Survival of Low Maintenance Turfgrasses in Two Climate Zones

Investigator(s):

B. Leinauer[1], V. Gibeault[2], L. Lauriault, R. Autio[2], S. Cockerham[2], R. Kirksey, and S. Ries[2]
[1]Department of Agronomy and Horticulture, New Mexico State University
[2]College of Natural and Agricultural Sciences, University of California, Riverside, CA

Abstract:

Establishment rates and winter hardiness of 15 low maintenance turfgrasses were compared at Agricultural Research Stations in Tucumcari, NM and Riverside, CA. The study was conducted in 2003 and 2004 and included *Elymus junceus* cv. Bozoisky, *Festuca longifolia* cv. Hardtop, *Koeleria macrantha* cv. Barleria, *Poa arachnifera x poa pratensis* cv. HB342, *Poa compressa* cv. Barpressa, *Bouteloua curtipendula* cv. Vaugn, *Bouteloua gracilis* cvs. Alma and Hachita, *Buchloe dactyloides* cvs. Cody, Legacy, and SWI 2000, *Cynodon dactylon* cvs. Princess and Sahara, *Disticlis spicata* cvs. A137 and A138, and *Zoysia japonica* cv. Zenith. None of the grasses were affected by winterkill and of all the grasses included in the study, *Bouteloua curtipendula* cv. Vaugn established the fastest and both *Disticlis spicata* cultivars established the slowest in Riverside and Tucumcari.

Introduction:

Due to rapid population growth and urban development in the southwestern United States, current water allocations coupled with expected future demands might soon exceed the supply required to satisfy present per-capita water-use rates. With up to 50% of total urban water consumption being utilized for irrigation of landscapes (Kjelgren et. al, 2000), and turfgrass being a major component of residential landscapes, it is becoming increasingly important to select low water use and/or drought tolerant species. In addition to water conservation strategies such as using reclaimed water to irrigate and setting watering restrictions (El Paso Water Utilities Public Service Board, 1992), some municipalities have banned certain grasses that are deemed to have high water demands in favor of other low water-use species (El Paso Water Utilities Public Service Board, 1992; California State Water Resource Control Board, 1993; Arizona Dept. of Water Resources, 1995). However, very little information exists on establishing these low maintenance or low input turfgrasses in the southwest. In the highly variable climate of high altitude desert locations, it is unknown whether the growing season is long enough to establish these low maintenance grasses, particularly warm season turfgrasses. The relatively short growing season in the arid southwest could lead to winterkill if the seedlings are not sufficiently mature.

In a study conducted at New Mexico State University and the University of California 16 grasses (5 cool season and 11 warm season) were compared. The objective of the study was to investigate if different climate zones had an effect on establishment rate and winter survival of low input- and low water use warm and cool season turfgrasses.

Materials and Methods:

The study was conducted from May 2003 until June 2004 at the New Mexico State University's Agricultural Science Center in Tucumcari, New Mexico (Latitude 35° 12' N, Longitude 103° 41' W and Altitude of 1247 m) and at the University of California in Riverside, California (Latitude 33° 54' N, Longitude 117° 24' W and Altitude of 249 m). The monthly average minimum air temperatures during the research period for both locations are listed in Table 19.

Soil types are Hanford fine sandy loam at the Riverside site and Redona fine sandy loam at the Tucumcari site. Twelve warm season and 5 cool season turfgrasses were established in the summer of 2003. With the exception of *Cynodon dactylon* cv. Princess, all grasses are marketed as low water use and low maintenance turfgrasses. Species, cultivars, type of establishment (seed vs. plugs), and seeding rate (for seeded cultivars) are listed in Table 20. The plugs measured 2 cm in diameter and were planted 20 cm apart.

Grasses at the Riverside location were established on May 28, 2003. To avoid the summer heat during germination and to provide favorable growing conditions for the cool season grasses, turf plots at the Tucumcari location were established on July 26, 2003. Warm and cool season grasses were established on the same day at each location. Plots were watered daily to prevent drought stress during establishment. Starter fertilizer (15-15-15) was applied at a rate of 5 g N m^{-2} 3 times during establishment: at seeding, in October 2003 and in May 2004. At both locations the 4 m^2 turf plots were replicated 3 times and were arranged in a completely randomized design. Visual ratings of percent turf cover were conducted monthly during summer and fall of 2003, and spring of 2004 to assess establishment. Establishment data were not collected during the winter. To allow data comparison of the 2 locations despite the different seeding dates, time of establishment was expressed in days after seeding (DAS). Differences in establishment rate among grasses and between locations were tested using SAS Proc Mixed (SAS Institute, Inc., 1996). The analysis was performed using a model that incorporated the structure of a completely randomized design with a measurement structure that incorporated repeated measures through time.

Results and Discussion:

When the establishment data were averaged over all grasses, turfgrass cultivars at the Riverside location established faster than at the Tucumcari location (Table 20).

It took 262 days in Riverside and 293 days in Tucumcari for plots to reach 80% coverage. With the exception of *Festuca longifolia* cv. Hardtop, all cool season grasses in Riverside had higher coverage in the fall of 2003 (80 days after seeding) compared to Tucumcari (Table 20). This was expected as temperatures in Riverside were cooler and more favorable to cool season grasses than temperatures in Tucumcari (Table 18). Establishment data for 2003 were inconclusive for the warm season grasses. While the higher temperatures in Tucumcari during the summer and fall of 2003 should have provided more favorable growing conditions for warm season grasses in general, only *Bouteloua gracilis* cv. Alma, and both *Disticlis spicata* cultivars plots had higher coverage 80 days after seeding compared to Riverside plots (Table 21). Coverage for Alma was significantly higher in Tucumcari than in Riverside.

While summer temperatures in Tucumcari may have been higher than in Riverside, the shorter growing period because of the later seeding date may not have provided enough cumulative heat units for warm season grasses to establish more quickly. Of all grasses tested, *Bouteloua curtipendula* and *Bouteloua gracilis* established the quickest at both locations. *Bouteloua curtipendula* cv. Vaugn showed coverage of 100% in Riverside and 88% in Tucumcari 80 days after seeding. *Bouteloua gracilis* cv. Hachita reached complete coverage 80 days after seeding in Riverside, while cv. Alma reached 87% in Tucumcari. Of all warm season grasses tested, *Zoysia japonica* cv. Zenith established the slowest in 2003 in Tucumcari and *Disticlis spicata* cv. A138 in Riverside. The cool season species hybrid bluegrass cv. HB342 was the slowest to establish in Riverside and *Koeleria macrantha* cv. Barleria was the slowest in Tucumcari. Despite the freezing winter temperatures in Tucumcari (Table 18), all grasses resumed growth in the spring and none were affected by winterkill. With the exception of *Bouteloua gracilis* cv. Alma, both *Disticlis spicata* cultivars, and *Elymus junceus* cv. Bozoisky, all warm and cool season grasses were fully established in Riverside 262 days after seeding, with coverages of at least 80%. Higher winter temperatures in Riverside provided conditions which allowed the grasses to continue to grow and establish faster than in Tucumcari. It took 293 days in Tucumcari for most of the warm season grasses to reach coverage of at least 80%. *Buchloe dactyloides* cv. Legacy, *Zoysia japonica* cv. Zenith, and both *Disticlis spicata* cultivars reached only 62%, 68%, 72%, and 52% coverage respectively. One year after establishment, 80% coverage was not achieved by *Disticlis spicata* cvs. A137 and A138 and *Bouteloua gracilis* cv. Alma in Riverside or by *Koeleria macrantha* cv. Barleria in Tucumcari. Of all grasses tested, *Bouteloua curtipendula* cv. Vaugn established the fastest and both *Disticlis spicata* cultivars established the slowest in Riverside and Tucumcari. Based on the results of this study, low maintenance turfgrasses can be established from seed and/or plugs even in high elevation, arid and semi arid locations without winterkill affecting the seedlings. However, it may take up to 10 months for some of the grasses to reach full coverage.

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Table 18. Monthly average minimum air temperatures (°C) for Tucumcari and Riverside during the research period (May 2003 to June 2004).

	Average minimum air temperature													
	May 03	Jun 03	Jul 03	Aug 03	Sep 03	Oct 03	Nov 03	Dec 03	Jan 04	Feb 04	Mar 04	Apr 04	May 04	Jun 04
	°C													
Tucumcari	12.7	15.0	20.4	19.6	14.1	9.2	2.6	-1.5	-1.8	-3.2	4.3	6.4	12.9	15.7
Riverside	14.4	18.8	17.5	15.8	14.0	7.3	5.0	11.4	5.2	4.7	9.8	10.4	13.4	14.6

Table 19: Common names, botanical names, cultivars, and type of establishment of grasses used in the study. Seeding rate in g m^{-2} is listed for seeded varieties.

Species	Cultivar	Botanical name	Seeding rate (g m^{-2})
Cool season grasses			
Russian wildrye	Bozoisky	*Elymus junceus*	35
Hard fescue	Hardtop	*Festuca longifolia*	20
Crested hairgrass	Barleria	*Koeleria macrantha*	7
Hybrid bluegrass	HB342	*Poa arachnifera x poa pratensis*	12
Canada bluegrass	Barpressa	*Poa compressa*	7
Warm season grasses			
Sideoats grama	Vaugn	*Bouteloua curtipendula*	50
Blue grama	Alma	*Bouteloua gracilis*	7
	Hachita		7
Buffalograss	Cody	*Buchloe dactyloides*	10
	Legacy		Plugs
	SWI 2000		10
Bermudagrass	Princess	*Cynodon dactylon*	5
	Sahara		5
Saltgrass	A137	*Disticlis spicata*	Plugs
	A138		Plugs
Zoysiagrass	Zenith	*Zoysia japonica*	10

Table 20: Model estimates for percent ground cover pooled over all grasses at the two locations at sampling dates (days after seeding [DAS]).

	Ground cover						
	Sampling dates (DAS)						
	20	34	80	262	293	321	358
	%						
Riverside	39a[¶]	49a	65a	83a	88a	86	92
Tucumcari	13b	38b	55b	71b	80b	82	93

[¶]values in a column followed by different letters are significantly different (α=0.05) from one another

Table 21: Model estimates for percent ground cover for all locations (Riv=Riverside, Tuc=Tucumcari), grasses and sampling dates (days after seeding [DAS]).

		Ground cover													
		Sampling dates (DAS)													
		20		34		80		262		293		321		358	
		Location													
Species	Cultivar	Riv	Tuc	Riv	Tuc	Riv	Tuc	Riv	Tuc	Riv	Tuc	Riv	Tuc	Riv	Tuc
		%													
Bouteloua curtipendula	Vaughn	80[¶]a	37b	90a	67b	100	88	93	87	97	85	97	85	98	95
Bouteloua gracilis	Alma	20	32	25a	67b	45a	87b	50a	88b	52a	93b	23a	93b	74a	98b
	Hachita	70a	23b	87a	53b	100a	77b	100a	78b	100	88	100	90	100	98
Buchloe dactyloides	Cody	27a	5b	40	37	92a	63b	100a	72b	100	91	100	99	100	99
	Legacy	30	13	33	27	68a	33b	90a	47b	98a	62b	98a	78b	100	91
	SWI 2000	30a	2b	40	27	93a	67b	100a	75b	100	95	100	97	100	99
Cynodon dactylon	Princess	17	6	40	57	93	77	100	85	100	96	100	98	100	99
	Sahara	43a	8b	63	47	97	95	100	88	100	97	100	97	100	99
Disticlis spicata	A137	30	18	30	33	25	40	59	65	69	72	65	70	70	88
	A138	18	17	21	30	15	33	37	47	47	52	35	48	59	82
Zoysia japonica	Zenith	6	1	13	17	38	27	88a	52b	93a	68b	98a	63b	100a	80b
Elymus junceus	Bozoisky	63a	25b	70	53	77	70	67a	88b	78	85	70a	90b	80	96
Festuca longifolia	Hardtop	45a	8b	55	40	42	50	83	77	95	90	98	83	99	98
Koeleria macrantha	Barleria	50a	1b	60a	7b	52a	12b	90a	53b	93a	60b	93a	57b	97	78
Poa arachnifera x poa pratensis	HB342	29a	2b	34	23	35	33	85	67	92	75	96	82	98	96
Poa compressa	Barpressa	73a	2b	83a	20b	67a	30b	92a	65b	97a	75b	97	80	100	90
LSD		27	20	22	20	22	20	26	20	28	20	27	20	25	20

[¶]values between locations (for each grass and DAS separately) followed by different letters are significantly different (α=0.05) from one another

Cotton Boll Weevil Program

Investigator(s):

R. E. Kirksey, L.M. Lauriault, P. Cooksey and Raymond Liles

Objective(s):

(1) To conduct a weekly cotton boll weevil trapping program for all cotton fields in Quay County. (2) To provide timely reports on positive boll weevil captures to affected growers, and (3) To maintain records on cotton boll weevil populations dynamics in Quay County.

Trapping Procedures:

Boll Weevil Scout traps (Hercon Laboratories Corp. South Plainfield, NJ) were set out in all known cotton fields in Quay County prior to June 19, 2004. Traps mounted on 4 ft stakes made of ¾ inch PVC pipe were set around the field perimeter. Traps were monitored on a weekly basis from June 19 until November 2. Pheromones and kill strips were replaced at two-week intervals throughout the season.

The boll weevil scouting program was conducted by the Quay County Boll Weevil Control District. Raymond Liles contracted directly with the Control District to provide the scouting services. The Agricultural Science Center at Tucumcari provided technical support and backup assistance. Aaron Miller, UDSA APHIS provided quality control assistance. Then New Mexico Department of Agriculture provided the traps, pheromones and kill strips.

Results and Discussion:

Because of the lack of water for irrigation there was only approximately 140 acres of cotton in Quay County in 2004. There were 19 traps positioned around the perimeter of those fields for a trap density of 7 acres per trap.

There were no boll weevils captured in 2004 from a total of 375 trap inspections. As such, 2004 was the second consecutive year with no observed boll weevil presence in Quay County.