Oklahoma Panhandle Research & Extension Center

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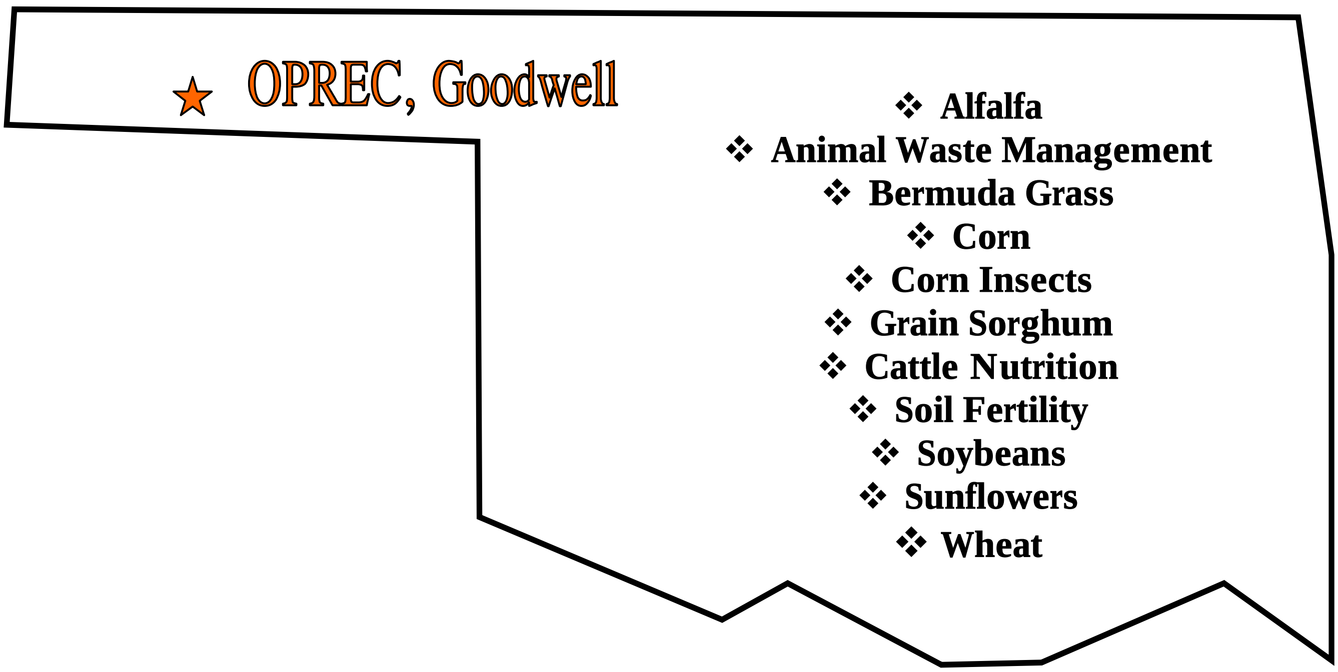

- **Alfalfa**
- **Animal Waste Management**
- **Bermuda Grass**
- **Corn**
- **Corn Insects**
- **Grain Sorghum**
- **Cattle Nutrition**
- **Soil Fertility**
- **Soybeans**
- **Sunflowers**
- **Wheat**

2001 Research Highlights

Division of Agricultural Sciences and Natural Resources
Oklahoma Panhandle Research and Extension Center
Oklahoma State University
Department of Animal Science
Department of Entomology and Plant Pathology
Department of Plant and Soil Sciences
Department of Biosystems and Agricultural Engineering
USDA – ARS

THE OKLAHOMA PANHANDLE RESEARCH AND EXTENSION CENTER
Division of Agricultural Sciences and Natural Resources
Department of Plant and Soil Sciences
Oklahoma Agricultural Experiment Station
Oklahoma Cooperative Extension Service
Oklahoma State University

The Division of Agricultural Sciences and Natural Resources (DASNR)/Oklahoma Agricultural Experiment Station (OAES)/Oklahoma Cooperative Extension Service (OCES) at Oklahoma State University (OSU) have a long history of working cooperatively with Oklahoma Panhandle State University (OPSU). A Memorandum of Agreement that outlined the major missions of each entity strengthened this cooperative effort in July 1994. OPSU's primary role is teaching. OAES is the research arm of the DASNR and is responsible for the fundamental research. OCES transfers technology generated for the research programs to clientele. These three entities complete the spectrum and constitute a true partnership in solving problems related to panhandle agriculture.

The Department of Plant and Soil Sciences with sole support from OAES and OCES has staffed the Oklahoma Panhandle Research and Extension Center (OPREC) with a Director (vacant), Area Crop-Soil Research/Extension Specialist, Area Livestock Extension Specialist, Senior Office Assistant, Senior Station Superintendent, Field Foreman, Field Assistant/Equipment Operator, wage payroll, and part-time OPSU student laborers. Dr. Curtis Bensch will join the team as an Assistant State Specialist/Lecturer on July 1, 2002. He will be in a position that is jointly funded by OPSU/OSU. He will teach part-time on the OPSU campus and will conduct research/extension activities at OPREC. The two Area Specialists are fully engaged in both on-and off-station applied research and extension programs throughout the panhandle area.

OSU faculty in the departments of Plant and Soil Sciences, Entomology and Plant Pathology, Biosystems and Agricultural Engineering, Agricultural Economics, Animal Science, and USDA/ARS continue to expand their research and extension efforts at OPREC and in the panhandle area. Oklahoma agriculture, especially in the Panhandle, is a powerful but rapidly changing economic sector. Agricultural industries are being challenged to maintain competitive market positions. Falling commodity prices, rising pressure from pests and disease, growing competition for water, greater sensitivity to environmental stewardship, increasing animal waste issues, and a shrinking supply of qualified labor are among some of the complex factors that are fundamentally reshaping agriculture in Oklahoma. Development of management practices to achieve maximum efficiency in crop production, judicious use of animal wastes, as well as identification of potential new crops adapted to the area have been the focal point of both research and extension programs at OPREC. Variety development of both hard red and hard white, winter wheat and performance evaluations of bermudagrass, buffalograss, alfalfa, soybean, wheat, grain sorghum, corn, and canola are being conducted. Conservation tillage, irrigation management, and the efficient use of fertilizer and pesticides are also being studied.

Progress made in development of research and education programs adapted to the panhandle area has been significant since establishing the Center. However, as the agriculture landscapes changes much more work will need to be initiated. Your continued support in our research and extension programs will help us better serve the clientele of the panhandle area.

James H. Stiegler
Professor and Head
Department of Plant and Soil Sciences

Oklahoma Panhandle Research and Extension Center

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2001 Oklahoma Panhandle Research and Extension Center

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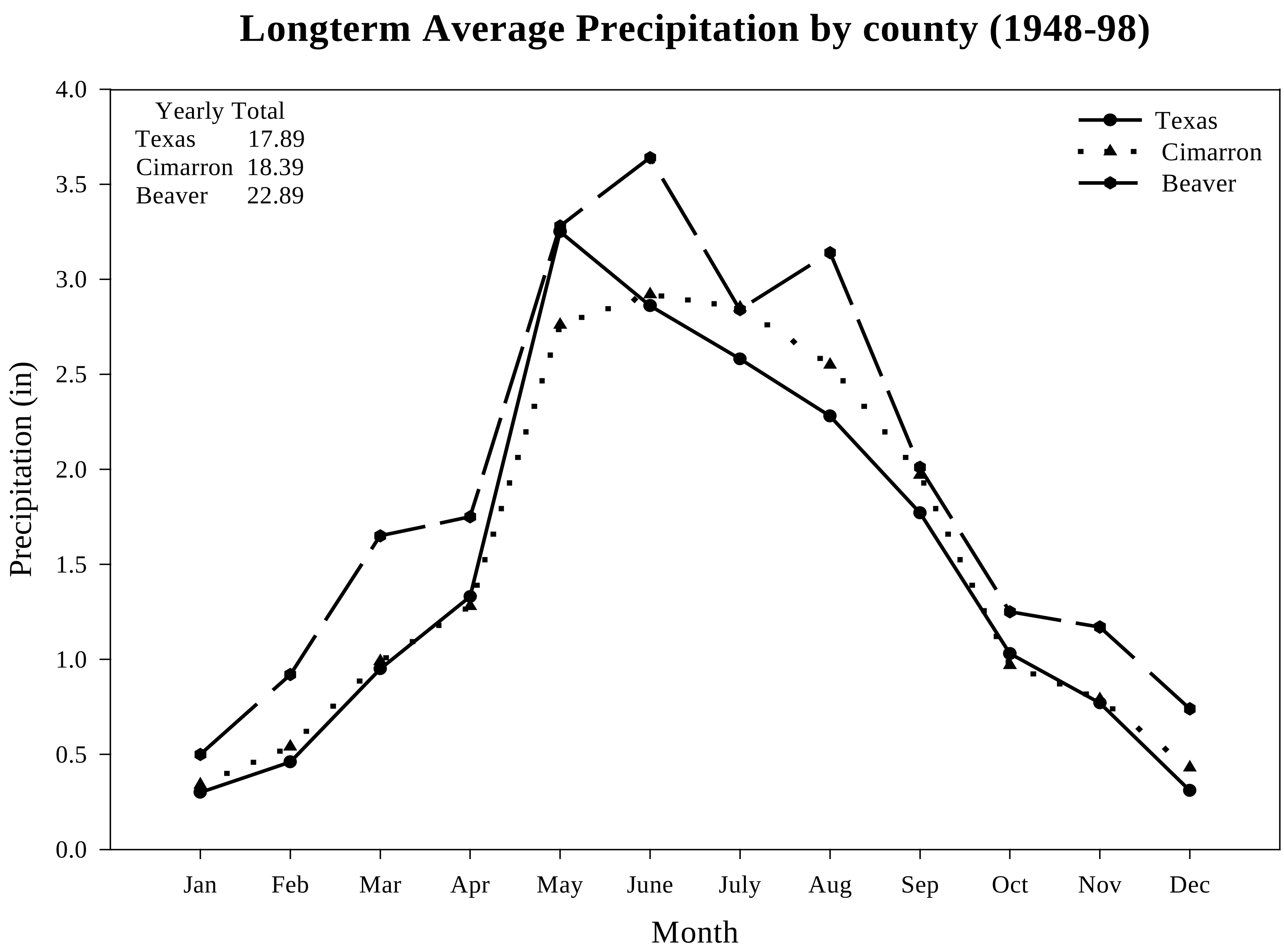
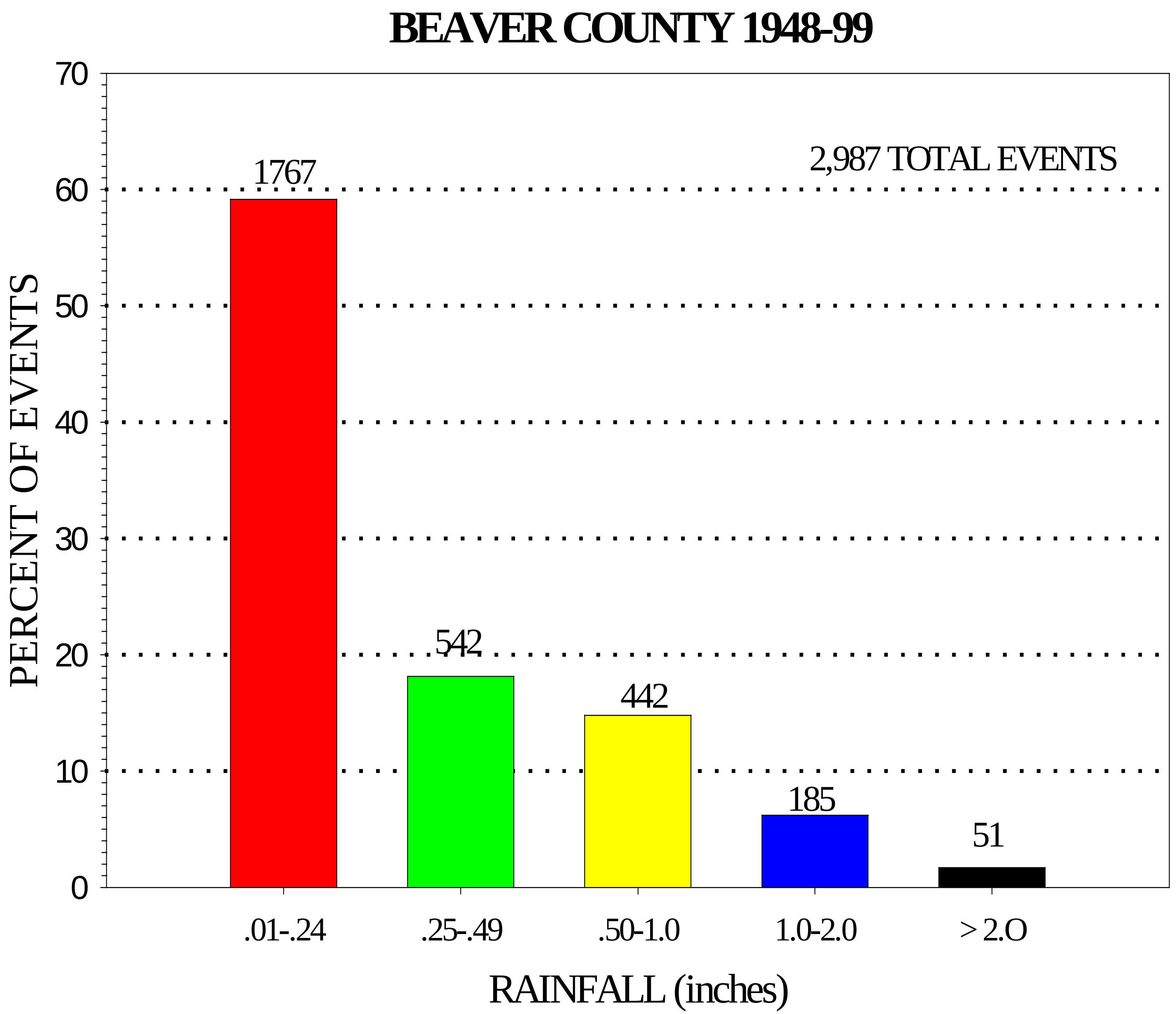
Charles Taliaferro (405) 744-6410	Regents Professor, Forage Breeding, Department of Plant and Soil Sciences, Oklahoma State University

Climatological data for Oklahoma Panhandle Research and Extension Center, 2001.

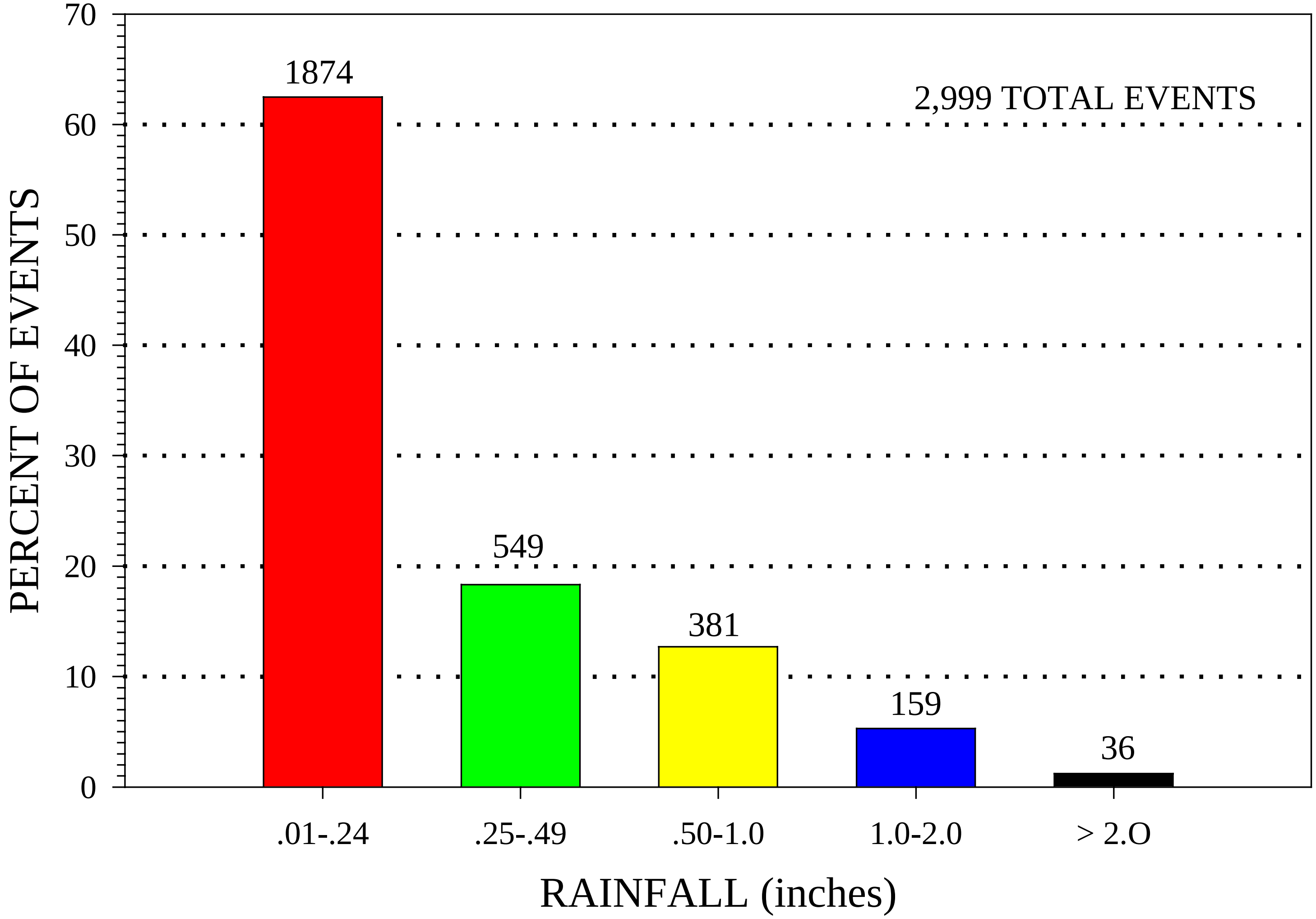
	Temperature				Precipitation			Wind	
Month	Max	Min	Max. mean	Min. mean	2001 Inches	Long term mean	One day total	AVG mph	Max mph
Jan	66	6	44	21	1.27	0.30	0.16	11.3	59.6
Feb	67	9	45	23	0.59	0.46	0.32	11.1	52.0
March	79	7	55	30	1.53	0.95	0.41	10.7	60.7
April	88	31	74	43	1.24	1.33	0.42	15.4	69.5
May	93	39	76	50	4.54	3.25	0.48	12.3	75.0
June	101	45	91	61	0.81	2.86	0.40	13.1	47.4
July	104	62	99	68	1.03	2.58	0.00	11.5	41.6
Aug	101	57	93	64	1.01	2.28	0.37	10.7	52.7
Sept	98	40	85	55	0.44	1.77	0.16	11.4	51.2
Oct	89	29	74	41	0.00	1.03	0.00	13.1	54.2
Nov	80	13	62	36	0.57	0.77	0.23	11.7	46.6
Dec	72	11	53	23	0.17	0.31	0.06	11.6	52.0
Annual total			71	43	13.7	17.9	NA	NA	NA

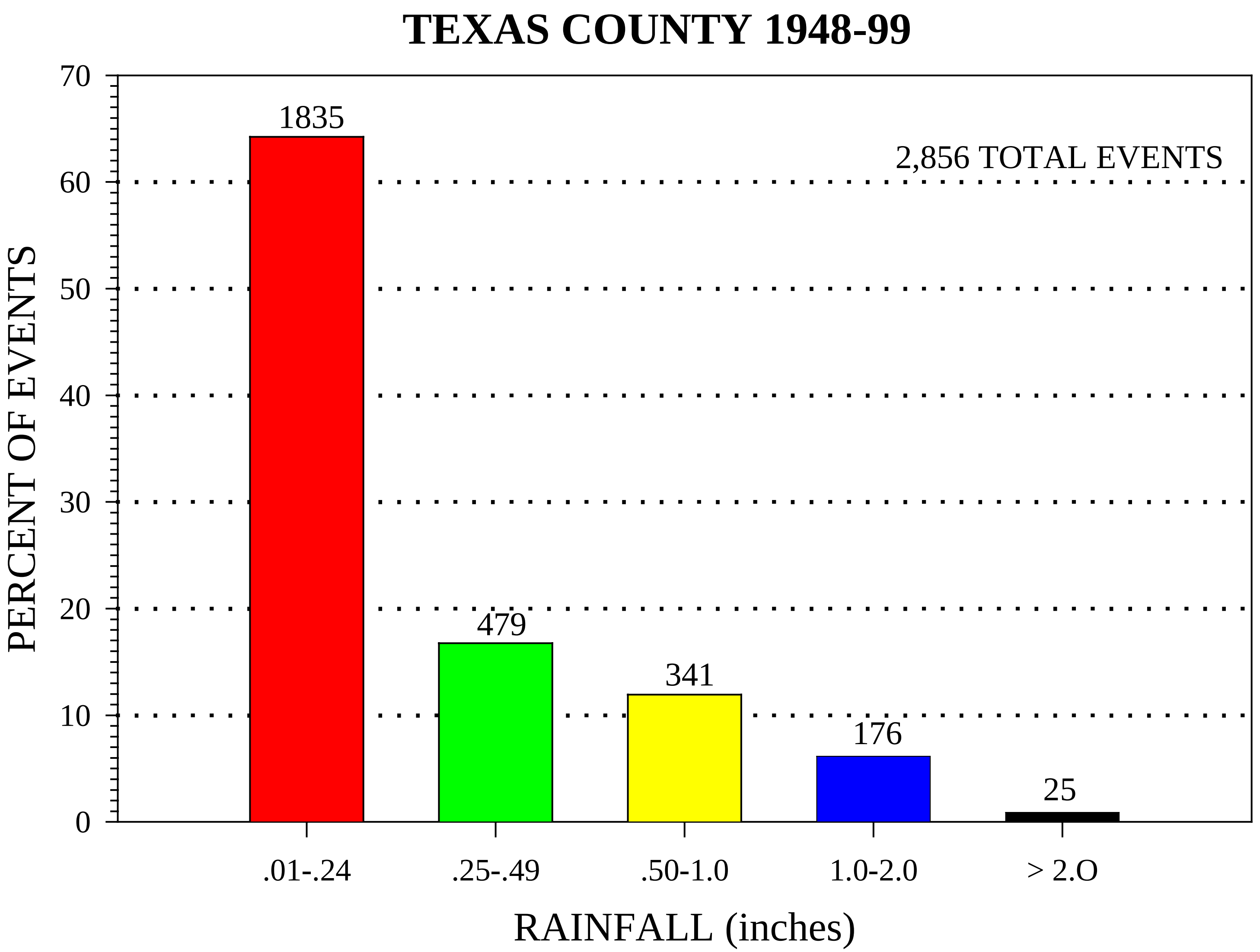
Data from Mesonet Station at OPREC


Longterm Average Precipitation by county (1948-98)
Yearly Total
Texas 17.89
Cimarron 18.39
Beaver 22.89
Texas
Cimarron
Beaver
Precipitation (in)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Jan
Feb
Mar
Apr
May
June
July
Aug
Sep
Oct
Nov
Dec
Month


BEAVER COUNTY 1948-99
2,987 TOTAL EVENTS
PERCENT OF EVENTS
70
60
50
40
30
20
10
0
1767
542
442
185
51
.01-.24
.25-.49
.50-1.0
1.0-2.0
> 2.O
RAINFALL (inches)

CIMARRON COUNTY 1948-99




TEXAS COUNTY 1948-99
2,856 TOTAL EVENTS
1835
479
341
176
25
70
60
50
40
30
20
10
0
PERCENT OF EVENTS
.01-.24
.25-.49
.50-1.0
1.0-2.0
> 2.O
RAINFALL (inches)

Oklahoma Panhandle Research & Extension Center
2001 Research Highlights

<u>Animal Science</u>

<u>Crops</u>

<u>Appendix</u>

EFFECT OF ZINC SOURCE AND LEVEL ON FINISHING CATTLE PERFORMANCE AND CARCASS TRAITS

L. J. McBeth, C. R. Krehbiel, and D.R. Gill, Dept. Of
Animal Science, Oklahoma State University
J.J. Martin, Oklahoma Panhandle State University
C. A. Strasia, Oklahoma Panhandle Research and Extension Center, Goodwell

Three hundred-thirty six English crossbred steers (BW = 768 ± 48.9 lb) were fed for 130d at the Panhandle State University Research Center. Steers were weighed upon arrival implanted with Ralgro®, vaccinated with IBR-PI_3-BVD-BRSV, seven-way clostridial preparation, and treated for parasites. Steers were stratified by weighed and randomly assigned to 30 pens (12 steers/24pens and 8 steers/6pens). The animals were re-implanted on day 56 with Revalor-S®.

Treatments were: 1) 60ppm $ZnSO_4$ (control); 2) 90 ppm $ZnSO_4$; 3) 90 ppm Zn®Methionine; 4) 90 ppm Availa®Zn; 5) 120 ppm $ZnSO_4$; and 6) 120 ppm Availa®Zn. The basal diet was purchased from Texas County Feed Yard, Guymon, OK and a premix containing the appropriate treatment was top-dressed at a rate of 0.5lb/hd/day. Interim weights and feed refusal were obtained every 28 days and upon completion of the feeding period steers were harvested at National Beef, Liberal Kansas. Upon harvest, hot carcass weight, external fat, internal fat, longissimus muscle area, marbling score, yield grade, and quality grade were determined.

Weights upon arrival did not differ (P = 0.53) and no significant differences (P > 0.10) were observed for dry matter intake or interim body weights were observed. However Steers that consumed Zn from inorganic sources were more efficient (P < 0.05 than those consuming organic sources of Zn from days 0 to 55. From days 0 to 112 steers consuming Availa®Zn were more efficient (P < 0.05) than those consuming Zn®Methionine. No significant differences (P > 0.10) were observed for average daily gain.

No differences (P > 0.10) were observed for hot carcass weight, dressing percent, external fat, internal fat, or longissimus muscle area. Steers that consumed organic sources of Zn had a greater (P > 0.01) degree of marbling than those consuming Zn from inorganic sources.

CORN PLANTING DATE

Rick Kochenower, Oklahoma Panhandle Research and Extension Center, Goodwell

Previous research has indicates that planting corn before the optimum date reduces yields less than planting after the optimum date (Fig. 1). Therefore, in 2000, a long-term study was initiated to determine the effect of planting date and starter fertilizer on corn ensilage and grain yield. Six planting dates were selected April (1, 10, 20, 30) and May (10 and 20). On each selected date corn was planted with and without a starter fertilizer (5 gal/ac 10-34-0) in the row. Pre-plant fertilizer applications were based on soil test N level of 250 lb/ac (soil test + applied) and (P and K) will be applied to 100% sufficiency. The hybrid DK 647BtY was planted in 2000, in 2001 the hybrid was switched to pioneer 33B51. Plots were planted in four 30-inch rows by 30 feet long with a target plant population of 32,000 plants per acre. Ten feet of one outside row is harvested for ensilage production and the two middle rows harvested for grain production.

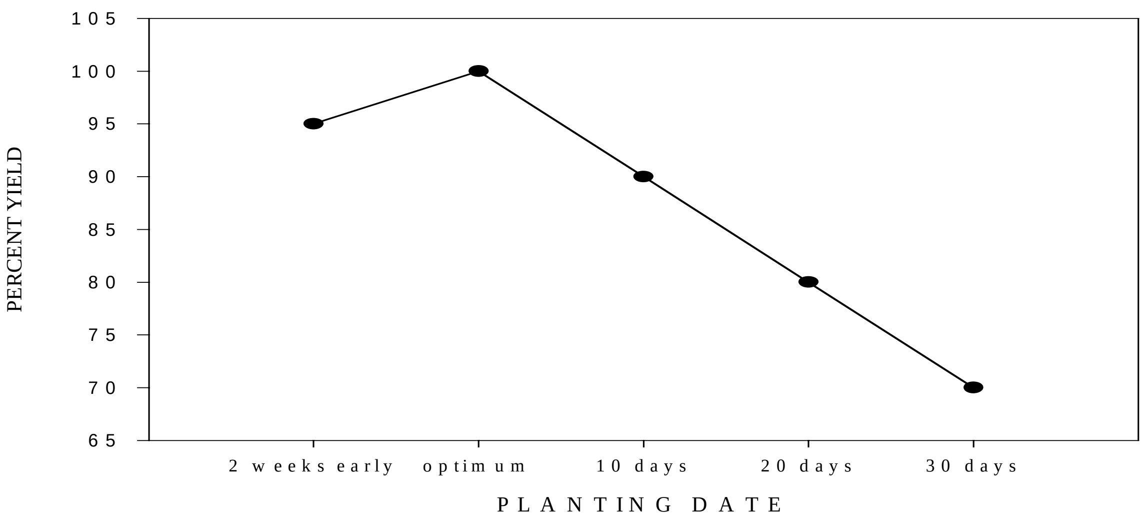


Figure 1. Ten years of grain yields at Lansing, Michigan. Source modern corn production

Results

Starter fertilizer did not affect ensilage (Table 1) or grain yield (Fig. 2), therefore means of planting dates are reported. Yields of grain and ensilage decreased when planted after April 10, with the largest decrease when planted after April 30. Test weight also decreased

Aldrich, S.A., W.O. Scott, and R.G. Hoeft. Modern Corn Production. 1986, A & L Publications.

when planted after April 10 but remained above the 56 lb/bu level until the April 20 planting (Table 1). After April 20 test weights were below 56 lb/bu and continued decreasing with each planting date. In 2000 or 2001, planting as early as April 1 did not reduce yield or test weight as expected from the Michigan data. This may have been because the earliest date (April 1) is not too early for optimum yield. Soil temperatures at two inches on April 1 were 60° F in both 2000 and 2001, and may differ in subsequent years with different environmental conditions. Several more years of data are needed to determine the optimum planting date for ensilage and grain yields.

Figure 1. Corn grain yields by planting date at OPREC.

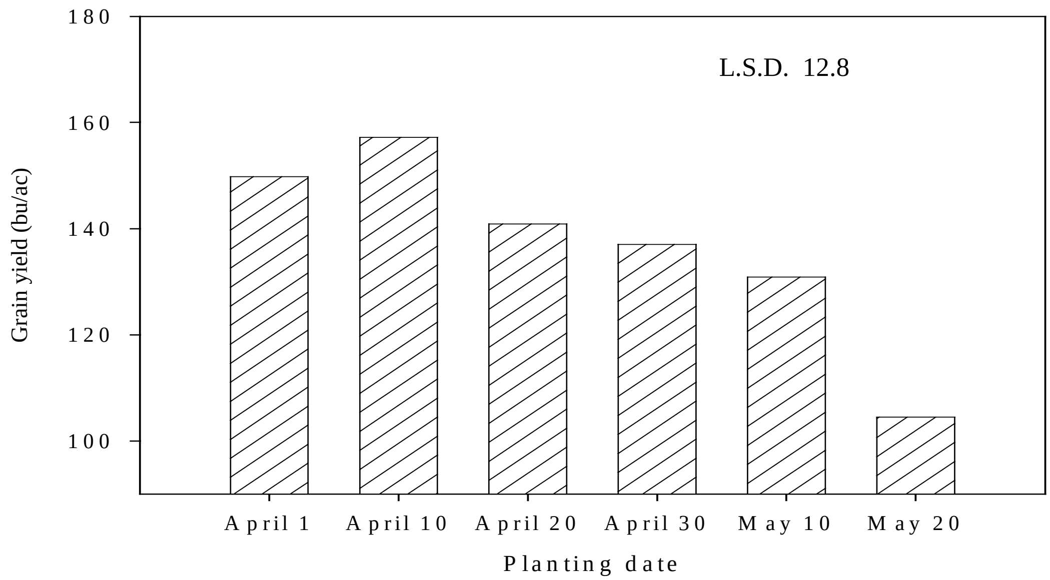


Table 1. Corn ensilage yields and grain test weight by planting date at OPREC.

Planting Date	Ensilage Yield tons/ac	Test Weight lb/bu
April 1	25.7	57.4
April 10	26.2	57.4
April 20	25.4	56.3
April 30	24.3	54.7
May 10	22.6	53.0
May 20	19.7	52.2
Mean	24.0	55.2
L.S.D.	1.9	1.4

LIMITED IRRIGATED CORN

Rick Kochenower, Oklahoma Panhandle Research and Extension Center, Goodwell

In the winter of 2000-01 natural gas prices increased dramatically. This increased the interest in growing corn with limited sprinkler irrigation. A study was initiated at OPREC to determine if corn maturity affected yield and test weight when irrigation was limited. Three hybrids with different maturities Dekalb DKC 57-72 (107 day), Dekalb DK 647 (114 day), and Pioneer 3162 (118 day) were planted. Irrigation was applied at four rates (3, 6, 9, and 12) inches with one inch applied at each irrigation. Applications were scheduled (Table 1) where all treatments received water at or near pollination. This is the most critical time for corn production. Plots were planted in four 30-inch rows by 25 feet long at a target population of 25,000 plants per acre with the two middle rows harvested for grain yield and test weight.

Table 1. Date of irrigation application for limited irrigated corn at OPREC.

Date	3 inches	6 inches	9 inches	12 inches
6-13				X
6-20			X	X
6-27			X	X
7-4	X	X	X	X
7-7	X	X	X	X
7-9	X	X	X	X
7-13		X	X	X
7-17		X	X	X
7-22		X	X	X
7-28			X	X
7-31				X
8-6				X

Results

Based on Oklahoma Climatological Service data the summer (June, July, and August) of 2001 was the second driest in the last 51 years at OPREC. Rainfall of 1.27 inches was received from June 1 until plots were harvested September 10 therefore yields were not significantly affected by rainfall. Maturity and irrigation rates did affect yields with the highest yields being with the 107 and 114-day hybrids (Table 2). The shorter maturity hybrids were able to make more grain with less water than the fuller season 118-day hybrid. The 107-day hybrid had higher yields with 9 inches of irrigation when compared to the 118-

day at 12 inches. Test weight was affected more by hybrid selection than by amount of irrigation with the highest test weights with the 118-day hybrid (Table 3) although all test weights were less than 56 lb/bu. Changes in amount of irrigation applied and the 118-day hybrid will be made in succeeding years. Three inches of irrigation applications will be replaced with a full irrigation to be able to do economic analysis. Also changing environmental conditions may affect grain yields and test weight.

Table 2. Corn grain yields from limited irrigation study at OPREC.

Maturity day	Irrigation inches	Grain Yield bu/ac
107	12	92.6
107	9	90.6
114	12	89.6
118	12	77.3
114	9	76.5
118	9	73.2
107	6	51.4
114	6	49.3
114	3	48.0
118	3	38.7
118	6	38.0
107	3	34.0
	Mean	63.3
	L.S.D.	10.7
	CV%	11.8

Table 3. Test weight from limited irrigation study at OPREC.

Maturity day	Irrigation inches	Test Weight lb/bu
118	12	54.7
118	9	54.6
107	12	54.6
107	9	54.4
118	6	53.4
114	12	53.0
114	6	52.3
114	9	52.2
118	3	51.3
114	3	50.2
107	6	47.7
107	3	45.0
	Mean	51.9
	L.S.D.	1.8
	CV%	2.5

GENETIC IMPROVEMENT AND VARIETY DEVELOPMENT IN WINTER WHEAT: RELEVANCE TO THE OKLAHOMA PANHANDLE

Brett Carver, Wheat Breeding Project Leader Dept. of Plant and Soil Sciences, Stillwater

The Wheat Improvement Team

Wheat variety development research at Oklahoma State University rests in the hands of the Wheat Improvement Team, which combines expertise in breeding and genetics, genomics, pathology, entomology, management, physiology, biotechnology, and cereal chemistry. This team stands behind the unified goal to develop hard red and hard white winter wheat varieties with marketable grain quality and adaptation to various wheat-production zones in Oklahoma.

The panhandle area, and generally the northwest region of Oklahoma, is considered one of those zones, unique from others in rainfall pattern, temperature, and disease pressure. Depending on adaptation characteristics, improved varieties are targeted for either the central corridor of the wheat acreage in Oklahoma, the northwest region, or possibly both. Recent examples are Intrada, a hard white wheat variety released in 2000 specifically for the northwest region, and Ok101, a hard red winter variety released in 2001 for both regions.

OSU Wheat Breeding

The 10-year breeding cycle is divided into three phases: i) parent hybridization and seed increase, ii) identification of worthy breeding populations and lines within populations, and iii) statewide testing of breeding lines. The earlier phases, identified as (i) and (ii), emphasize selection under early-planting conditions, with the intent to provide all Oklahoma wheat producers with varieties better adapted to dual-purpose management systems. Thus, all breeding materials up through the F_6 generation (six generations following the last cross) are planted early to accommodate either cattle grazing or mechanical removal of forage. Much of that work is conducted in Stillwater and at the Wheat Pasture Center near Marshall.

Breeding lines in subsequent generations are evaluated in two clusters of sites distinguished mostly by *disease pressure*, or specifically leaf rust, wheat soilborne mosaic virus, and Septoria complex. We refer to these two sets of sites simply as the Western cluster

(Goodwell—irrigated and dryland, Sweetwater, and Altus), and Central cluster (Lahoma, Enid, Marshall, Ft. Cobb, and Stillwater). Field selection encompasses a myriad of agronomic traits, but four which we emphasize most are: i) leaf rust resistance, ii) wheat soil-borne mosaic virus resistance, iii) adaptation to low-pH soils, and iv) adaptation to a dual-purpose system. Weakness in any one of these must be compensated by exceptional strengths in other traits. With regard to physical grain quality, test weight receives highest priority due to its importance in grain grading and its perceived relationship to milling quality.

Importance of the Oklahoma Panhandle to OSU Wheat Breeding

The Oklahoma Panhandle offers a unique environment for testing and selecting new varieties. With reduced pressure from foliar diseases more common in central Oklahoma, the full genetic potential of a given variety is often expressed in grain production, provided that irrigation is supplied in optimal amounts. Thus, irrigated breeding trials located at Goodwell provide critical information on "yield potential" of breeding lines, reflecting the upper range of performance. Without irrigation, grain production is primarily limited by drought stress, reflecting the lower end of the yield distribution. Yield potential, however, only partially explains performance under drought. Our breeding strategy is to identify and select lines having improved yield potential in irrigated trials and improved water-use efficiency or drought tolerance in dryland trials, before they are promoted for release.

The Oklahoma Panhandle Research and Extension Center provides a critical site for determining genetic variability under both irrigated and dryland conditions. Approximately 800 irrigated field plots and 600 dryland plots are dedicated to advanced breeding line evaluation at the Center. This includes a USDA-ARS sponsored regional nursery containing candidate varieties from public and private breeding programs throughout the Great Plains. Those results are distributed to breeding programs throughout the region, and they are posted on the USDA-ARS website at *http://www.ianr.unl.edu/arslincoln/wheat/default.htm.*

Finally, the Center serves another function by supplying a high-yielding environment for breeder seed multiplication of candidate varieties currently under consideration for release.

In 2001, we produced breeder seed of OK97508 (Cimarron/2174) for foundation seed production in 2002. Pending final approval by the Oklahoma Agricultural Experiment Station, it will be released in spring of 2002. Further details of this variety are given below. In addition, we have two other candidates under increase. Those are OK96717-99-6756 (Abilene/2180//Chisholm), a hard red winter wheat targeted strictly for the panhandle and the High Plains, and OK96705-99-6738 (2180/OK88803//Abilene), another hard red winter wheat with statewide adaptation. Large plots of these candidates are available for observation by visitors to the Center.

Ok102, a New Variety for All of Oklahoma

Pending final approval, the Oklahoma Agricultural Experiment Station is intending to release the breeding line, OK97508, as Ok102 hard red winter wheat. Ok102 is widely adapted to Oklahoma and should mimic the adaptation range of one its parents, 2174. It should be most competitive in areas with i) a history of soilborne mosaic virus, ii) the likelihood of leaf rust infection in adult-plant stages, or iii) moderate soil acidity and aluminum toxicity. Ok102 is also adapted for the High Plains, with or without irrigation. Ok102 has no known defects in physical grain quality or in milling and baking quality, regardless of production site. Moreover, it has consistently demonstrated moderately high protein levels and good protein strength and, therefore, constitutes a desirable grain source for leavened bread products. Its test weight is very good and similar to that of 2174, plus it exceeds Jagger and 2137 by one pound and Custer by one-half pound.

With regard to grain yield and quality, Ok102 may be used in dual-purpose and grain-only management systems, but its post-harvest seed dormancy will cause it to be a “slow-starter” if planted extremely early under hot soil conditions. Thus, Ok102 is not recommended for a forage-only management system where planting date is earliest and emphasis on fall forage production is highest. An avoidance for premature plant dormancy release should allow extended grazing without sacrificing grain yield, provided grazing termination precedes first-hollow-stem stage.

Ok102 is highly resistant reaction to WSBMV, and it shows a susceptible seedling reaction but a resistant adult-plant reaction to leaf rust. Its reaction to stripe rust is intermediate. An intermediate reaction to barley yellow dwarf virus places Ok102 in a class unlike most HRW varieties that tend to be more susceptible.

Ok102 will constitute the third winter wheat variety released by the OAES in as many years. All three varieties, Intrada, Ok101, and Ok102, offer producers in the panhandle and northwest region of Oklahoma highly competitive choices for varieties. Positioning varieties for a particular region requires adequate testing within that region. The Oklahoma Panhandle Research and Education Center plays a vital role in meeting that requirement.

GREENBUG IPM RESEARCH

Gerritt Cuperus, Kris Giles, and Tom Royer, Department of Entomology and Plant Pathology, Oklahoma State University, Stillwater
Norm Elliott and Dean Kindler, USDA-ARS Plant Science and Water Conservation Research Laboratory, Stillwater
David Waits, SST Development Group, Inc., Stillwater.

In spring of 2001 we completed three years of research investigating the effect of greenbugs on wheat yields at the Goodwell station and at three other locations in Oklahoma (Perkins, Altus and Chickasha). The refinement of economic injury levels at these locations provided a broad database on greenbug impact, which was critical for development of an easy to use computer program to aid growers, crop consultants, and others in making economically sound greenbug management decisions in winter wheat. Two regionally adapted varieties were evaluated at each location. Four levels of greenbug infestation in both fall and spring were established in small plots of each variety. In each replicated plot, greenbug numbers per tiller were monitored during the growing season and the maximum number of greenbugs per tiller was calculated. Yield was taken from each plot. Results indicate a predictive relationship between the maximum number of greenbugs per tiller and wheat yield for all varieties. Results from the study provided a scientific basis for predicting yield in greenbug-infested wheat.

We also completed three years of research investigating greenbug population dynamics and are currently constructing a population dynamics simulation model based on the resulting data. The population dynamics research was conducted at the Goodwell station and at Perkins, Altus and Chickasha. Throughout the growing season, several quantitative measures were taken including environmental conditions (temperature, rainfall, wind speed, etc.), greenbug density, greenbug age distribution, greenbug reproduction, parasitism levels, and predator densities. These measures, combined with a laboratory study on basic greenbug reproductive processes, provided the necessary data for development of the population dynamics simulation model.

We have developed computer program, called a decision support system, to help growers make economically correct greenbug management decisions. The decision support system was developed to be compatible with web-based programs and linked to Oklahoma State University and USDA-ARS web sites. The decision support system was designed to be very easy to use and requires minimal training. Participants in the study and OSU extension personnel are currently testing the greenbug decision support system. We anticipate releasing the decision support system on-line for free public use this year (2002) prior to the start of the planting season for winter wheat.

References:

Elliott, N. C., K. L. Constein, T. R. Royer, K. L. Giles, S. D. Kindler, and D. A. Waits. 2001. An expert system for greenbug management in wheat Proc. Proc. 71st Rocky Mountain Conf. Entomol. pp. 5.

Kindler, S. D., N. C. Elliott, T. A. Royer, K. L. Giles, F. Tao, and R. Fuentes. 2002. Effect of greenbugs on winter wheat yield. J. Econ. Entomol. 95: 89-95.

PLANTING DATE, SEEDING RATE, AND VARIEY DIFFERENCES IN IRRIGATED DUAL PURPOSE WHEAT

Rick Kochenower, Oklahoma Panhandle Research and Extension Center, Goodwell
Gene Krenzer, Dept. of Plant and Soil Sciences, Oklahoma State University, Stillwater

Irrigated wheat is planted in the panhandle region each year to utilize fall forage for cattle as well as harvest grain the next spring. In the fall of 2000, an experiment was initiated to determine the effects of seeding rate, planting date, and variety on fall forage and grain production. Three seeding rates were used 60, 120 and 180 pounds per acre. The three most widely grown Hard Red Winter Wheat varieties (HRW) (TAM 107, Custer, and Jagger) and a recently released Hard White Winter Wheat (HWW) (Intrada) from Oklahoma State University were used. Plots were 5 feet wide by 22 feet long planted with a Hege plot planter. Planting dates were September 1, October 1, and November 1 in 2000. In 2001 planting dates where changed to September 1, and two plantings on October 1, one for forage plus grain and the other for grain only. The September 1 planting date coincides with planting wheat following corn ensilage production. The October 1 planting date is reflective of planting wheat following corn for grain harvest. The November 1 planting date was selected to determine grain production on late-planted wheat. After 2000 yields were so low for November 1 planting, another October 1 planting was added to determine yield loss from forage removal. Forage harvest dates are listed in Table 1. One meter of row from each end of a plot was hand clipped to soil surface and placed in drying oven for 48 hours to determine forage production. Plots were then mowed with a 5-foot finishing mower to simulate forage removal by grazing. After mowing, the September 1 planting area that was hand clipped was marked so same area could be hand clipped again for subsequent harvest. Irrigation applied in the fall of 2000 and 2001 was 5 and 7 inches respectively.

Table 1. Forage harvest dates by planting dates for OPREC irrigated dual-purpose wheat.

--- Planted September 1 ---		--- Planted October 1 ---	
2000	2001	2000	2001
Oct. 12	Oct. 1	Dec. 15	Dec. 19
Nov. 1	Nov. 6		
	Dec. 6		

Results

No differences in forage yields have been associated with varieties, therefore reported forage yields are an average of all varieties. Seeding rate and planting date have the largest impact on fall forage production (Fig. 1). The 180 lb/ac seeding rate planted on September 1 resulted in the highest forage production at 3,040 lbs/ac of dry matter. The increased forage production from the 180 lb/ac seeding rate appears to occur during the early period of growth (Fig 2). The difference in forage production between seeding rates does not increase after first harvest as approximately the same difference is observed after final harvest (Fig 1). The 180 lb/ac seeding rate will also allow earlier grazing due to increased early forage production.

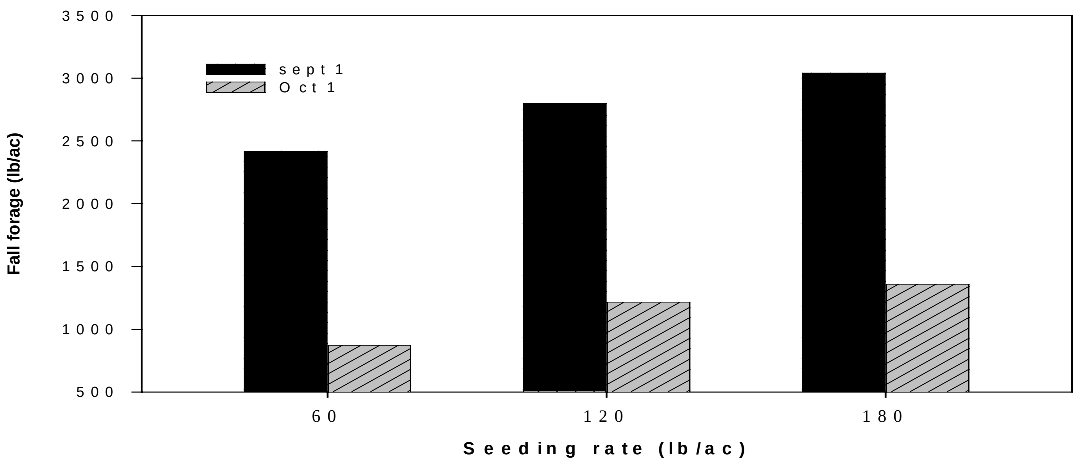


Figure 1. Fall forage production in irrigated dual-purpose wheat at OPREC.

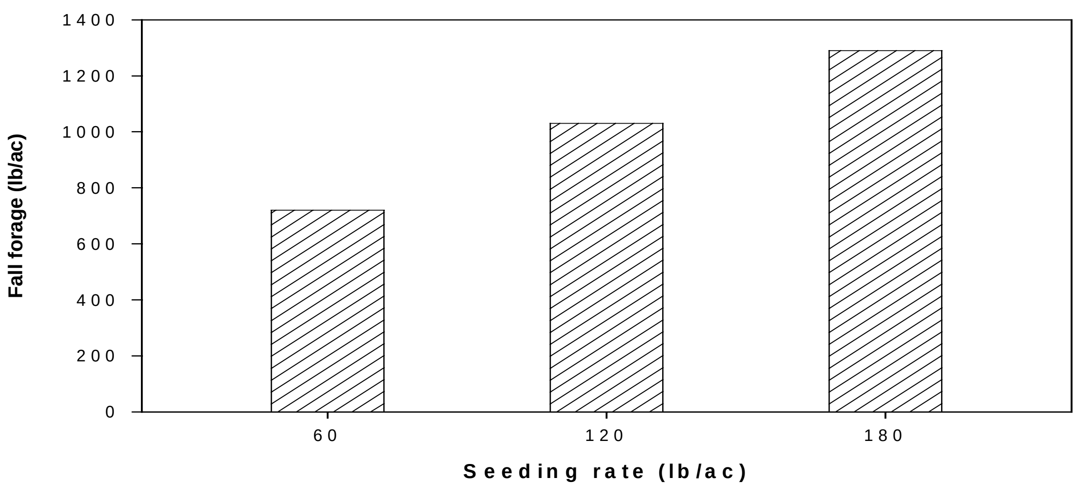


Figure 2. Forage production averaged across variety and year for first harvest of September 1 planting date in irrigated dual-purpose wheat at OPREC.

Grain yields (Fig 3), for the first planting date were affected by winterkill in the plots. Forage was 14 inches tall before the second harvest, and with the cold temperatures following removal of large amounts of forage explains damage in the plots. There was a trend in 2001 for higher yields with increased seeding rates for the Oct. 1 and Sept. 1 planting dates. The Nov. 1 planting date grain yields were so drastically reduced compared to earlier dates that the planting date was dropped in 2001. Test weights (Fig. 4) were not affected by either planting date or seeding rate. Variety was the only factor affecting test weight and means across planting date and seeding rate are reported.

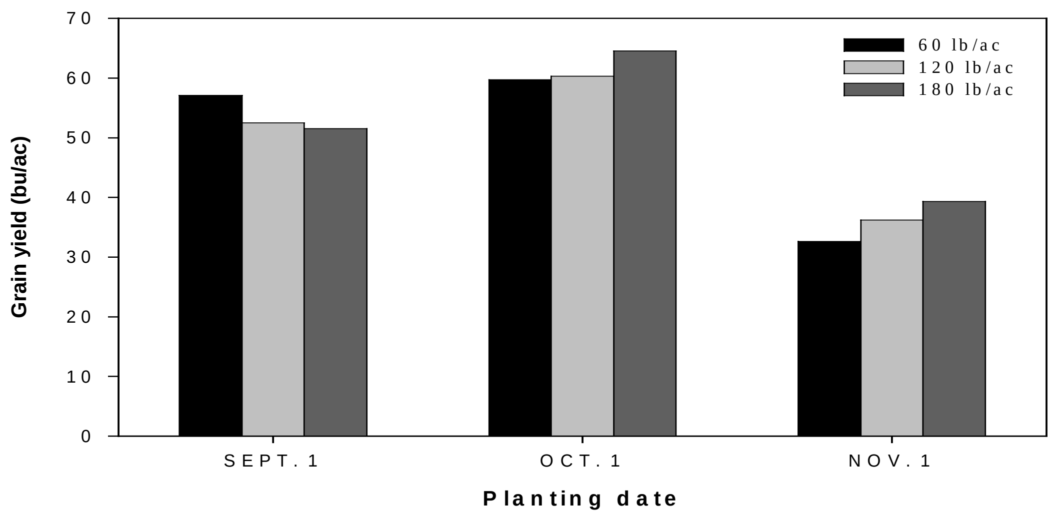


Figure 3. Grain yields for irrigated dual-purpose wheat 2001 at OPREC.

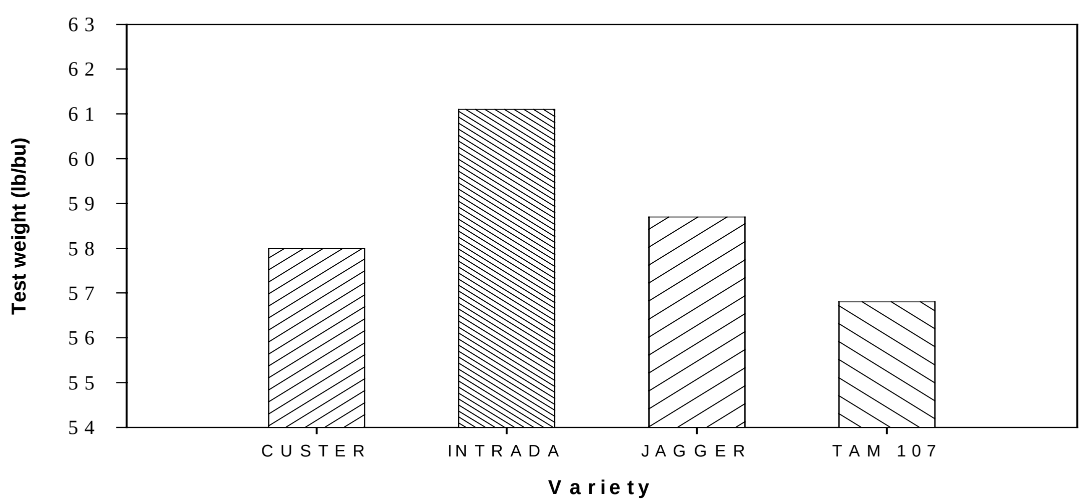


Figure 4. Test weights for irrigated dual-purpose wheat 2001 at OPREC.

IRRIGATED CROP ROTATION

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In 1999, an irrigated crop rotation study was established to determine if the crop rotation effect reported by researchers in dry-land systems exist under a high yield environment. In 2000, problems with insects, birds, and water well were encounted so data was not collected. Researchers at Kansas State University have reported 12 bu/ac yield increases in grain sorghum rotated yearly with soybeans when proper fertilization is used (Gordon, B., et al., 1999). Researchers at the University of Minnesota have reported yield increases of 12% (138 vs. 122 bu/ac) in corn rotated with soybeans when compared to continuous corn (Porter, P.M., et al., 1997). The crop rotation effect is not clearly understood and has many possible explanations. What is understood are the benefits in weed management, breaking of insect and disease cycles, improved soil physical properties, and increased water use efficiency. Rotations include corn-soybean (CS), corn-sorghum (CM), soybean-sorghum (SM), along with continuous corn (CC), soybeans (SS), and grain sorghum (MM). Plots size was 10 feet by 30 feet long, planted with a John Deere 1710 Maxemerge 4-row 30-inch planter.

Results

The crop rotation affect appears to exist when grown with irrigation. Corn yields were 29.6 and 24.7% higher when rotated with sorghum and soybeans respectively when compared to continuous corn (Table 1.). The higher yields associated with the corn-grain sorghum rotation was unexpected, but the higher yields associated with the corn-soybean rotation has been shown by other researchers. Corn yields may have been reduced by high winds at the V7 stage of development, plants were lying on the ground the morning after the storm. Corn test weights were not affected by any rotations in the first year of data collection. Soybeans yields were also affected by rotations with yields 15.7% higher when grown in rotation with corn when compared to soybeans grown continuously for 3 years. Test weight of soybeans was also affected when comparing the continuous soybeans to soybeans grown in rotation with corn. Grain sorghum yields or test weight was not affected by any of the rotations, but did have an affect when in the rotations. More years of data are needed to determine if the rotations affect does exist in a high yield environment, specifically the benefits of grain sorghum in rotation with corn.

Table 1. Grain yield and test weights in Irrigated Crop Rotation Study at OPREC.

Treatment	Corn		Soybean		Grain sorghum	
	Yield	Test weight	Yield	Test weight	Yield	Test weight
CM	143.2	57.0			105.1	59.0
SC	137.8	57.5	54.4	53.4		
CC_3	115.4	55.7				
CC_2	105.5	55.9				
MM_3					113.7	59.6
MM_2					102.7	58.4
SM			51.9	52.9	119.2	58.7
SS_2			53.2	54.1		
SS_3			47.0	54.5		
Mean	125.5	56.5	51.6	53.7	110.2	58.9
L.S.D.	28.4*	NS	6.3	1.7	NS	NS

Note: subscripted number indicates number of years in continuous crop
Yield: bushels/acre; Test Weight pounds/bushel
* significant at the 0.1 level

References:

Gordon, B., D. Whitney, and R. Lamond. 1999. Grain Sorghum Nutrient Management in Reduced Tillage Systems. Proceeding of the 21st Biennial Grain Sorghum Research and Utilization Conference. p 8-10.

Porter, P.M., J.G. Lauer, W.E. Lueschen, J.H. Ford, T.R. Hoverstad, E.S. Oplinger, and R.K. Crookston. 1997. Environment affects the corn and soybean rotation effect. Agron. J. 89:442-449.

NO-TILL VS MINIMUM-TILL DRY-LAND CROP ROTATIONS

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In 1999, a study was started to evaluate four different dry-land cropping rotations and two tillage systems for their long-term sustainability in the panhandle region. Rotations include Wheat-Sorghum-Fallow (WSF), Wheat-Corn-Fallow (WCF), Wheat-Soybean-Fallow (WBF), and Continuous Sorghum (CS). Tillage systems include no-till and minimum tillage. All crops will be planted no-till and minimum tillage. Two maturity classifications were used with all summer crops in the rotations to determine optimum maturity classifications. Most dry-land producers in the panhandle region utilize the WSF rotation. Other rotations would allow producers flexibility in planting, weed management, insect management, and marketing.

Results

Data from the Oklahoma Climatological Service indicated the summers of 1999, 2000, and 2001 have been 3 of the 5 driest summer periods (June – August) in the last 51 years. Precipitation for summers of 1999, 2000, and 2001 was 49, 54, and 19% of long-term mean, respectively (Table 1). There was no difference in wheat yields in 2000 and 2001 among rotations or tillage treatments with a yield of 27 and 40 bushel per acre respectively. The year 2000 was the first year of continuous grain sorghum and it has yet to be harvested, nor was corn or soybeans in 2001. Grain sorghum yields for 1999 - 2001 were higher for full season hybrids than the medium maturity by 6.4 bushels/ac (Table 2). No difference in test weights to tillage have been observed, but medium maturities have been 2.4 lb/bu higher than full season with 55.4 and 53.0 lb/bu, respectively. A yield increase for grain sorghum has been observed due to tillage with a 5.0 bushel/ac increase for no-till across maturities. Grain sorghum yields for 2000 were reduced by poor weed control. The herbicide was never activated. Corn yields have been higher for the 112-day corn than the 108-day corn, however yields from either would not be economically feasible (Table 2). Soybean yields have been the same with both Group III and Group IV soybean (Table 2). It appears after three years of the study that the WSF rotation is best suited for the panhandle region, however if in succeeding years more precipitation is received yield may improve for corn and soybean.

Table 1. Summer growing season precipitation at OPREC

Month	1999	2000	2001	Long-term mean
June	2.85	2.29	0.61	2.86
July	0.20	0.76	0.00	2.58
August	0.75	1.09	0.66	2.28
Total	3.80	4.14	1.27	7.72

Table 2. Yields (bu/ac) from summer crops in dry-land tillage and crop rotation study at OPREC.

Year	----- Soybean -----		----- Corn -----		-- Grain Sorghum --	
	Group III	Group IV	108 day	112 day	Medium	Full
1999	12.3	11.3	2.5	15.6	52.0	61.8
2000	8.3	10.2	5.3	8.6	18.0	17.3
2001	0	0	0	0	28.5	38.7
Mean	6.9	7.2	2.6	8.1	33.6	39.9
L.S.D.	NS	NS	NS	NS	4.4	

SOYBEAN PLANTING DATE TESTS

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Interest in soybean production has increased among producers in the Oklahoma panhandle in recent years. Previous soybean research concentrated mostly on variety selection through variety trials at Oklahoma Panhandle Research and Extension Center (OPREC) Goodwell, OK. Research was initiated in 1999, to determine the optimum planting date for irrigated soybeans for the region. Plots were 10 feet by 25 feet planted with a 4-row 30-inch planter. Asgrow AG4602RR was planted at a rate of 160,000 seeds per acre. The earliest planting date in 1999 was May 1. After yields were obtained in 1999 it was determined that an earlier planting date should be included in future research. Therefore planting dates (Table 1) were expanded in 2000 to include an April 15 planting date. The same planting dates were used in 2001 as in 2000.

Table 1. Planting dates for soybean planting date study at OPREC.

1999	2000 and 2001
NA	April 15
May 1	May 1
May 15	May 15
June 1	June 1
June 15	June 15
July 1	July 1

Results

Data were not collected in 2000 due to a hailstorm and irrigation problems occurring the first two weeks of August. Data were not collected for the July 1 planting date in 2001 due to herbicide injury to that planting date.

The highest yield obtained was 76.6 bu/ac for the April 15, 2001 (Table 2) planting. However, since data have been collected for only one year with this planting date, additional testing is required. When data were collected for two years, yields for the May plantings were superior to other planting dates. For the two years of the study, both May plantings averaged more than 60 bu/ac. Based on the two years when data have been collected, results indicate that both April and May plantings are superior to later plantings.

Planting during the first two weeks of June also produced good yields but less than the earlier plantings. The June 1 and June 15 planting dates resulted in average yields for the two years of 58.4 bu/ac and 44.2 bu/ac, respectively. For the single year when data were collected for the July 1 planting, yields were reduced by 51% when compared to the May 15 planting date. In 2001, plant height data were also collected (Table 2). The data were interesting in that plant height at harvest was greater for each succeeding planting date.

Additional research was conducted OPREC to determine if maturity group has an effect on yields for different planting dates and is reported elsewhere in the 2001 Research Highlights for OPREC. Future research will look at row spacing effect on yield and plant height.

Table 2. Yields and plant heights of soybean planting date study at OPREC.

Planting date	2001	1999	2-year	Plant height
April 15	76.6	NA	76.6	33.5
May 1	64.8	60.5	62.7	34.3
May 15	64.2	72.5	68.4	36.1
June 1	56.7	60.1	58.4	40.9
June 15	42.7	45.7	44.2	41.8
July 1	NA	33.5	33.5	NA
Mean	60.9	54.5	57.3	37.3
LSD	9.7	8.6	7.6	5.0

SOYBEAN DATE OF PLANT

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Soybean development is influenced by temperature, water availability, day length, variety, and other factors (Sholar, 1997). By altering the date soybeans are planted, a producer can change, to a limited extent, the time of the year that the most critical stages in soybean development occur, such as flowering, pod set, and pod fill. Theoretically, by choosing an optimum planting date, heat and drought stresses that traditionally occur during certain months of the year, could be avoided. Planting maturity groups III and IV in April in Oklahoma reduces the probability that the crop will be flowering or maturing in hot, dry conditions (Sholar and Edwards, 1997), while full season groups V and VI should be planted between May 10 and June 15 (Sholar, 1997). Generally, in Oklahoma, significant yield reductions begin when planting date is delayed beyond late June (Sholar and Edwards, 1997). This information provides general planting date concepts for eastern Oklahoma, but it is unknown if these same principals will work in western Oklahoma.

Maturity groups III and IV are considered “early varieties,” although IV’s can be planted as a full season soybean. Recent studies have focused on the performance of these maturity groups based on planting dates ranging from early April to mid July. In Kentucky, yield response to planting date of III’s and IV’s showed the best results for mid-June plantings, contradicting Arkansas, Kansas, and South Central Texas studies that favored April planting systems (Steele and Grabau, 1997). In Kentucky, high seed-fill temperatures were associated with reduced yields of the early-maturing cultivars planted in late April (Kane, Steele and Grabau, 1997).

Yield results (Tables 1 and 2) for the date of plant study at the Oklahoma Panhandle Research Station in the summers of 2000 and 2001. Maturity groups III, IV, and V were planted at a rate of approximately 150,000 plants per acre with 30-inch row spacing. The cultivars that were used in 2000 were Asgrow 3301, 4602, and 5602. The cultivars used in

2001 were Asgrow 3302, 4602, and 5602. This study was also repeated at the North Central Research Station in Lahoma and the Eastern Research Station in Haskell.

Table 1. Grain yields for planting date and maturity for Soybean planting date OPREC 2000.

Planting date	April 15	May 5	May 15	June 1	June 15	July 1
MG III	23.7	25.5	21.7	10.2	13.0	16.9
MG IV	26.9	31.4	22.0	13.0	16.1	20.0
MG V	23.3	25.3	24.4	23.7	24.1	20.8

LSD (0.05) among planting dates 9.5 LSD (0.05) among maturity groups 1.5
Yield reported in bu/ac

Table 2. Grain yields for planting date and maturity for Soybean planting date OPREC2001.

Planting date	April 17	May 5	May 14	May 30	June 14	July 1
MG III	52.9	67.1	52.8	60.1	57.2	53.6
MG IV	60.9	63.9	57.0	54.4	59.1	37.6
MG V	57.9	57.9	51.1	59.8	34.7	34.4

LSD (0.05) among planting dates 9.5 LSD (0.05) among maturity groups 1.5
Yield reported in bu/ac

Yields for 2000 were severely affected by irrigation problems during the first two weeks of August, which is a critical period for soybean development. They were also affected by a hailstorm in early august. Results from 2001 indicate that group III soybeans may be the best option as yield is least affected by planting date. When planting before June all maturity groups appear to work well, this is supported by other research conducted at OPREC. Future research may need to include late group II soybeans as an alternative.

SOYBEAN PLANT POPULATION

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Plant population is an additional determining factor of soybean yield. The correct plant population will vary with cultivar, row width, and production area. Generally, early-maturing cultivars produce higher yields at high plant populations. This is due to the growth habit of these cultivars. This cultivar type tends to branch less than a later maturing cultivar and therefore cannot compensate as well for low plant populations. Medium to late varieties tend to lodge at high populations because of reduced light penetration, resulting in thin, weak stems (Sholar, 1997).

Soybeans can compensate in yield for a wide range in plant populations. As seeding rates increase, plant height, height of the lowest pod, and lodging tend to increase. When planting indeterminate cultivars, tall plants with small, weak stems are usually produced at excessive seeding rates, such as 250,000 seeds/acre. With these high populations, severe lodging is likely to occur, resulting in excessive harvest loss and poor grain quality. If the seeding rate is lower, such as 60,000 seeds/acre, the plants will be short, produce many branches, and the pods will be close to the soil surface, also making harvest losses excessive (Beuerlein, 1988).

General Cooperative Extension recommendations made for Oklahoma closely follow other regional production practices, but these recommendations have not been validated by field research. As row width is narrowed, planting rate per foot of row should be adjusted. In 30-inch rows, there should be 6 to 8 harvested plants per foot of row. There should be 4 to 6 plants in 20-inch rows and 2 to 4 in rows measuring 10 inches or narrower. If planting is delayed until July, an increase in planting rate is desirable because of the short stature of late planted soybeans (Sholar, 1997). In addition to seeding rate increases due to late planting date, seeding rate should be increased 10% for a poor seedbed, 10% for early maturing varieties, and 10% when planting late or after wheat (Sholar and Edwards, 1997).

Yield results (Tables 1 and 2) for the plant population study at the Oklahoma Panhandle Research Station in the summers of 2000 and 2001. Maturity groups III, IV, and V were planted at varying rates in 30-inch row spacing. Varieties planted in 2000 were Asgrow 3301, 4602, and 5602 and for 2001 were Asgrow 3302, 4602, and 5602. Planting dates where May 15, 2000 and May 14, 2001 This study was also repeated at the North Central Research Station in Lahoma and the Eastern Research Station in Haskell.

Table 1. Yields from soybean planting rate by maturity group study OPREC 2000.

Planting Rate	100,000	125,000	150,000	175,000	200,000	225,000	250,000
MG III	20.2	19.7	21.0	22.4	23.0	22.3	22.5
MG IV	20.7	21.0	18.4	20.4	20.7	19.6	21.2
MG V	19.0	18.4	18.9	18.9	14.6	19.6	19.1

LSD (0.05) among populations 3.2 Yield reported in bu/ac

Table 2. Yields from soybean planting rate by maturity group study OPREC 2001.

Planting Rate	100,000	125,000	150,000	175,000	200,000	225,000	250,000
MG III	61.7	57.1	58.8	56.0	59.5	57.4	61.4
MG IV	59.0	57.3	57.7	56.6	60.0	57.7	60.6
MG V	46.3	55.2	55.4	55.3	53.4	52.7	52.4

LSD (0.05) among populations 3.2 Yield reported in bu/ac

Yields in 2000 were severely affected by irrigation problems the first two weeks of August, which is a critical period in soybean development. These results indicate no significant difference among the plant populations. Therefore, it does not appear to be beneficial in terms of yield to plant higher populations of soybean.

EVALUATION OF MONSANTO BT-CORN HYBRIDS FOR CONTROL OF SOUTHWESTERN CORN BORER, 2000

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Several transgenic *Bacillius thuringiensis* (Bt) corn hybrids developed by Monsanto Co. were evaluated for control of second generation southwestern corn borer (SWCB) on irrigated corn at the Panhandle Research Station, Goodwell, OK. Plots measured 10 ft x 20 ft and were replicated 4 times in a RCB design. Plots were planted in 30-inch rows on May 18, 2000 with a cone planter at 26,000 plants per acre into a Richfield clay loam soil. Plant stand counts were collected on June 6. On July 22 each plant received approximately 30 newly hatched SWCB larvae using a bazooka gun dispenser. The larvae were placed on the collars of the leaf just above, and just below the ear. On August 29, fifteen plants per plot were split from root to tassel and evaluated for the number and length of borer-induced tunnels and borer larvae. Data were subjected to ANOVA and individual means compared using Fisher's protected LSD.

SWCB larvae numbers were significantly reduced in the MON 85006, MON 84005+MON 810, MON 84006+MON 810, and MON810 hybrids which essentially eliminated any tunneling injury to the plants. MON 84005 reduced larval survival and subsequent larval tunneling when compared to the untreated check, but was not as efficacious as the other events. These events, with the exception of MON 84005, provided nearly 100% control of 2nd generation SWCB in corn grown in the Oklahoma panhandle.

Hybrid/Transgenic Event	Mean # Tunnels/plant	Tunnel length Cm/stalk	Tunnel length Cm/ear	# borers/plant	% stalks with visible feeding damage
MON 84005	0.7 b	1.9 b	0.4 a	0.0 a	51.6 b
MON 84006	0.1 a	< 0.1 a	0.0 a	0.0 a	6.6 a
MON 84005 + MON 810	0.1 a	< 0.1 a	0.0 a	0.0 a	8.3 a
MON 84006 + MON 810	0.1 a	< 0.1 a	0.0 a	0.0 a	5.0 a
MON 810	0.1 a	< 0.1 a	0.0 a	0.0 a	8.3 a
Non-Bt isoline	2.1 c	11.6 c	1.4 b	0.3 b	95.0 c
LSD	0.25	1.14	0.33	0.13	0.17

Means within same column followed by the same letter are not significantly different according to Fisher's Protected LSD (P=0.05).

EVALUATION OF EXPERIMENTAL AND REGISTERED INSECTICIDES FOR CONTROL OF SOUTHWESTERN CORN BORER IN CORN

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Southwestern corn borer is a consistent pest of corn grown in the Oklahoma Panhandle. In the summer of 2001, we evaluated XR225 and Intrepid against several registered insecticides for control of second generation southwestern corn borer (SWCB) on irrigated Pioneer 3162 corn. Each treatment was applied to plots measuring 7 ft x 40 ft and replicated 4 times in a RCB design. Plots were planted on May 12 with a John Deer Max emerge planter at 34,000 plants per acre. On August 2, pretreatment counts of egg masses collected during pollen shed indicated SWCB populations had exceeded the economic threshold of 25% infested plants. Insecticide treatments were applied on August 3 with a CO2-charged hand held sprayer through 0015 flat fan nozzles at 30 psi for a total volume of 20 gallons per acre. On September 9, ten plants were split from each plot and evaluated for the number and length of borer-induced tunnels and borer larvae. Treatments were compared using ANOVA and individual means distinguished using Fisher's Protected LSD.

SWCB populations were moderate. Egg lay was extended for several weeks following the application, so control was not as efficacious as expected. Warrior, both rates of XR-225 @ 0.015, both rates of Intrepid, and Tracer @ 0.062 lb ai/A reduced larval tunneling compared to the untreated check. The percentage of infested plants was reduced with Warrior, XR-225 @ 0.015 lb ai/A and Intrepid at 0.06 lb ai/A compared to the untreated check plants. Ear tunneling was not significantly ($P \leq 0.05$) different from the untreated check.

Treatment/ formulation	Rate Lb (AI)/ac	Tunneling (cm/plant)	# borers/10 plants	% infested
XR-225 1.25 EC	0.01	8.15 cd	0.08	68.0 bcd
XR-225 1.25 EC	0.015	5.90 d	0.05	55.0 cd
Warrior 1EC	0.03	6.13 d	0.03	47.0 d
Tracer 4 SC	0.031	13.33 ab	0.05	90.0 ab
Tracer 4 SC	0.062	10.22 bcd	0.03	67.0 bcd
Tracer 4 SC	0.093	11.90 abc	0.00	95.0 a
Intrepid 2F + Latron CS-7	0.06 0.125[a]	6.70 d	0.00	57.0 cd
Intrepid 2F + Latron CS-7	0.12 0.125	6.72 d	0.00	77.0 abc
Untreated	---	16.50 a	0.03	88.0 ab
	L.S.D. = 0.05	4.95	n.s.	0.25

Means in a column followed by the same letter are not significantly different according to Fisher's Protected LSD (P=0.05)

[a] % vol./vol.

EVALUATION OF FO570 FOR CONTROL OF SOUTHWESTERN CORN BORER IN CORN

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Southwestern corn borer is a consistent pest of corn grown in the Oklahoma Panhandle. In the summer of 2001, we evaluated an experimental insecticide, FO570, for control of second generation southwestern corn borer (SWCB) on irrigated Pioneer 3162 corn. Each treatment was applied to plots measuring 7 ft x 40 ft and replicated 4 times in a RCB design. Plots were planted on May 12 with a John Deer Max emerge planter at 34,000 plants per acre. On August 2, pretreatment counts of egg masses collected during pollen shed indicated SWCB populations had exceeded the economic threshold of 25% infested plants. Insecticide treatments were applied on August 3 with a CO2-charged hand held sprayer through 0015 flat fan nozzles at 30 psi for a total volume of 20 gallons per acre. On September 9, ten plants were split from each plot and evaluated for the number and length of borer-induced tunnels and borer larvae. Treatments were compared using ANOVA and individual means distinguished using Fisher's Protected LSD.

SWCB populations were moderate. Egg lay was extended for several weeks following the application, so control was not as efficacious as expected. Warrior, FO570, and the high rate of Capture reduced SWCB tunneling compared to the untreated check, but the low rate of Capture did not significantly reduce tunneling. Ear tunneling, and percent infested plants were not significantly ($P \leq 0.05$) different from the untreated check.

Treatment/ formulation	Rate lb (AI)/acre	Tunnel (cm/plant)	# borers/ 10 plants	% infested
Warrior 2E	0.02	7.05 c	0.00	55.0
Capture 2E	0.04	9.23 bc	0.05	65.0
Capture 4EC	0.05	12.55 ab	0.03	88.0
FO570	0.017	11.25 bc	0.00	70.0
Untreated	---	16.50 a	0.03	85.0
LSD = 0.05		5.11	n.s.	n.s.

Means in a column followed by the same letter are not significantly different according to Fisher's Protected LSD (P=0.05)

EVALUATION OF A PIONEER BT-CORN HYBRID FOR CONTROL OF SOUTHWESTERN CORN BORER, 2001

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A Cry 1F transgenic *Bacillius thuringiensis* (Bt) corn hybrid (Event TC1507), developed by Pioneer Hi-Bred was evaluated for control of second generation southwestern corn borer (SWCB) on irrigated corn at the Panhandle Research Station, Goodwell, OK. Plots measured 10 ft x 20 ft and were replicated 4 times in a RCB design. Plots were planted in 30-inch rows on May 31, 2001 with a cone planter at 26,000 plants per acre into a Richfield clay loam soil. Plant stand counts were collected on June 3. On August 1, each plant received approximately 30 newly hatched SWCB larvae using a bazooka gun dispenser. The larvae were placed on the collars of the leaf just above, and just below the ear. On September 5, fifteen plants per plot were split from root to tassel and evaluated for the number and length of borer-induced tunnels and borer larvae. Data were subjected to ANOVA and individual means compared using Fisher's protected LSD.

SWCB larvae numbers were significantly reduced in the hybrid and essentially eliminated any tunneling injury to the plants. Reduction in damage to ear tips caused by corn earworm feeding was also observed. This event provided excellent control of 2nd generation SWCB in the Oklahoma panhandle.

Hybrid/Transgenic Event	Tunnel length Cm/stalk	Tunnel length Cm/ear	# borers/plant	% ear damage
Pioneer Cry 1F (Event TC1507)	0.62 a	0.15 a	0.00 a	22 a
Non-Bt isoline	21.80 b	2.13 b	0.08 b	85 b
LSD	3.99	1.3	0.05	25

Means within same column followed by the same letter are not significantly different according to Fisher's Protected LSD (P=0.05).

EVALUATION OF A DOW AGROSCIENCE *HERCULEX* ® BT-CORN HYBRID FOR CONTROL OF SOUTHWESTERN CORN BORER, 2001

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A Cry 1F transgenic *Bacillius thuringiensis* (Bt) corn hybrid (Herculex®), developed by Dow Agrosciences was evaluated for control of second generation southwestern corn borer (SWCB) on irrigated corn at the Panhandle Research Station, Goodwell, OK. Plots measured 10 ft x 20 ft and were replicated 4 times in a RCB design. Plots were planted in 30-inch rows on May 31, 2001 with a cone planter at 26,000 plants per acre into a Richfield clay loam soil. Plant stand counts were collected on June 3. On August 1, each plant received approximately 20 newly hatched SWCB larvae using a bazooka gun dispenser. The larvae were placed on the collars of the leaf just above, and just below the ear. On September 5, ten plants per plot were split from root to tassel and evaluated for the number and length of borer-induced tunnels and borer larvae. Data were subjected to ANOVA and individual means compared using Fisher's protected LSD.

SWCB larvae numbers were significantly reduced in the hybrid and essentially eliminated any tunneling injury to the plants. This event provided excellent control of 2nd generation SWCB in the Oklahoma panhandle.

Hybrid/Transgenic Event	Tunnel length Cm/stalk	Tunnel length Cm/ear	# borers/plant
Herculex® Cry1F Bt	0.75 a	0.08 a	0.03 a
Non-Bt isoline	22.20 b	1.40 b	0.32 b
LSD	8.88	0.96	0.23

Means within same column followed by the same letter are not significantly different according to Fisher's Protected LSD (*P*=0.05).