SDSU

Progress Report

1981 RESEARCH RESULTS

James Valley Agricultural Research & Extension Ctr.
Redfield, S.D. 57469

Agricultural Experiment Station • South Dakota State University • Brookings, South Dakota 57007

MARCH, 1982

1981 REFIELD PROGRESS REPORTS

Order additional Copies or entire sets with this order blank.

Send to: James Valley Research & Extension Center
RR 2 Box 90A
Redfield, South Dakota 57469

Copies Desired		Page
_______	Redfield Weather 1981	1
_______	1981 Performance Trials of Corn, Grain Sorghum, Soybeans and Winter Wheat	6
_______	Spring Wheat Breeding	12
_______	Soybean Irrigation	15
_______	Sunflower Varieties-1981-Dryland	17
_______	Agronomic Trait Responses of 5 Inbred Lines to Line Source Sprinkler Irrigation	19
_______	Sunflower Fertility Research	22
_______	Chemical Control Of Sunflower Seed Weevils	25
_______	Chemical Control of Stalk-Boring Insects In Sunflowers	26
_______	Tillage Control of Sunflower Seed Weevils	29
_______	Improvement of Alfalfa Stand Establishment Through Control of Alfalfa Damping-off and Parastic Nematodes	33
_______	Alfalfa Variety and Seeding Rate Trial	36
_______	Corn Herbicide Demonstration Plots	38
_______	Saving Irrigation Energy Not Always Easy	40
_______	Effect of Length of Feeding Period of Performance of British and Exotic Crossbred Yearling Heifers	42
_______	Feedlot Performance of Growing Steer Calves on High Roughage Ration Supplemented with High "ByPass" or All Natural Protein Supplement	45
_______	Preweaning & Post Weaning Performance of Crossbred Calves 0, 1 or 2 Ralgro Implants	48
_______	Treflan on Corn Postermergence	52

James Valley REPORT

REDFIELD - WEATHER 1981

The weather statisctics for 1981, at the James Valley Research & Irrigation Center Redfield, was not to favorable for crop production. The temperatures for the growing season (April-September) were about normal with about one degree below normal. The precipitation for the same period was approximately six inches below normal. No doubt with the lack of moisture and the high evaporation had a tremendous effect on the germination of the crops in early spring. Fair precipitation was received the last of May which helped to get the row crops off to a better start than the small grain. The showers that were received during this time were very timely, just when the crop needed moisture, with the temperatures staying at normal or a little below helped to reduce the evaporation and transpiration (water lost through the leaves of the plant). Although evaporation was running rather high due to the winds the crops still made fairly good yields even though in some areas the crop was cut for feed. The timely showers did help to reduce the transpiration and helped to give the plant that cooling effect so it would not dry up and wither away.

All these indicators, temperature, precipitation, evaporation, growing degree days and soil temperatures are characteristics that are employed at the station to measure the weather conditions, which are necessary to insure a good crop.

These charateristics are very important and have certain aspects when applying to research and the National Oceanic and Atmospheric Administration Environmental Data Service in their analysis in predicting crop and weather conditions. Another characteristic added last fall in keeping weather records at James Valley Research and Irrigation Center was measurement of the relative humidity.

Temperatures

The temperatures for the year (see table 1) were near normal. The first four months January, February, March and April were considerable above normal. May and June were below normal, which was in our favor to help keep down the evaporation. July and September were normal with August below normal. In all, the temperatures were approximately normal. October and December were below normal, but November was considerable above normal with a 5.5 degree above average.

Precipitation

The precipitation for the year was 5.16 below normal with an annual precipitation of 18.62 inches. The station received 13.46 inches precipitation for this year. The growing period (April-September) was below normal

with a normal of 14.45 inches. The station received 8.85 inches during the growing period, this being below normal of 5.60 inches. The months considered the growing period were below their respective normal. Rainfall in May was an inch and a half below normal.

Degree Day and Evaporation

The open pan evaporation (Table 3) is a means where by measurement is made for the loss of water from the soil and transpiration through the plant. coincides with the temperatures and amount of precipitation received.

A "Growing Degree Day" is not the same as a calendar "day" of 24 hours. The term "Growing Degree Day" (GDD) is used to designate calculations based on temperature factors or "heat units". Many seed corn companies are using the GDD in measuring the maturity of their seed corn. The corn is based on the number of GDD between planting time and physiologic maturity (first killing frost). At the station, we can expect killing frost (28 degrees or lower) on the average by October 4th. The sum of these "heat units" for each calendar day of the growing season provides a figure ranging from 2,300 to 3,000 in South Dakota -- that may better pin down the maturity period or rating of corn.

Growing degree days are calculated by subtracting a base temperature from the average of the maximum and minimum temperatures for the day. Corn doesn't grow much at temperatures of 50 to 55 degrees (F). As temperature rises to a gauge of 80 to 86 degrees, corn grows faster if moisture is plentiful. But at a temperature above 86 degrees the roots have increasing difficulty taking in water fast enough to keep the plant cells turgid (full of water) and working at top speed. Consequently only temperature extremes of 50 degrees and 86 degrees are used in calculating GDD. The mathematical expression for calculating GDD is:

$$GDD = \frac{\text{Max. Temp. plus Min. Temp.}}{2} = \text{Base Temp.}$$

For example, if the maximum temperature for the day is 84 degrees and the minimum is 60 degrees such as: $GDD = \frac{84 \text{ plus } 60}{2} = 72 - 50 = 22$ which is 22 growing degree days occuring on that day.

This method is used because temperature is one of the most important environmental factors affecting the rate of plant development. It is recognized that growth is also affected by several other environmental factors such as, moisture, nutrients, length of time temperature is above 50 degrees and photoperiod. Perhaps some of these environmental factors can eventually be used in a formula to help estimate maturity ratings, but "Growing Degree Days" seems to be the best rating developed to date.

Soil Temperatures

There are six different depths 2,4,8,20,40 and 72 inches taken twice (a.m. & p.m.) daily through out the year. The soil temperatures are a very strong indicator in helping the farmer when it is time to seed the crop. The two inch level in April was 36 degrees in the evening and 32 degrees in the morning. The four inch level was about the same. The eight inch level morning reading was 36 degrees and the evening was 40 degrees. However, in May, 42 degrees at the 2 inch level was recorded in the morning and 64 degrees recorded in the evening while at the 4 inch depth was 44 and 60 respectively.

The eight inch level was 50 and 55 degrees. At the two and four inch level the temperatures fluctuated considerable from day to day as the temperature rises and falls. The eight inch depth and deeper the temperatures stay more even and gradually rises in temperature as the summer days get warmer. At the six foot level temperatures stayed pretty well constant with a variation of summer time in the mid-fifties to the lower 40 degrees in the winter. The station reports the 2,4 and 8 inch readings to the Sioux Falls office every morning from April through October which are broadcast over the air for your information.

Table 1

1981 Temperatures (^oF)

Month	Maximum	Minimum	Average	Long Term Average	Deviation From Average
January	32.5	4.6	18.6	12.8	+5.8
February	37.4	10.3	23.9	16.7	+7.2
March	52.7	18.8	35.	30.2	+5.6
April	64.7	34.4	49.6	45.9	+3.7
May	70.1	40.0	55.1	57.6	-2.5
June	79.9	52.9	66.4	67.2	-0.8
July	88.0	60.3	74.2	73.5	+0.7
August	84.5	57.6	71.1	71.6	-0.5
September	78.0	45.8	61.9	61.4	+0.5
October	57.8	31.1	46.4	49.9	-3.5
November	49.7	26.0	37.8	32.3	+5.5
December	24.3	6.9	15.6	18.9	-3.3

Table 2

1981 Precipitation (inches)

Month	1981	Long Term Average	Deviation From Average
January	0.03	0.44	-0.41
February	0.08	0.56	-0.48
March	1.38	0.83	+0.55
April	1.04	1.93	-0.89
May	1.12	2.67	-1.55
June	2.63	3.49	-0.86
July	1.19	2.45	-1.26
August	2.16	2.29	-0.13
September	0.71	1.62	-0.91
October	1.93	1.29	+0.64
November	0.15	0.59	-0.44
December	1.04	0.46	+0.58

Table 3

1981 Growing Season Open Pan Evaporation

Month	1979	1980	1981
April	*1	*1	7.52
May	5.86	8.30	6.65
June	7.03	4.88	7.62
July	5.12	5.94	9.59
August	4.91	5.48	7.36
September	5.93	5.92	6.10
TOTAL	28.85	30.52	44.84
AVERAGE	5.77	6.10	7.47

*1 Pan froze up no Data available

Table 4

1981 Growing Season, Growing Days

Month	1981	Normal Average	Deviation From Normal	Cooling Degree Days
April	458	570	-112	0
May	316	255	+61	22
June	40	67	-17	133
July	17	09	+8	278
August	6	12	-6	242
September	133	156	-23	45
TOTAL	970	1069	-99	---

SDSU
James Valley
REPORT

1981 PERFORMANCE TRIALS OF CORN, GRAIN SORGHUM, SOYBEANS AND WINTER WHEAT

J.J. Bonneman and G.W. Erion
DEPARTMENT OF PLANT SCIENCE

Performance Trials with corn, grain sorghum, soybeans and winter wheat were seeded at the Research Center for 1981 harvest. The winter wheat trials suffered from and open winter and the soybeans were damaged severely by jack-rabbits early in the season. Data from the winter wheat and soybean trials was so variable it is considered to be of questionable value and the results are not reported here.

The corn trials were seeded May 13 on both dryland and irrigated fields of the Center. The dryland field was quite firm and moist. The irrigated field was somewhat lumpy, though moisture seemed adequate for decent germination. Custom built 31-cell cone seeders mounted above standard flexi-planter units with double disc openers were used for seeding the row crops. The corn was seeded in 36-inch row spacings.

The grain sorghum and soybeans were seeded on May 29 in 36-and 30-inch row spacings, respectively. The grain sorghum seedbed was firm, though somewhat lumpy for grain sorghum. The soybean seedbed was firm though somewhat dry. Emergence of the plots appeared to be good initially.

Recommended herbicides and insecticides were incorporated or banded in the plot areas at seeding. Between the row, weeds were the most serious problem. Fertilizer was applied to the field broadcast at the rate of 45-20-0 prior to discing and an additional 80 lbs/A of anhydrous ammonia were knifed into the irrigated field later in the season. The irrigated trials received two applications of water during the season.

Plant populations were not as high as intended. Adequate seed, 20% above desired final populations for corn and about 40% more than desired final population for grain sorghum was placed in the soil at time of seeding. Corn populations of 10,500 plants per acre were desired for the dryland trial; the final count in late August averaged 10,225 plants per acre for all hybrids entered. Two populations were planned for the irrigated trial, 24 and 28,000 plants per acre. The final late August counts averaged 20,830 and 24,085 plants per acre, respectively, for the two irrigated populations. The grain sorghum trials averaged three to four plants per foot instead of the desired five to six per foot. The corn trial yields are an average of 6 replications for the irrigated trial and four replications for the dryland trial. The sorghum trial results are the average of three replications. No statistical significance was found for the higher or lower population in the corn trial.

The grain sorghum and soybean trials were harvested on October 15. The irrigated corn trial was harvested on November 3 and the dryland trial on November 4.

Grain sorghum yields ranged from 5575 down to 4210 pounds per acre, good to excellent for the crop year and additional irrigation water available. The quality was good or better and test weights ranged from 56 to 61 lb/B. The drier weather and cooler than normal July and August delayed heading about two weeks as heading usually begins about July 20 and was delayed until August 4, 1981. The warm, dry September without a killing frost was very beneficial and permitted plants to continue growth and produce excellent yields of good quality grain.

The corn yields were good in the dryland trials considering the dry, hot weather at the Center. The irrigated yields were good also but not what might be expected from irrigated fields. Dryland corn yields ranged from 76.8 down to 49.0 B/A: the trial mean being 63.5 B/A. Irrigated corn fields ranged from 143.2 down to 84.8 B/A. Moisture content in the kernels averaged about 20% in both trials and stalk breakage averaged 5% or less in both trials.

Current years data are presented for the corn trials and two years yield data for the grain sorghum trials. Additional data on the trials will be found in the Performance Trial Publications for all these crops available from the South Dakota State University Agricultural Experiment Station or your County Extension Office.

1981 CORN PERFORMANCE TRIALS, AREA C1(DRY), REDFIELD, SD
Table 1.

Brand and Variety	Type and Cross	Yield B/A	PCT Stalk Lodged	Percent Moisture	Performance Score Rating
Curry SC-1424	M 2X	76.8	2,3	17,1	1
Keltgen KS104	M 2X	75.0	2.5	17.1	2
Keltgen KS102	M 2X	73.3	8.7	20.9	7
Curtis 460	E 2X	72.8	4.9	17.4	3
Curry SC-1422	M 2X	71.7	3.1	20.1	8
Cargill 426	E 2X	71.4	4.8	16.6	4
DeKalb XL-28	M 2X	71.2	3.1	18.4	5
Curry SC-1420	E 2X	71.00	4.3	17.8	6
Pag SX181	E 2X	69.4	5.0	16.1	9
Cenex 3103	M 3X	68.6	9.6	16.2	11
Northrup King PX49	M 2X	68.4	5.5	19.6	13
Curry SC-1455	M 2X	68.2	2.4	20.2	12
Western KX-52	M 2X	67.6	4.8	20.2	19
PAG SX157	E 2X	67.3	4.7	14.5	10
DeKalb XL-36	M 2X	66.7	3.2	20.0	22
Curry SC-1421	E 2X	66.6	8.0	21.2	26
Asgrow RX40	E 2X	66.5	11.0	14.5	14
Acco Paymstr UC2990	M 2X	66.2	5.4	17.6	21
Asgrow RX511	M 2X	65.6	1.7	17.2	18
Trojan T950	E 2X	65.2	5.8	14.8	17
Top Farm SX104	M 2X	65.1	4.8	14.6	15
Funks G-4315	M M2X	65.0	1.6	15.7	16
Funks G-4256	M 3X	64.8	2.3	17.0	23
Pride 5578	M 2X	64.6	7.1	19.1	28
Top Farm SX104A	M 2X	64.5	10.4	17.7	29
Keltgen KS1020	M 2X	64.4	3.2	18.7	24
Keltgen KS101	M 2X	64.1	2.4	14.7	20
Northrup King PX9288	E 2X	63.3	5.8	15.9	27
Cenex 2119	E 2X	62.9	4.8	15.3	25
Western KX-55	M 2X	62.7	8.5	20.9	35
Trojan TXS 99	E 2X	62.5	12.2	16.2	32
DeKalb XL-55A	M 2X	62.3	22.8	22.6	44
Cargill 862	E 2X	62.3	4.7	17.7	31
Top Farm SX99	M 2X	62.2	7.9	15.2	30
DeKalb XL-18	M 2X	60.9	3.1	19.0	34
SDAES Check 4	M 2X	59.6	4.0	17.3	36
SDAES Check 10	M 2X	59.2	5.0	14.7	33
Pride 4480	M 2X	58.9	4.0	17.8	37
PAG SX189	E 2X	58.0	5.3	16.8	39
Funks G-4195	E 3X	57.4	7.4	15.3	40
Cargill 834	E 2X	57.3	2.5	16.2	38
Pride 3322	E 2X	55.6	7.8	15.8	43
Sigco I90	E 2X	55.6	1.6	15.7	41
SDAES Check 11	E 2X	55.3	7.4	14.6	42
Sigco 192	E 2X	54.1	11.3	14.8	46
Asgrow RX355	E 3X	54.1	7.2	14.4	45
DeKalb XL-25A	M 2X	53.9	11.0	17.0	48
Cenex 3094	E 3X	52.2	5.1	14.2	47

1981 Corn Trials (dry) Continued
Table 1.

Brand and Variety	Type and Cross	Yield B/A	PCT Stalk Lodged	Percent Moisture	Performance Score Rating
Fontanelle 611	L 2X	51.4	3.1	30.3	50
Funks G-4085	E 3X	49.0	8.6	14.5	49
Means		63.5	5.9	17.3	
LSD (.05)		12.0	C. V - % = 13.6		

1981 Corn Performance Trial, Area C1 (Irrigated), Redfield, SD
Table 2.

Brand and Variety	Type and Cross	Yield B/A	PCT Stalk Lodged	Percent Moisture	Performance Score Rating
Top Farm SX104A	M 2X	143.2	2.2	21.9	1
Keltgen KS104	M 2X	139.3	1.7	22.0	2
Trojan T1000	M 2X	139.2	2.9	22.2	3
Curry SC-1455	M 2X	135.7	0.9	29.6	15
Curry SC-1422	M 2X	135.5	1.4	29.6	9
Acco PayMstr UC2990	M 2X	135.3	2.1	24.6	5
Keltgen KS95	E 2X	134.9	0.6	21.6	4
Curry SC1424	M 2X	134.7	0.0	23.5	6
Curry SC142C	E 2X	134.1	2.9	22.3	7
ASgrow RX511	M 2X	133.5	10.9	20.4	11
Keltgen KS107	M 2X	132.6	2.8	21.6	10
CS Gold 6880	M 2X	131.8	1.5	22.3	12
McCurdy 4855	M 2X	130.5	3.7	22.1	13
PAG SX397	M 2X	129.9	4.6	25.2	19
Keltgen KS1060	M 2X	129.5	0.0	26.0	18
Top Farm SX104	M 2X	128.6	0.9	18.0	8
Cenex 2108	M 2X	128.0	0.9	20.9	14
Circle Seed CS-203	M 2X	127.8	0.3	22.8	16
Western KX55	M 2X	124.9	1.9	24.9	23
McCurdy X956	M 2X	123.4	0.3	24.6	25
Keltgen KS102	M 2X	123.2	1.7	24.5	28
Circle Seed CS-202	M 2X	121.6	1.0	17.8	17
Northrup King PX49	M 2X	121.1	3.8	21.5	27
Trojan TXS-102	M 2X	120.8	1.2	23.6	35
CS Gold 2330	M 2X	120.4	2.2	18.2	21
MC Curdy 4664	E 2X	120.3	2.1	17.8	20
Cenex 2119	E 2X	119.5	6.3	16.8	22
DeKalb XL-25A	M 2X	119.5	1.2	20.5	24
SDAES Check 10	M 2X	119.0	5.9	19.3	29
SDAES Check 2	M 2X	118.8	0.9	20.3	26
Cargill 436	M 3X	118.5	1.4	22.0	36
Cargill 838	E 2X	118.3	1.8	20.4	31
Cargill 426	E 3X	118.1	2.0	20.3	32
Curtis 460	E 2X	118.0	1.4	22.7	38

1981 Corn Trial (Irrigated) Continued
Table 2.

Brand and Variety	Type and Cross	Yield B/A	PCT Stalk Lodged	Percent Moisture	Performance Score Rating
DeKalb XL-36	M 2X	117.3	0.9	24.0	41
Acco Paymstr UC2951	M 2X	117.2	1.8	19.1	30
DeKalb XL-54	M 2X	117.2	2.3	30.3	56
Western KX52	M 2X	116.9	4.7	24.8	45
McCurdy 37	E 2X	116.4	6.1	17.5	34
DeKalb XL-28	M 2X	115.6	0.9	24.0	42
DeKalb XL-55A	M 2X	115.4	2.9	31.0	59
Asgrow RX40	E 2X	115.2	2.1	17.7	33
McCurdy 46	M 2X	115.1	5.2	22.9	44
Northrup King PX39	M 2X	114.7	4.4	23.7	47
Cargill 834	E 2X	114.0	7.0	18.3	39
Funks G-4224	E H2X	113.6	3.4	19.6	40
Cenex 2106	M 2X	113.2	1.3	17.6	37
Acco Paymstr UC466C	M 2X	111.4	1.9	24.8	53
CS Gold 940	E 2X	110.8	9.0	18.5	40
Cargill 862	E 2X	110.3	1.8	20.6	48
DeKalb XL-1B	M 2X	109.3	0.6	23.4	54
Circle Seed CS-2502	M 2X	108.8	5.0	17.2	46
Funks G-4315	M M2X	108.5	2.0	19.4	51
PAG SX189	E 2X	108.3	3.9	21.3	55
Pag SX181	E 2X	107.6	1.8	19.0	52
McCurdy 4436	E 2X	107.4	1.8	16.2	43
Pride 2222	E 2X	106.6	2.5	17.0	50
Pride 3322	E 2X	105.1	4.3	19.5	57
Northrup King PX9288	E 2X	103.1	0.3	19.4	58
Fontanelle 580	L 2X	99.6	1.8	44.6	63
PAG SX157	E 2X	99.2	3.0	16.1	60
Northrup King PX37	M 2X	98.5	5.7	20.7	61
Pride 4488	M 2X	84.8	7.7	20.7	62
Means		119.2	2.7	21.8	
LSD(.05)		11.9		C.V-% = 8.8	

Table 3. 1981 Grain Sorghum Performance Trial, Area C1(Irrigated), James Valley Research Center, Redfield, Sping County, South Dakota.

Brand and Hybrid	Yield, lb/A 1981	Yield, lb/A 1980-81	Test Weight, lb/B	Height, Inches	Date Headed
Northrup King 180	5575	5140	57	43	8/12
Asgrow Corral	5220	5265	58	46	8/13
Sigco X9220	5175		60	46	8/5
Sigco 254YG	5150	4915	57	45	8/15
Warner W-655T	5130	4970	58	47	8/14
SeedTec 652G	5100		57	45	8/14
Warner W-545T	5065	4920	59	38	8/5
Western W-212	5065		58	35	8/14
Seed Tec 624G	5045		60	52	8/11
Stauffer Seeds V535	4945		57	46	8/15
Pride P508GB	4920	4865	61	43	8/4
Northrup King 2030	4810	4460	58	42	8/8
Cenex 228T	4795	4920	59	45	8/10
DeKalb DK-38	4750		59	51	8/8
Northrup King 2018	4695	4590	61	42	8/4
Western WS-203	4685	4910	60	45	8/6
Cenex 224T	4655	4480	59	38	8/4
Cenex 310T	4625	4520	57	46	8/14
Northrup King 2222	4620	4700	54	46	8/17
Stauffer Seeds PV515GR	4615	4610	60	38	8/6
Cargill Ex 91002	4590		59	41	8/4
Cargill 30	4585	4705	57	46	8/14
Barzan Ranch 30Y	4540		59	44	8/13
SeedTec 651DR	4490		58	51	8/13
Pag 4433	4480	4500	56	42	8/12
DeKalb A-28+	4405	4700	59	45	8/8
Asgrow Dorado E	4380	5170	59	44	8/11
Sgco 252YG	4360		58	41	8/12
Pioneer Brand 8790	4330		59	40	8/7
PAG 354	4290	4355	57	39	8/5
PAG Ex 91008	4210		57	44	8/17
Means	4750		58	44	8/10
LSD .05	N.S.		C.V. % = 11.4		

James Valley REPORT

SPRING WHEAT BREEDING

F. Cholick, D.K. Steiger, K.M. Sellers
DEPARTMENT OF PLANT SCIENCE

The experiments were seeded on April 24, 1981. Soil temperature and moisture were adequate for good germination.

In the Advanced Yield Trial (AYT) Table 1, both varieties Alex and Olaf performed well. Leaf rust infection was quite low on most varieties.

In the selection nursery,over 2,800 plots were grown for observation and selection. Those lines selected will be advanced in the program next year after yield and quality analysis is completed.

Harvest was completed by August 7, 1981.

Table 1. 1981 Spring Wheat Breeding - Redfield

Variety	Entry No.	Grain 1981	Yield Bu/A 80-81	Test Weight #/Bu	Days to Head	Plant Height (in)	Leaf Rust
Alex	48	38.5	--	59.0	56	30.7	TR
Olaf	3	38.1	42.9	57.9	55	27.3	TR
SD2861	11	36.7	43.9	57.5	50	26.7	TMR
SD2911	21	35.3	--	57.8	56	27.0	TR
Pavon 76	47	35.3	--	56.8	59	27.3	5MR
SD2882	16	35.1	42.1	59.2	52	28.0	TMR
SD2912	22	35.0	--	58.0	52	26.7	TR
Era	2	34.8	38.8	58.8	58	26.7	5MR
SD2934	39	34.8	--	58.4	50	28.3	TMR
SD2853	8	34.2	38.8	58.6	52	29.0	TR
SD8015	43	33.8	--	58.2	54	25.3	TR
SD2920	28	33.7	--	58.6	51	27.7	TMR
SD2935	40	33.7	--	55.4	53	26.7	T-5MR
SD2933	38	33.6	--	58.4	52	27.3	TMS
Len	4	33.5	--	58.0	56	27.7	TR
SD2932	37	33.5	--	57.8	51	28.0	TR
Eureka	1	33.3	37.9	58.1	54	29.0	TMR
SD2925	31	33.3	--	56.5	54	27.0	TMR
SD2939	42	33.1	--	60.0	52	26.7	TR
SD8021	44	33.1	--	59.5	54	31.3	TR
SD8026	45	33.1	--	--	52	29.3	R
SD2854	9	32.8	40.1	56.7	55	27.7	TMS
SD2903	20	32.7	41.5	60.3	50	29.3	5MR
SD2868	14	32.4	39.5	60.0	52	31.7	TMR
SD2884	17	32.2	32.7	58.6	52	29.7	O
Butte	5	31.6	38.8	60.4	51	31.0	TMR
SD2881	15	31.5	39.7	58.3	53	29.7	TR
SD2865	13	31.3	39.0	57.1	56	29.0	TMR
SD2919	27	31.3	--	56.0	53	30.7	5R
SD2931	36	31.1	--	57.9	50	26.3	TMS
SD2917	25	31.0	--	58.5	54	29.7	TMS
SD2902	19	30.9	39.3	58.5	51	29.0	TR
SD2916	24	30.9	--	58.9	55	32.0	TMS
SD2914	23	30.8	--	58.8	52	27.3	TMS
SD2937	41	30.6	--	59.0	54	30.3	TR
James	49	30.6	--	58.0	52	29.3	TMS
SD2864	12	30.5	35.7	58.7	54	30.0	O
SD2921	29	30.5	--	57.9	57	30.7	TR
Protor	6	30.4	37.2	57.5	53	25.0	5MS
SD2930	35	30.2	--	59.6	53	30.3	R
SD2926	32	30.0	--	58.6	53	28.7	TMS
SD2922	30	29.6	--	55.9	57	25.3	O
SD2860	10	29.3	38.4	58.3	54	30.0	TMS
SD2927	33	29.2	--	57.6	52	27.3	TR
SD9009	46	28.8	--	45.5	56	34.0	TR
SD2918	26	28.3	--	58.5	54	29.3	TR
SD2256	7	27.5	38.7	58.8	51	32.3	TMR
SD2929	34	26.3	--	60.2	50	28.0	TR
SD2899	18	24.3	--	58.2	52	27.0	TMS

Table 1. Spring Wheat Breeding Continued

Average grain 1981	32.0
C.V. average	9.1
LSD05 average	5.1

Table 2. 1981 Hessian Fly Spring Wheat Yield Trial - Redfield

Name	Entry No.	Grain Yield 1981	1980	80-81	Test Weight	Days to Heading	Plant Height
			-bu/A-		-lb/bu-		-inches-
SD8025	16	47.4	--	--	60.4	56	31.0
SD8024	15	47.2	--	--	61.0	56	31.0
Proband711	28	45.4	--	--	60.5	57	31.7
Era	5	44.8	36.2	40.5	60.9	62	30.0
SD8034	25	43.9	--	--	62.3	57	38.7
Len	3	43.8	--	--	59.8	59	30.3
Butte	1	43.7	41.3	42.5	63.4	54	31.7
Eureka	2	43.3	36.4	39.9	59.8	56	35.0
SD8015	10	43.2	42.8	42.0	60.1	56	27.7
SD8022	13	43.2	--	--	61.9	56	28.3
SD8023	14	42.7	--	--	60.8	56	29.0
Sd8027	18	42.5	--	--	60.7	56	33.3
Olaf	6	42.0	41.5	41.8	60.3	58	31.7
SD8029	20	41.0	--	--	61.9	57	32.0
James	4	39.7	37.8	38.8	59.6	54	33.0
SD8020	11	39.6	--	--	63.2	57	32.7
SD8010	8	39.3	48.8	44.1	61.9	58	35.3
SD8032	23	38.9	--	--	60.6	60	33.3
Lew	27	38.1	--	--	61.8	60	35.7
SD8021	12	36.8	--	--	62.0	58	33.3
Protor	7	36.5	36.5	36.5	60.2	56	31.0
SD8028	19	35.9	--	--	59.8	58	33.3
SD8026	17	35.0	--	--	60.7	54	31.7
SD8014	9	34.5	41.4	38.0	60.2	54	33.3
Coteau	26	33.4	--	--	59.5	62	33.7
Waldron	--	--	38.2	--	--	--	--
Average		40.9			60.9	57.1	32.4
C.V.		7.3%					
Baye LSD		4.34					

TR = Trace
TMR = Trace moderate resistant
5MR = 5% infection moderate resistant reaction
T-5MR = Trace 5% infection moderate resistant reaction
TMS = Trace moderate susceptible
R = Resistant
0 = None on plant
5R = 5% infection resistant
5MS = 5% infection moderate susceptible reaction

James Valley REPORT

SOYBEAN IRRIGATION

L.O. Fine
DEPARTMENT PLANT SCIENCE

Even though the stand of soybeans in our 1981 experiment at Redfield was destroyed by jackrabbits grazing off the growing points of the young plants, there are some worthwhile conclusions from the years of data obtained here, and similar experiments conducted elsewhere in the state. Experiments on soybean management have been conducted intermittently since 1952 at some points in the state.

Row Spacing: Whatever the water management practice, great benefit in yield was always experienced by using rows 18-21 inches apart rather than 30-36 inch rows. Yield increases recorded as early as 1952 at Redfield were 58% higher for 18 inch than for 36 inch rows; in 1980 and '81 yield increases at Onida and Pierre were 28% and 31% for similar row spacings. Planting in 9-inch rows in limited trial in earlier years resulted in yields intermediate between those with 18 and 36 inch rows.

Plant Density in Rows: Early controlled experiments and one test in 1980 showed absolutely no advantage of beans closer than 2-inches apart in rows; in 1952 our experiments at Redfield showed 4-inch spacing to about equal 2-inch or 3-inch spacing in rows.

Weed Control: Use a pre-plant incorporated program such as Treflan-Sencor or Tolgan. Our experience has been good with these chemicals, but Russian thistle and redroot pigweed may give problems in the latter part of the season.

Irrigation: Water management has been the most difficult variable to assess in this experimental work for 3 reasons: 1) The soybean is a remarkably buffered plant, 2) the vagaries of climate/rainfall over the time and area involved have been great, and 3) the very high available water capacity of the soils involved has made it difficult to create or alleviate plant stress at specific stages in the growth cycle. Experiments have been conducted at Jefferson, Hurley, Pierre-Canning (3) Redfield (3) and Onida in the past 4 years. Only in a few cases has heavy rainfall not interfered with or obliterated the effect of an irrigation by relieving the plant stress on the "control" plots.

However, enough has been learned to make the following statements. It should be emphasized that all the experiments conducted, with water management as a controlled variable, were done with surface (gated pipe) irrigation, and the amount of water actually put on the soil was quite closely measured.

1. The "full pod", "beginning seed", and "full seed" stages of growth as judged by development at the top 4 nodes with fully developed leaves, are the 3 most important stages in the soybean plant development for water stress.

2. If only one irrigation can be made, a thorough irrigation (at least 2 inches) made at the full pod through beginning seed stage, is most valuable. A single irrigation at this stage in 1979 netted more than a 6 bushel increase.

3. Do a thorough job of irrigating -- for a silt loam or loam soil this means at least 2 inches net application.

Yields: With top management, 55-63 bushels per acre have been obtained.

James Valley REPORT

SDSU

SUNFLOWER VARIETIES - 1981 - DRYLAND
JAMES VALLEY RESEARCH CENTER-REDFIELD

M. Esser, Q. Kingsley, A. Dittman, L. Gabriel, R. Flint[1]
PLANT SCIENCE DEPARTMENT

Sunflower varieties were planted on May 14 at a rate of 16,000 seeds per acre. The varieties were harvested on October 8, 1981. All seeding and harvesting was done mechanically to achieve more compatibility with common farm practices.

Soil was fall plowed wheat ground. Treflan was applied on May 13 at a rate of 2 pts. per acre and then was disked twice to incorporate and prepare seedbed. The seedbed was dry and coarse and crop emergence was inhibited and resulted in a poor stand.

Seed weevil infestation was heavy approximately 15-20 per head in late July and early August. Supracide was applied at the recommended rate at approximately 80-90 percent bloom. Crop was sprayed once due to faulty equipment, would recommend two sprayings with a two week interval if heavy infestation is still noticeable.

Yields were low due to lack of rainfall and crop damage caused by high winds in late summer.

Rainfall: 8.85 inches
Planted: May 14
Harvested: October 8

Normal Rainfall April thru Sept.: 14.45 In.
Population: 16,000
Moisture Content: 9% at harvest.

[1]Michael Esser, Ag Research Tech II
Q. Kingsley,Field Experiment Research
A. Dittman, Manager, JVAREC
LeRoy Gabriel, Ag Research Tech I
Roger Flint, Student summer employee

Table I. James Valley Research Center Sunflower Variety 1981 Dryland
Redfield, South Dakota

Identification

Brand and	Variety	Yield	% Oil	Test Wt
Northrup King	Sunbred 275	1815.0	37.9	34.1
Interstate	CX 7101	1725.9	41.0	34.4
Sigco	SGO 448	1659.9	41.1	35.2
Kraig Seed	HYB 903	1650.0	41.0	35.4
Cal/West Seed	HY 48N	1584.0	41.7	34.7
RBA	RBA 3000G	1584.0	41.1	34.2
Red River Com	IMP 897	1565.5	39.4	34.3
Growers Seed	SG 342	1560.9	39.7	35.3
Seedtec Int'l	ST 327	1518.0	39.4	33.9
Growers Seed	SG 380A	1485.0	40.7	35.8
Red River Com	IMP 672	1452.0	42.6	35.9
Northrup King	NK 265	1445.4	42.2	33.7
Sokota Hybrid	SKA 5000	1428.9	40.2	34.3
Sigco	SGO 449	1412.4	41.1	35.3
RBA	RBA 3101	1402.5	41.5	35.4
Cal/West Seed	HY 54L	1402.5	40.0	34.2
Jacques	J 503	1402.5	39.4	34.3
Red River Com	IMP 675	1395.9	41.5	35.1
Golden Harvest	GH 10	1395.9	40.6	34.6
Interstate	IS 907E	1386.0	39.6	34.9
Pfizer Genetic	P 620	1386.0	39.9	34.8
Northrup King	NK 254	1353.0	39.3	34.8
Red River Com	IMP 673	1336.5	41.8	35.1
Seedtec Int'l	ST 349	1313.4	39.6	33.6
Cal/West Seed	HY 54K	1303.5	40.5	33.1
Dahlgren Co	DO 844	1296.9	38.8	34.6
Dahlgren Co	DO 704XL	1280.4	40.9	34.3
Sigco	SGO 472	1270.5	38.3	34.8
Seedtec Int'l	ST 315	1254.0	38.0	34.1
Sokota Hybrid	SKA 4000	1237.5	40.9	34.4
Growers Seed	SG 378	1237.5	40.3	34.7
Inter-tate	IS 7775S	1237.5	39.8	35.9
Northrup King	NK 212	1230.9	40.1	34.8
Cal/West Seed	HY 41M	1221.0	40.4	32.3
Interstate	IS 7116	1204.5	39.8	35.6
RBA	RBA 303	1197.9	41.7	32.8
Dahlgren Co	DO 164	1197.9	40.6	35.2
Growers Seed	SG 372A	1148.4	40.8	35.3
Sokota Hybrid	SKA 6000	1115.4	38.5	33.9
Peredovik		1089.0	38.9	32.3
Sexauer	SX 305A	1089.0	37.5	35.4
Cal/West Seed	HYB 894	1049.4	38.6	35.1
Dahlgren Co	DO 705	1039.5	39.9	34.8
Northrup King	EXS 37	891.0	39.4	34.3
	Average	1346.7	40.1	34.5

AGRONOMIC TRAIT RESPONSES OF 5 INBRED LINES TO LINE SOURCE SPRINKLER IRRIGATION

T. Foley, Z.w. Wicks, A. Dittman, M. Esser and L. Garbirel
DEPARTMENT OF AG ENGINEERING

A line source irrigation system was used to determine the Response of agronomic traits of 5 inbred lines commonly grown for hybrid production in South Dakota. The line source system applied irrigation water at a maximum rate in the plot nearest the sprinkler line. Also, the amount of water delivered decreased in a linear fashion to essentially zero or dryland conditions 55 feet from the source. Therefore, the system allowed the establishment of a water gradient, i.e. Maximum application near the center to minimum water or dryland conditions away from the line.

The principle objectives of this project were to determine if the agronomic traits measured responded similarly to applied water for each of the inbreds studied. This could give insight as to which characters are important in dryland performance or performance in irrigated conditions. In order to achieve these objectives, traits were measured throughout the summer and fall of 1981. Seven irrigations were conducted during the period July 1 to August 15. Each irrigation consisted of approximately 1 inch of water applied in the centermost rows. Tensiometers were used to determine when each irrigation was necessary.

Correlations (a measure of how closely two traits are related) were conducted to determine relationships between traits. For instance, a correlation of +1.0 would indicate the two traits under consideration responded identically. A correlation of -1.0 would indicate the two traits responded in opposite directions, i.e. the valves of one trait increased while the values of the other trait decreased.

The correlations of irrigation and agronomic characters are of particular interest. Specifically, correlations between irrigation applied and grain moisture at harvest indicated increased amounts of irrigation resulted in lower grain moisture at harvest for 3 of the 5 inbreds studied. However, it is important to note the correlations obtained apply only to the dry environment of Redfield in 1981. Increased rainfall in a different year or different location would tend to change these values.

Table 1. Correlations of Agronomic Traits at Redfield, SD

		A619	A632	A634	H99	W64A	Overall Correlation
Irrigation x	yield	.65**	.88**	.74**	.49**	.78**	.58**
	flower	-.53**	-.65**	-.77**	-/32NS	-.33NS	-.33**
	plant height	.86**	.95**	.95**	.93**	.93**	.66**
	ear height	.81**	.87**	.87**	.84**	.78**	.37**
	ear lenght	.84**	.88**	.71**	.72**	.91**	.68**
	grain moisture	-.63**	-.59**	-.75**	-.22NS	.08**	-.22**
	test weight	.70**	.53**	.60**	.39*	.53**	.19*
	300 K weight	.30NS	.80**	.75**	-.10NS	.80**	.41**
Yield x	flower	-.21NS	-.67**	-.65**	-.51**	-.20NS	-.50**
	plant height	.82**	.93**	.83**	.58**	.85**	.74**
	ear height	.81**	.89**	.81**	.47**	.84**	.60**
	ear lenght	.72.**	.80**	.68**	.57**	.76**	.50**
	grain moisture	-.54**	-.59**	-.73**	-/32NS	-.04NS	-.45**
	test weight	.69**	.67**	.59**	.64**	.58**	.49**
	300 K weight	.27NS	.79**	.74**	.07NS	.76**	.01NS
Flower x	plant height	-.47**	-.77**	-.80**	-.29NS	-.38*	-.39**
	ear height	-.39*	-.75**	-.73**	-.33NS	-.29NS	-.44**
	ear lenght	-.46**	-.70**	-.64**	-.53**	-.39*	-.04NS
	grain moisture	.50**	.49**	.69**	.12NS	-.15NS	.63**
	test weight	-.52**	-.60**	-.52**	-.41*	.05NS	-.68**
	300 K weight	-.14NS	-.87**	-.60**	.21NS	-.32NS	.25**
Plant ht x	ear height	.85**	.95**	.88**	.85**	.85**	.87**
	ear lenght	.85**	.88**	.77**	.70**	.89**	.48**
	grain moisture	-/74**	-.59**	-.77**	-.36*	.11NS	-.40**
	test weight	.83**	.64**	.66**	.53**	.52**	.22**
	300 Kweight	.34*	.89**	.80**	-.8NS	.88**	.23**
Ear ht. x	ear lenght	.87**	.87**	.69**	.70**	.79**	.26**
	grain moisture	-.54**	-.60**	-.72**	-.20NS	-.06NS	-.59**
	test weight	.70**	.72**	.56**	.42*	.58**	.38**
	300 K weight	.39**	.88**	.75**	-.21NS	.77**	.04NS
Ear lenght x	grain moisture	-.60**	-.65**	-.75**	-.18NS	.05NS	-.13NS
	test weight	-.76**	.64**	.53**	.36*	.52**	.14NS
	300 K weight	.37*	.82**	.60**	-.32NS	.83**	.44**
Grain moisture x	test wt	-.86**	-.60**	-.53**	-.76**	-.64**	-.85**
	300 K weight	-.21NS	-.51**	-.69**	.02NS	.13NS	.30**

-2-

Table 1. Correlations of Agronomic Traits at Redfield (cont.)

	A619	A632	A634	H99	W64A	Overall Correlation
Test wt x 300 K weight	.34NS	.72**	.62**	.12NS	.47**	-.39**

*, **, NS Denotes significance at $P \leq .05$, $P \leq .01$ and nonsignificant as determined by t.test.

SUNFLOWER FERTILITY RESEARCH

R. Narem, R. Gelderman, M. Esser, L. Gabriel
DEPARTMENT OF.PLANT SCIENCE

Summary

Ferility research on sunflowers was conducted at the James Valley Research Center in three different areas.

A. Nitrogen Soil Test - Fertilizer Calibration Trials
B. Phosphorus Soil Test - Fertilizer Calibration Trials
C. Plant Sampling for Determination of Sunflower Nutrient Uptake

Sunflower growth in 1981 was excellent under irrigated conditions and quite good under dryland conditions. Results from the nitrogen fertilizer test plot showed no yield increase from added N with a medium N soil test and 2500# yield. Results from the phosphorus fertilizer plot showed a possible small yield increase from added P on a medium P-testing soil and a 2000# yield level. These and other results from the past two years indicate adjustment may need to be made in the fertility recommendations provided by the South Dakota State University Soil Testing Laboratory.

Materials and Methods

The site was a 370' by 370' field on the east side of the farm located on a Beotia silt loam. Soil tests were taken separately on the north and south halves of the site because of differences in past management. Soil test results were as follows:

		South	North
0-2'	NO_3-N	175# Very High	191# Very High
	P	18# Medium	34# High
	K	720# Very High	740# Very High
	pH	7.2	7.3
	O.M.	2.1%	2.1%
	Salts	1.1 mmho	1.0 mmho

During a period in mid April to early May large amounts of irrigation water were applied to a one acre area of the north half of the site in an attempt to leach the nitrates from the soil. Profile nitrates after leaching are as follows:

Soil Depth	#N
0-2'	51
0-3'	78
0-4	108

Cultural practices used were as follows:

Spring plowed and field cultivated.
2 pints Treflan and 1 gallon Amiben applied preplant and incorporated.

Sokota 894 seed sown 6/12 at a rate of 22,000 plants per acre.
2 cultivations.
Pounce sprayed 8/24 to control seed weevil.
Measurol (sp) applied to the ground around the plot to drive birds away.
20' of row hand harvested in each plot 10/8; Harvest population 17,500 plants/acre.

Emergence was good, though stand was reduced by rabbit feeding. Weed control was excellent and growth through the season was satisfactory. A very strong wind in early August caused some blow-down in the plots. Some yield (estimated at 10-15%) was lost to birds. Plot results as follows:

A. N-Study

Table 1. Yield and Oil Content of Sunflower as Influenced by N-Fertilization.

# N	# Seed Yield	% Oil	# Oil
0	2425	39.2	872
30	2445	38.8	870
60	2434	39.6	884
90	2458	38.9	877
120	2410	38.6	853

The results indicate that in 1981 51# N in the top two feet and 108# N in the top four feet was sufficient to produce 2400-2500# sunflowers without fertilization.[1] Present recommendations, using a 2500# yield goal, would have advised application of 75# actual N in fertilizer. The overall high yields were a result of the pre-watering applied in the leaching and a supplemental 2.5" irrigation just before bloom.

B. P-Study

Table 2. Yield and Oil Content of Sunflower as Influenced by P-Fertilization.

# P_2O_5	# Seed Yield	% Oil	# Oil
0	1961	38.6	694
15	1971	39.8	720
30	2188	39.0	783
60	1917	38.8	681
120	2050	38.1	716

Though there seems to be an increase in yield and oil production at the 30# fertilization rate it is uncertain as to whether this increase is due to the fertilizer or due to random differences between the plots. This study was conducted on the south half of the site, where a medium P-test was found.

[1] This suggests that the sunflowers were able to make full use of the N in the 2-4' soil depth.

C. Nutrient Uptake Study

A plant sampling program at Redfield gave the following season-end results:

Table 3. Nutrient Uptake of Sunflower in Pounds Per Acre.

Nutrient	Seed	Whole Plant
N	85	160

Table 3.

Nutrient	Seed	Whole Plant
P	6	10
K	25	300

Yield Level of 2600#/Acre

More than half of both the nitrogen and phosphorus accumulated in the seed; whereas less than 10% of the potassium was found in the seed. Adjusting this to a 2000# yield gives the following results for seed removal of nutrients.

Nutrient	Seed
N	50-65#
P	4-5#
K	18-20#

SDSU
James Valley REPORT

CHEMICAL CONTROL OF SUNFLOWER SEED WEEVILS

Dr. David Walgenbach, Terril Heilman and Joe Gednalske
DEPARTMENT OF PLANT SCIENCE (ENTOMOLOGY)

Twenty experimental chemicals were evaluated for their control of sunflower seed weevils in 1981. The chemicals were tested at differnt rates and at different times of applications with ground application equipment.

Both yield data and percent of the seed infested with weevils was recorded for each treatment.

While the data is still being evaluated at this time, it apprears that the synthetic pyrethroids have potential in seed weevil control. These chemicals will be registered in approximately two years.

SDSU
James Valley
REPORT

CHEMICAL CONTROL OF STALK-BORING INSECTS IN SUNFLOWERS

Dr David Walgenback, Terril Heilman and Joe Gednalske
DEPARTMENT OF PLANT SCIENCE (ENTOLOMOGY)

Stalk-boring insects and associated stalk-rot diseases appear to be common in sunflowers and may reduce potential seed yields. During the 1980 and 81 growing seasons, the larvae of four insect species were commonly found in sunflower stems in South Dakota. This complex of stalk boring insects includes two stem weevils, *Apion occidentale* and *Cylindrocopterus adspersus*; one long horned beetle, *Dectes texanus*; and one tumbling flower beetle, *Mordellistena* sp.

Little research has been done on the effect of these insects on sunflower seed yields or the potential for chemical control of insect larvae in the stem. An investigation was initiated at Redfield and other locations in 1981.

Three granular, systemic insecticides were applied at planting time: Furadan 10G, Counter 15G and Temik 15G. Each of these were applied at several rates and with different placements i.e., (a) band over the seed furrow, (b) seed furrow, (c) subseed. An application of Counter 15G at first cultivation was also made.

The effectiveness of each insecticide, rate and placement was determined by hand splitting of twenty sunflower stems (5 from each of 4 replications) from each of the chemical treatments. The species of insects present and a subjective rating of the severity of stalk-rotting (fungal infection) were recorded for each stem. Ratings of stalk-rot were as follows: 0 for stems with no fungal growth (no infection), 1 for stems with a light fungal growth in the pith only (light infection), 2 for stems with a fungal growth throughout the pith in one area of the stem (moderate infection), and 3 for stems with a complete destruction of the pith and partial destruction of vascular tissue by fungus in one area of the stem (severe infection). All stems were split and the above information recorded during the full bloom stage of the sunflowers.

Table 1 summarizes the results from tests at Brookings, Watertown, Redfield and Highmore.

Few of the chemical treatments had a major effect on the percentage of stalks infested (by any insect) or on the percentage of stalks infested by the stem weevil, *Apion occidentale*. The only exception to this was Counter 2 lb. subseed, which gave excellent control of all insects. Several of the treatments significantly reduced the percentage of stalks infested by the other insect species, particularly the stem weevil, *Cylindrocopterus adspersus* and the long horned beetle, *Dectes texanus*. The same treatments were also effective in reducing the severity of stalk rots in the stem. the placement of the chemical appeared to be more important than the rate.

Generally, subseed placement of Counter and first cultivation application of Counter were the most effective treatments at the lower rates. At higher rates, Counter subseed, Counter cultivation, and Furadan in furrow produced equal or greater control of most insects and somewhat less stalk-rot. It should be noted that Furadan was not applied subseed at higher rates. Also, the difference in insect control or severity of stalk-rot between the lower and higher rates of the insecticides may not be economically important.

No significant differences in seed yield were found at Watertown, where there was a light infestation of stalk-boring insects. The test crops at other locations, including Redfield, were damged by high winds, and or birds prior to harvest, so differences in seed yield could not be measured. Yield tests will be repeated in 1982.

Some recent research done by C.E. Rogers on sunflowers in Texas indicates that heavy infestation of the stem weevil, Cylindrocopterus adspersus can reduce seed yields by stunting plant growth and or through lodging of the plants before harvest. Other research done by J.H. Hatchett, et al. on the long horned beetle, Dectes texanus, indicates that this insect uses both sunflowers and soybeans for host plants and it has caused significant soybean yield losses in Missouri. Soybean yield losses have resulted from lodging of the plants before harvest or from harvesting losses when stalks break off to easily to properly feed into a combine. Crop losses have not yet been attributed to either the stem weevil, Apion occidentale, or the tumbling flower beetle, Mordellistena sp.

Since all four of these insects are natural pests of wild sunflowers and do overwinter in South Dakota, one or more of these species may increase in number with continued cultivation of domestic sunflowers. Future research on these insects in South Dakota will help determine their effect on sunflower seed yields and what control measures are the most effective. Despite the loss of yield information in 1981, two important discoveries were made toward those goals. First, it is now evident that these stalk-boring insects are associated closely with stalk-rot diseases. Second, granular insecticides can be used effectively to control these insects and to reduce the occurance of stalk-rot diseases.

The chemicals used in this study are not registered for use on sunflowers in South Dakota. Registration of Furadan and Counter may occure within the next two or three years.

Table 1. Effect of Insecticide Treatments on the Percent of Sunflower Stems Infested (by insects); on the Sererity of Stalk-Rots (fungal infections rating); and on the Percent of Stalks Infested by Each of the Four Insect Species.

					% of Stalks Infested by Species			
Treatment	Rate	Placement	% Stems Infested	Stalk Rot Rating	Apion	Cylindrocopterus	Dectes	Mordellistena
Untreated	---		97	2.28	45	65	33	50
Furadan	1.0 lb	Furrow	85	1.55*	40	23*	20	43
Furadan	1.5 lb	Furrow	70*	1.38*	38	13*	10*	23*
Furadan	2.0 lb	Furrow	67*	1.18*	45	8*	20	13*
Furadan	2.0 lb	Band	70*	1,28*	50	13*	15	20*
Furadan	1.0 lb	Subseed	85	1.65	45	8*	30	33
Counter	1.0 lb	Band	72*	1.60*	50	23*	18	23*
Counter	1.0 lb	Furrow	75	1.75*	58	28*	12*	23*
Counter	1.0 lb	Cultivation	83	1.30*	63	10*	13	30
Counter	1.0 lb	Subseed	65*	1.00*	45	5*	10*	28*
Counter	2.0 lb	Band	72*	1.65*	58	40*	5*	33
Counter	2.0 lb	Furrow	60*	1.63*	38	23*	5*	20*
Counter	2.0 lb	Cultivation	57*	1.30*	33	13*	3*	17*
Counter	2.0 lb	Subseed	30*	0.83*	15*	8*	8*	5*
Temik	1.0 lb	Furrow	97	1.95	52	30*	33	38
Temik	0.5 lb	Furrow	97	2.05	33	40*	45	33

Most stalks were infested by more than one insect species.

* Means followed by an asterisk were significantly different from the untreated mean in the same column of the table at .05 probability level.

SDSU
James Valley REPORT

TILLAGE CONTROL OF SUNFLOWER SEED WEEVILS

Joe Gednalske, Dr. David Walgenbach and Terril Heilman
DEPARTMENT OF PLANT SCIENCE (ENTOMOLOGY)

This project was initiated at the James Valley Research and Irrigation Center in the fall of 1980. It was designed to determine if the type of tillage used following sunflower harvest would affect the mortality of seed weevil larvae and subsequent adult populations.

The plot used for the experiment was planted to sunflowers in 1980. This sunflower crop had 20-25 adult weevils per head in 1980.

Following harvest in 1980, a portion of the plot received tillage treatments with a mold-board plow, tandem disk, chisel plow, nobel blade and untilled. Treatments were replicated three times and randomized within each block. The same treatments were applied to the rest of the plot in the spring of 1981.

Three cropping patterns were evaluated across the treatments including spring wheat and sunflowers with and without a post emergence cultivation.

Larvae numbers and larvae placement were evaluated using a 4.5 inch diameter soil probe. Larvae samples were taken in all treatments with 9 subsamples being taken in each treatment in all three replications. Results of the larvae samples are shown in the attached charts.

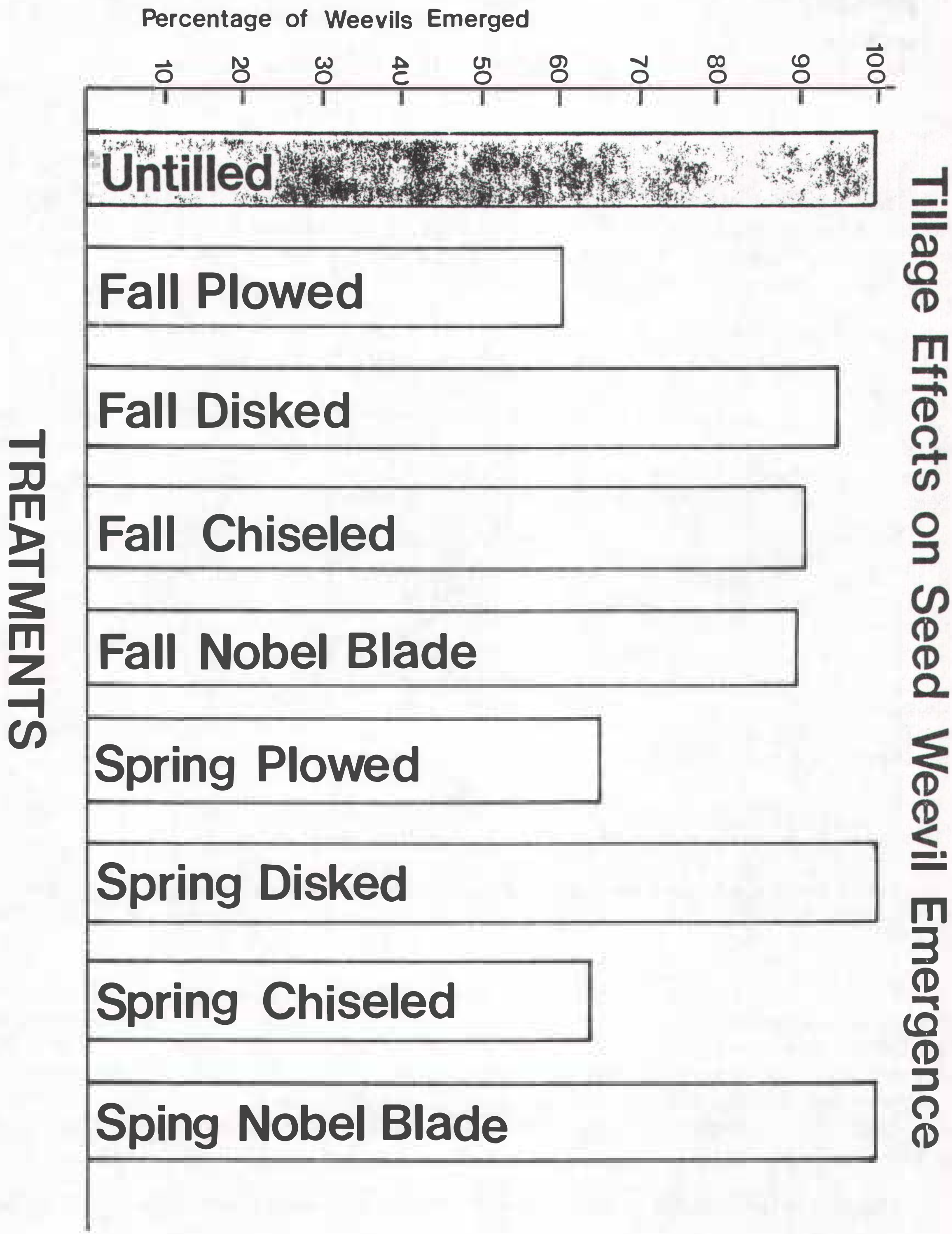
Emergence traps were placed in all treated areas and the number and time of emergence of all seed weevils were recorded.

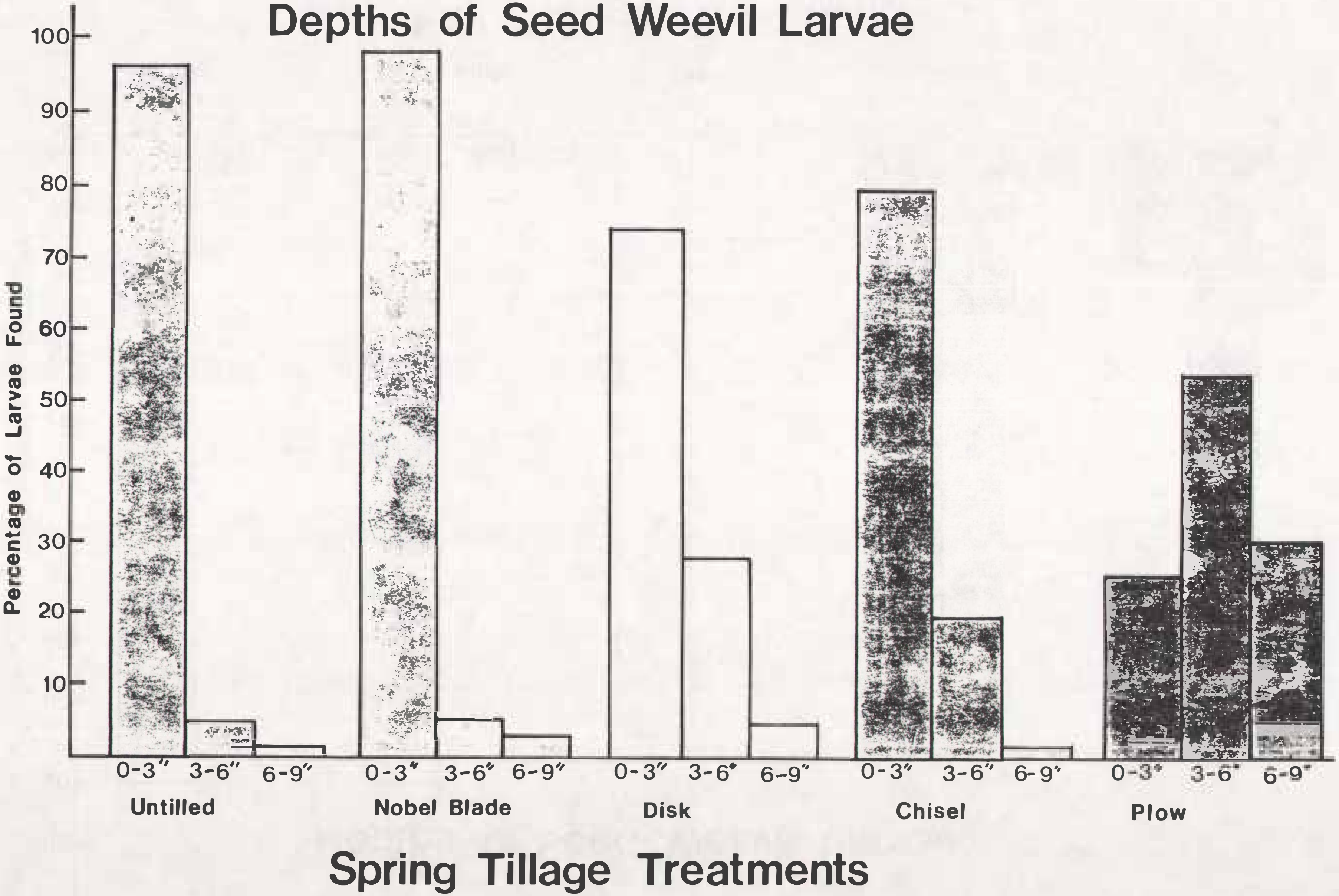
Adult weevils began emerging July 8, 1981. Weevil emergence peaked during the first week of August and weevils continued to emerge until the first week of September.

The mold-board plow treatments had a significant effect on the number of weevils which emerged. In the fall plowed plots, only 61% as many weevils emerged as compared to the untilled areas. The spring plowed plots had 63% as many weevils emerge as the untilled areas. The only other treatment to show a reduction in the number of weevils emerging was the spring chisel plow treatment. Using spring chiseling, 61% as many weevils emerged as compared to the untilled areas.

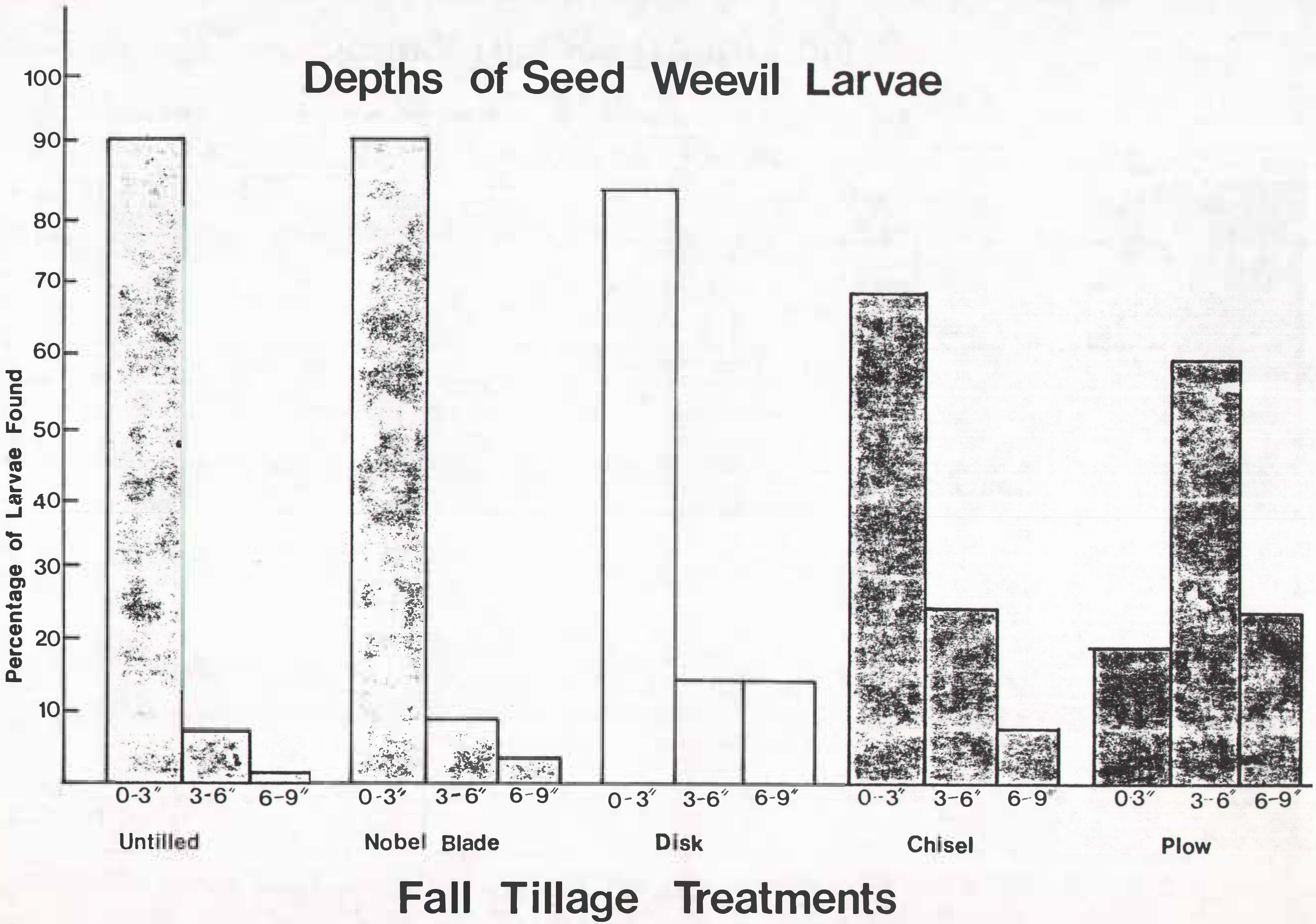
The cropping patterns had little effect on weevil emergence in 1981.

This experiment will be repeated at the James Valley Research and Irrigation Center and at one other location in 1982.


Tillage Effects on Seed Weevil Emergence
Percentage of Weevils Emerged
10
20
30
40
50
60
70
80
90
100
TREATMENTS
Untilled
Fall Plowed
Fall Disked
Fall Chiseled
Fall Nobel Blade
Spring Plowed
Spring Disked
Spring Chiseled
Sping Nobel Blade


Depths of Seed Weevil Larvae
Percentage of Larvae Found
100
90
80
70
60
50
40
30
20
10
0-3" 3-6" 6-9"
Untilled
0-3" 3-6" 6-9"
Nobel Blade
0-3" 3-6" 6-9"
Disk
0-3" 3-6" 6-9"
Chisel
0-3" 3-6" 6-9"
Plow
Spring Tillage Treatments

-3-


Depths of Seed Weevil Larvae
Percentage of Larvae Found
100
90
80
70
60
50
40
30
20
10
0-3″ 3-6″ 6-9″
Untilled
0-3″ 3-6″ 6-9″
Nobel Blade
0-3″ 3-6″ 6-9″
Disk
0-3″ 3-6″ 6-9″
Chisel
0-3″ 3-6″ 6-9″
Plow
Fall Tillage Treatments

James Valley REPORT

IMPROVEMENT OF ALFALFA STAND ESTABLISHMENT THROUGH THE CONTROL OF ALFALFA DAMPING-OFF AND PARASTIC NEMATODES.

G.S. Buchenan, F.R. Vigil, J.D. Smolik and D.A. Abdelwahab
DEPARTMENT OF PLANT SCIENCE

Stand establishment failures in alfalfa, grass-alfalfa mixtures and perennial grasses have been common occurances in South Dakota in recent years. Damping-off disease caused by the fungus *Pythium* may be a cause of these failures. Damping-off is a seedling disease attacking both grasses and legumes.

Plant parasitic nematodes may also be reducing stand establishment in South Dakota. In north central Minnesota, a nematode-forage complex is thought to be responsible for poor legume establishment, yield and persistence. The study's objectives were to increase the success of alfalfa stand establishment through seed and soil treatments for the control of alfalfa damping-off and plant parasitic nematodes. Without some type of fungicide or nematicide protection damping-off and nematodes may destroy the majority of alfalfa and grass seedlings. Although *Pythium* is primarily a seedling disease, it also causes considerable damage by root pruning, thus reducing plant vigor.

A preliminary field study was conducted in an attempt to determine the importance of damping-off and nematodes on stand establishment. In this study both seed and soil treatments were attempted for damping-off control and soil treatment for nematode control.

The experimental design was a factorial design with four replications. The seed treatments were as follows: none, Captan and Ridomil. The soil treatments were as follows: none, Captan, Furadan, Ridomil and biological control. Fungicide rates applied to the seed were as follows: Captan 25 WP, 227 grams formulation per 100 pounds of seed; and Ridomil 2E, 203 grams formulation per 100 pounds of seed. Soil treatments were as follows; Furadan, 10 pounds formulation per acre; Captan, 1 pound active ingredient per acre; Ridomil, .75 pounds active ingredient per acre; biological control from 8 to 30 million spores per square feet. Biological control included the fungus *Gliochrdum virens* that parasite *Pythium.*

Travois alfalfa was seeded at the rate of 2 pounds pure live seed per acre on April 24, 1981. Large variations existed between replications in plants per square foot. The four replications used were not enough to detect differences due to treatments (Table 1-2). Significant differences occured only between replications. This indicates that the experiment should be repeated, with an increase in the number of replications and a decrease in chemical treatments. The seeding rate should also be increased to a 8-10 pounds pure live seed per acre.

Table 1. Stand count on an alfalfa establishment study, May 21, 1981. Average number of alfalfa plants per square foot, Redfield, SD. Average of four observations in each of four replications.

Seed Treatment	Soil Treatment				
	None	Biological	Captan	Furadan	Ridomil
			Planting ft.		
None	.2	1.2	1.6	1.4	.9
Captan	.9	.9	1.9	1.2	.5
Ridmil	2.2	1.0	2.2	1.0	.9

Table 2. Stand counts on an alfalfa establishment study, July 28, 1981. Average number of plants per square foot, Redfield, SD. Average of four observations in each of four repoications.

Seed Treatment	Soil Treatment				
	None	Biological	Captan	Furadan	Ridmil
			Planting ft.		
None	3.6	5.1	4.0	3.1	5.0
Captan	5.7	6.3	5.7	3.6	5.2
Ridomil	4.4	3.9	3.4	3.3	3.4

The plant count showed a very low density on May 21, this density was increased by July 28 due to the application of water, but no differences were observed due to treatments. The plots were clipped to remove weed competition on July 15, but had not regrown to allow for yield harvest determination (September 1).

Nematodes can also be a problem in reducing plant vigor during the seeding year. One of the soil treatments applied in this study was the nematicide Furadan. Plant parasitic nematodes are root pruners and can reduce seedling vigor. Control of the parasitic nematode population was obtained by using 1 Pound active material Furadan per acre (Table 3). Nematode control was 5%.

Table 3. Effect of Furadon, 1 pound active per acre, on the average parastic nematode populations. Nematode population per 200 cc of soil, average of four replications. The April sampling was taken before Furadan was applied.

Treatment	Tylen-chus	Helicoty-lenchus	Pratyl-enchus	Tylenchor-hynchus	Paratyl-enchus	Xiphin-ema	TOTAL
				April 1981			
	238	0	0	13	8	0	259
				August 1981			
Control	26	0	13	650	25	13	727
Furadan	46	0	0	246	29	0	317

James Valley REPORT

SDSU

ALFALFA VARIETY AND SEEDING RATE TRIAL

Arvid Boe and Richard Wynia
DEPARTMENT OF PLANT SCIENCE

A forage yield trial of 26 varieties was planted on May 13, 1981. A randomized complete block design with four replications and two seeding rates, six and twelve pounds per acre, was used. The planter was a four row V-belt seeder with double-disk openers and depth bands. The seedbed was packed before and after planting. Planting depth was approximately three-quarters of an inch. Plot size was four by 21 feet. The varieties included were:

Cenex
- Super 721
- Spectrum
- Hy phy

Northrup King
- Thor
- Spredor II
- Variety 919

DeKalb
- 131
- 120
- 123
- 130
- 117

Sexauer
- SX-418
- KN 33
- SX-10
- Baker
- DF 44
- 545
- SX-208
- Agate
- 532
- 526
- 524

Cal West
- 61
- 8032

North American Plant Breeders
- Migro Duke

Two inches of irrigation water were applied on May 26th and September 23. No cuttings were made in 1981, but stand establishment was excellent. Two to three cuttings are planned for 1982.

James Valley REPORT

CORN HERBICIDE DEMONSTRATION PLOTS

W.E. Arnold and L.J. Wrage
DEPARTMENT OF PLANT SCIENCE

Herbicide demonstration plots provide side-by-side comparison of herbicide treatments. Treatments include herbicides presently labeled and those which may be approved in the near future. Demonstration plots are the final step in the herbicide evaluation program. Rates and application methods for each are based on results obtained in previous years screening tests.

Methods

Preplant and preemergence treatments were applied June 10. a Plot sprayer delivering 20 gpa water and 40 psi pressure was used. Preplant treatments were incorporated immediately with two tandem diskings and harrowed. Shallow incorporated treatments were disked shallowly once and harrowed. Rainfall the first week totaled .80 inches and .43 inches the second week.

Weed pressure was moderate. Green foxtail was the predominant grass. Redroot pigweed and Russian thistle were predominant broadleaves.

Results

The performance of the treatments is present in the following table. Evaluations are based on two visual ratings per plot on July 28. A three year average for early season weed control is included.

Table 1. Corn Herbicide Demonstration

		Percent Weed Control			
		1981		3 year ave.	
Treatment	lb/A act	Gr	Bdlf	Gr	Bdlf
Preplant Incorporated					
Check	--	0	0	--	
Eradicane	4	91	70	92	68
Eradicane+atrazine	3	93	92	--	--
Eradicane+bladex	4	89	88	--	--
Sutan$^+$	4	82	53	86	50
Sutan$^+$+atraxine	4+1	87	91	87	93
Sutan$^+$+bladex	4+1½	91	87	91	92
Sutan$^+$+bladex+atraxine	4+1½+½	95	97	93	95
Shallow Preplant Incorporated					
Atrazine	2½	85	68	82	88
Lasso	3	92	45	92	67
Dual	2½	85	27	90	51
Preemergence					
Atrazine	2½	69	95	67	96
Bladex	3	82	93	81	88
Lasso	3	93	57	91	69
Dual	2½	91	45	92	59
Prowl	2	87	61	85	75
Propachlor	6	95	25	86	47
Mon-097 (8 #)	2½	97	43	--	--
Lasso+atrozine	2+1	93	93	90	94
Lasso+bladex	2+2½	92	90	90	89
Dual+atrazine	2+1	89	89	90	91
Dual+bladex	2+1½	88	95	--	--
Propachlor+atrazine	4+1	94	85	90	91
Lasso+Bladex+atrazine	2+1½+½	91	93	--	--
Dual+bladex+atrazine	2+1½+½	89	95	--	--
Lasso+bladex+sencor	2+1½+¼	95	97	--	--
Post-Emergence					
Prowl+atrazine (2 lf)	1½+1	87	75	--	--
Prowl+bladex (2 lf)	1½+1½	88	79	--	--
Atrazine+oil	1½+1 gal	82	69	62	88
Bladex wp+WA	1½+½%	83	75	69	85
Treatment					
Preemergence & Post-Emergence					
Propachlor&banvel	4&¼	92	83	75	83
Propachlor&2,4-D amine	4&½	90	60	74	71
Check	--	0	0	--	--

SDSU
James Valley
REPORT

SAVING IRRIGATION ENERGY NOT ALWAYS EASY

LeRoy W. Cluever,
EXTENSION AGRICULTURAL ENGINEER

Saving energy dollars and irrigating do not always go together, it takes energy to do an adequate job of irrigating. New irrigation systems can be designed to be energy efficient. Existing systems may be modified for greater efficiency or in some cases it's best to leave the system as it is and modify irrigation practices.

The surest way to reduce energy use is to stop irrigating. That may also be the surest way to stop farming since you have the investment in the system and also would lose production that may be needed for feed.

A second way to reduce energy use is to plant a crop that uses less water. Small grains use less water than corn which, in turn, uses less water than alfalfa. But an alternative crop may not produce as well as your first choice and it may not fit your farming operations.

So let's look at some concrete steps that can be taken, first for a new system and than for the energy inefficient system already in place.

The first place to start is water source development. Make sure surface water supplies will yield sufficient water and that the pumping plant can be installed close to water level. For wells be sure that proper techniques are used in drilling and that the well is developed to its full potential by surging or jetting. The well should yield as much as the aquifer will permit and still have a minimum of draw-down.

Pump selection is extremely critical as improper pump selection may more than double energy bills. Select pumps that will give the discharge you want at no more pressure than you need. And then from the pumps that meet those criteria check the pump curves so you can select the most efficient one.

Next the power unit. Electric motors all are about 90% efficient in converting energy to motion. But careful selection may get you a motor that converts 92% of the energy rather than 88%. Internal combustion engines are more difficult to select. Select the accessories you need but realize that each increases fuel consumption slightly. Fans and radiators take 5% of the engines output but also allow it to be operated without pumping water onto the field.

Pipeline selection may be a big item in some systems. Select pipe materials that are smooth and the select large sizes so that friction loss is low.

Selection of the water application method may be the first and most important decision made. Gravity systems such as a gated pipe operate at low

pressure. Center pivots require much energy but are much easier to manage. Select a pivot pressure that is just high enough to give good water distribution without excessive runoff from any part of the field.

The selection of new equipment that will meet your needs and still be efficient is not easy. Maintaining that efficiency may be even more difficult.

Wells need regular maintenance to control iron bacteria accumulation and monitor incrustation development. Pumps should be tested on a regular basis to be sure that they maintain efficiency. Accurate records on energy use, drawdown and pressure readings are the first step in monitoring well and pump efficiency.

The power unit need regular normal maintenance to be efficient. Internal combustion engines should be tested periodically to see that they efficiently convert to horsepower. Minor adjustments may greatly reduce fuel use. Once again records are the key. By knowing hours of use and fuel consumed you can determine if fuel use per hour has increased from last season.

Pivots need to be checked for worn nozzles and uniform water distribution. Changing nozzles or operating pressures on the system should be done only after consulting the manufacturer to insure uniform water distribution. Reducing pivot pressures may require changes in the pumping plant.

Energy efficiency in irrigation is more than the sum of small adjustments or changes. It is an attitude. And water management is a part of that attitude. Efficient operators put on as much water as the crop needs but no more. Yields are high but no water runs out of the field and none go deeper than roots can use it. Water is also put on at the right time for maximum yield.

Energy efficiency is fine but yield pays the bills. Making adjustments to your system that saves energy but that reduces yield will not pay.

SDSU
James Valley
REPORT

EFFECT OF LENGTH OF FEEDING PERIOD OF PERFORMANCE OF BRITISH AND EXOTIC CROSSBRED YEARLING HEIFERS[1]

D.L. Whittington, L.B. Bruce, A. Dittman and M. Esser
DEPARTMENT OF ANIMAL SCIENCE

Introduction

Producers very often question the additional length of time they should feed exotic cross-cattle as opposed to the feeding period required for the traditional British breeds of cattle. Also implied in this question is the additional amount of feed needed for the exotic-cross animal to attain an optimum weight and an acceptable grade. This trial was conducted in an attempt to help answer these basic questions.

Procedure

Thirty-six large framed Charolais-cross heifers averaging 688 pounds were allotted by weight to 3 pens. Thirty-six medium framed Angus x Hereford cross bred heifers averaging 582 pounds were allotted by weight to the remaining 3 pens. One pen each of Charolais-cross and black baldy heifers were fed for 98, 112 and 126 days. On each of the three slaughter dates the assigned pens were shrunk over night, weighed the following day and taken to a commercial packing house and sold on a grade and yield basis. Carcass data were collected in the plant.

All of the heifers were fed the same ration consisting of 1 pound of a 55/25% urea based supplement and the balance of the ration being 10% ground hay and 90% whole shelled corn. Heifers were started out on a high roughage ration and gradually brought up to a full feed of the above ration. Sufficient ration was offered daily so that heifers were never without feed. Ample quantities of fresh clean water and trace mineralized salt were available at all times.

The economic comparison was made using the following values; feed = \$3.20/cwt, carcass prices; choice grade 615 lbs. and up = \$.96/lb, (choice 565-614 lbs = \$.94/lb) choice 515-564 lbs. = \$.91 lb., good 615 lbs. and up = \$.94/lb. and good 515-614 lbs. = \$.92/lb. No values were assigned for purchasing and marketing costs ,labor or yardage fees.

Results

The results of this study are summarized in Table 1. Average daily gains were similar for the Charolais-cross and black baldy heifers in each slaughter group. Feed conversion ranged from 7.6 to 8.5 pounds of feed per pound of gain. The feed conversions were very similar for the exotic-cross and black baldy groups killed on the same day.

Differences in carcass weights (652.8 vs. 553.7) were greatest between the Charolais-cross and the black baldy heifers killed in the 112 day

slaughter group, which may have been more a function of the differences in average daily gains of these groups, as compare to slaughter groups 1 and 3. The dressing percent between the heifers killed in group 3 was greatest (61.7 vs 60.7). The Charolais-cross cattle in the other kill groups had heavier carcasses and somewhat higher dressing percents. The difference in average fat thickness was greater in the first kill group and come closer together as cattle were fed longer.

Quality grade was also greater between heifers killed in the first group. As heifers were on feed longer,quality grades came closer. However, the spread in yield grade stayed rather constant at about 16 to 17 of a grade. The average yield grade of the Charolais-cross cattle did not exceed 2.0 indicating that these heifers could have been fed longer to attain a higher degree of finish without jeopardizing yield. However, the rate of gain had declined indicating the cost per pound of gain was going up for the last 14 days in group 3. The black baldy heifers in group 3 averaged 2.7 yield grade, indicating that there age and weight was somewhat optimum for attaining a desirable grade and yield. The feeder should keep in mind that these black baldy heifers were long yearlings. Black baldies started on high concentrates at a younger age may not reach these weights without a lot of yield grade 4's.

As can be seen from Table 1, carcass value increased with weight and grade. Cost per pound of gain was similar for all groups.

Summary

Seventy-two heifers were fed for 98, 112 and 126 days to determine the optimum feeding period for Charolais-cross and black baldy heifers. Average daily gains and feed conversions of the heifers were similar among treatments. Carcass weight, quality grade and yield grade increased with time on feed. Fat thickness, quality grade and yield grade increased faster for the black baldy heifers. Cost per pound of gain was similar for all treatments.

The optimum weight at which to slaughter the black baldy yearling heifers appreared to be between 925 and 975 lbs., both from a quality and economic view point. The optimum weight for slaughtering the Charolais-cross heifers was apparently about 1050 pounds as gains had declined in kill group 3.

The limited research conducted in this study indicates that a producer feeding mixed lots of cattle needs to be aware of the weight at which different types of cattle reach optimum condition. The feeder has greater flexibility in marketing the larger framed exotic-cross type cattle as compared to the relatively smaller framed English breeds.

---

[1]Trial conducted at the James Valley Research Farm, Redfield, SD.

Table 1. Comparison of Charolais Cross and Black Baldy Heifers
Fed 98, 112 and 126 Days

Slaughter group	1		2		3	
Breed Cross	Exotic	British	Exotic	British	Exotic	British
No. days on feed	98	98	112	112	126	126
Avg. initial wt., lb.	694.8	585.6	688.6	578.5	681.8	581.3
Avg. final wt., lb.	995.3	875.9	1053.0	902.6	1059.6	954.2
Avg. daily gain, lb	3.1	2.9	3.25	2.9	3.0	2.9
Avg. daily ration, lb. (as fed basis)						
Shelled corn	19.4	18.4	19.6	18.5	20.4	18.8
Ground hay	4.3	4.0	4.0	3.9	4.1	3.5
Supplement	1.0	1.0	1.0	1.0	1.0	1.0
Total	24.7	23.4	24.6	23.4	25.5	23.3
Lb. feed/lb. gain	7.9	8.1	7.6	8.1	8.5	8.0
Carcass characteristics						
Avg. carcass wt., lb.	609.7	533.0	652.8	553.7	654.3	579.2
Avg. dressing percent, %	61.2	60.8	61.9	61.3	61.7	60.7
Avg. fat thickness, in.	.33	.45	.35	.45	.43	.46
Avg. quality grade[1]	10.2	11.0	10.7	11.4	11.2	11.0
Avg. yield grade	1.8	2.4	2.0	2.6	2.0	2.7
Economic comparison						
Avg. carcass value, $	560.92	485.03	620.16	503.8	628.12	544.44
Avg. price per lb., $	.92	.91	.95	.91	.96	.94
Total feed cost, $	77.45	73.38	88.16	83.86	102.81	93.94
Feed cost per lb. gain, cents	.25	.26	.24	.26	.27	.26

[1] 10 = high good, 11 = low choice, 12 = average choice

-3-

SDSU
James Valley
REPORT

FEEDLOT PERFORMANCE OF GROWING STEER CALVES ON A HIGH ROUGHAGE RATION SUPPLEMENTED WITH A HIGH "BYPASS" OR AN ALL NATURAL PROTEIN SUPPLEMENT [1,2]

D. L. Whittington, M.D Aseltine, [3] and A. Dittman
DEPARTMENT OF ANIMAL SCIENCE

Summary

Seventy-two crossbred steer calves were utilized in a 105-day feed lot trial to evaluate two types of protein supplement fed with a low-energy high roughage ration. Animals were fed either 1 lb/hd/day of a high "by-pass" protein supplement or 1.5 lb/hd/day of an all natural protein supplement. All animals received 2 lb. of whole corn per day and ad libitum corn silage. Results of the trial indicated no significant differences for average daily gain or feed efficiency. However, an economic benefit was realized with $.05 reduction in the cost per pound of gain utilizing the urea-containing "bypass" protein supplement.

Introduction

In recent years a lot of nutrition research has been conducted in the area of By-Pass Proteins. Scientists, at the University of Nebraska and Iowa State University have developed a means of measuring the degree of "by-pass" in natural ingredients. The naturally occurring proteins which do not undergo degradation in the rumen pass into the lower digestive system, thus the term "by-pass". The protein is then more efficiently utilized by the ruminant animal, as compared to proteins being degraded by the micro-organisms. To aid in by-pass a form of nitrogen, such as urea generally accompanies the "by-pass" proteins, which is readily converted into ammonia for the rumen micro-organisms. This form of nitrogen serves to insure adequate health of microbes. The physical effect of heat is most commonly used to insure some protein by-pass. Thus, due to manufacturing techniques, some products such as blood meal, meat and bone meal, corn gluten meal, dehydrated alfalfa meal and dried distillers grains have protein by-pass capbilities.

This study was undertaken to compare urea based protein supplement containing meat and bone meal and dehydrated alfalfa as the primary "by-pass protein" source to a protein supplement containing soybean meal and sunflower meal as the protein sources.

Procedures

Seventy-two steers with an average initial weight of 577 pounds were lotted on the basis of previous treatment (Ralgro implant study) and body weight into six pens with 12 animals per pen and three pens per treatment. Upon arrival at the feed lot, all animals were vaccinated, wormed, and implanted with Ralgro. All animals were fed silage free choice, two pounds of corn per head per day and either 1.5 pounds per head per day of a 35% all natural protein supplement containing 200 mg of rumensin or one pound per head per day of a 55% high by-pass protein supplement which contained 25% protein equiv-

alent from urea and 300 mg of rumensin per pound. This will be refered to as "by-pass 55-25". Table 1 contains the nutrient composition of each concentrate. Animals were taken off feed and water the evening prior to initial and final weights. Animals were weighed every 28 days. Average daily gains, costs/lb of gain and feed efficiency were subjected to an analysis of variance.

Results

Table 2 compares the performance of steers fed either 1.5/lb/hd/day of the 35% natural protein supplement or 1 lb of the 55-25 "by-pass" protein supplement. The steers consuming the "by-pass" supplement gained somewhat better than the steers consuming the 35% all natural supplement (2.22 vs 2.14 lb/hd/day. This difference was not significant (P = 27). Total consumption of feed by both groups was similiar. Feed conversion favored the 55-25 "by-pass" protein supplement (6.94 vs 7.39 lbs feed/lb gain), but the differences were not significant (P = 05). The cost of putting on a pound of gain was $.05 less for animals consuming the urea-containing "by-pass" protein. This difference was highly significant (P = .01).

The percent rumen degradable protein (RDP) and percent rumen undegradable protein (RUDP) are shown for the two diets in Table 2. On a diet basis similar amounts of RUDP and RDP were fed. Based on these values, similar performance of the two groups would have been expected and indeed was received. Cost per pound of gain was less for the "by-pass" protein supplement fed group due to the lower cost of a urea-containing concentrate, and the apparent but non-significant improvement in feed conversion by the "by-pass" fed group. This economic advantage of replacing part of the natural protein with urea in ruminant rations has been well documented. Thus the feeder can obtain similar gains with low energy, high roughage growing rations, with a considerable cost savings on feed, utilizing a urea-containing "by-pass" protein supplement.

---

[1]Trial conducted at the James Valley Research Farm, Redfield SD.

[2]Appreciation is expressed to Farmland Industries for providing and manufacturing the protein supplements.

[3]Dr. M. S. Aseltine is a Nurtitionist with Farmland Industries, Kansas City, Missouri.

Table 1. Supplement Nutrient Levels

Item	By-pass 55-25	All Natural 35
Crude protein, %	55.00	35.00
NPN, %	25.00	0
Fiber	11.27	9.30
Ca	3.0	2.50
P	1.41	.75

Table 2. The Performance of Steers Fed Either "By-pass" 55-25 or 35% All Natural Protein Supplement

Treatment	By-pass 55-25	All Natural 35
No. of days on trial	105	105
No. animals	36	36
Initial wt. (lb)	577	577
Final wt. (lb)	810	802
Average daily gain (lb)	2.22	2.14
Average daily ration (lb)[a]		
Corn	1.8	1.8
Concentrate	.9	1.35
Silage	12.73	12.69
Total	15.43	15.84
RDP, %	7.12	6.85
RUDP, %	2.03	2.17
Feed per lb. gain[a]	6.94	7.39
Cost, lb of gain, $[a]	0.33[c]	0.33[b]

[a]Dry matter basis
[b,c]Significantly different (P = .01)

James Valley REPORT

PREWEANING AND POST WEANING PERFORMANCE OF CROSSBRED CALVES[1] 0, 1 OR 2 RALGRO[2] IMPLANTS

D.L. Whittington, G. Kuhl[3] and A. Dittman
DEPARTMENT OF ANIMAL SCIENCE

Summary

The preweaning performance of 221 steer and heifer calves given differing numbers of Ralgro Implants was evaluated. The steer and heifer calves given one implant had an additional 25 and 33 pounds weaning weight compared to those receiving no implant. No additional response was shown by steer calves receiving a second implant 100 days after the first was given. Average daily gains during the 105 day growing period were not significantly faster than those receiving 2 implants during the 103 day finishing phase.

This work supports other studies indicating that implanting calves at weaning time is an economical management practice. The work further indicates to feeders that calfhood implants have little or no effect on subsequent performance in the feed lot.

Introduction

Although a great deal of work has been done with Ralgro Implants identifying their benefit for varying ages of cattle, there has been no work in South Dakota to demonstrate these benefits throughout the lifetime of a calf. Therefore, this series of trials was done to evaluate the performance of beef calves receiving varying number of Ralgro Implants during calfhood and to follow the performance of steer calves through to slaughter to identify the possible effects of previous implant treatments.

Procedures

On May 15, 1980 one hundred eleven steers and one hundred ten heifer calves belonging to Dennis Ruzicka, Highmore, South Dakota, were randomly alloted to evaluate the effect of Ralgro Implants on calf performance. The calves were out of large crossbred cows and Gelbieh bulls. Twenty-three steer and twenty-two heifer calves received no implant throughout the study. Forty-three steers and eighty-six heifers received one implant in the base of the ear on May 15 when calves were being branded, dehorned and castrated before going on summer pasture. Forty-five steer calves were implanted at branding and received a second implant on August 21, 1980, ninety-eight days after receiving the initial implant.

Initial weights were taken on May 15. An intermittant weight was taken on August 21 and the final weight was taken at weaning on October 10. All weights were full bodyweights. The entire study period was 167 days.

[1]Trial conducted at Dennis Ruzicka Ranch, Highmore, South Dakota and James Valley Experiment Farm, Redfield, South Dakota.

[2]Gratitude is expressed to Dr. John Bonner of International Minerals and Chemical Corporation for furnishing the Ralgro Implants.
[3]Gerry Kuhl is crrently Beef Cattle Extension Specialist, Kansas State University, Manhattan, Kansas.

The calves were born between March 26 and May 9. On May 15 they were turned on to native range with their dams. The calves were given access to a commercial pelleted creep feed. All calves were handled similarly and maintained on similar range throughout the study.

At weaning the steer calves were purchased to be fed out at the Redfield Experiment Station. Seventy-two of the steers were allotted by shrunk weight taken November 25 and previous treatment (0,1 or 2 implants) into six pens to evaluate a commercial High-By-Pass Protein supplement. The 105 day growing period ended on March 11 and shrunk weight was taken to end the growing phase and start the 103 day finishing phase. The steers were shrunk and weighed off test to go to slaughter on June 6. Carcass data was collected at the slaughter plant.

The growing ration consisted of corn silage plus two pounds of shelled corn plus a pound or a pound and a half of protein supplement depending on the treatment. The same finishing ration was fed to all steers which was 80% shelled corn plus 20% ground oat hay + 1.5 lb. of a 55-25 R300 protein supplement.

All steers were implanted irregardless of previous treatment on November 25, 1980 and April 8, 1981. Therefore the steers in the growing and finishing phase had received 2,3 or 4 Ralgro Implants throughout their lifetime.

Results and Discussion

Table 1 compares the performance of 0, 1 and 2 Ralgro Implants on steer calves and 0 and 1 Ralgro Implants on heifer calves in the preweaning phase of the study. Steers given 1 implant gained significantly faster (.15 lb/day) than the implanted control steers. Steers given 2 implants gained significantly faster (.13 lbs/day) than controls but did not differ in gain from the steers receiving 1 implant. The heifers given 1 implant gained significantly faster (.2 lb/day) than those receiving no implants.

Although the differences in average daily gain seem small the additive effect across the 67 day study is economically important. Those steers and heifers receiving 1 implant gained an additional 25 and 33 pounds total respectively. On a $75 feeder calf market this is worth an additional $18 to $25. This work agrees with many research findings indicating a 20 to 30 pound response from one Ralgro Implant.

Other workers have found that 2 Ralgro Implants given 100 days apart will be worth from 15 to 25 pounds per implant. However, this study would not support this as there was no additional response to the second Ralgro Implant.

Table 2 compares the feed lot performance of steer calves given 0, 1 and 2 implants during the preweaning phase. Average daily gains during the 105 day growing period did not differ significantly, although the steers which

had received either 1 or 2 implants during calfhood gained slightly faster (2.19 vs. 2.10) than steers receiving no implant. In the 103 day finishing phase steer calves receiving no Ralgro Implant as a calf gained significantly better than those receiving 1 implant (3.02 vs 2.76), however this difference was not significant.

The apparent compensatory gain observed by the steers not receiving Ralgro Implants as a calf has not been found by other research workers. Generally speaking the accumulative work has shown an additional response to Ralgro with every implant.

There were no apparent or significant effects on the carcasses. The steers could have been fed another 30 days to a higher quality grade without affecting yield grade.

Table 1. Preweaning Performance of Crossbred Steer and Heifer Calves Receiving 0, 1 or 2 Ralgro Implants.

Item	No. Implants		1 Implant		2 Implants
	Steers	Heifers	Steers	Heifers	Steers
No.	23	22	43	86	45
Wt. 5/15, lb.	153.8	141.7	147.6	153.4	146.9
Wt. 1-/29 lb	529.3	497.9	548.2	542.9	543.9
Gain, lb.	375.5	356.2	400.6	389.5	397.0
Advantage	------	------	25.1	33.3	21.5
A.D.G., lb.	2.25[a]	2.13[a]	2.40[ab]	2.33[ab]	2.38[ab]

a,b, column values with different super scripts are significantly different (P -- .05).

Table 2. Post Weaning Performance of Crossbred Steer Calves receiving 0, 1 or 2 Implants Preweaning.

Item	Calfhood Implant Treatment		
	0	1	2
No. Steers	20	24	28
Beg. Wt. 11/25, lbs.	577.7	575.6	581.5
End Growing Period, 3/11, lbs.	798.7	804.1	813.3
A.D.G., Growing Period (105 days)	2.10	2.18	2.21
Finished Wt., 6/22, lbs.	1110.4	1088.3	1094.4
A.D.G., Finishing Period (103 days)	3.02[a]	2.76[a]	2.73[b]
A.D.G., Accumulative (208 days)	2.56	2.47	2.47
Carcass Data			
Carcass Wt. (lbs)	668.7	659.7	664.3
Fat Thickness (inches)	.37	.36	.38
Loin Eye Area (square inches)	13.26	12.94	13.06
Quality Grade [1]	5.95	6.00	5.61
Yield Grade	2.25	2.39	2.25

[1] 5 = low choice, 6 = high grade

[ab] Column values different super scripts are significantly different (P --.05).

SDSU
James Valley
REPORT

TREFLAN ON CORN POSTEMERGENCE

Michael Esser and Albert Dittman

DEPARTMENT OF PLANT SCIENCE

Introduction

Treflan was applied as a postemergence on field corn to determine its effectiveness of controling late season grasses and other treflan susceptible weeds. Treflan was also applied before planting and incorporated to determine and demonstrate crop damage when treflan is applied as a preplant incorporated herbicide on corn. Treflan was approved for postplant and incorporated application in 1981. Application should be broadcast or direct sprayed over the top after corn is eight inches tall. Rates for application range from 3/4 pints for sandy soil to two pints for heavy clay soil. Treflan is not approved for preplant or preemergence treatment.

Method of Application

One half of the field was sprayed with treflan and incorporated before planting at a rate of two pints of treflan 4EC per acre. The treflan was incorporated with a tandem disk and gone over twice. The other half of the field was sprayed when the corn was approximately eighteen inches tall. The treflan was applied at a rate of two pints of treflan 4EC per acre over the top of the corn. Treflan was then incorporated with a shovel type cultivator with hillers immediately after spraying. A ground sprayer was used in both applications, applying twenty gallons of water per acre at 40 psi pressure.

Results

In the preplant and incorporated part of the study there was considerable damage to the germinating seeds resulting in a very poor stand. Number of plants in this part of the study was approximately 50 to 60 percent of the plants in the post emergence study. The plants,that did emerge, were smaller, had thin (light) stalks and showed some discoloration in the leaves. The damage done to the corn by applying treflan as a preplant and incorporated herbicide, was extremely high with very noticeable retardation in the maturity rate.

Crop emergence was normal in the postemergence part of the study. The plants were healthy in appearance with no noticeable damage to the stalks or leaves. Maturity was very normal with no retardation of growth caused by the treflan.

Weed control in both studies was exellent, in a year when many herbicides didn't receive adequate rainfall to activate them. The treflan controlled approximately 90% of the grass-like weeds and approximately 80% of the broadleaf weeds.

This study was conducted to determine weed control and crop tolerance in corn. Treflan appears to be effective in weed control and corn is tolerant if treflan is applied as a postemergence herbicide. Treflan could be benificial on dry years or on years when corn emerges before herbicides can be applied due to weather or equipment failure.

990/750/LT/3-82