Agricultural Experiment Station

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

1976

Progress Report

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Reclamation and Improvement of Solodized Solonetz (Alkali Claypan) Soils

L. O. Fine and P. D. Weeldreyer,
Plant Science Department

The experiments concerned with the modification and improvement of claypan soils of the Lake Dakota basin were continued at a satellite location leased from Glenn Magen, 5 miles NW of the Center.

General Operations

A major modification was made in the cropping operations--all alfalfa was discontinued. The tillage operations consisted of a 1974 fall disking (7-inch cut) with a heavy tandem disk. The spring, 1975 tillage consisted of field cultivator coverage twice followed by harrowing prior to planting with a 4-row double disk-opener type planter.

Fertilizer application consisted of 78 lbs. N per acre broadcast before the spring tillage. Weed control consisted of 3/4 lb. 2,4-D plus 1/2 lb. banvel broadcast spray May 13 pre-plant plus 1 3/4 lb. Lasso II over-the-row at planting. Thimet 15G was applied over-the-row at the rate of approximately 2 lbs/A for rootworm control. (Both were spread out by high winds during planting.)

Sokota hybrid SS-51 was planted May 20 at rates of approximately 22,500/A on the irrigated and 17,500 on the dryland plots. Showers on May 22, 23, and 27 brought about good emergence of corn except some which was at shallow depths and left exposed after the rains. A hail storm on June 3 did moderate damage and killed some shallow-planted seedlings which had the growing point at the surface. This resulted in a non-uniform stand, especially on Exline soil and non-deep-plowed areas. No attempt was made to make final stand counts.

The corn was cultivated 3 times in June and early July and furrows for irrigation made on July 8. Also on this day, both 2,4-D and Banvel were applied by drop nozzle for bindweed control.

Grasshoppers were again somewhat of a problem this year, especially after the bordering grain field was harvested. The borders of the field and the center grass strip was sprayed July 24. All plots were aerially sprayed for grasshoppers again on August 9th.

Due to the extreme drought experienced during July and August, the dryland corn experienced severe moisture stress. This was the main controlling factor on dryland production.

Irrigations

Five irrigations were made by the furrow technique, July 14-17, 21-22, 29-30, August 4-6, and 18-19. Approximately 20 inches of water is estimated to have been pumped to the plots. A re-use pump recycled all tailwaters so no water was lost. Rainfall after planting on May 20 amounted to 1.70" in May, 4.46" in June, a trace in July, 1.64" in August, and 0.47" in September.

The source of water for the five irrigations was the James River. Due to the excessive rainfall on the upper watersheds of the James River, the flow was extremely high. This high flow rate resulted in the James River water being of very good quality in 1975.

Table 1. James River Irrigation Water Quality Observations, 1975 Growing Season.

Date of Sampling	E.C. micro-mhos/cm	Sodium Adsorption Ratio
July 21, 1975	685	1.40
July 30, 1975	680	1.83
August 19, 1975	541	1.15
August 22, 1975	536	0.64

Drainage

The drains began continuous flow July 21, 4 days after the initial irrigation was completed. Prior to that time, rain and fluctuating water table had resulted in small volume flowage (135 cu ft).

Tile flowage continued through September 14, but had stopped by September 18. A final tile flowage water sample was taken from the main sump on 9-14. The dates of sampling, and/or meter volume readings of water pumped between these dates and the electrical conductance and sodium absorption ratios of the water samples are given in Table 2.

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Table 2. Tile drainage and water quality observations, 1975 growing season, claypan soil research site.

Date of Sampling or meter reading	Water pumped since previous reading, cu ft.	EC, micro-mhos/cm	Sodium adsorption ratios
5 June		351	0.43
23 June	135	684	0.86
21 July	14	768	0.89
22 July	10	813	0.97
24 July	82	840	1.1
30 July	37	848	1.4
4 August	38	878	0.69
6 August	310	1032	0.77
8 August		1267	1.4
13 August	559		
18 August	302	2099	2.8
19 August		1715	2.2
22 August	805	2872	3.2
26 August	1083	3080	3.6
4 September	968	3208	3.6
14 September	433	3252	2.9
18 September	16		
Total for season	4792		

The total drainage was equivalent to 0.23 inches of water from the 5.9 acres irrigated.

As in previous years the water quality in drain lines was highest at the beginning of flowage or in general periods of high volume, and gradually deteriorated as flow diminished towards the end of the season. This is possibly due to an increment of fresh water being in the soil at the beginning of the growing season, which is gradually concentrated by root extraction and evaporation as the season progresses. Any drainage occurring early in the season reflects the generally very low salinity of soil water which is freshly added and not concentrated by evapotranspiration, whereas later on, increments of water added to the surface displace into the drain tile increments of water somewhat concentrated by plant growth and direct surface evaporation.

Yields

The estimated corn yields for 1975 produced and harvested as averages of four replications are summarized below in bu/A of corn at 15% moisture.

Deep-Plowed		Shallow-Plowed	
Irrigated	Non-Irrigated	Irrigated	Non-Irrigated
116.7	39.1	102.3	34.2

1975 corn yields adjusted by removing all known Exline soil plots and other plots influenced by extraneous occurrences, as headlands.

Deep-Plowed		Shallow-Plowed	
Irrigated	Non-Irrigated	Irrigated	Non-Irrigated
119.1	45.7	108.7	36.7

Plans

Because of a fire in the dryer in the Agronomy seedhouse, about half of the corn samples taken for moisture determination during harvest were destroyed. Precision in yield determinations of individual soil treatments were thus lost, but mean moisture content at harvest was approximately 20%. Using this as a common moisture content for all plots (probably not a valid assumption), the ranking of soil treatments (highest to lowest) for the irrigated deep-plowed portion of the experiment is: gypsum @ 1400 lbs.> fly ash @ 4000 lbs.> sulfur @ 1350 lbs.> gypsum @ 10 T > control> sulfur at 520 lbs.> gypsum @ 2800 lbs.> fly ash @ 10 T, all in weights applied per surface acre. The range in yields observed for these treatments was 124.6 to 108.0 bushels per acre.

This experiment is scheduled to be terminated after the 1976 growing season. All plots will again be planted in row crops (corn) in 1976. Infiltration tests will be conducted at the end of this experiment.

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1975 Weather

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Climate conditions of 1975 are shown in the table. The crop season started out with a shortage of sub-soil moisture. Rains in early April supplied enough moisture to facilitate tillage, planting and proper germination of crops. Rainfall was limited during the remainder of the growing season. Very little rainfall occurred from June 21 until August 1, and by July 31 the deficit was 1.75 inches. The rainfall in late August allowed for good germination of fall seeded grains.

Temperatures were above or near normal from May through August. July was warmer than normal with 5 days over 100 degrees.

Water supply in the James River was above normal throughout the growing season and allowed for adequate irrigation. Some experimental plots were irrigated as late as October.

Table 1. Precipitation, Temperature, and Evaporation Data for the James Valley Agricultural Research and Extension Center for 1975 from Weather Observer Station at Redfield.

Month	Precip. Inches	Departure	Temp. (^oF)	Departure	Evap. open pan inches
Jan.	1.04	+0.69	14.6	+4.4	--
Feb.	0.09	-0.27	14.7	-3.0	--
March	3.25	+1.78	23.4	-4.9	--
April	4.37	+1.18	37.8	-6.0	--
May	2.29	-0.24	58.8	+1.7	6.07
June	4.62	-0.23	66.7	-0.1	7.94
July	0.03	-2.46	76.6	+4.3	10.89
Aug.	1.97	-0.16	71.6	0.8	8.05
Sept.	0.61	-1.01	57.6	-2.9	4.65
Oct.	1.15	-0.07	49.8	1.3	5.01
Nov.	0.00	-0.59	32.9	0.6	--
Dec.	0.07	-0.32	19.9	1.0	--
Total	19.49	-1.70		-2.8	42.61

Last frost: April 13 (32^oF)
First frost: September 24 (32^oF)
Frost free days: 151

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Effect of Tillage Practices on Spring Wheat Production at Redfield in 1975

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and T. Schneeweis

Introduction

Crop residue on the soil surface reduces wind and water erosion, improves the water-catching capability of the land and reduces water lost to evaporation.

Certain diseases of wheat, however, are more serious under high levels of residue, due to the fact that propagules of pathogens carried on straw are not decomposed as rapidly at the soil-straw interface as they are when buried. Pyrenophora trichostoma, the cause of yellow leaf spot of wheat, is such a pathogen. This disease is rarely seen in plow-disk-harrow operations, but can destroy 30% or more of the crop under stubble-mulch practices.

Other wheat diseases may become more serious on surface residue culture. Among those suspected but not definitely known to be aggrevated by surface residues are: Septoria leaf spot, common root rot, and root feeding nematodes.

The experiments reported here are initial steps in a study to clarify the influence of surface residue on these diseases and to control them in stubble-mulch culture on spring wheat.

Materials and Methods

The four tillage practices, chosen to leave a range of surface residue, were applied to 30-foot strips 150 feet long. The order of tillage was randomized within replications of a randomized complete block design of four replications. Fungicide or nematicide treatments were superimposed across the blocks, and were assigned at random to plots with the block. This arrangement, with tillage treatments in strips going in one direction, with fungicide-nematicide treatments superimposed across them in another direction, is known as a split-block or stratified split-plot design.

Fall tillage operations on September 3, 1974 followed the harvest of Kitt spring wheat. Spring tillage was completed immediately prior to planting on May 5, 1975; after which Era spring wheat was planted at 1 bu/A with a standard drill. Furadan was applied at planting with a grass seeder drill attachment at a nematicidal rate of 12 lb/A of active ingredient. Emergence notes were taken on May 16, benomyl fungicide treatments were sprayed at 2 lb/A active ingredient on May 28 (4-5 leaf stage), and maneb fungicide sprays were applied on June 24 (jointing). Due to the very dry season and lack of foliage disease, maneb treatments were discontinued at that time.

Root disease, nematicide counts, foliage disease and soil moisture determinations were monitored at planting, mid-season, and at harvest, Harvest was completed on August 2 using a small-plot combine.

Results

Yield was greatest in plots with the greatest residue (noble blade, Table 1). The relation between residue and yield was not consistent, since low residue treatment 2 (chisel-disk) outyielded treatment 3 (chisel-chisel).

Soil moisture differences in the tillage treatments were not detected until mid-season. On July 9, treatment 4 (disk-disk) had significantly lower soil moisture levels than the other treatments (Table 2).

Low levels of root, crown and foliage disease in the first year of this study did not measurably affect yield, nor did tillage practice measurably affect disease or nematode levels.

(Turn page for Tables)

Table 1. Yield of Era spring wheat grown under several tillage practices and fungicide-nematicide treatments in 1975.

F - N Treat. Pesticide & Dose (ai)	Cultural Practice & Preplant Residue 1[1/] 100 g/m²	 2 35 g/m²	 3 65 g/m²	 4 34 g/m²	F-N Mean
	Yield (bu/A)				
1. Furadan 12 lb/A Preplant	20.8	17.7	13.1	14.8	16.6[a]
2. Benomyl 2 lb/A: Postemergence	25.9	21.8	13.6	16.5	19.4[a]
3. Maneb 1.4 lb/A Foliage	21.9	18.2	15.7	16.0	17.9[a]
4. Untreated	23.3	15.1	11.5	14.6	16.1[a]
5. Untreated	24.2	20.5	13.6	14.9	18.3[a]
6. Furadan + Benomyl + maneb	24.5	21.4	14.8	17.8	19.6[a]
7. Furadan + Benomyl + maneb	20.8	18.2	12.7	17.1	17.2[a]
8. Furadan + Benomyl	21.5	19.4	12.8	15.8	17.4[a]
9. Benomyl + maneb	19.2	16.6	15.3	16.8	17.0[a]
10. Furadan + maneb	18.3	20.7	14.8	18.2	18.0[a]
CP Means	22.0[c]	19.0[bc]	13.8[a]	16.2[ab]	

1/ Tillage practices (Fall-spring)
1. Noble-Noble
2. Chisel-Disc
3. Chisel - chisel
4. Disc-disc

a/ Yields of treatments within the F-N mean or CP mean columns that have the same letter are not significantly different from one another at the 5% level of probability.

Table 2. Soil moisture levels under tillage plots at Redfield, 1975.

Tillage Practice	Sample Date % moisture Sept. '74	 5 May	 9 July
1. Noble-Noble	15.2	26.4	12.5
2. Chisel-Disk	15.1	25.4	12.0
3. Chisel-Chisel	15.3	26.4	12.8
4. Disk-Disk	15.1	26.0	10.8[a]

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Methods of Incorporating Trifluralin for Weed Control in Spring Wheat

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The purpose of this experiment was to determine the potential of trifluralin (Treflan) for controlling grassy weeds in spring wheat.

Trifluralin can be successfully used to control weeds in soybeans and other crops. To be effective the chemical must be incorporated into the soil to reduce loss.

In this experiment Era wheat was planted 2 inches deep. Various tillage implements were used to incorporate trifluralin after planting. Tillage implements used were a tandem disk, rotary hoe, flextine harrow, field cultivator, and a roto tiller. Rainfall received the first week after application was 0.3 in.; 1.16 in. was received the second week.

Trifluralin caused a reduction in the stand of wheat regardless of the method of incorporation. Wheat stand was most severely reduced when trifluralin was incorporated with the field cultivator and tandem disk. Incorporation with the tandem disk and field cultivator substantially reduced the stand of wheat at only 1/2 lb/A. Shallow incorporation caused less injury to wheat at all rates of herbicide.

Wheat yields were reduced when a tandem disk was used for incorporation. Trifluralin did not reduce yields when the chemical was incorporated with a rotary hoe, flextine harrow, field cultivator or roto tiller.

A heavy infestation of kochia was present in the experiment. Wheat yields in the control plots were suppressed by presence of this weed. When treflan was incorporated with the rotary hoe, flextine harrow, field cultivator or roto tiller, injury to the wheat was offset due to removal of kochia even though control was not considered satisfactory.

The Percentage Stand Reduction and Yield of Spring Wheat as Affected by Rate of Trifluralin and Method of Incorporation of Trifluralin

Stand Reduction

Method of	Rate (lb/A)				
Incorporation	0	1/2	3/4	1	1.5
Tandem Disk	0	10	18.8	52.5	52.5
Rotary Hoe	0	2.5	6.2	3.8	7.5
Flextine Harrow	0	6.2	11.2	7.5	16.2
Field Cultivator	0	15.0	13.8	15.0	11.2
Roto Tiller	0	0	2.5	13.8	16.2

Yield

Method of	Rate (lb/A)				
Incorporation	0	1/2	3/4	1	1.5
Tandem Disk	18.7	17.0	16.5	12.8	9.9
Rotary Hoe	16.5	19.1	16.7	19.5	16.9
Flextine Harrow	15.4	18.9	19.5	16.7	18.4
Field Cultivator	17.5	16.9	18.7	18.9	16.9
Roto Tiller	18.3	20.3	18.4	14.9	19.0

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Agronomic Effects of Bifenox on Spring Wheat as Affected by Growth Stage and Variety

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The purpose of these experiments was to determine the tolerance of spring wheat (*Triticum aestivum*) to bifenox (tradename Modown). The experiments were maintained weed-free so that any variations found would not be due to weed competition.

The growth stage study was planted in a randomized complete block design with four replications on May 19 using Era spring wheat. The 4 lb/gal flowable formulation of bifenox was applied preemergence at 1, 2, and 3 lb/A three days after planting with a tractor mounted sprayer. Postemergence applications of 1/4, 1/2, and 1 lb/A were made at 1- to 2-leaf, 3-leaf, 4-leaf, 5-leaf, early boot, and late boot growth stages. The 80% wettable powder formulation was used in all postemergence applications and was applied with a bicycle-type sprayer. Six spring wheat varieties were used to determine the varietal response of spring wheat to bifenox. Fortuna, Protor, Tioga, Nowesta, Bonanza and Era spring wheat

Table 1. Effect of bifenox on spring wheat when applied at various growth stages

Rate (lb/A)	Growth Stage	Injury (%)	Plant Height (inches)	Stand Spikelets/yd.	Test Weight (lb/Bu)	Yield (Bu/A)
1	Preemergence	0	23.6	63.5	59.5	38.5
2	Preemergence	0	25.0	66.0	59.6	46.9
3	Preemergence	0	24.4	57.8	59.5	45.5
1/4	1 to 2-leaf	0	23.8	58.9	59.8	41.9
1/2	1 to 2-leaf	0	23.0	55.1	59.4	39.6
1	1 to 2-leaf	0	25.2	61.0	59.4	44.5
1/4	3 leaf	0	23.0	56.0	59.4	33.2
1/2	3 leaf	10	24.9	57.6	59.2	38.7
1	3 leaf	10	23.4	61.5	59.5	40.4
1/4	4 leaf	10	23.6	68.6	59.9	38.8
1/2	4 leaf	10	25.2	61.2	59.9	43.9
1	4 leaf	10	25.1	65.2	59.2	41.2
1/4	5 leaf	10	24.5	58.5	59.3	38.7
1/2	5 leaf	10	24.0	58.5	59.6	37.2
1	5 leaf	10	24.6	60.2	59.8	42.5
1/4	Early boot	10	23.8	55.6	59.1	38.7
1/2	Early boot	15	23.4	55.0	59.4	36.5
1	Early boot	15	22.9	59.9	59.6	30.2
1/4	Late boot	15	23.3	64.6	59.5	36.4
1/2	Late boot	15	21.7	54.7	59.1	29.7
1	Late boot	15	24.4	56.6	59.9	39.2
No Herbicide		0	22.9	59.5	59.9	38.0

varieties were planted in strips in a completely randomized design with four replications. Two rates of bifenox, 1/2 and 1 lb/A were applied at the 4-leaf growth stage. The amount of carrier solution was 20 gpa of water for all treatments. A hail storm on June 20 did slight damage but the wheat recovered with minimal effect.

The application of bifenox did not significantly reduce yields, test weight, stand, or plant height at any rate of any growth stage. However, slight injury was noted on all growth stages except the preemergence or 1- to 2-leaf growth stages. Significant differences between varieties were found but no varietal differences to bifenox existed between the varieties.

Table 2. Effect of Bifenox on Different Spring Wheat Varieties

Measurement	Rate (lb/A)	Semi-dwarf Varieties			Standard Varieties		
		Era	Bonanza	Protor	Nowesta	Tioga	Fortuna
	0	30.4	29.8	18.2	25.4	22.7	9.6
Yield (Bu/A)	1/2	34.4	31.6	19.4	21.4	25.7	9.3
	1	28.9	28.6	22.0	25.7	22.4	10.2
	0	57.8	57.5	57.2	56.3	55.8	--
Test Weight (Lb/Bu)	1/2	56.9	57.2	57.4	55.9	56.0	--
	1	58.6	57.3	56.9	56.4	56.3	--
	0	23.0	20.6	17.3	27.0	23.9	23.8
Plant Height (Inches)	1/2	23.4	21.3	16.8	24.5	25.8	22.4
	1	22.4	20.3	18.5	28.1	24.8	24.8
	0	72.0	64.3	40.2	62.5	52.6	58.2
Stand (Spikelets/Yd)	1/2	61.3	65.3	40.7	60.6	52.4	53.3
	1	60.9	73.4	45.8	64.6	58.6	47.4

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Corn Desiccation as a Means of Reducing Drying Costs

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Plant Science Department

A study to determine the feasibility of desiccating corn in the field to reduce the amount of energy required for drying was conducted at the James Valley Agricultural Research and Extension Center near Redfield. Two varieties of corn, Pioneer 3780, a 100-day maturity corn, and Acco 1151, a 90-day maturity corn were planted May 28, 1975. The experimental design was a randomized complete block with five replications.

The corn was desiccated with paraquat at the three dates shown in the table. Paraquat was applied over the top and also with drop nozzles to get complete coverage. A killing frost occurred on September 23, two days after the third application of paraquat.

Excellent kill was achieved for all treatments. Harvest moisture percentages and 1,000 kernel weights are summarized in the table. Paraquat applied on September 9 substantially reduced the weight of 1,000 kernels. This indicates that the treatment must have been before physiological maturity. Moisture percentage at harvest was also reduced but not enough to make the treatment economical. A period of cool, wet weather in late September may have prevented drying of the corn killed by the first two treatments. After the frost a period of 90^{o} F temperatures and 30 mph winds dried all plots quickly. Paraquat applied on September 23, two days before the killing frost, did not reduce weight of 1,000 kernels or moisture percentage.

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Table 1. Kernel weight and moisture drydown of two corn hybrids as affected by paraquat.

Rate of Paraquat lb/A	Date of Treatment	Acco 1151[1] % Moisture at Application	Acco 1151[1] 1,000 Kernel[3] Weight	Acco 1151[1] % Moisture at Harvest	Pioneer 3780[2] % Moisture at Application	Pioneer 3780[2] 1,000 Kernel[3] Weight	Pioneer 3780[2] % Moisture at Harvest
1/2	9/9/75	50.7	206.91	18.1	58.7	207.53	17.4
1	9/9/75	50.7	201.69	18.3	58.7	207.62	16.7
1/2	9/13/75	46.5	217.72	19.7	57.2	232.60	19.2
1	9/13/75	46.5	223.25	19.8	57.2	228.90	17.4
1/2	9/21/75	41.0	233.83	21.3	54.9	252.56	21.3
1	9/21/75	41.0	230.03	21.3	54.9	254.69	21.2
0	---	---	229.99	21.9	---	262.58	22.2

[1]90-day maturity, harvested 10/10/75
[2]100-day maturity, harvested 10/14/75
[3]all 1,000 kernel weights standardized at 15.5% moisture

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The Effect of Difenzoquat Applied at Six Growth Stages to Four Wheat Varieties

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Plant Science Department

Difenzoquat (Avenge) is a postemergence herbicide being investigated for the control of wild oats. Barley has good tolerance to difenzoquat but spring wheat appears to be susceptible. A growth stage study at Redfield in 1975 attempted to determine a stage of growth at which wheat is not susceptible. Four varieties of spring wheat, Era, Kitt, Tioga, and Waldron, were planted. Previous experiments showed that these varieties differ in their response to difenzoquat. Era and Kitt appear to be tolerant of difenzoquat whereas Tioga and Waldron appear to be susceptible. Two rates of difenzoquat, 1/2 and 1 lb/A were applied to the 2-leaf, 2- to 3-leaf, 4-leaf, boot, early heading, and late heading growth stages.

Yield and percent crop injury indicate that Tioga and Waldron, the two varieties considered highly susceptible to difenzoquat, sustained the greatest amount of injury. These varieties were most susceptible when difenzoquat was applied at the earlier stages. Era and Kitt, both tolerant to difenzoquat, were not significantly affected by difenzoquat at any growth stage.

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The Yield and Percent Crop Injury of Era, Kitt, Tioga, and Waldron Spring Wheat as Affected by Difenzoquat

Stage of Growth at Treatment	Rate lb/A	Variety Era	Kitt	Tioga	Waldron
		Yield (gm/plot)			
2 leaf	1/2	732.0	338.0	939.0	859.2
	1	556.3	276.5	579.0	433.3
2-3 leaf	1/2	1218.3	356.8	977.5	848.5
	1	738.3	324.2	1118.2	666.5
4 leaf	1/2	1475.0	221.8	675.8	886.0
	1	1242.0	203.5	523.8	631.2
boot	1/2	1174.7	238.5	1180.5	873.0
	1	1153.3	204.2	1331.5	913.2
early heading	1/2	463.5	309.5	1331.5	1145.0
	1	1010.0	219.0	1350.5	1066.0
late heading	1/2	409.0	270.5	1058.0	1260.0
	1	784.3	308.0	1146.5	1353.8
		% Crop Injury			
2 leaf	1/2	4.75	4.50	0.00	3.00
	1	13.25	5.80	25.80	48.20
2-3 leaf	1/2	0.00	4.50	3.20	2.20
	1	0.20	3.80	3.80	15.80
4 leaf	1/2	0.80	2.00	34.00	6.00
	1	0.70	7.50	63.80	59.80
boot	1/2	0.00	1.75	1.20	7.00
	1	0.00	6.25	0.00	0.00
early heading	1/2	3.75	5.00	0.80	0.00
	1	2.50	7.00	0.00	0.50
late heading	1/2	3.25	9.30	0.00	1.20
	1	1.25	3.00	0.00	0.00

Agricultural Experiment Station

James Valley Agricultural
Research and Extension Center
Redfield, S.D. 57469

1976

Progress Report

South Dakota State University

Redfield--1976--8

1975 Performance Trials of Corn and Grain Sorghum

J. J. Bonnemann, assistant professor,
Plant Science Department

Performance trials with winter small grains, corn and grain sorghum were seeded at the James Valley Agricultural Research and Extension Center for the 1975 crop year. Winter wheat and rye trials were abandoned. Germination of the winter wheat was very poor and the rye stand was so uneven the yield data were quite variable and of no value.

Corn trials were seeded May 21, 1975 on both irrigated and dryland portions of the Station. The grain sorghum trial was also seeded on the same date. The trials were seeded with a custom-built 31-cell cone seeder mounted above a commercially built flexi-planter unit with double-disc openers. The row spacing was 36 inches. Recommended insecticides and herbicides were banded over the row at the time of seeding all trials.

Anhydrous ammonia applications supplied 130 lb/A actual N to the irrigated trials and 41 lb/A actual N to the dryland trial. The irrigated trials received 4 applications of water for a total of 12.5 inches of supplemental moisture.

The irrigated trials were at two populations, 16,250 and 19,550 plants per acre, and the dryland corn trial population was 11,225 plants per acre. Mean yields are reported for both trials as there was no significant difference in yield favoring one population over the other. Irrigated corn yields ranged from 74.0 to 142.5 B/A; the mean was 116.1 B/A. Dryland corn yields were spread from 78.2 B/A down to 45.0 B/A; the mean yield was 62.1 B/A. The mean yield for the grain sorghum trials was 4,645 pounds per acre.

The irrigated grain sorghum trial was harvested on October 1, 1975. Yields in pounds per acre are the mean of three replications. The irrigated corn trial was harvested on October 27; the dryland corn trial on October 28. The irrigated yields are the average of six replications and the dryland yields are the mean yield of four replications.

The results presented are only for 1975 (see tables). Additional data on these trials is found in Performance Trial Circulars published for corn and grain sorghum each year and available from the SDSU Agricultural Experiment Station or County Extension offices.

(Continued, over)

1975 Irrigated Grain Sorghum Trial, James Valley Agricultural Research and Extension Center, Redfield, Spink County, SD

Brand & Variety	Yield lb/A	Test Wt. lb/B	Ht. in.	Date Head	% Moist. 9/17/75
Warner W-561	5640	58	43	8/04	35.+
Pride P570	5375	58	43	7/31	33.3
Funk's G-393	5290	58	44	8/04	31.2
DeKalb B-35	5230	57	47	8/04	35.+
Northrup, King NK233A	5150	61	46	8/01	35.+
Northrup, King NK180	5130	58	47	8/01	33.4
ACCO R 1014	5125	57	47	8/05	34.8
DeKalb A-25a	5060	56	35	7/29	32.8
Northrup, King NK129	5005	60	46	7/29	28.7
ACCO R 1019	4860	57	46	8/08	35.+
SDAES RS 506	4820	58	47	7/29	35.+
Warner W-601	4705	58	45	8/02	32.3
Funk's G-490	4705	54	44	8/03	35.+
SDAES RS 610	4675	59	49	8/05	34.9
SDAES SD 503	4620	58	53	7/29	23.9
Warner W-55	4515	58	41	8/04	32.8
Pride P500A	4505	58	44	7/28	30.9
Pioneer 8901	4490	55	40	7/29	25.4
Northrup, King NKX3118	4355	57	43	8/02	35.+
Western WS-201	4330	57	44	7/26	25.6
ACCO R 920	4255	57	43	7/28	29.1
Funk's G-251	3895	59	37	7/26	27.9
Pioneer 894	3550	57	37	7/28	26.8
SDAES SD 106	3540	54	41	7/24	21.4
P-A-G 269	3280	58	44	7/26	21.1
Mean	4645				

C.V. - 11.3% LSD (.05) 857

1975 Dryland Corn Performance Trial, James Valley Agricultural Research and Extension Center, Redfield, Spink County, SD

Brand & Variety	Cross	Yield B/A	% Moist.	% Stalk Lodge
Western KX-55	2x	78.2	23.2	0.0
Sokota SS-67	M2x	75.4	22.6	0.0
ACCO UC 1151	2x	75.4	17.7	0.0
Trojan TXS 102	2x	74.3	23.4	0.0
Funk's G-4321	2x	73.0	21.5	0.0
Payco SX 865	2x	72.9	23.7	0.0
Funk's G-4444	2x	72.4	24.2	0.0
Trojan TXS 94	2x	71.6	20.2	1.7
Sokota TS-67	2x	70.7	23.5	0.0
Sokota SS-51	M2x	70.2	18.5	0.9
Payco SX 775	2x	69.7	20.1	0.0
Pioneer 3785	2x	69.2	19.3	0.0
ACCO DC 147	4x	68.6	18.1	1.8
Security ST 95	3x	68.5	18.3	0.9
Payco SX 680	2x	68.2	19.5	0.9
Curtis A201	2x	67.8	24.8	0.0
Check #4	2x	67.6	20.3	0.0
SDAES PP 147	4x	67.0	18.0	0.0
ACCO UC 2301	2x	65.8	17.7	0.0
Northrup, King PX20	2x	65.3	17.3	0.0
Pioneer 3932A	2x	64.6	17.5	0.9
Funk's G-4343	2x	62.9	22.2	0.0
Funk's G-4288	3x	62.7	21.0	0.0
SDAES Ex 104	2x	61.7	20.3	0.0
Trojan TXS 99	2x	61.0	18.0	0.0
SDAES PP 199	3x	60.7	18.5	0.0
Trojan TXS 92	2x	60.4	16.8	0.9
Pioneer 3955	3x	60.1	17.7	0.0
Northrup, King PX32	2x	59.7	20.9	0.0
Pride 3315	2x	59.7	18.9	0.0
Curry TC-338	3x	58.7	16.9	0.0
ACCO U 322	3x	57.9	19.7	0.0
ACCO UC 1131	2x	57.7	16.6	0.9
SDAES Ex 103	2x	57.4	19.3	0.0
Check #5	4x	57.1	19.7	0.0
Pride R-200A	2x	57.0	18.8	0.9
Funk's G-4141	2x	56.0	17.4	0.0
Security ST 105	3x	55.4	21.5	0.0
ACCO U 334	3x	54.1	19.5	0.0
SDAES PP 198	4x	53.7	17.7	0.0
SDAES PP 171	3x	53.5	16.8	0.0
Pride 5525	2x	52.8	22.0	0.0
Pioneer 3780B	M2x	52.8	19.8	0.0
Curry SC-144	2x	50.9	20.9	0.0
Check #8	2x	50.7	16.0	0.0
Pride 4404	2x	49.5	21.3	0.0
Pioneer 3596	3x	49.0	19.5	0.0
Northrup, King PX466	3x	47.9	18.0	0.0
Northrup, King PX442	3x	45.0	17.6	1.0
Mean		62.1	19.7	0.2
C.V. - 15.1%	LSD (.05)	13.1		

1975 Irrigated Corn Performance Trial, James Valley Agricultural Research and Extension Center, Redfield, Spink County, SD

Brand & Variety	Cross	Yield B/A	% Moist.	% Stalk Lodge
McCurdy MSX 44A	2x	142.5	24.0	0.0
Trojan TXS 102	2x	139.3	23.5	0.0
Security SS 105	2x	138.0	23.7	0.4
Check #2	2x	136.1	23.4	0.0
Western KX-55	2x	134.4	24.5	0.4
Pioneer 3780B	M2x	128.8	19.6	0.0
Funk's G-4444	2x	128.6	23.4	0.0
SDAES Ex 105	2x	128.2	18.6	1.1
Curtis A201	2x	126.8	25.0	0.8
Sokota TS-67	2x	125.8	23.9	0.0
Disco SX 16	2x	125.6	23.5	0.0
Trojan TXS 94	2x	124.9	21.3	0.4
Sokota SS-51	M2x	124.3	19.5	0.4
McCurdy MSX 46	2x	123.2	23.4	0.0
Curry SC-142	2x	121.6	24.2	0.4
Security SS 95	M2x	121.6	19.0	0.0
ACCO UC 1151	2x	121.4	19.4	0.8
Funk's G-4288	3x	120.8	21.1	0.8
ACCO UC 2901	2x	120.4	20.8	1.3
O's Gold SX 1100	2x	120.2	23.4	0.0
McCurdy 36M	M2x	119.8	23.6	1.6
Funk's G-4321	2x	119.5	21.9	0.0
Payco SX 680	2x	119.1	21.1	0.0
O's Gold SX 900	M2x	118.4	19.2	0.8
Payco SX 775	2x	118.1	20.4	0.4
Pride 3315	2x	117.7	19.0	0.5
Pride 4404	2x	117.6	21.9	0.0
Funk's G-4141	2x	117.5	18.2	0.0
Pioneer 3785	2x	117.5	21.4	0.9
Pioneer 3780	2x	117.4	20.7	0.0
Check #3	2x	117.2	19.4	2.5
Trojan TXS 105A	2x	115.4	21.7	0.0
McCurdy MSP 333	3x	115.0	20.9	0.8
ACCO UC 3201	2x	114.8	25.2	0.0
ACCO U 322	3x	114.6	19.8	0.9
Northrup, King PX20	2x	113.7	18.1	0.0
Funk's G-4180	3x	112.3	20.8	0.4
Pride 5525	2x	110.5	23.3	0.0
Sokota SS-67	M2x	110.5	23.9	0.4
Sokota TS-49	2x	110.3	21.6	0.9
McCurdy MSX 24	2x	108.8	19.3	2.2
Northrup, King PX32	2x	108.7	21.8	0.9
Pioneer 3965	2x	108.6	18.1	0.4
McCurdy MSP 111B	3x	105.8	20.0	0.4
Sokota TS-46	2x	105.8	20.1	1.4
Pride R-200A	2x	105.3	19.7	0.9
ACCO UC 2301	2x	103.5	19.6	0.5
Security SS 97	2x	102.8	22.0	0.0
ACCO UC 1131	2x	101.7	17.2	2.7
Northrup, King PX448	3x	98.8	19.0	1.3
Check #5	4x	96.9	21.1	0.4
Northrup, King PX466	3x	95.4	20.2	0.9
McCurdy 73-9	M2x	83.8	23.6	0.4
Curry TC-343	3x	74.0	24.7	0.4
Mean		116.1	21.4	0.5
C.V. - 14.1%	LSD (.05)	19.0		

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Progress Report

South Dakota State University

Redfield--1976--9

Increasing Water Use Efficiency of Smooth Bromegrass Through Plant Selection

James G. Ross
Professor, Plant Science Department

Introduction

The objective of this work is to obtain, through plant selection, a variety of smooth bromegrass which will continue to produce forage during the summer, and remain in mixture with alfalfa under an intensive harvesting program designed to maximize alfalfa yields.

Procedure

Bromegrass was seeded one seed to a hill, 40 inches each way in the fall of 1969 on 6 acres of irrigated land. The next spring alfalfa was over-seeded and in subsequent seasons harvested to give maximum yield. In 1973, 1974 and 1975, harvests were made on May 30, June 29, August 10, and October 9.

Results and Discussion

Outstanding plants have been marked before each cutting in each year. The identity of outstanding plants has in this fashion been maintained. In early spring, the plants which had consistently given good regrowth the previous years were marked with a permanent wooden stake. Small plastic stakes were used to mark the outstanding plants before each harvest in 1973, 1974, and 1975. The plants which have consistently given good regrowth will be observed in 1976 for desirable agronomic characteristics such as seed set, disease, and forage quality, and the best of these placed in a synthetic for testing for regrowth with alfalfa.

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Progress Report

South Dakota State University

Redfield--1976--10

Grass -- Alfalfa Variety Test

J. F. Giles, research manager, James Valley
Agricultural Research and Extension Center,
and J. G. Ross, professor, Plant Science Department

Introduction

The objective of this experiment was to obtain information on the relative yielding capacity of varieties of adapted species under irrigation with and without a mixture of alfalfa and under an intensive cutting program. The particular interests in this experiment are the comparative yields of SD 101 creeping foxtail with Garrison and SD 5 bromegrass with Lincoln.

Materials and Methods

The following grasses were seeded at 10 lbs. of pure live seed (pls) per acre and in mixture with alfalfa at 8 lbs. pls of grass seed and 8 lbs. pls of Iroquois alfalfa seed on August 20, 1974 in four replicates of 8' x 20' plots in rows 6" apart.

Garrison and SD 101 creeping foxtail
Lincoln and SD 5 bromegrass
Oahe and Slate intermediate wheatgrass
Nordstern orchardgrass
Commercial reed canarygrass

In the fall of 1974, this experiment was irrigated to obtain a good established stand. No winter injury on the alfalfa was noted the next spring.

On May 12, 1975, 50 lbs. of nitrogen (N) as ammonium nitrate was applied only to the grass plots. The first cutting was made June 19 after which 50 lbs. of N was again applied. Likewise, after the second cut (August 4) 50 lbs. N was applied. The third cut was made September 17 after which nitrogen will be applied in early spring.

The following irrigations were made using an overhead irrigation system spaced through the center of the experiment:

July 16--2 inches; July 28--1.5 inches.
Aug. 6--2.0 inches; Aug. 15--2.0 inches; Aug. 22--2.0 inches.
Sept. 3--2.0 inches; Sept. 8--4.0 inches.

The plots were harvested with an 8-foot self-propelled swather, the forage weighed, moisture samples taken and forage weights adjusted to 12% moisture.

Results

Because no significant differences were found between plots with and without alfalfa, forage yields are reported in Table 1 as averages of both subplots. The expected larger yields, normally present in plots containing alfalfa, were not found because of the optimum nitrogen fertility maintained on the grass and also because of the annual weed growth that occurred. These weeds have been found to have a high nutrient content so would not lead to a lowered actual forage yield from these plots.

In Table 1, total yields of the three cuttings during the year indicate that reed canarygrass and

(Continued, over)

Table 1. Yields of forage from grass varieties under irrigation at Redfield, 1975.

Species	Cuttings			
Variety*	June 19	Aug. 4	Sept. 17	Total
		Tons/acre**		
Creeping Foxtail				
Garrison	2.86c	1.61c	1.85ab	6.32f
SD 101	3.05c	1.64c	1.52b	6.21f
Bromegrass				
Lincoln	3.22bc	1.62c	2.08ab	6.93e
SD 5	3.34bc	2.25abc	2.15ab	7.74ab
Intermediate Wheatgrass				
Oahe	4.02a	1.94bc	1.57b	7.39bcd
Slate	3.71ab	1.79c	1.55b	7.62bc
Orchardgrass				
Nordstern	2.55d	2.51ab	2.32ab	7.38cd
Reed canarygrass				
Commercial	2.70c	2.80a	2.46a	8.00a

*Because no significant difference between grass alone and with alfalfa was found. Yields are reported as overall means.
**Yields in a column having the same letter do not differ significantly.

SD 5 bromegrass do not differ significantly and are the highest yielding grasses in the test. SD 5 bromegrass yields significantly more than Lincoln and Nordstern orchardgrass and about the same as the intermediate wheatgrass varieties. Oahe and Slate intermediate wheatgrass do not differ significantly in yield though Slate is slightly higher. The creeping foxtail yielded the poorest of the grasses tested but no significant difference between the varieties occurred.

When yields at the different cutting dates were examined, the June 19 cutting was shown to yield the most. The intermediate wheatgrasses yielded more than the other species and the bromegrasses next. In the summer cutting, reed canarygrass, orchardgrass and SD 5 yielded the highest. SD 5 did not yield significantly more than Lincoln though the difference was almost significant.

From this experiment, it appears that SD 5 bromegrass which has been selected for increased regrowth has shown increased yield under the intensive cutting program. The other new variety, SD 101 creeping foxtail, which has been selected for seed retention has not yielded differently than the original Garrison which loses its seed before it is ripe. SD 101, though the same for forage yield, would be an advantage over Garrison creeping foxtail because of its higher seed yield and ease of seed harvest.

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South Dakota State University

Redfield--1976--11

1975 Sunflower Variety Trial
James Valley Research and Extension Center
Redfield, S. D.

Q. Kingsley, J. Giles, R. Sanders

Objectives

1. Seed yields of sunflower varieties or hybrids.
2. What dates do sunflowers reach 50% bloom?
3. What effect, if any, will sunflowers have on other crops in the sequence?

Cropping Sequence

1. Corn 74, Sunflowers 75
2. Sunflowers 74, Wheat and Oats 75
3. Sunflowers 75, Wheat, Oats, and Corn 76

Crop Year History -- Sunflowers, Wheat and Oats

Planted: Wheat (Olaf 1 Bu/A) May 12, Harvested August 13
Oats (Spear 2 Bu/A) May 12, Harvested July 29
Sunflowers May 29, Harvested September 23
Row Space: 36 inches at 16,000 plants/A, Sunflowers
Replications: 4
Treatments: Fertilizer - none
(all crops) Herbicides - none
Bird Control - Avitrol, 3 applications, Sunflowers
Insecticides - none
Rainfall: May 29 to September 23, 6.59 inches
Soil Type: Beotia Silt Loam
Tillage: Corn and sunflowers stalks disked in.

Discussion

The results illustrated in Table 1 are mainly for comparisons of hybrid and open pollinated sunflowers. Yields were not taken from this area in 1974 due to excessive bird damage. Avitrol was applied, for bird control, August 8, 17 and the 22nd in 1975. The loss in yield was estimated at about 15% in the earlier maturing sunflowers from bird damage. Insects had made entries into the heads, but in many cases the damage was caused by one single insect. Oil content is not too high for the oil seed varieties and this is due partially to the summer heat, low rainfall, and no fertility added.

Yields of spring wheat and oats (Table 2) reflect the lack of fertility and also the effect of being planted late in the season. There were no disease or insect reactions present that seemed to depress the growth of either crop.

Table 1. Sunflower yields, test weight, percent oil and days to 50% bloom.

Hybrid or Variety	Test Wt. lb/bu	% Oil	Seed Yield lb/A	50% Bloom Days from 5/29/75
Dahlgren				
DO 411	32.0	43.4	1225.1	69
DO 410	31.0	42.9	898.4	68
DO 514	31.0	44.2	874.8	68
DO 515	32.5	45.4	976.4	69
Peredovik 66	30.2	43.8	896.6	64
Sputnik 71	31.2	47.4	773.1	66
Sun Hi 372	30.2	46.9	849.1	68
Sun Hi 380	32.5	47.9	1076.2	68
Inter State 896	32.7	46.9	1021.8	65
Inter State 8941	33.7	43.9	952.9	65
Inter State 8944	32.7	44.2	1076.2	63
NK Hi 212	33.2	44.4	1032.7	62
Rumson HS 52	28.7	45.3	1152.5	69
Cargil 201	32.7	47.9	1112.5	70
Cargil 204	31.2	45.8	1020.0	67
Pacific Sun Hi 301	33.0	48.2	889.3	69
Pacific Sun Hi 304	33.0	46.5	918.4	66
NAPB RE	30.7	40.8	813.1	65
NAPB AE	31.7	44.3	923.8	64
NAPB 12	31.7	42.4	940.1	63
NAPB 55	32.7	43.5	490.0	62
NAPB RX	31.7	42.0	940.1	63
USDA 874	32.5	47.4	878.4	67
USDA 873	32.7	47.5	843.9	66
USDA 903	31.7	42.4	798.5	63
USDA 904	33.0	43.2	1027.3	63
Sundak	27.7	31.7	1127.1	66
Sexauer POI 896	32.0	47.1	983.7	69
Record	30.0	46.2	954.7	70
Commander	26.5	35.9	725.9	65

Table 2. Yield in bushels per acre of oats and wheat following sunflowers.

Variety	Test Weight lb/bu	Yield Bu/A
Oats (Spear)	35.0	41.5
Wheat (Olaf)	56.0	21.9

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Progress Report

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Redfield--1976--12

Methods of Supplementing Vitamin A to Finishing Beef Cattle

R. M. Luther, L. B. Embry and J. F. Giles

Supplementation of vitamin A to cattle is commonly done by including the vitamin in the daily ration or supplement. However, cattle are frequently fed rations adequate in protein without additional supplementation. Under these conditions, supplemental vitamin A may be needed and methods other than through the daily feed may be a more practical and economical means of administration. Alternate methods of vitamin A supplementation of recent interest include intermittent feeding as a supplement top-dressed to the ration, free-choice feeding in a mineral supplement and massive doses by injection. These appear to offer convenience and labor saving advantages under certain conditions to the cattle feeder.

The objectives of this experiment were to study the nutritional aspects of these methods such as their effect on feedlot performance and on the status of vitamin A in the body in terms of blood plasma levels and liver storage. The feeding trial was conducted at the James Valley Research and Extension Center near Redfield during the summer and fall of 1975.

Procedure

Sixty-five steers averaging 735 lb. were purchased from an auction market, but all from one source for use in the experiment. During a 60-day preliminary period prior to the start of the trial the cattle were fed whole oats and/or corn grain and 2 lb. low-quality legume-grass hay. The cattle were eartagged, weighed and allotted to 5 pens of 13 steers each. The pens were unpaved without shade or shelter and equipped with automatic drinking waterers.

Experimental treatments were as follows:

1. Control -- no vitamin A, minerals free-choice.
2. Vitamin A supplement with minerals fed daily.
3. Vitamin A supplement, top-dressed every 2 weeks, minerals free-choice.
4. No supplement, vitamin A in free-choice mineral mixture.
5. No supplement, vitamin A injected at start of experiment, minerals free-choice.

Each pen of cattle were given a full feed of whole shelled corn and 2 lb. of chopped average-to-poor quality alfalfa-bromegrass hay per head daily. The mineral mixtures were composed of ground limestone and trace mineral salt (Table 1). The conventional supplement fed daily and the one fed intermittently (Table 1) were made into 1/4-inch pellets. Rate of feeding was 1 lb. per head daily and 1 lb. per head one time at 2-week intervals. The injectible vitamin A treatment consisted of administering 3 million International Units intramuscularly once at the beginning of the feeding period.

Table 1. Composition of mineral and supplement mixtures

	Free-Choice Mineral Mixture[1]		Vitamin Supplements	
Ingredient	Without Vit. A	With Vit. A	Conven-tional	Top-dressed
	%	%	%	%
Ground corn	—	—	85.55	97.94
Ground limestone	74.43	74.42	10.00	—
Trace mineral salt	25.57	24.47	3.20	—
Vitamin A premix[2]	—	1.11	0.15	2.06

[1]Formula based on expected mineral consumption of 60 grams/head/day.
[2]Premix contained 30,000 IU vitamin A palmitate/gm.

The cattle were weighed with a fill and following 18 hours without feed and water at the start of the 145-day trial. Final weights were taken at slaughter following a 4-hour transit period. Samples of the supplements and feeds were collected periodically and analyzed for carotene and vitamin A.

Samples of blood plasma were taken initially at 93 days and at slaughter for carotene and vitamin A determinations. Liver tissue was taken at slaughter for similar analyses.

Results

The results of the fattening trial are presented in Table 2. Each of the four methods of providing additional vitamin A to fattening steers resulted in improved performance as compared to the control treatment without vitamin A. However, there were some apparent differences between the methods. Steers fed a daily supplement providing 20,000 IU of vitamin A per steer and those given a single injection of 3 million IU of the vitamin consumed about the same amount of feed and gained at similar rates. The performance of steers on these treatments was superior to that of steers also fed a supplement providing the equivalent of a 20,000 IU daily allowance of the vitamin but supplemented at two-week intervals. Steers offered vitamin A in the free-choice mineral supplement made more rapid gains than those fed the vitamin A supplement every 2 weeks, but less than those receiving the daily supplement or the initial injection. Free-choice mineral consumption was considerably less than estimated resulting in a vitamin A intake much lower than through the feed supplements.

Reductions in weight gains for the control, intermittent supplementation and mineral supplementation treatment groups were associated with lower feed consumption and higher feed requirements.

Even though weight gains for controls and some supplemented groups appeared to be reduced in comparison to adequate rates of supplementation, there were no gross signs of vitamin A deficiency.

Analyses of feed, blood plasma and liver samples for carotene and vitamin A content are presently in progress. These analyses are expected to provide additional information as to the relative merits of the various methods of supplementation.

Table 2. Feedlot performance and methods of vitamin A supplementation. (July 17 to December 8, 1975--145 days)

	Methods of Vitamin A Supplementation				
	Control (None)	Daily suppl.	Suppl. at 2-week intervals	Free-choice in minerals	Injection 3 million IU
No. steers[1]	13	12	12	12	13
Avg. init. wt., lb.	735	739	738	738	734
Avg. final wt., lb.	1047	1167	1099	1127	1151
Avg. daily gain, lb.	2.16	2.95	2.49	2.68	2.88
Avg. daily ration, lb.					
Whole corn	16.95	19.20	18.25	18.94	19.51
Chopped hay	1.99	1.99	1.99	1.99	1.99
Supplement	---	0.993	0.076	---	---
Minerals	0.036	0.006	0.028	0.016	0.002
Total	18.976	22.189	20.344	20.946	21.502
Feed/100 lb. gain, lb.					
Whole corn	786	651	733	707	679
Chopped hay	92	67	80	74	69
Supplement	---	34	3	---	---
Minerals	2	0	1	1	0
Total	880	752	817	782	748

[1]Removed from lot because of wildness or injury.

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1976

Progress Report

South Dakota State University

Redfield--1976--13

Bi-Level Drainage Evaluation

Shu T. Chu and Darrell W. DeBoer,
assistant professor and associate professor,
Agricultural Engineering Department

An experimental drainage plot was modified in late 1974 and early 1975 by installing two shallow (4.5 feet deep) drains and one deep (8.0 feet deep) drain. The existing experimental area is shown in Figure 1. The modification was completed for the purpose of collecting field data which will be used to evaluate a drainage theory and to formulate criteria for design.

The experimental area was irrigated during the fall until the water table was near the soil surface. Then drain line discharge and water table elevation data were collected during the recession of the water table (see Tables 1 and 2). Water table elevations from well 1 through 10 were omitted because of a problem with the shallow line B.

Table 1. Drain line discharge in cubic feet per day for north drain plot at Redfield.

Time		Drain Line D[a]	Drain Line CS[b]	Drain Line CN[b]
9/26/75	6:45 p.m.	471	360	475
9/27/75	9:00 a.m.	235	263	319
	2:30 p.m.	208	235	291
9/28/75	3:45 p.m.		194	
9/29/75	10:00 a.m.	129	172	191
10/01/75	9:00 a.m.	77	121	140
10/03/75	3:55 p.m.	54	97	117
10/06/75	9:00 a.m.	30	80	88
10/10/75	5:10 p.m.	0	50	61
10/15/75	1:20 p.m.	0	36	38
10/16/75	1:40 p.m.	0	33	36

[a]150 foot long drain line
[b]75 foot long drain lines

Table 3 presents a summary of several parameters used to describe the quality of the drain line discharges. The CN quality data are very similar to the 1972 data presented in the March 1973 Center publication, however, the CS data show some improvement in quality when compared to the 1972 data.

(Turn page for Tables 2 and 3)

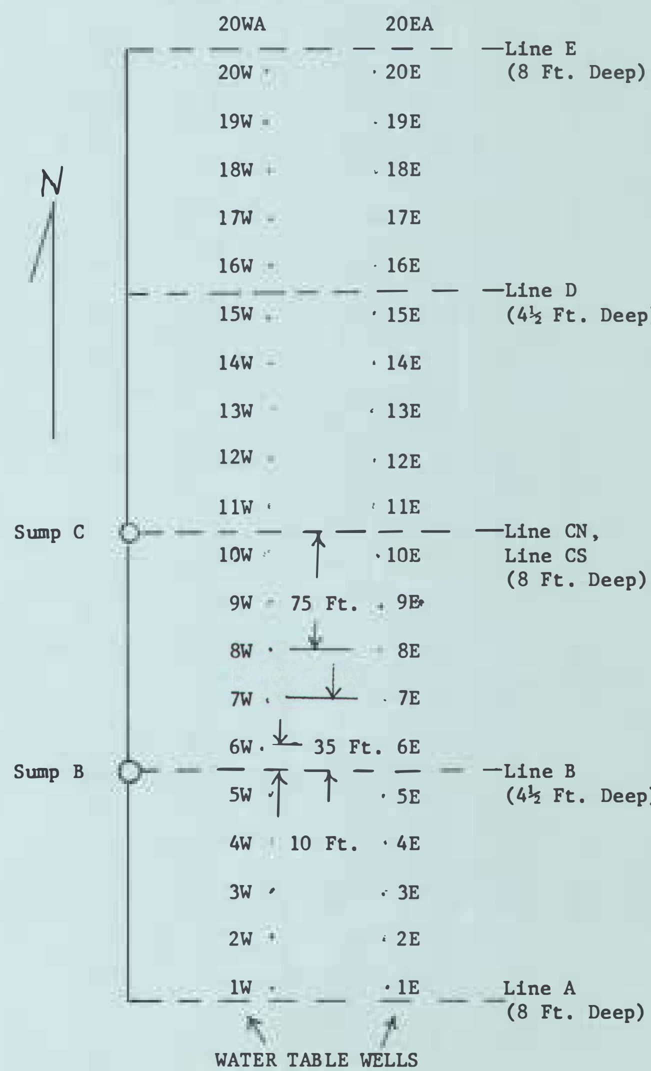

Figure 1. Water table well location in north drain plot for 1975.

Table 2. Water table elevations in feet for north drain plot at Redfield.

Observation well	Ground surface elevation	9/26/75 10:30 a.m.	9/26/75 12:00 noon	9/26/75 1:15 p.m.	9/26/75 3:00 p.m.	9/26/75 6:55 p.m.	9/27/75 0:00 a.m.	9/27/75 8:15 a.m.	9/27/75 1:55 p.m.	9/28/75 4:50 p.m.	9/29/75 10:45 a.m.	10/1/75 9:40 a.m.	10/3/75 4:30 p.m.	10/6/75 9:30 a.m.	10/10/75 5:40 p.m.	10/16/75 2.25 p.m.
11 W	101.31	101.11	101.06	100.76	100.11	99.41	98.91	98.36	98.16	97.43	97.07	96.47	96.03	95.63	95.13	94.75
12 W	101.50	101.27	101.27	101.12	101.12	101.02	100.87	100.37	100.07	99.23	98.73	97.84	97.25	96.60	95.90	95.27
13 W	101.56	101.36	101.36	101.31	101.26	101.16	101.06	101.06	100.86	100.12	99.62	98.71	98.14	97.39	96.60	95.82
14 W	101.72	101.44	101.39	101.34	101.19	101.14	101.04	100.79	100.64	99.95	99.69	98.95	98.46	97.84	97.09	96.25
15 W	101.76	101.28	101.08	100.83	100.68	100.38	100.13	99.88	99.73	99.30	99.09	98.61	98.33	97.89	97.30	96.52
16 W	101.75	101.45	101.25	101.05	100.90	100.55	100.30	100.00	99.90	99.44	99.27	98.76	98.47	98.07	97.47	96.62
17 W	101.83	101.68	101.63	101.63	101.58	101.43	101.33	101.13	100.93	100.36	100.06	99.38	99.03	98.48	97.73	96.78
18 W	101.99	101.76	101.76	101.88	101.88	101.73	101.73	101.51	101.46	100.96	100.70	99.85	99.45	98.82	97.89	96.82
19 W	101.99	101.87	101.87	101.82	101.77	101.67	101.47	101.27	101.12	100.48	100.19	99.34	98.81	98.12	97.22	96.35
20 W	102.15	101.72	101.62	101.52	101.37	100.82	100.42	100.07	100.02	99.16	98.89	98.07	97.63	97.07	96.36	95.75
11 E	101.59	101.46	101.06	100.76	100.36	99.76	99.36	98.86	98.66	97.90	97.53	96.82	96.51	96.07	95.55	95.09
12 E	101.72	101.72	101.72	101.67	101.62	101.37	101.22	100.82	100.52	99.45	98.96	97.94	97.46	96.84	96.14	95.47
13 E	102.02	101.69	101.69	101.69	101.69	101.59	101.49	101.39	101.29	100.66	100.17	99.10	98.50	97.79	96.89	96.05
14 E	101.83	101.41	101.61	101.56	101.51	101.31	101.26	101.06	100.96	100.30	99.95	99.13	98.64	98.06	97.22	96.38
15 E	101.94	101.52	101.27	101.17	100.87	100.57	100.37	100.07	100.02	99.53	99.33	98.74	98.44	97.98	97.28	96.43
16 E	101.85	101.63	101.38	101.13	100.93	100.63	100.48	100.33	100.13	99.60	99.34	98.78	98.50	97.97	97.28	96.44
17 E	101.94	101.81	101.76	101.71	101.66	101.46	101.36	100.96	100.96	100.33	99.89	99.22	98.82	98.21	97.41	96.42
18 E	102.04	101.81	101.81	101.81	101.76	101.61	101.61	101.46	101.41	100.70	100.19	99.49	99.02	98.40	97.48	96.50
19 E	102.12	101.87	101.87	101.82	101.72	101.42	101.42	101.37	101.22	100.44	99.95	99.23	98.70	98.01	97.11	96.23
20 E	102.12	101.72	101.67	101.62	101.47	101.27	101.12	100.77	100.57	99.81	99.19	98.57	98.08	97.43	96.60	95.88
20 EA	101.83	101.78	101.58	101.38	101.18	100.83	100.58	100.08	99.88	99.13	98.84	98.12	97.64	97.09	96.39	95.75

Table 3. Water quality of drain line discharge on September 26, 1975.

Water Quality Parameter	Drain Line CS	CN	B
Electrical Conductivity (Micromhos/cm @ 25°C)	7563	5147	7298
Sodium Adsorption Ratio	9.3	4.7	8.7
Sodium (Na) (ppm)	1260	570	1170
Sodium (% of cations)	43.8	30.3	42.6
Sulfate (SO_4) (ppm)	3900	2350	3500

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Redfield--1976--14

Bacterial Leaf Necrosis of Wheat

Sandra Fryda and Jack Otta,
graduate assistant and assistant professor,
Plant Science Department

Bacterial leaf necrosis, caused by *Pseudomonas syringae*, has the potential of being a serious problem for South Dakota wheat growers. A study was done in 1975 to determine if seedborne *P. syringae* could cause disease and if so what its status is before disease symptoms occur and how the yield is affected by the disease. The following results were obtained.

The pathogen was isolated from apparently healthy wheat plants which were grown from seed artificially inoculated with the bacteria. Later on during the boot stage, symptoms of bacterial leaf necrosis appeared.

This indicates that the disease can be caused by seedborne *P. syringae* and also that the pathogen may survive on the plant as on epiphyte long before symptoms occur. This ability increases the chance for dispersal of the pathogen and has important implications concerning epidemics of this disease.

The disease appeared in both treated and check plots and was probably spread from the treated plots to the checks by wind and rain. Yield data was taken but no significant differences were obtained between the treated and check plots which could be expected since both seemed to be affected to about the same extent.

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Redfield--1976--15

Soybean Research and Testing

A. O. Lunden and G. W. Erion

Soybeans have a considerable and profitable production potential in the Spink County area if they are properly managed and have irrigation water available when it is needed. Dryland production, however, is not to be recommended.

Irrigated soybean yield test entries at the Redfield Station in 1975 included ten standard varieties, six experimental entries and 29 commercial lines or blends from 11 cooperating seed companies. Yields which ranged from 25 to 33 bushels per acre were well below the long-time expected averages because of lack of field uniformity which reduced yields in two of the four replications. Yields were very low in 1973 because of water shortage and below average in 1974 from early frost injury on September 1. Yields are recorded in Table 1.

Wells is the most desirable full-season standard variety as it is more resistant to lodging than Corsoy. Harcor, a new release from Canada which will not be commercially available until 1977 was also excellent. Evans may prove to be an excellent early variety at Redfield in 1976. Several lines and blends from the various companies also have excellent yield records.

(Over for Table 1)

Table 1. Irrigated Soybean Performance in Mideastern South Dakota (Redfield, 1972-75).

Identification of Entries[1]			1975 Field Data: Maturity Date (Mo.-Day)	1975 Field Data: Plant Height (in.)	1975 Field Data: Potential Shatter Loss[4]	Average Yield in Bu/Acre: 73	74	75	72-75	74-75
Standard Varieties:										
Entry	Maturity Group[2]	Days to Mature[3]								
Evans	0	-4	10-3	25	1	--	28.8	31.0	--	29.9
Harlon	I	-3	10-4	26	2	--	--	25.8	--	--
Swift	0	-2	10-5	24	1	--	25.3	25.2	--	25.3
Hodgson	I	+3	10-6	24	1	--	28.0	28.0	--	28.0
Anoka	I	+4	10-7	22	1	20.8	24.2	25.6	25.0	24.9
Steele	I	+4	10-7	26	1	25.2	28.3	28.6	28.4	28.5
Corsoy	II	+10	10-9	26	1	24.3	26.5	31.9	29.4	29.2
Hark	I	+11	10-10	24	1	22.9	23.5	29.4	27.2	26.5
Wells	II	+12	10-14	32	1	25.2	21.9	30.2	29.8	26.1
Harcor	II	+12	10-10	29	1	--	--	31.6	--	--
Commercial Entries:										
Brand	Entry									
Peterson-Pioneer	81		9-30	15	5			18.8		
Jacques	J84		10-4	24	1			24.8		
Peterson-Pioneer	85		10-4	20	1			25.8		
SRF	100		10-4	26	1	22.9	17.8	24.5	22.3	20.4
Weathermaster	SB43		10-5	23	2			29.4		
Jacques	J94		10-5	24	1			30.3		
Land-O'Lakes	GO-45-A		10-5	24	1			26.6		
Weathermaster	SB53		10-6	26	1			29.3		
Riverside	404		10-7	26	1		25.4	31.1		28.3
Rob-See-Co	Miami II		10-7	26	1			26.2		
Northrup King	1346		10-8	24	1			31.8		
Northrup King	M40		10-8	27	1			26.9		
Pride	B186		10-8	32	1			31.0		
Asgrow	A2340		10-9	31	1			33.1		
Agripro	1235		10-9	28	1	20.1	26.1	31.3		28.7
Asgrow	XP2444		10-10	29	1			28.5		
Weathermaster	63		10-10	26	1			25.8		
Agripro	14		10-10	24	1		25.0	27.1		26.1
Northrup King	S1244		10-10	30	1			29.8		
Asgrow	2440		10-10	28	1			31.1		
Rob-See-Co	Apache II		10-10	27	1			30.0		
Land-O'Lakes	GO44		10-11	33	1		23.3	31.8		27.6
Riverside	303		10-12	29	1		29.4	26.0		27.7
Peterson-Pioneer	3100		10-12	32	1			30.8		
SRF	150		10-12	30	1	19.2	24.2	30.2	25.7	27.2
Asgrow	2656		10-	30	1			31.4		
Jacques	J98		10-13	35	1			33.0		
Agripro	20		10-15	30	1			27.5		
Weathermaster	70		10-17	32	1			24.0		
LSD								4.7		

[1] Listed in order of maturity.
[2] Maturity "group" from USDA classification: 0=Early, I=Early to Midseason, II=Midseason to Late at Redfield.
[3] Expected relative maturity at this site when not exposed to killing frost.
[4] Shattering potential: 1=no loss, 2=up to 5%, 3=5 to 10%, 4=10 to 20%, 5=20% or more.

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Redfield--1976--16

Alfalfa Yields Under Irrigation

Joseph F. Giles and Robert A. Sanders

The objective of this experiment was to obtain information on the relative yielding capacity of three newer varieties of alfalfa during the third year of production under irrigation.

Procedure

The alfalfa was seeded in May 1973. The varieties were not fertilized, as soil tests for phosphorus and potassium were high. Water was applied as needed from July to September with an overhead sprinkler system. A total of approximately 12 inches of water was applied.

The alfalfa was harvested with a self-propelled swather, the forage weighed and moisture samples taken. Yields were converted to tons of 12% moisture hay per acre.

Results and Discussion

Yields of the three varieties of alfalfa are illustrated in Table 1. The yields of the first cutting were reduced by a hail storm on June 3, which did moderate damage. Varieties were in the bud stage when the damage occurred and had not attained full growth. The following two cuttings were taken at the 1/10 bloom stage of development. There was no significant difference between the varieties at any of the harvest dates nor in total production.

Iroquois and Saranac alfalfa varieties were selected because of their regrowth characteristics. After each cutting these two varieties observed to grow back at a more rapid rate than did Vernal. This increased regrowth could be observed for about three weeks after cutting.

Table 1. Yield of three varieties of alfalfa under irrigation.

	Cutting			
Variety	June 16	June 17	Sept. 3	Total
	Yield, tons/acre			
Vernal	2.29	2.64	2.27	7.20
Iroquois	2.29	2.25	2.71	7.25
Saranac	2.45	2.45	2.65	7.55

LSD (.05) = .44 T/A

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Redfield--1976--17

Zinc Rate Experiment

Joseph F. Giles and Robert A. Sanders

Summary

No corn yield increase was obtained from rates of zinc applied in 1973.

Introduction

Zinc deficiency symptoms were observed in corn grown on Field 1 in 1972. Zinc fertilizer as zinc sulfate was broadcast and plowed under in 1973. Corn was grown during the following three years to determine the effect of the applied zinc on the yield.

Procedure in 1975

Corn stalks were tandem disked twice and harrowed prior to planting on May 15. Acco 1900 was planted at a rate of 20,600 seeds per acre in 30 inch rows. Furadan insecticide (7.5 lb/acre) and Lasso herbicide (20 lb/acre) were applied at planting. The corn was cultivated twice and hilled for irrigation. Prior to hilling, anhydrous ammonia at 130 lbs. actual N was sidedressed on June 30. Approximately 12 inches of water were applied in four furrow irrigations. Yield samples were hand harvested on October 27. The harvested plant population was 16,500 plants per acre.

Results and Discussion

Yield and moisture content of ear corn are shown in Table 1. Zinc rates did not significantly increase yield or moisture content.

The application of the zinc fertilizer has had no significant effect on corn yield or moisture content since it was applied. However zinc deficiency usually occurs when soil temperatures are below normal, which has not been the existing conditions since the year of application.

Table 1. Effects of zinc rates on corn yield and ear moisture, 1975.

Zinc rates lbs. Zn/A	Yield Bu/A	Moisture %
0	106	15.7
5	102	15.3
10	102	15.9
20	108	16.4
LSD (.05)	ns	ns
Coefficient of variation	8.5%	9.8%

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Redfield--1976--18

Two-Field Irrigation of 95- and 105-Day Corn

Darrell W. DeBoer and Shu T. Chu,
associate professor and assistant professor,
Agricultural Engineering Department

The objective of this experiment was to investigate the possibility of irrigating two corn fields with a single irrigation machine. The irrigation management program consists of concentrating the irrigation water on a full term (105 day) corn variety with the possibility of moving the irrigation machine to a second corn field (95 day variety) for two supplemental irrigation applications during the growing season. The early (95 day) variety should tassel before the later (105 day) variety which will allow for irrigation at tasseling time on both fields.

Twelve 40x40-foot corn plots were planted to corn on May 15 at the rate of 20,600 seeds/acre. Jacques JX 52 was the 95-day variety and Acco 1900 was the 105-day variety. The plots were irrigated with a solid set sprinkler system where the 105-day variety was irrigated during all of July and August and the 95-day variety was irrigated once during July and once during early August. This irrigation schedule was intended to be similar to a schedule which would be practical for an irrigator to follow.

Soil in the experimental plots is classified as a Great Bend silt loam with about 7.5 inches of available moisture in the top 3 feet. Soil moisture content of the top 3 feet was near field capacity in early June, therefore no irrigations were required during June. Table 1 summarizes the water inputs to the plots during June, July and August. The three treatments for the 105-day variety represent the application depths used for each irrigation. For example, there were five 1.0-inch irrigations and three 2.0-inch applications in August on the 105 day plots. The projected irrigation schedule was not completely followed during late July and August which caused a moisture stress period during the first half of August.

Weed control was fair although 20 lb/A Lasso was applied at planting. Furadan insecticide (7.5 lb/A) was banded over the row at planting time. Anhydrous ammonia was applied at the rate of 130 lbs of actual N per acre on July 1.

Table 2 summarizes the hand harvested corn yields where the average harvested plant population was 15,750 plants/acre. The 105-day variety yields were less than the projected yield goal. The average yields for the 105-day variety treatments are almost the same, while the 95-day variety yield is lower than the 105-day yield, however, there are no statistically significant differences among any of the four treatments.

Table 2. Corn yields for 1975 (15% moisture).

	Corn Yield (bu/acre)			
	Replication			
Treatment	1	2	3	Average
1 in (95 day)	67.6	87.2	83.5	79.4
1 in (105 day)	95.8	93.1	87.9	92.3
2 in (105 day)	81.7	84.8	98.3	88.3
3 in (105 day)	79.4	102.4	89.7	90.5

Table 1. Water inputs to the experimental plots during 1975.

	Water Input (inches)							
	June		July		August		Total	
Treatment	Precip	Irrig	Precip	Irrig	Precip	Irrig	Precip	Irrig
1 in (95 day)	4.6	0.0	0.0	2.0	1.9	2.0	5.5	4.0
1 in (105 day)	4.6	0.0	0.0	4.0	1.9	5.0	5.5	9.0
2 in (105 day)	4.6	0.0	0.0	3.0	1.9	6.0	5.5	9.0
3 in (105 day)	4.6	0.0	0.0	4.0	1.9	5.0	5.5	9.0

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Redfield--1976--19

Plowing vs. Disking for Corn Under Irrigation

Joseph F. Giles and Robert A. Sanders

This experiment was conducted to compare the yield of corn on land that was spring plowed and disked to that on land that was tandem disked only. Since the plowing operation is the most expensive tillage operation, its elimination would help reduce the cost of production.

Procedure

The land in 1974 was in corn which was harvested for grain. The field was tandem disked after harvest without chopping stalks. On May 16, the half of the field which had been plowed during previous springs was plowed. The plowing was tandem disked on May 16. The disked half of the field was tandem disked on May 16. Trojan TX94T was planted at 20,600 seed per acre in 30 inch rows. Furadan insecticide (7.5 lb/A) and Lasso herbicide (20 lb/A) were banded over the row at planting time. The entire field was cultivated on June 23. Nitrogen was applied as anhydrous ammonia at 130 lbs. actual N per acre on July 1. Following a hilling operation, approximately 12 inches of water were applied in 3 irrigations. Corn yields were hand harvested on October 27.

Results and Discussion

Yield, ear corn moisture, and plant populations for the 3 years during which the above procedure was basically repeated each year are summarized in Table 1. In 1973, the disk tillage treatment yields and population was significantly greater than that of the plow tillage treatment. The moisture percentage was significantly lower for the disk tillage treatment. The following year, the plow tillage treatment yield was significantly greater than that of disk tillage. There were no significant differences between the two tillage treatments in any of the three measured parameters in 1975. The three year mean of yield and plant population are greater for the disk tillage treatment.

A decrease in plant population in the plow tillage treatment occurred in the years when there was adequate soil moisture in the spring. With more moisture, the plowed seeded was softer and thus the corn seeds were planted 1 to 1.5 inch deeper than on the disk tillage. This decrease in population resulted in a lower yield and a delayed maturity as shown by the higher moisture percentage at harvest. During a dry spring the residue left by the disking operations was a disadvantage. The double disk openers of the planter could not penetrate the excess surface residue and a non-uniform planting depth resulted with many shallow or surface seedings.

Table 1. Effect of tillage on yield, moisture content, and population of corn.

Tillage Treatment	Year	Yield Bu/A	Moisture %	Population Plants/A
Disk-Disk-Disk	1973	163.2	33.3	20,880
	1974	95.0	31.7	19,100
	1975	112.8	19.7	18,650
	3-year mean	123.7	---	19,550
Disk Plow-Disk-Disk	1973	143.4	35.4	18,950
	1974	106.0	29.5	19,500
	1975	110.1	21.4	17,100
	3-year mean	119.8	---	18,500

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Pre-Harvest Desiccation of Sunflowers

Joseph F. Giles and Robert A. Sanders

The objective of this study was to determine if the application of a pre-harvest desiccant to sunflowers would reduce the yield losses to pests and weathering, by allowing an earlier, faster and cleaner harvesting. Since the peak populations of blackbirds occur in late September, which coincides with the development of mature sunflower seed, being able to harvest at that time should reduce the losses.

Procedure

Sunflower plots were established under both irrigated and dryland conditions. The irrigated land was corn in 1974. It was tandem disked after chopping of stalks and tandem disked again and harrowed prior to planting on June 11. No herbicide or fertilizer was applied. The planting rate was 20,300 seeds per acre. The sunflowers were cultivated once and hilled for irrigation. Approximately 8 inches of water were applied in three irrigations.

Dryland

Sunflowers were planted June 11 on spring wheat land that had been field cultivated and harrowed. Planting rate was 20,300 seeds per acre. The sunflowers were cultivated twice. Paraquat was applied to both the irrigated and dryland plots on September 22. Approximately 75% of the heads had turned from green to yellow on the back. A ground application was used to apply the pint/acre rate over the top of the plants. Avitrol was applied for bird control on same day as desiccant treatment. A temperature of 25°F occurred on October 1. Yields were taken by hand during October when the plots appeared visually ready for harvest.

Results and Discussion

Yields and plant populations at harvest for both the irrigated and dryland plots are presented in Table 1. These results indicate that treating with Paraquat reduced yield losses from 21 to 33% by harvesting 6 to 17 days early. The treated plots were initially harvested 10 days following treatment. A second harvest of the treated plots 4 days after the initial harvest shows a yield reduction of 14 to 38%. This points out the necessity of harvesting when the plants are ready. The application of the desiccant caused rapid shrinkage of the sunflower head and allowed the blackbirds to remove the seeds more towards the center of the head. The resulting loss, in treated hybrid plot was greater than that in the untreated hybrid plot.

Results of past years showed very little difference in irrigated and dryland sunflower production. This lack of difference may have been due to the amount of seed loss which occurred as shown by this data. The loss in the irrigated plots was 12% greater than that in the dryland plots. Thus the untreated yields were very similar for irrigated and dryland conditions.

Table 1. Yield of sunflowers harvested at various dates from pre-harvest desiccant plots under irrigated and dryland conditions.

	Date of Harvest			
Variety	Oct. 3	Oct. 7	Oct. 9	Oct. 20
	Yield, lbs/A			
Irrigated				
Peredovik	1823	1483	1217*	---
Dryland				
Peredovik	1593	1369	1275*	---
Interstate 8941	2026	1266	---	1600*
	Actual Population at Harvest Plants Per Acre			
Irrigated				
Peredovik	16,500	14,000	16,000	---
Dryland				
Peredovik	16,500	14,000	16,500	---
Interstate 8941	20,000	19,000	---	19,000

*Untreated with desiccant.

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1975 Herbicide Performance in Corn and Soybeans

W. E. Arnold and L. J. Wrage

These plots demonstrate the performance of corn and soybean herbicides that are labeled or have an experimental label and are recommended by SDSU. These treatments have been tested previously in research screening trials. These demonstration plots are larger than research plots, and can be viewed by producers periodically during the season.

Early season weed control ratings for the 1975 treatments are listed in the following tables. A 2-year (1974-75) and 4-year (1972-75) average are also given. The long-term averages give an indication of weed control consistency with varying conditions. All evaluations were made in uncultivated areas.

Corn Herbicide Demonstration. General soil and moisture conditions were favorable in the early season. However, rainfall during the first week after treatment was marginal for some preemergence treatments with higher rainfall requirements. Grassy weed infestations were moderately heavy and broadleaved weeds (pigweed species and lambsquarter) were light but ample for evaluation.

The strength and weakness of each treatment are indicated by the data presented. The consistency of broad-spectrum weed control with the combination treatments is evident. Slight stunting was observed for the Bladex post-emergence treatment in 1975. This effect might be less apparent under dry conditions or with a reduced rate.

Soybean Herbicide Demonstration. Several herbicide treatments provided above-average results in 1975. General soil conditions and moisture were favorable in early season. Weed infestations were moderate. The broadleaf weeds were primarily pigweed species and lambsquarter. Broadleaved weeds such as cocklebur were not found in the plot area; therefore, the herbicide for broadleaved control in the overlay or combination treatments show less advantage than they would if the hard-to-control species were present.

Some treatments produced visual effects on the soybean plants. Modown caused severe early season leaf abnormalities. The treatments with Sencor or Lexone caused slight early-season leaf burn. Cobex caused slight stunting at emergence. In all cases, plants recovered as the season progressed with no visual differences apparent at harvest.

(Turn page for result tables)

1975 Corn Herbicide Demonstration Results

Treatment	lb/A a.i.	1975 Gr	1975 Bdlf	2-Yr. Avg. Gr	4-Yr. Avg. Gr	4-Yr. Avg. Bdlf
PREPLANT INCORPORATED						
Sutan+	4	92	90	89	83	--
Sutan+ + AAtrex	3+1	94	94	94	92	90
AAtrex	2½	96	99	97	95	99
Sutan+ + Bladex	3+1½	90	88	90	--	--
Eradicane	3	99	94	97	--	--
Eradicane	4	90	75	--	--	--
Eradicane + Bladex	3+1½	--	94	--	--	--
PREEMERGENCE						
Lasso	3	95	92	93	89	--
Ramrod	5	94	88	93	91	--
Prowl	2	85	88	80	--	--
AAtrex	2½	92	94	79	67	91
Bladex	3	90	70	75	75	--
Lasso + AAtrex	2+1	94	98	93	88	79
Lasso + Bladex	2+1½	94	96	91	--	--
Lasso + Banvel	2+½	90	94	93	--	--
Ramrod + AAtrex	3+1	96	95	91	86	78
Ramrod + AAtrex	3+1½	98	92	92	--	--
POST-EMERGENCE						
AAtrex + oil	2+1 gal	99	99	69	69	94
Bladex	2	96	99	53	--	--
Bladex + surfactant	2	99	99	64	--	--
Outfox	3/4	70	90	50	56	--

Evaluated: 6/30

Weeds: Green and yellow foxtail; prostrate, smooth and rough pigweed; lambsquarter

Rainfall after preemergence (5/13): 1st wk. = .30"; 2nd wk. = 1.16"

1975 Soybean Herbicide Demonstration Results

Treatment	lb/A a.i.	Estimated Percent Weed Control: 1975 Gr	1975 Bdlf	2-Yr. Avg. Gr	4-Yr. Avg. Gr	4-Yr. Avg. Bdlf
PREPLANT INCORPORATED						
Vernam	2½	75	90	80	83	88
Treflan	3/4	90	96	94	92	82
Cobex	½	90	90	94	89	--
Tolban	1	90	90	93	--	--
Treflan+Sencor/Lexone	3/4+½	96	99	--	--	--
PREPLANT INC. & PRE						
Treflan+Sencor/Lexone	3/4+½	99	99	98	94	--
Treflan+Lorox	3/4+1	99	99	98	91	88
Treflan+Modown	3/4+1½	98	99	--	--	--
PREPLANT INC. & POST						
Treflan+Basagran	3/4+1	95	98	95	--	--
PREEMERGENCE						
Amiben	3	92	85	92	86	83
Lasso	3	99	88	95	86	83
Lasso+Sencor/Lexone	2+½	99	90	96	90	--
Lasso+Lorox	2+1	99	98	93	84	84
Sencor/Lexone	½	88	96	79	73	--
Lasso+Premerge	2+4½	99	95	--	--	--
Modown	2	88	96	--	--	--
Lasso+Solo	2+4	85	90	--	--	--
Lasso+Amiben	2+2	95	90	--	--	--
Lasso+CIPC	2+3	95	94	--	--	--

Evaluated: 7/30

Weeds: Green and yellow foxtail, prostrate, rough pigweed, and lambsquarters.

Rainfall after preemergence (5/28): 1st wk. = .38", 2nd wk. = .83"

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Solar-Electric Drying of Shelled Corn

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professor, Agricultural Engineering Department

Conventional drying methods often require more petroleum fuel to dry a corn crop than to raise and harvest it. Increasing prices and threatened scarcity of fuels make it worthwhile to investigate drying methods that do not require the use of petroleum fuels.

The solar-supplemental drying installations being studied use a solar collector attached to the southern two-thirds of the circumference of the vertical wall of a conventional round bin. Air is routed through the solar collector and an air tunnel, to the fan, which forces the air under a standard raised, perforated floor.

A solar drying bin was operated for the third year at the Myron Pedersen farm, near Arlington, and performance compared with that of a conventional low-temperature electric-heat drying bin at the Laverne Converse farm, near the Pedersen farm. Comparative data are given in Table 1. In 3 years of operation of the Pedersen solar bin, no electric heat has been required.

The solar-electric bin at the James Valley Research and Extension Center is fitted with five different types of solar collectors (see Figure 1). One collector, Collector A, was changed for the 1975 drying operation, to a deep-vee corrugated bare-sheet type. The deep-vee design is intended to absorb more of the solar energy striking it, particularly as the flat-black paint weathers and absorbs less solar energy. Preliminary data indicate that the deep-vee corrugation produced somewhat poorer performance than the other bare-sheet collectors (C, D and E) in the fall of 1975, with new paint on all collectors. The bare-sheet collectors C, D and E, produced approximately the same amount of heat as the plastic-covered one (B).

The drying bin uses a 3 hp fan and 8000-watt heater. Operation of the heater was by time-clock, from midnight to 6 a.m. From November 3 to November 17, 4000 watts of heat were used, which produced about 3 degrees temperature rise in the airstream, plus 3 degrees from the fan and motor, for a total of about 6 degrees. From November 17 to November 24, 8000 watts of heat were used, with a total temperature rise of about 9 degrees. The solar collectors produced a temperature rise of up to 12 degrees to the air entering the fan.

Data on the Redfield bin, as well as the Pedersen and Converse bins, is presented in Table 1. In the Redfield bin, 2.37 Kilowatt-hours of energy were used per bushel, to dry from 22.2 percent moisture down to 14.9 percent. At 1.5 cents per KWH, this would be approximately 3.5 cents per bushel.

(Over for table and illustration)

Table 1. Comparison of selected data, Pedersen solar bin, Converse control bin, and Redfield solar bin.

	Pedersen Solar	Converse Control	Redfield Solar
Starting date	Oct. 14	Oct. 21	Nov. 3
Finishing date	Nov. 10	Nov. 17*	Nov. 24
Initial moisture	22.05	20.0	22.2%
Final moisture	13.6	15.78	14.9
Moisture removed, points	8.45	4.22	7.3
Bushels	3053	3053	1000
Kwh-Fan	4869	3474	1757
Hwh-Heater	0	2014	621
Kwh-Total	4869	5488	2378
Kwh/Bu.	1.59	1.79	2.37
Kwh/Bu.-point	0.1887	0.424	0.32
Btu/Lb. water removed	930	2081	1570

*Corn was not dried to desired moisture on this date, but drying was discontinued due to cold weather.

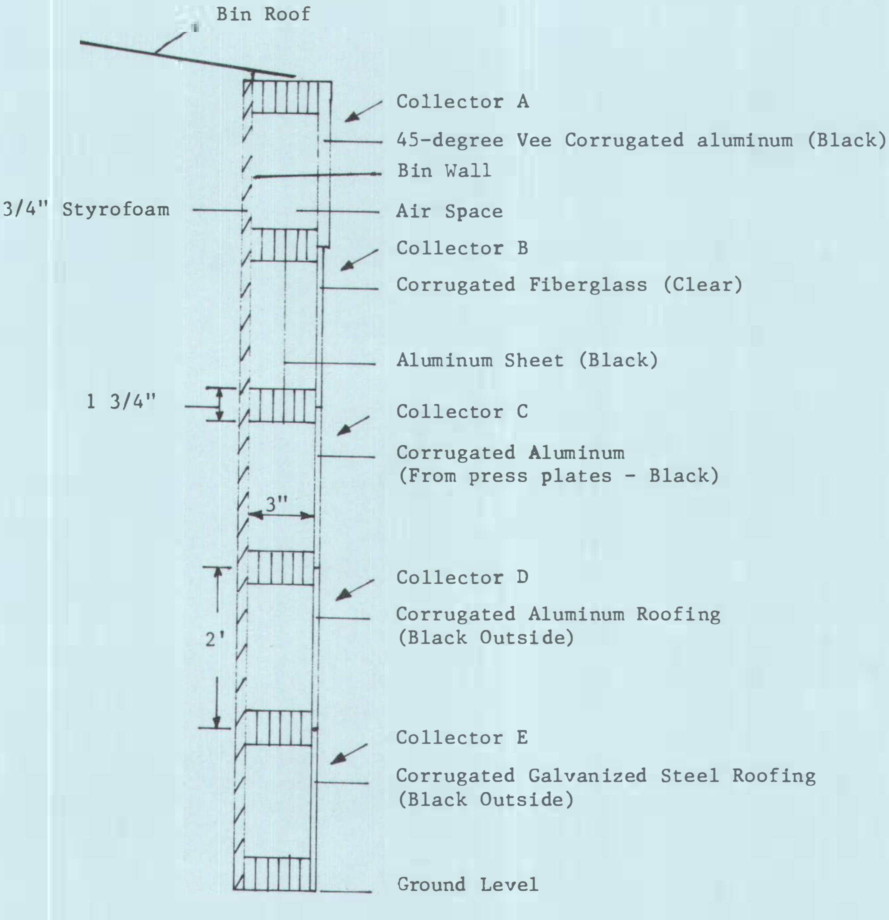

Figure 1 -- Crossection of Five Types of Solar Collector

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