A report of

Sugar Beet Research

in

Southeast Missouri--1969

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SUGAR BEET RESEARCH IN SOUTHEAST MISSOURI 1969

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SUMMARY

Sugar beet research was conducted by the University of Missouri Agricultural Experiment Station at the Delta Center near Portageville in 1969. Experiments included varieties, weed control, soil fertility, fungicides for control of cercospora leaf spot, row spacing, water infiltration, irrigation, fumigants, insecticides, and rhizoctonia control. Selection in breeding stock was made in the field for resistance to the root knot nematode, after which it was screened in the greenhouse. Sugar beet experiments were conducted on three of the major soil types of southeast Missouri.

The results of the variety tests varied from 29.0 to 17.2 tons per acre with an average yield of 26.1 tons of sugar beets (5159 pounds of sugar) per acre on the clay soil as compared to 20.6 tons of sugar beets (4121 pounds of sugar) per acre on the silt loam soil. Herbicide chemicals effectively controlled weeds when applied preemergence and post emergence thus reducing hand labor to a minimum. Variety tolerance and foliar fungicidal sprays were very effective in the control of cercospora leaf spot. Irrigation has proven to be an essential practice. Sprinkler irrigation which previously increased leaf spot disease was more effective in wetting the soil as compared to furrow irrigation. Fungicide spray controlled the leaf spot of the sprinkler beets and satisfactory yields were obtained.

In addition to sugar beets grown on the experimental fields in 1969, ten farmers, as selected by the Pemiscot-Dunklin-New Madrid Sugar Beet Association, grew from 23 to 45 acres or a total of 284 acres. The Great Western Sugar Company stationed an agronomist in the area who assisted the growers in production of sugar beets. The crop was harvested, washed and shipped to Colorado for processing into sugar. Yields of the commercial fields varied from five to sixteen tons per acre.

The staff of The Great Western Sugar Company of Denver, Colorado provided valuable assistance in the research conducted in southeast Missouri during 1969.

INTRODUCTION

The research involving sugar beets in 1969 included three different soils of the Delta Center experiment fields. The Portageville Field has two soils, one of which was a Tiptonville silt loam or clay loam with a sandy loam overwash phase and is referred to in this report as the "Loam" soil. The other soil on the Portageville Field was of the Sharkey Clay type and is referred to as the "Clay" soil in this report. Experiments at the Clarkton Field were on a Beulah fine sandy loam soil which has a low water holding capacity requiring frequent irrigations.

The clay soil on the Portageville Field has produced continuously the higher yields of beets relatively free of cercospora leaf spot. This soil has a high water holding capacity and the need for irrigation was only a fraction of the requirements of the loam soil at the Portageville Field or sandy soil of the Clarkton Field. The clay soil is very difficult to till and preparation of the seedbed the previous fall or winter has been essential for early planting on this soil.

The loam soil on the Portageville Field consists of a texture that is desirable to till but compacts easily during a rain which renders the soil practically impervious to supplementary irrigations. An experiment in 1969 included various materials incorporated into the soil and deep tillage to improve the rate of water infiltration. Cercospora leaf spot has been a serious problem on the loam soil but resistant varieties and fungicide sprays have reduced considerably the damage caused by the disease.

The sandy soil of the Clarkton Field has not been as desirable as the other two locations for production of sugar beets. This soil is infested with root knot nematodes (Meloidogyne sp.) and has required fumigation which adds considerably to the production costs. Selections were made from sugar beets grown on this soil for resistance to the nematode. Seed will be increased from these selections, planted and additional selections made. The production of sugar beets on the sandy soils would be very desirable in the operation of a sugar mill to insure a steady supply of beets during harvest. Beets on the sandy soil may be harvested soon after a rain while the other soils may be too wet for harvesting equipment to operate.

Irrigation was available and required at all locations in 1969. The row method was used on the graded land of the Portageville Field and sprinklers were used at the Clarkton Field. The 1969 growing season was dry and several irrigations were applied at each location.

All experiments except the variety tests were sprayed with a fungicide to control cercospora leaf spot disease. Various fungicides were included in an experiment to determine their effectiveness in the control of leaf spot disease.

Surveillance of the sugar beet plots indicated very little damage from insects during 1969. Feeding by Blister beetles Epicauta and the garden fleahopper Halticus bracteatus (Say) resulted in minor damage in the experimental plots on the Portageville Field.

The beets were harvested mechanically and pulp samples were obtained from each plot. These samples were frozen and shipped to The Great Western Sugar Company Experiment Station laboratory for sugar and purity analyses.

Ten farmers of the area produced a total of 284 acres during 1969. The Great Western Sugar Company stationed a field man in the area to assist the growers. Yields of the growers plots ranged from five to sixteen tons per acre.

James A. Roth, Assistant Professor of Agronomy (Soil Fertility); Harold D. Kerr, Associate Professor of Agronomy (Weed Science); and Armon J. Keaster, Assistant Professor of Entomology, University of Missouri, Delta Center, Portageville.

Sweet stalk corn and sorghum varieties were tested at Portageville and Clarkton fields to determine potential of these crops in sugar production. If feasible these crops could extend the operating season of a sugar mill.

Research in 1970 will be a continuation of the 1969 experiments with some modification. Rows on beds spaced 26 inches apart will be used in 1970 which was the same spacing as in 1969.

The sugar beet research over the past nine years has been summarized in a UMC Science and Technology Guide number 4713 "Producing Sugar Beets in Missouri" which is available at the University of Missouri-Columbia Extension Division.

Preparing beds for planting of Sugar Beets

Planting sugar beets

SUGAR BEET VARIETY EXPERIMENTS IN SOUTHEAST MISSOURI 1969

James A. Roth

Two sugar beet variety tests were grown on two soils in southeast Missouri during the 1969 growing season. The soils included the "Loam" soil (Tiptonville series) and the "Clay" soil (Sharkey series) located on the Portageville Field of the Delta Center. The soil at each location was graded and irrigation water applied by the row method as needed.

Planting of both tests was completed on March 14 on beds spaced 26 inches apart. Fertilizer (100+N+100 P_2O_5+100 K_2O+2B) was incorporated into the bed prior to planting and additional nitrogen sidedressed in July on the loam soil. On the clay soil fertilizer (38 N+100 P_2O_5+100 K_2O+2B) topdressed after planting.

The experimental design of the two experimental trials was a randomized complete block with ten replicates of nine varieties. No attempt was made to control disease in the tests during the season so as to measure natural resistance to diseases of the area. Varieties varied considerably in their resistance or susceptibility to cercospora leaf spot.

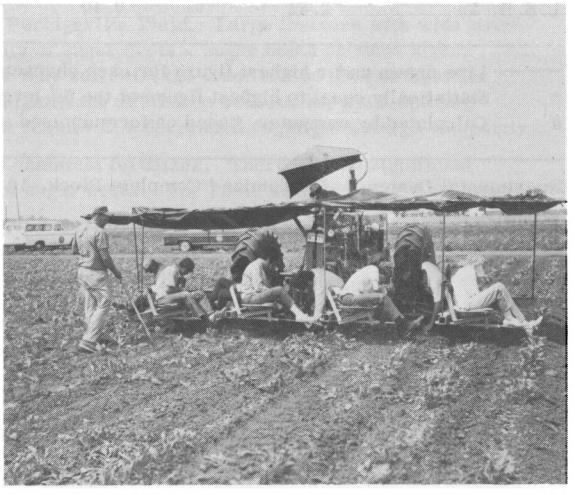
The experiments were harvested November 3. Pulp samples were obtained and shipped to The Great Western Experiment Station at Longmont, Colorado for sugar and purity analyses.

The clay soil produced the highest yield of 28.95 tons per acre with the 68MSH110 variety. Previous tests on the clay soil exceeded yields on the loam soil at the Portageville Field. The 68MSH472 variety was the high yielder on the loam soil in 1969.

Varieties varied considerably in their sugar content as grown under southeast Missouri conditions. On the clay soil the percent sugar varied from 10.8 to 13.2 whereas on the loam soil percent varied from 11.0 to 13.5. Several varieties were severely affected by leaf spot disease which caused complete desiccation of the leaves and a low sugar content. The loss of leaves generally reduces the sugar content of the beets as new leaves replace the dead leaves. If the beets had been sprayed to control leaf spot the yield and sugar content would have been increased considerably.

The testing and selection of sugar beet varieties adapted to southeast Missouri is an essential part of the sugar beet research program in southeast Missouri. Progress has been made over the years in trials that have been conducted in determining suitable varieties for the area.

The assistance of Dr. A. W. Erichsen of The Great Western Sugar Company Experiment Station is acknowledged in supplying the variety test seed, design, and computation of the data.



Thinning sugar beets with electronic thinner as compared to thinning by hand on the research plots.

SUGAR BEET VARIETY TEST ON THE CLAY SOIL AT THE PORTAGEVILLE FIELD - 1969

Variety	Yield Tons/A	% Sugar Content	Juice Purity %	Recoverable Sugar/A (lbs)[a]	Leaf Spot	Stand %
A402-64R	28.35*	13.2*	91.1	6089	1.7	148.5
68MSH110	28.95	12.4	89.7	5661*	3.7	131.7
AH-1-69	26.71*	12.7*	90.4*	5480*	4.6	140.2
68MSH259	24.78*	13.2	90.6*	5326*	5.3	108.0
68MSH111	27.14*	12.7	90.2*	5489*	3.8	125.5
GWH23-68A	25.30*	12.1	90.1*	4895	4.4	140.7
68MSH136	24.05	12.7	90.2*	4885	5.4	122.9
68MSH472	27.64*	10.8	87.2	4373	5.6	66.9
GWH1-68A	21.85	12.4	89.4	4234	5.8	113.3
General Mean	26.09	12.46	89.88	5159	4.47	121.95
C.V. (%)	18.38	4.55	1.12	20.16		
L.S.D. 5%	4.52	0.53	0.95	980		

SUGAR BEET VARIETY TEST ON THE LOAM SOIL AT THE PORTAGEVILLE FIELD - 1969

A402-64R	20.32	13.5	92.1*	4595	3.5	142.6
68MSH110	21.26*	12.5	91.4	4372*	5.0	144.8
AH-1-69	22.01*	12.3	91.9	4510*	5.5	143.0
68MSH259	21.04*	12.8	92.7	4583*	6.4	125.9
68MSH111	20.72*	12.3	91.9	4254*	5.7	148.7
GWH23-68A	20.14	11.9	91.7	3968	5.2	142.2
68MSH136	19.94	11.4	91.1	3707	5.8	141.9
68MSH472	22.76	11.0	90.2	3968	7.1	94.4
GWH1-68A	17.19	11.5	90.2	3132	5.6	136.5
General Mean	20.60	12.13	91.45	4121	5.53	135.56
C.V. (%)	12.64	3.64	0.99	12.76		
L.S.D. 5%	2.31	0.40	0.81	468		

——— Line drawn under highest figure for each character.
* Statistically equal to highest figure at the 5% level of significance.
a Calculated by computer, based on formula used since 1954.

Experimental Design: Randomized Complete Block, 10 replicates.

Fertilizer: Clay Soil - 38 lbs. nitrogen topdressed at planting 0+100+100+2B topdressed May 6. Sidedressed 100 lbs. nitrogen May 26.
Loam Soil - 100+100+100+2B ($N+P_2O_5+K_2O$+Boron) broadcast and incorporated into bed. Sidedressed 100 lbs nitrogen July 11.

Row Irrigated: Clay Soil - June 11; July 17.
Loam Soil - July 3, 17; August 4, 15, 27; September 17.

Fungicide: None used on variety tests.

Harvested: Clay Soil - November 10.
Loam Soil - November 3

SOIL FERTILITY, IRRIGATION, SPACING, DEEP PLOWING, AND ROTATION EXPERIMENTS WITH SUGAR BEETS

James A. Roth

Soil fertility research involving sugar beets in 1969 included the loam and clay soils of the Portageville Field and the sandy soil at the Clarkton Field. Experiments also included rotations, methods of irrigation, various row spacings, plant spacing, deep plowing and soil treatments to improve rate of water penetration.

Soil fertility experiments in 1969 included mainly rates and time of nitrogen applications. Since the soils on which these experiments have been conducted are naturally high in phosphorous and potash, response has not been experienced in previous experiments with the application of these elements. Boron is very essential in sugar beet nutrition so this element has been included in the soil treatments of all plots. Limestone has been applied to all plots prior to planting of the sugar beets so as to maintain the soil pH between 6.0 and 7.0.

Nitrogen has been a very critical element but it is very difficult to determine the correct amount. Excess nitrogen has reduced sugar percentage whereas an insufficient amount has reduced yield. The results in the following tests indicate that 150 pounds of nitrogen was an ample amount in 1969. At the Portageville Field on both soil types the split application of 75 pounds of nitrogen each increased the yield over the single application of 150 pounds of nitrogen at planting. These differences were not statistically significant in 1969.

Yield of sugar beets at the Clarkton Field was too low regardless of soil treatment. The damage caused by the root knot nematode was severe in 1969 during the latter part of the growing season. Control of this pest is essential if sugar beets are to be produced on this soil. Fumigation tests will be included in the 1970 research program on the Clarkton Field.

Penetration of irrigation water on the loam soil of the Portageville Field as applied by the row method has been very slow requiring long and frequent irrigations. Sprinkler irrigation has been compared with row irrigation and found to be more effective in 1968. In 1969 there was indication that sprinkler irrigation was superior but the increase in yield was not statistically significant. Even though sprinkler irrigation may increase leaf spot disease a timely fungicide spray program has maintained the disease under control.

Deep plowing 27 inches deep in 1968 followed by sugar beets in 1969 was another attempt to improve water penetration. Deep plowing increased yields of sugar beets by 3.6 tons but this difference was not statistically significant. A statistical difference was obtained on the area on which two tons of limestone was applied in addition to the deep breaking. There was a question as to the practicability of deep breaking but the percent clay in the top soil was increased approximately ten percent. The increase in clay in the top soil caused cracking of the soil upon drying which allowed a more rapid rate of penetration of irrigation water.

Row and plant spacing experiments were conducted on two soil types at the Portageville Field. Large tractors with wide tires require wider rows than former tractors but rows too wide reduce yield and quality of sugar beets. Sugar beets produce higher yields on 26 inch rows, 34 tons, as compared to the 30 inch rows, 30 tons, on the clay soil. On the loam soil at the Portageville Field there was no difference in yield of the 26 and 30 inch rows. There was no significant difference between the plant spacing within the row. There was indication that the 12 inch plant spacing within the row results in a decreased sugar percentage and purity.

Sewerage sludge increased yields of sugar beets when applied in addition to chemical fertilizer. There was no significant difference between 2 and 32 tons per acre but 16 tons produced the highest yield of sugar beets. For some unknown reason the sugar percentage was low in this experiment.

Crop rotation experiments were initiated on the two soil types of the Portageville Field to determine the effects of various crops on sugar beet production. These experiments will require several years before results will be of any value.

Commercial harvesting of sugar beets as compared to harvesting research plots at the Delta Center

THE EFFECT OF SOIL FERTILITY TREATMENTS ON YIELDS AND QUALITY OF SUGAR BEETS - 1969
PORTAGEVILLE FIELD - CLAY SOIL

Soil Test (1969)	O.M.	P_2O_5	K	Mg.	Ca	pH	H	C.E.C.	Soil Series
Topsoil	2.7	448+	500	920	5600	5.5	5.0	23.5	Sharkey
Subsoil	2.3	221	430	960	5700	5.9	3.5	22.5	

Soil Treatment[1/]					
Pounds of Nitrogen Per Acre					
Sidedress May 2	Sidedress	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
0		139 ab[4/]	15.6 ab[4/]	89.5 d[4/]	13.1 d[4/]
75		123 abc	16.2 ab	94.4 a	22.9 c
150		128 abc	16.3 ab	93.7 abc	29.8 a
75	75-June 27	120 bc	16.0 ab	94.2 ab	32.5 a
225		133 abc	15.7 ab	93.0 abc	30.2 a
75	75-June 27 - 75-August 4	123 abc	13.9 c	91.4 cd	31.6 a
[2/]150		113 bc	15.7 ab	91.8 bc	25.5 bc
75 + 8 Tons Fine Lime	75-August 4	148 a	15.2 b	92.7 abc	31.9 a
[3/]150		108 c	16.4 ab	93.2 abc	28.1 ab
150 + 200 lbs. Salt		124 abc	16.7 a	93.5 abc	30.7 a
Minimum Least Significant Range(L.S.D.)(.05)		23.9	1.17	2.17	3.99
Maximum Least Significant Range		27.4	1.34	2.49	4.59
Coefficient of Variance		11.1%	4.3%	1.4%	8.4%

Planted: Variety - 66MSH2 on March 15.
Row Irrigated: June 11 and July 17.
Fungicide: Ten oz. Du-Ter sprayed on June 27, July 11, 24; August 27. Six oz. Benlate sprayed on September 13.
Herbicide: Incorporated with cultivator 1.25 lb. trifluralin May 13.
Insecticide: Sprayed for control of garden fleahoppers August 12 (Sevin 2 lbs ai) and August 27 (Dylox 1.5 lb ai).
Harvested: October 30.

1/ Topdressed all plots with 10 lbs. nitrogen at time of planting and 0+100+100+2B ($N+P_2O_5+K_2O$+Boron) on May 6.
2/ Sodium nitrate used as source of nitrogen.
3/ Ammonium sulphate used as source of nitrogen. Ammonium nitrate source of nitrogen for all other treatments.
4/ Duncan's New Multiple Range Test: Results followed by same letters are not significantly different (.05).

OBJECTIVE: To determine rate of nitrogen required for high yields of high quality sugar beets. To determine if all nitrogen can be applied in one operation, either preplant or at time of planting or is it desirable to apply part of the nitrogen later in the season.

PROCEDURE: Land was prepared and shaped into beds during the fall season of 1968. Beds were rolled before planting this spring. Land was shaped into beds by use of rotor-tiller. Beets were fertilized after emergence according to treatments as listed above. At thinning trifluralin was applied and incorporated into the soil with the rotary cultivator. Leaf spot was controlled by periodic spraying of a fungicide. Irrigation water was applied as needed by the row method of application. Sugar beets were harvested, yields determined, samples obtained from which sugar and purity analysis were made.

RESULTS: Yields in excess of 20 tons per acre were obtained on this clay soil in 1969. The highest yield (32.5 tons) was obtained with a split application of nitrogen but increase was not significant as compared to single application.

As the rate of nitrogen was increased the quality of the sugar beets declined. Just the opposite occurred in regard to yields which increased as the nitrogen was increased. On this clay soil the split applications of nitrogen outyielded the same total nitrogen applied in one application. One hundred fifty pounds of nitrogen appears to be the optimum nitrogen application in 1969 as well as in previous seasons.

THE EFFECT OF SOIL FERTILITY TREATMENTS ON YIELDS AND QUALITY OF SUGAR BEETS - 1969
PORTAGEVILLE FIELD - LOAM SOIL

Soil Test (1969)	O.M.	P_2O_5	K	Mg.	Ca	pH	H	C.E.C.	Soil Series
Topsoil	2.3	320	410	260	3400	5.5	2.5	12.5	Tiptonville
Subsoil	2.1	160	220	340	4000	5.3	4.0	15.5	

Soil Treatment[1/] Pounds of Nitrogen Per Acre					
Sidedress May 2	Sidedress	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
0		138 b[4/]	17.4 a[4/]	94.4 a[4/]	10.9 c[4/]
75		147 ab	17.3 a	94.7 a	14.2 b
150		151 ab	16.6 abc	94.1 a	18.7 a
75	75-June 27	154 ab	16.0 bcd	93.0 ab	19.6 a
225		159 ab	15.6 cd	92.9 ab	18.9 a
75	75-June 27 - 75-August 4	162 a	15.1 d	91.9 b	18.4 a
2/150		163 a	17.0 ab	93.4 ab	17.3 ab
75 + 8 Tons Fine Lime	75-August 1	154 ab	16.6 abc	94.2 a	16.9 ab
3/150		155 ab	16.1 abcd	93.3 ab	16.5 ab
150 + 200 lbs. Salt		158 ab	16.6 abc	93.3 ab	19.3 a
Minimum Least Significant Range(L.S.D.)(.05)		18.1	1.15	1.85	3.08
Maximum Least Significant Range		21.1	1.34	2.15	3.58
Coefficient of Variance		8.1%	4.8%	1.4%	12.4%

Planted: Variety - 66MSH2 on March 15.
Row Irrigated: June 14; July 3, 17; August 4, 15; September 17.
Fungicide: Ten oz. Du-Ter sprayed on June 27; July 11, 28; August 12, 27. Six oz. Benlate sprayed on September 12.
Herbicide: Incorporated with cultivator 1 lb. trifluralin May 14.
Insecticide: Sprayed for control of garden fleahoppers August 12 (Sevin 2-1/2 lbs. ai) and August 27 (Dylox 1.5 lb. ai).
Harvested: November 3.

1/ Fertilizer broadcast preplant and disc in before bedding 0+100+100+2B ($N+P_2O_5+K_2O$+Boron). Two ton calcitic limestone applied before breaking.
2/ Sodium nitrate used as source of nitrogen.
3/ Ammonium sulphate used as source of nitrogen. Ammonium nitrate source of nitrogen for all other treatments.

OBJECTIVE: To determine rate of nitrogen required for high yields of high quality sugar beets. To determine if all nitrogen can be applied in one operation, either preplant or at time of planting or is it desirable to apply part of the nitrogen later in the season.

PROCEDURE: Limestone, phosphate, potash and boron were applied broadcast and disc into the soil. Land was shaped into beds spaced 26" apart by use of bed shaper. Beets were planted on top of the beds. Beets were fertilized after emergence according to treatments as listed above. At thinning trifluralin was applied and incorporated into the soil with the cultivator. Leaf spot was controlled by periodic spraying of a fungicide. Irrigation water was applied as needed by the row method of application. Sugar beets were harvested, yields determined, samples obtained from which sugar and purity analysis were made.

RESULTS: As the rate of nitrogen was increased, yields increased but the percent sugar and juice purity declined. The season was extremely hot and dry during July and August which necessitated weekly applications of irrigation water. Poor penetration of water prevented restoration of the soil moisture to the full capacity of the soil. The results indicate that 150 pounds of nitrogen was adequate if applied in two applications. Due to the high soil test of phosphorous and potassium this soil in past experiments has not responded to the addition of these nutrients. The additional fine lime applied reduced yield but was not significant.

THE EFFECT OF SOIL FERTILITY TREATMENTS ON YIELDS AND QUALITY OF SUGAR BEETS - 1969
CLARKTON FIELD

Soil Test (1969)	O.M.	P_2O_5	K	Mg.	Ca	pH	H	C.E.C.	Soil Series
Topsoil	1.3	326	220	220	1300	5.7	2.0	6.5	Beulah
Subsoil	0.8	80	160	280	700	4.8	3.0	6.0	

Soil Treatment[1/] Pounds of Nitrogen Per Acre					
Sidedress April 22	Sidedress	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
0		95 a[4/]	16.0 bc[4/]	93.8 a[4/]	5.8 d[4/]
75		91 a	15.7 bc	95.3 a	8.4 bcd
150		113 a	15.8 bc	95.2 a	13.8 a
75	75-June 26	109 a	15.8 bc	95.6 a	8.1 bcd
225		101 a	15.5 bc	94.8 a	10.3 abcd
75	75-June 26 - 75-August 4	124 a	15.5 bc	94.8 a	12.2 abc
2/150		115 a	15.3 c	94.9 a	13.1 ab
75 + 8 Tons Fine Lime	75-August 4	116 a	16.4 ab	95.3 a	6.4 d
3/150		117 a	15.8 bc	95.3 a	10.6 abcd
150 + 200 lbs. Salt		104 a	17.1 a	95.3 a	7.5 cd
Minimum Least Significant Range(L.S.D.)(.05)		30.1	0.84	1.87	4.55
Maximum Least Significant Range		34.5	0.97	2.15	5.22
Coefficient of Variance		16.2%	3.1%	1.2%	27.6%

Fumigated:	All plots fumigated with 25 gallons Shell DD on February 14.
Planted:	Variety - 66MSH2 on March 28.
Sprinkler Irrigated:	May 30; June 6, 15, 30; July 10, 18: August 4, 12; September 22.
Fungicide:	Ten oz. Du-Ter sprayed on June 26; July 10, 23; August 5: Three lbs. Manzate on September 5.
Herbicide:	Incorporated 3/4 lb. trifluralin May 15 with rotary cultivator.
Insecticide:	None
Harvested:	November 11.

1/ Two tons of calcitic limestone and 0+100+100+2B ($N+P_2O_5+K_2O$+Boron) broadcast and disc before bedding. Ten lbs. nitrogen topdressed on all plots at planting.
2/ Sodium nitrate used as source of nitrogen.
3/ Ammonium sulphate used as source of nitrogen. Ammonium nitrate source of nitrogen for all other treatments.
4/ Duncan's New Multiple Range Test: Results followed by same letters are not significantly different (.05).

OBJECTIVE: To determine rate of nitrogen required for high yields of high quality sugar beets. To determine if all nitrogen can be applied in one operation, either preplant or at time of planting or is it desirable to apply part of the nitrogen later in the season.

PROCEDURE: Limestone, phosphate, potash and boron were applied broadcast and disc into the soil. Land was shaped into beds by use of a bed shaper. Beds were permitted to settle approximately six weeks after which beets were planted on top of the beds 26" apart. Beets were fertilized after emergence according to treatments as listed above. At thinning trifluralin was applied and incorporated into the soil with the cultivator. Leaf spot was controlled by periodic spraying of a fungicide. Irrigation water was applied as needed by the sprinkler method of application. Sugar beets were harvested, yields determined, samples obtained from which sugar and purity analysis were made. A later harvest was made to determine change in yield and quality of the beets due to a delayed or an early harvest.

RESULTS: Sugar beet yields on this sandy soil were below what would be acceptable in commercial production. Root-knot nematode and poor water holding capacity of this soil have contributed to the low yields. The split application totaling 150 pounds of nitrogen with additional limestone produced the maximum yield in 1968. The higher rate of nitrogen (225 pounds) reduced percent sugar and juice purity without improvement in yield.

Future study will aim toward the determination of production methods required to produce satisfactory sugar beet crops on this soil. In the operation of a sugar mill beets may be harvested on this soil at times when wet soil conditions would prevent harvest on the loam or clay soils. Thus it will be desirable that some beets be grown on the sandy soils.

IRRIGATION AND WATER PENETRATION TESTS ON SUGAR BEETS - 1969
PORTAGEVILLE - LOAM SOIL

Soil Treatment	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
	SOIL TREATMENT X IRRIGATION			
ROW IRRIGATED				
1/2/ 1 Ton Sewerage Sludge	129 d[5/]	14.9 ab[5/]	92.1 bc[5/]	24.1 ab[5/]
1/2/ 4 Tons Sewerage Sludge	72 e	14.0 d	88.9 d	19.3 cd
1/2/ 2 Inches Clay Soil	152 bc	14.8 bc	92.3 abc	22.2 abcd
2/No Treatment	149 bcd	15.5 ab	93.5 a	22.7 abcd
3/No Treatment-3 seed per foot	195 a	15.7 a	92.7 abc	18.7 d
2/4/No Treatment-Chisel plow under row	146 bcd	15.6 ab	92.2 abc	20.8 abcd
SPRINKLER IRRIGATED				
1/2/ 1 Ton Sewerage Sludge	134 bcd	14.1 cd	91.5 c	23.4 abc
1/2/ 4 Tons Sewerage Sludge	132 cd	12.9 e	89.5 d	24.4 a
1/ 2 Inches Clay Soil	147 bcd	15.1 ab	93.3 ab	22.9 abcd
No Treatment	156 b	15.2 ab	93.4 ab	22.2 abcd
3/No Treatment-3 seed per foot	206 a	15.2 ab	93.6 a	19.9 bcd
2/4/No Treatment-Chisel plow under row	146 bcd	15.5 ab	93.6 a	22.7 abcd
Minimum Least Significant Range(L.S.D.)(.05)	19.3	0.75	1.26	3.73
Maximum Least Significant Range	22.4	0.88	1.46	4.34
Coefficient of Variance	7.7%	3.0%	0.8%	10.0%
	TREATMENT MEANS			
1/2/ 1 Ton Sewerage Sludge	132 c	14.5 c	91.8 b	23.8 a
1/2/ 4 Tons Sewerage Sludge	102 d	13.4 d	89.2 c	21.9 ab
1/ 2 Inches Clay Soil	149 b	15.0 bc	92.8 a	22.6 a
No Treatment	152 b	15.4 ab	93.4 a	22.4 a
3/No Treatment-3 seed per foot	200 a	15.4 ab	93.2 a	19.3 b
2/4/No Treatment-Chisel plow under row	146 b	15.6 a	92.9 a	21.8 ab
Minimum Least Significant Range(L.S.D.)(.05)	13.6	0.53	0.89	2.64
Maximum Least Significant Range	15.2	0.60	1.00	2.95
Coefficient of Variance	7.7%	3.0%	0.8%	10.0%
	IRRIGATION MEANS			
Row	141 a	15.1 a	91.9 a	21.3 a
Sprinkler	154 b	14.7 a	92.5 a	22.6 a
Coefficient of Variance	2.4%	14.7%	3.2%	25.3%

Planted: Variety - 66MSH2 on March 24.
Irrigated: June 5, 14, 19; July 4, 16; August 5; September 1 and 17.
Fertilizer: All plots 0+100+100 ($N+P_2O_5+K_2O$) broadcast and incorporated into bed, 40 lbs nitrogen topdressed April 16 and 100 lbs sidedressed July 1.
Fungicide: Ten oz. Du-Ter on June 27; July 11, 28; August 11, 26. Six oz. Benlate on September 12.
Herbicide: Incorporated 1 lb. trifluralin May 14.
Insecticide: Sprayed for control of garden fleahoppers August 12 (Sevin 2 lbs Ai) and August 26 (Dylox 1.5 lbs Ai).
Harvested: November 5.

1/ Soil treatment incorporated into bed.
2/ Seed planted at rate of 10 seed per foot and later thinned to 8 inches between plants.
3/ Three seed planted per foot and not thinned.
4/ Chisel plowed directly under each row.
5/ Duncan's New Multiple Range Test: Results followed by same letters are not significantly different (.05).

OBJECTIVE: To determine a soil treatment method that would increase the rate of penetration of irrigation water into the loam soil and to determine the most effective method of irrigation on yield and quality of sugar beets.

PROCEDURE: Various materials as listed in the above table were incorporated into the soil eight inches deep with a rotor-tiller. The plots were then shaped into beds and sugar beets planted on top of the beds. Trifluralin was incorporated into the soil after thinning to control leaf spot. The beets were harvested mechanically, yield determined, and samples obtained for sugar percentage and purity analysis.

RESULTS: In 1969 there was indication that sprinkler irrigation was more effective but the increased yield was not statistically significant. In 1968 the sprinkler plots were heavily infested with leaf spot disease but in 1969 fungicide sprays were very effective in the control of this disease. The soil treatments applied this season did not increase yields and in some instances reduced the quality of the beets.

THE EFFECT OF DEEP PLOWING AND LIMESTONE ON YIELD AND QUALITY OF SUGAR BEETS - 1969
PORTAGEVILLE FIELD - LOAM SOIL

Soil Treatment	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
Check	137 a	16.3 a	94.7 a	19.7 b
Deep Plowed 27" (1968)	140 a	15.7 a	92.7 a	23.3 b
Deep Plowed 27" (1968) + 2 Tons Limestone	141 a	15.5 a	93.6 a	28.6 a
Minimum Least Significant Range(L.S.D.)(.05)	16.3	1.21	2.87	4.87
Maximum Least Significant Range	16.7	1.23	2.92	4.97
Coefficient of Variance	5.2%	3.4%	1.4%	9.0%

Planted: Variety - 66MSH2 March 15.

Irrigated: June 6, 20; July 4, 16; August 6, 27; September 17.

Fertilizer: 0+100+100 ($N+P_2O_5+K_2O$) broadcast and disc in before bedding March 12: Forty lbs. N topdressed March 15 and April 17. One hundred lbs. N sidedressed July 1.

Fungicide: Du-Ter 10 oz. (4.75 oz ai/A) June 27, July 29, August 12, 26. TBZ 10 oz (6.0 oz ai/A) July 11. Benlate 6 oz (3.0 oz ai/A) September 12.

Herbicide: Incorporated 1 lb trifluralin/A May 14.

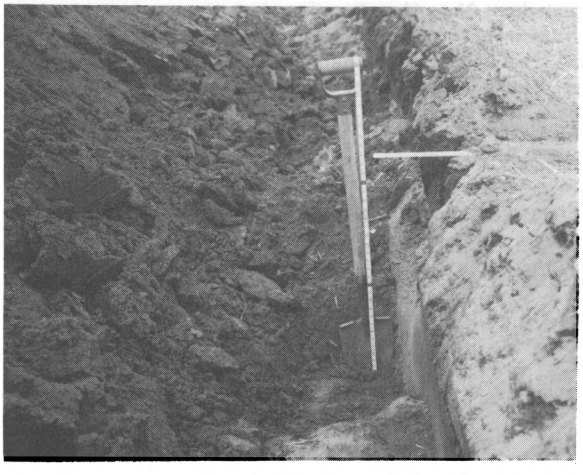
Insecticide: Sprayed for control of garden fleahopper August 12 (Sevin 2 lb ai) and August 26 (Dylox 1.5 lb ai).

Harvested: November 6.

OBJECTIVE: To determine if sugar beet roots and irrigation water will readily penetrate a soil which has been plowed deep.

PROCEDURE: In 1968 an area was plowed approximately 27 inches deep which increased the clay content of the surface soil. This soil has been very difficult to irrigate because of the slow penetration of the irrigation water when applied by the row method. Fertilizer, herbicides, and insecticide were applied at optimum rates.

RESULTS: Limestone in addition to the deep breaking increased the yield of beets 8.9 tons. Deep breaking alone increased yield 3.6 tons per acre. The yield of 28.6 tons per acre has been one of the highest yields obtained on this soil type.



Breaking loam soil 27 inches deep at the Delta Center near Portageville, Missouri

THE INFLUENCE OF ROW AND PLANT SPACING ON SUGAR BEET YIELDS AND QUALITY - 1969
PORTAGEVILLE FIELD - CLAY SOIL

Single Row Width Inches	Plant Spacing Within Row Inches	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yields Tons/A
		ROW WIDTH X PLANT SPACING			
26	12	106 b[1/]	13.9 b[1/]	90.8 b[1/]	37.3 a[1/]
	8	131 ab	14.7 a	92.0 ab	32.3 ab
	6	150 ab	14.6 ab	92.2 a	32.5 ab
30	12	128 ab	14.7 a	92.2 a	27.3 b
	8	138 ab	14.1 ab	91.5 ab	30.8 ab
	6	163 a	14.1 ab	91.8 ab	32.0 ab
Minimum Least Significant Range(L.S.D.)(.05)		45.4	0.68	1.13	7.30
Maximum Least Significant Range		50.1	0.75	1.24	8.06
Coefficient of Variance		21.7%	3.1%	0.8%	14.8%
		ROW WIDTH MEANS			
26		128 a	14.4 a	91.7 a	34.0 a
30		142 a	14.3 a	91.9 a	30.0 b
Coefficient of Variance		13.0%	5.0%	0.5%	7.9%
		PLANT SPACING MEANS			
12		117 b	14.3 a	91.5 a	32.3 a
8		134 ab	14.4 a	91.8 a	31.5 a
6		157 a	14.3 a	92.0 a	32.2 a
Minimum Least Significant Range(L.S.D.)(.05)		32.1	0.48	0.80	5.16
Maximum Least Significant Range		33.6	0.50	0.84	5.41
Coefficient of Variance		21.7%	3.1%	0.8%	14.8%

Planted: Variety - 66MSH2 March 17.
Irrigated: June 11, 17.
Fertilizer: Forty lbs. nitrogen topdressed March 17. 0+100+100+2B ($N+P_2O_5+K_2O$+Boron) topdressed May 6. 100 lbs nitrogen sidedressed May 26.
Fungicide: Six oz. Benlate sprayed on July 29, September 12. Ten oz. Du-Ter sprayed on June 30, July 11.
Herbicide: Incorporated with cultivator 1-1/4 lbs trifluralin May 13.
Insecticide: Sprayed for control of garden fleahoppers August 12 (Sevin 2 lbs Ai) and August 27 (Dylox 1-1/2 lbs Ai).
Harvested: October 30.

1/ Duncan's New Multiple Range Test: Results followed by the same letters are not significantly different (.05).

OBJECTIVE: To determine the most desirable sugar beet row and plant spacing for maximum yield and highest quality. However it was desired in this experiment to keep the row spacing within practibility of present day equipment.

PROCEDURE: Preplant fertilizer was broadcast and disc into the soil. Sugar beets were planted on a flat seed bed in row spacings as listed in the above table. Plants were thinned to desired spacing within the row. The herbicide trifluralin was applied and incorporated into the soil at time of thinning. Irrigation water was applied as needed. Fungicide was applied during the season to prevent leaf spot. The beets were harvested, yields determined, and samples obtained for sugar percentage and purity analysis.

RESULTS: Narrow rows were not practical with the size tires of tractors used in modern agriculture. These data obtained from the soil above indicate that the 26 inch rows produced the higher yields of the two row widths tested. The 30 inch rows would be the more ideal spacing as far as machinery was concerned but the quality and yield of the beets were reduced on this soil. Plant spacing did not significantly affect the results.

In harvesting the 6 inch plant spaced plots that many beets were too small to be harvested by the mechanical harvester.

THE INFLUENCE OF ROW WIDTH AND PLANT SPACING ON SUGAR BEET YIELDS AND QUALITY - 1969
PORTAGEVILLE FIELD - LOAM SOIL

Single Row Width Inches	Plant Spacing Within Row Inches	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
		ROW WIDTH X PLANT SPACING			
26	12	106 c[1/]	15.4 ab[1/]	91.9 bc[1/]	24.0 a[1/]
	8	150 b	15.8 ab	92.6 ab	23.4 a
	6	167 a	16.0 a	93.2 a	23.4 a
30	12	105 c	14.4 d	90.5 d	23.2 a
	8	145 b	15.2 bc	92.7 ab	22.3 a
	6	168 a	14.6 cd	90.7 cd	21.5 a
Minimum Least Significant Range(L.S.D.)(.05)		14.2	0.76	1.17	3.49
Maximum Least Significant Range		15.7	0.84	1.29	3.85
Coefficient of Variance		6.6%	3.2%	0.8%	9.9%
		ROW WIDTH MEANS			
26		141 a	15.7 a	92.6 a	23.6 a
30		139 a	14.7 b	91.3 b	22.3 a
Coefficient of Variance		2.5%	1.5%	1.1%	6.3%
		PLANT SPACING MEANS			
12		105 c	14.9 b	91.2 b	23.7 a
8		147 b	15.5 a	92.7 a	23.3 a
6		167 a	15.3 ab	92.0 ab	21.9 a
Minimum Least Significant Range(L.S.D.)(.05)		10.0	0.54	0.83	2.47
Maximum Least Significant Range		10.5	0.56	0.87	2.59
Coefficient of Variance		6.6%	3.2%	0.8%	9.9%

Planted: Variety - 66MSH2 March 17.
Irrigated: June 5, 20: July 4, 17: August 5, 15, 27; September 2, 17.
Fertilizer: 100+100+100+2B ($N+P_2O_5+K_2O$+Boron) broadcast and incorporated into bed before planting. 100 lbs nitrogen side-dressed July 1.
Fungicide: Ten oz. Du-Ter on June 20: August 12, 27: Six oz. Benlate on July 29 and September 12.
Herbicide: Incorporated with cultivator 1 lb trifluralin May 14.
Insecticide: Sprayed for control of garden fleahoppers August 12 (Sevin 2 lbs Ai), Dylox (1.5 lb Ai) August 27.
Harvested: November 5.

1/ Duncan's New Multiple Range Test: Results followed by the same letters are not significantly different (.05).

OBJECTIVE: To determine the most desirable sugar beet row and plant spacing for maximum yield and highest quality. However it was desired in this experiment to keep the row spacing within practibility of present day equipment.

PROCEDURE: Preplant fertilizer was broadcast and disc into the soil. Sugar beets were planted on a flat seed bed in row spacings as listed in the above table. Plants were thinned to desired spacing within the row. The herbicide trifluralin was applied and incorporated into the soil at time of thinning. Irrigation water was applied as needed. Fungicide was applied during the season to prevent leaf spot. The beets were harvested, yields determined, and samples obtained for sugar percentage and purity analysis.

RESULTS: Narrow rows were not practical with the size tires of tractors used in modern agriculture. These data obtained from the soils above indicate that the 26 inch rows produced the higher yields of the two row widths tested. The 30 inch rows would be the more ideal spacing as far as machinery was concerned but the quality and yield of the beets were reduced on loam soils. There was no significant difference in yield between plant spacings within the row. Percent sugar and purity was depressed significantly by the 12 inch spacing.

In harvesting the 6 inch plant spaced plots that many beets were too small to be harvested by the mechanical harvester.

THE INFLUENCE OF DRIED SEWERAGE SLUDGE ON SUGAR BEETS - 1969
PORTAGEVILLE FIELD - LOAM SOIL

Soil Treatment Tons Per Acre of Sewerage Sludge	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
None	147 a	13.1 a	92.9 a	17.1 bc
1	136 a	12.3 b	92.6 a	14.7 c
2	124 a	12.4 ab	91.8 a	19.8 abc
4	125 a	11.4 d	92.0 a	18.9 abc
8	131 a	13.1 a	89.1 b	20.2 ab
16	143 a	11.6 cd	88.6 b	22.9 a
32	131 a	12.2 bc	87.7 b	22.2 ab
Minimum Least Significant Range(L.S.D.)(.05)	24.2	0.66	1.35	5.0
Maximum Least Significant Range	27.6	0.75	1.54	5.7
Coefficient of Variance	15.3%	4.6%	1.3%	21.8%

Planted: March 15 66MSH2

Row Irrigated: June 5, 13; July 3, 15, 21; August 4, 27; September 17.

Fertilizer: 100+100+100+2B ($N+P_2O_5+K_2O$+Boron) March 12 disc in before bedding. 100 lb N sidedressed July 1.

Fungicide: Du-Ter 10 oz/A (4.75 oz ai) June 27; July 11, 28; August 12, 27: Benlate 6 oz/A (3.0 oz ai) September 12.

Herbicide: Incorporate 1 lb trifluralin/A May 14.

Insecticide: Sprayed for garden fleahopper August 12 (Sevin 2 lb ai/A) and August 26 (Dylox 1.5 lb ai/A).

Harvested: November 5.

OBJECTIVE: To determine the effectiveness of sewerage sludge on production of sugar beets and the penetration of irrigation water.

PROCEDURE: Sewerage sludge was applied broadcast at various rates and plowed under December 11, 1968. Optimum rate of fertilizer was broadcast on all plots before bedding in the spring. Beds were spaced on 26 inch center and a single row of beets planted on top of the row. Irrigation water was applied as needed by the row method. Leaf spot disease was controlled by periodic spraying of a fungicide. Insects were controlled as required during the season. The beets were harvested, yield determined, and samples obtained for sugar percent and purity analysis.

RESULTS: The results indicate that sewerage sludge increased the yield of beets as compared to chemical fertilizer alone. Can only surmise that the high rate of application of sewerage sludge increased water penetration.

THE INFLUENCE OF VARIOUS FIELD CROPS ON SUGAR BEETS IN A THREE YEAR ROTATION - 1969

Crop Sequence			Sugar Beet Data 1969			
First Year	Second Year	Third Year	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
			PORTAGEVILLE FIELD - CLAY SOIL			
Sugar Beets	Cotton	Soybeans	121 a	14.8 a	93.1 a	16.8 a
Sugar Beets	Corn to Wheat	Wheat to Soybeans	111 a	15.4 a	93.4 a	14.0 a
Sugar Beets	Soybeans	Corn	118 a	15.2 a	94.2 a	17.2 a
Sugar Beets	Soybeans	Cotton	123 a	15.0 a	93.0 a	16.4 a
Minimum Least Significant Range(L.S.D.)(.05)			34.1	0.61	1.19	5.2
Maximum Least Significant Range			35.9	0.65	1.25	5.5
Coefficient of Variance			14.5%	2.0%	0.6%	16.3%
			PORTAGEVILLE FIELD - LOAM SOIL			
Sugar Beets	Cotton	Soybeans	136 a	11.5 b	87.2 a	21.0 a
Sugar Beets	Corn to Wheat	Wheat to Soybeans	142 a	12.7 a	88.4 a	21.5 a
Sugar Beets	Soybeans	Corn	143 a	11.9 ab	89.6 a	21.7 a
Sugar Beets	Soybeans	Cotton	130 a	12.1 ab	86.8 a	21.5 a
Minimum Least Significant Range(L.S.D.)(.05)			14.2	0.82	4.74	4.23
Maximum Least Significant Range			14.9	0.87	4.99	4.45
Coefficient of Variance			5.2%	3.4%	2.7%	9.9%

Planted: Clay - Variety - 66MSH2 April 23
Loam - Variety - 66MSH2 March 20

Irrigated: Clay - July 15: September 2.
Loam - June 4, 13; July 3, 15, 21; August 4, 14; September 17.

Fertilizer: Clay - 100+100+100+B ($N+P_2O_5+K_2O$+Boron) disc in before March 20, 100 lb N sidedressed July 1, 2 tons limestone applied March 17.
Loam - Sludge 2 ton/A February 14, limestone 2 ton/A March 17, 100+100+100+B ($N+P_2O_5+K_2O$+Boron) March 19, 100 lb N sidedress July 11.

Fungicide: Clay - Du-Ter 10 oz/A (4.75 oz ai) July 11, 29: August 11: 3 lb Manzate/A (2.4 lb ai/A) August 27: 6 oz Benlate/A (3 oz ai) September 12.
Loam - 10 oz TBZ (6 oz ai) June 27; July 11: 10 oz Du-Ter (4.75 oz ai) July 28; August 12, 27: 6 oz Benlate September 12.

Herbicide: Clay - Pyramin Plus 12 lb/A ai postemergence 10" band. May 14 1 lb/A trifluralin incorporated June 20.
Loam - Incorporated 1 lb trifluralin May 14 with rotor-cultivator.

Insecticide: Clay - Sprayed for control of garden fleahopper August 12 (Sevin 2 lb/A ai) and August 26 (Dylox 1.5 lb/A ai).
Loam - Sprayed for garden fleahopper August 12 (Sevin 2 lb ai/A) and August 26 (Dylox 1.5 lb ai/A).

Harvested: Clay - October 30.
Loam - November 5

OBJECTIVE: To determine a desirable crop rotation in which the sugar beet crop is included.

PROCEDURE: The three years of the rotation were initiated on the two soil types in 1969. Fertility, herbicide, fungicide and insecticide treatments were applied at rates optimum for each of the crops grown. All crops will be harvested and yield data obtained annually.

RESULTS: The above data from the sugar beet crop was from the first year. Results will be of little value until the experiment has been in progress for several years.

WEED RESEARCH IN SUGAR BEETS

Harold D. Kerr

Weed control studies were conducted on Beulah sandy loam, Tiptonville silt loam, and Sharkey clay soils. Grass weeds were crabgrass, goosegrass, barnyard grass, and fall panicum on Tiptonville silt loam. Dicot weeds were redroot pigweed, lambsquarter, prickly sida, cocklebur, and smartweed. Weeds on the Sharkey clay site were mainly Polygonum species, knotweed and smartweed with purslane and barnyardgrass present at lower frequency. The Beulah sandy loam was infested with crabgrass and evening primrose with crabgrass being the main competitor.

Beulah loamy sand (Clarkton Farm)

This soil is infested with root knot nematodes. However, no nematocide was applied ahead of planting because of the possible effect on weed populations.

Data are summarized in Table 1. Early postemergence application of herbicides was superior to the preemergence application just after planting. This is a result of crabgrass being the abundant weed and it did not begin to germinate rapidly until mid-April about two weeks after the preemergence treatments were applied. Conversely, the postemergence application on April 15 when the sugar beets had developed 1 to 2 square inches of foliage surface caught the crabgrass seeds in the processes of germination and emergence. Soil moisture was not a directly limiting factor in the performance of herbicides applied at either date. Comparing BAS 2430 with pyrazon, BAS 2430 tended to control dicot weeds more effectively. Neither of these herbicides controlled crabgrass. Comparing preemergence treatments 1 through 7, crabgrass controlling effectiveness appeared to be related to the relative water solubility of the herbicide included in the mixture with pyrazon. Generally the more soluble compounds were less effective for control of crabgrass. Two pounds of CP 52223 applied preemergence controlled crabgrass much better than the one pound dose. One pound of CP 53619 was definitely inferior to CP 52223 at the same dosage applied postemergence.

Reduction of the stand of sugar beets was most severe following treatment 13, the combination of pyrazon plus dalapon at 2+3 lbs/A. The CP 52223 combined with pyrazon (treatment 14) reduced the stand compared to pyrazon alone.

Tiptonville silt loam (Delta Center Farm)

Two experiments were conducted on this soil type in 1969. One was a comparison of treatments for preemergence application at planting. A second experiment in the same area was an evaluation of treatments applied just after thinning for control of weeds for the remainder of the growing season.

Preemergence herbicide treatments in Table 2 were effective in reducing the initial infestation of weeds compared to cultivation alone. However, it was necessary to remove weeds by hoeing in late summer after the levels of herbicide residues remaining in the soil had been depleted below the amounts needed to control late germinating weeds. Combinations of TCA, dalapon, and siduron with pyrazon effectively controlled the early weed infestation with minimal injury of the seedling sugar beets. Treatment 15 in Table 2, pyrazon plus CP 52223 at 3+1.5 lb/A respectively, was nearly perfect for weed control but a temporary slight reduction in rate of sugar beet growth resulted. The sugar beets recovered from the temporary stunting within two weeks and grew normally thereafter.

Postemergence treatments after thinning time are shown in Table 3. All grasses and dicot weeds growing in the row were removed in thinning the sugar beets. Benzadox was applied in this experiment after the dicot weeds were emerging. Since dicot weeds were more prevalent than grasses in the plots at the time of treatment, application of benzadox at 1.5 to 2 lbs/A or BAS 2430 at 3 lbs/A resulted in higher yields of sugar beets. Grasses germinated in July after the plots had been irrigated twice. By then, the sugar beets had developed adequately to withstand competition from the grasses and differences among treatments in control of grasses were not apparent in the beet yields. Rotary hoeing favored germination of more weeds, treatments 31-34, and benzadox was the best herbicide treatment on plots that were rotary hoed.

Sharkey clay (Delta Center Farm)

Results are in Table 4. Smartweed and knotweed, Polygonum species were the most abundant weeds on this site in the spring. Other species such as purslane, prickly sida, and velvetleaf were present at much lower frequencies than the knotweed and smartweed. Sugar beet stands were quite variable in the studies conducted on the Sharkey clay and differences in populations from plot to plot were not significantly different. However, all stands were adequate for a normal population after thinning on May 3 following the counts. One beet plant in 8 inches of drill row (2 decimeters) was adequate.

The combination of BAS 2430 plus dalapon at 3+3 lbs/A, respectively or BAS 2430 alone or combined with TCA were the effective weed control treatments. At 4 or 5 lbs/A, CP 52223 controlled knotweed well.

Nitrogen applied as a spray over the drill row did not affect emergence and early growth of the beet seedlings. Sixty pounds of nitrogen per acre (treatment 30, Table 4) stimulated the beets to develop faster than those treated with only 30 lbs/A. Knotweed had started to germinate when these treatments were applied and a significant reduction of knotweed resulted from the 60 lbs/A of nitrogen. Only the newly emerged knotweed seedlings with poorly developed chlorophyll or green coloration were eliminated.

Table 1

Bv 0469 Sugar beet plants in 10 meters of row and weed plants per square meter (row width = 2/3 meter = 26 inches)[1/]

Treatment[a/]	Lb/A, 40 gpa	Plants Counted May 1		
		Beets	Dicot	Grass
PREEMERGENCE March 31, 1969				
1. pyrazon + TCA	2+5	251	4	15
2. pyrazon + propachlor	2+3	283	4	16
3. pyrazon + alachlor	2+1	273	3	7
4. pyrazon + CP 53619	2+1	292	1	1
5. pyrazon + CP 52223	2+1	262	1	12
6. pyrazon + CP 52223	2+2	257	0	0
7. pyrazon + dalapon	2+3	252	3	45
8. cultivate timely	-	250	7	10
9. pyrazon	2	266	5	12
10. pyrazon	3	265	5	8
11. BAS 2430	2	248	1	4
12. BAS 2430	3	257	2	8
POSTEMERGENCE April 15, 1969				
13. pyrazon + dalapon	2+3	186	0	3
14. pyrazon + CP 52223	2+2	223	0	1
15. alachlor	1	267	1	1
16. CP 52223	1	265	0	0
17. CP 52223	2	242	4	4
18. CP 53619	1	287	20	10
LSD .05, 50 df		42		
LSD .01, 50 df		55		

1/Crabgrass, Digitaria sanguinalis, and evening primrose, Oenothera laciniata, were the most frequent weeds.

a/The sugar beets were planted March 30, 1969. The timely cultivation (treatment 8) was done as needed up to May 20 when the experiment was terminated. The soil type is Beulah loamy sand.

Table 2

Bv 0569 Sugar beet plants in 10 meters of row and weed plants per square meter (row width = 2/3 meter = 26 inches)

Treatment Applied Preemergence April 17[a/]	Lb/A, 40 gpa	Plants Counted May 20		
		Beets	Dicot	Grass
1. alachlor	1.5	68	1	1
2. alachlor	2	59	1	0
3. CP 52223	1.5	82	1	1
4. CP 52223	3	99	0	1
5. CP 53619	1.5	92	1	2
6. CP 53619	2	102	3	4
7. Cycloate	2	105	1	2
8. Cycloate	3	117	0	6
9. pyrazon + TCA	3+5	112	1	2
10. pyrazon + dalapon	3+3	119	1	7
11. pyrazon + siduron	3+4	121	1	3
12. pyrazon + siduron	3+5	101	1	2
13. pyrazon + propachlor	3+3	77	2	4
14. pyrazon + alachlor	3+1.5	54	0	1
15. pyrazon + CP 52223	3+1.5	91	0	0
16. BAS 2430 + alachlor	3+1.5	68	0	0
17. cultivated	-	111	19	86
18. CP 52223	3.5	79	0	0
LSD .05, 50 df		33		
LSD .01, 50 df		43		

a/The sugar beets were planted in Tiptonville silt loam on Spril 16, 1969.

Table 3

Bv 05a69 Yield and quality of sugar beets as affected by herbicides applied just after thinning the beets on Tiptonville silt loam[1/]

Treatment Applied May 5 After Thinning	Lb/A 40 gpa	Beet Yield Tons/A	Weight Grams/Beet	% Sugar	% Juice Purity	Estimated Sugar Tons/A
19. benzadox	1.5	17.2	289	13.9	90.5	2.39
20. benzadox	2.5	15.5	388	13.6	92.1	2.11
21. pyrazon + dalapon	3+2	16.0	368	13.4	90.4	2.14
22. BAS 2430 + dalapon	3+2	16.8	364	14.3	92.0	2.40
23. BAS 2430 + benzadox	3+2	16.8	308	14.0	91.7	2.35
24. dalapon + benzadox	2+2	12.3	298	14.0	92.2	1.72
25. dalapon + endothall	2+1	14.8	293	13.6	90.4	2.01
26. dalapon + benzadox + endothall	2+2+1	15.1	285	14.0	91.0	2.11
27. BAS 2430 + nitralin	3+1	16.5	404	14.1	89.6	2.33
28. BAS 2430 + DCPA	3+6	15.6	435	13.0	90.3	2.03
29. BAS 2430 + bensulide	3+6	15.4	302	13.8	90.8	2.13
30. Cultivated timely	-	13.4	328	14.3	92.0	1.92
31. Rotary hoe + benzadox	2	17.3	352	14.2	91.6	2.46
32. Rotary hoe + nitralin	1	13.7	328	14.0	90.5	1.92
33. Rotary hoe + DCPA	6	11.9	344	13.5	92.5	1.61
34. Rotary hoe + bensulide	6	12.4	252	14.2	91.8	1.76
35. Delay first cultivation	-	11.0	292	14.6	92.0	1.61

1/ The sugar beets were planted April 1, treated May 5, and harvested November 6, 1969.

Table 4

Bv 0369 Sugar beet plants in 10 meters of row and weed plants per square meter (row width = 2/3 meter = 26 inches)[1/]

Preemergence Treatment Applied March 20	Lb/A 40 gpa	Counted April 22			Counted May 2		
		Beets	Dicot	Grass	Beets	Dicot	Grass
1. pyrazon	3	78	35	0	68	38	2
2. pyrazon	4	102	52	0	92	56	2
3. pyrazon + TCA	3+5	65	38	0	55	41	0
4. pyrazon + TCA	3+7	95	26	0	85	25	0
5. pyrazon + dalapon	3+3	165	28	1	140	25	3
6. pyrazon + dalapon	3+4	172	43	2	135	39	0
7. BAS 2430	2	142	17	8	113	23	3
8. BAS 2430	3	55	55	0	62	45	1
9. BAS 2430	4	108	2	0	83	5	1
10. BAS 2430 + TCA	2+5	123	9	0	112	4	0
11. BAS 2430 + TCA	3+5	105	7	1	112	10	0
12. BAS 2430 + TCA	2+7	53	13	0	45	17	0
13. BAS 2430 + dalapon	2+3	100	32	2	110	34	2
14. BAS 2430 + dalapon	2+4	142	11	0	112	15	2
15. BAS 2430 + dalapon	3+3	107	30	0	100	8	1
16. propachlor	3	67	33	0	68	27	0
17. propachlor	4	143	30	0	100	17	0
18. alachlor	1.5	168	35	1	140	32	0
19. alachlor	2	57	70	0	50	57	1
20. alachlor	3	65	28	0	68	24	0
21. CP 52223	3	77	72	0	77	59	1
22. CP 52223	4	122	31	6	112	30	0
23. CP 52223	5	143	22	2	132	23	0
24. CP 53619	3	80	91	2	58	78	1
25. CP 53619	4	108	50	1	105	44	1
26. CP 53619	5	95	28	0	92	27	0
27. delayed cultivation	-	168	62	0	167	48	0
28. timely cultivation	-	55	64	0	63	60	0
29. liquid N (32%)	30	73	132	0	78	110	0
30. liquid N (32%)	60	67	72	0	75	58	0
LSD .05, 29 df		NS	52	-	NS	42	-

1/ Polygonum aviculare (knotweed) and P. pensylvanicum (smartweed) and Echinochloa crusgalli (barnyardgrass) were the most frequent weeds. The soil type is Sharkey clay.

Table 5

Bv 0669 Sugar beet plants in 10 meters of row and weed plants per square meter (row width = 2/3 meter = 26 inches) counted May 5, 1969

	Lb/A, 20 gpa	Beet Plants	Dicot Weeds	Grass Weeds
1. pyrazon + dalapon	3+3	89	111	3
2. BAS + dalapon	3+3	96	100	18
3. benzadox + siduron	2+5	77	89	6
Over treated with benzadox + endothall at 2+1 lb/A (treatments 4-8 only)				
4. BAS 2430	3	63	51	4
5. siduron	5	79	70	2
6. CP 52223	3	73	18	8
7. DCPA	6	81	46	3
8. bensulide	6	72	51	7
9. Liquid Nitrogen (32%)	20	96	141	2
10. Liquid Nitrogen (32%)	30	93	136	6
11. Nitrogen + endothall	20+1	77	59	22
12. endothall	.75	106	118	9
13. endothall	1	70	147	7
14. CP 52223	2	88	86	7
15. CP 52223	4	69	111	17
16. BAS 2430	3	58	96	3
17. pyrazon + Citowett^{R}	3+1/4 %	102	101	7
18. pyrazon + non-phytotoxic oil	3+5 %	80	172	9
LSD .05, 34 df		NS	NS	-

INSECT PESTS OF SUGAR BEETS IN 1969

Armon J. Keaster

A survey was made in 1969 for insects in the sugar beet field plots located in three southeast Missouri counties.

The survey was made for two purposes: 1) To check for the insect species which were present in the sugar beet fields, and 2) To estimate the populations of these insect species.

The procedure involved three approaches: 1) Ten plants in the seedling stage were selected at random at three sites within each sugar beet field for the dates of April 30, May 5 and May 27. The plants were taken into the laboratory and examined for thrips, aphids and other insects. Beginning June 11, the small plant samples were discontinued and 25 leaves were randomly selected at three different sites in the field and taken into the lab for examination. Two medium size leaves were usually taken near the crown for each plant sampled. The leaves were examined for various insects, feeding by chewing insects, and the leaves which were damaged were further examined for the number of holes made by chewing insects.

2) A D-VAC machine, which is a large suction-type machine resembling a large vacuum cleaner but powered by a small gasoline engine, was used for the collection of insects which normally would not be picked up in leaf samples. D-VAC machine samples were also started June 11 and continued on an approximate two week basis until September 16. The D-VAC machine samples were taken at three different sites per field. Each site consisted of 33 feet which approximates 100 feet of row.

3) In addition to the above sampling methods several insect species such as grasshoppers and moths and other miscellaneous insects missed by the D-VAC machine were collected along the margin of the field or while makeing observations over the entire field.

RESULTS

The data for the ten plant samples on April 30, May 5, and May 27 and the leaf samples beginning June 11 taken through September 16 are summarized in the following table.

The insects collected using the D-VAC machine and by other methods are preserved in alcohol or other preservative solutions for identification at a later time. These data will be reported as soon as identification has been completed.

In looking at these data, it is apparent that thrips and aphid populations were only present in appreciable numbers during the first three observation periods. The garden fleahopper, Halticus bracteatus (Say), was not found until August 15. At this time an average of .4 or almost one half leafhopper per leaf was observed. On August 28 the overall average had increased slightly but did not increase significantly until the middle of September when an average of over two garden fleahoppers were found per leaf.

The average per cent leaves damaged by chewing insects was 39% June 11, but declined for the June 25 observation. However, from June 25 the percentage of leaves damaged increased for each observation period until September 16. Although several foliage feeding insects were present, no single species was found to be of major significance for any of the observation periods, there was a continuous increase of damage throughout the growing season. The insects responsible were apparently grasshoppers, fall armyworm and webworms.

INSECTICIDE APPLICATIONS

In addition to the survey, recommendations for insect control were given to those farmers who were found to have damaging insect populations. For the most part insecticidal applications were made for garden fleahopper control after the middle of August. Until the results of the D-VAC machine samples are analyzed it will be difficult to determine the real benefit gained from the insecticidal applications. The control recommended for this pest were either an application of a half pound of methyl parathion per acre or one pound of Dylox per acre.

SUMMARY OF INSECTS PRESENT AND DAMAGE TO FRESH SUGAR BEET PLANT SAMPLES TAKEN ON 10 SAMPLING DATES
SOUTHEAST MISSOURI - 1969

Observation	Hunter	Gee	Vandiver I	Vandiver II	Gideon Anderson	Pierce	Simcoke	Harris
				Field				
				April 30, 1969				
Thrips/plant		0.07	0.07	0	0.40	0.30	0.13	0.30
Aphids/plant		0	0	0	0.03	0.07	0.03	0
				May 5, 1969				
Thrips/plant	0.43	0.03	0.37	0.47	0.53	0.83	0.33	1.10
Aphids/plant	0.03	0.03	0.07	0	0	0.10	0.10	0.03
				May 27, 1969				
Thrips/plant	0.47	0.70	1.03	0.93	1.77	1.37	0.57	0.73
Aphids/plant	0	0.03	0	0	0.10	0.03	0	0.03
				June 11, 1969				
Thrips/leaf	1.10	0.43	0.40	0.51	0.28	0.21	0.37	0.59
Fleahoppers/leaf	0	0	0	0	0	0	0	0
Aphids/leaf	0	0	0	0	0	0	0	0
% Leaves damaged	61	47	41	45	39	24	45	31
# Feeding holes/leaf	1.32	0.83	0.68	0.69	0.65	0.49	0.68	0.47
				June 25, 1969				
Thrips/leaf	0	0	0	0.03	0	0	0	0.03
Fleahoppers/leaf	0	0	0	0	0	0	0	0
Aphids/leaf	0	0	0	0	0	0	0	0
% Leaves damaged	17	31	20	27	19	7	12	5
# Feeding holes/leaf	0.31	0.12	0.27	0.39	0.40	0.15	0.39	0.05
				July 14, 1969				
Thrips/leaf	0	0	0	0	0	0	0	0.07
Aphids/leaf	0	0	0	0	0	0	0	0
% Leaves damaged	31	24	36	21	39	12	25	17
# Feeding holes/leaf	1.04	0.44	0.91	0.44	0.40	0.21	0.65	0.33
				July 29, 1969				
Thrips/leaf	0	0	0	0.01	0.01	0.01	0.07	0
Aphids/leaf	0.03	0	0	0	0	0.01	0.01	0
% Leaves damaged	61	32	36	19	17	37	61	23
# Feeding holes/leaf	3.60	1.17	1.12	0.72	0.47	2.29	1.73	0.43
				August 15, 1969				
Thrips/leaf	0.01	0	0	0.04	0	0	0	0.05
Fleahoppers/leaf	1.84	0.01	0.04	0.04	0.23	0.59	0	0.47
Aphids/leaf	0	0	0	0	0	0	0	0
% Leaves damaged	40	37	83	64	61	65	53	33
# Feeding holes/leaf	1.19	0.65	4.08	1.60	1.57	1.96	1.69	0.77
				August 28, 1969				
Thrips/leaf	0.05	0	0.01	0	0	0	0	0
Fleahoppers/leaf	0.07	0.05	0.21	0.67	0.35	0.24	0.65	2.19
Aphids/leaf	0	0	0	0	0	0	0	0
% Leaves damaged	51	57	84	79	76	92	75	52
# Feeding holes/leaf	1.15	0.97	2.44	2.05	1.72	2.05	2.33	1.08
				September 16, 1969				
Thrips/leaf	0	0	0	0	0.04	0	0	0
Fleahoppers/leaf	0.07	0.11	0.04	0.08	3.40	0.11	0.41	13.33
Aphids/leaf	0	0	0	0	0	0	0	0
% Leaves damaged	44	48	77	55	45	31	85	85
# Feeding holes/leaf	1.39	12.0	2.68	1.32	1.53	0.85	2.91	5.20

AVERAGE FOR ALL FIELDS

Observation	Date of Observation									
	April 30	May 5	May 27	June 11	June 25	July 14	July 29	Aug. 15	Aug. 28	Sept. 16
Thrips/plant or leaf	0.18	0.51	0.94	0.49	0	0.01	0.01	0.01	0.01	0
Garden Fleahopper/leaf	-	-	-	0	0	0	0	0.40	0.55	2.19
Aphids/plant or leaf	0.02	0.05	0.03	0	0	0	0.01	0	0	0
Percent leaves damaged	-	-	-	39	17	26	36	55	71	59
Number feeding holes	-	-	-	0.72	0.26	0.55	1.44	1.69	1.72	2.14

SUGAR BEET PATHOLOGY TRIALS

James A. Roth

CERCOSPORA LEAF SPOT FUNGICIDE CONTROL

Cercospora leaf spot in combination with the climate of southeast Missouri may result in very drastic reduction in yield and quality of sugar beets. Varieties first tested nine years ago were very susceptible to leaf spot but through plant breeding over the years considerable improvement in resistance has been accomplished.

To improve production fungicides have been tested to determine effect of various rates and time of application. Copper and oil have been the universal treatment in control of leaf spot over past years but in more recent years such fungicides as TBZ, DuTer, and Benlate have been very effective in controlling the disease. Although these chemicals have not been approved label requirements have or are in the process of being completed. TBZ and Benlate are expected to be cleared for commercial production in 1970.

In 1969 two varieties were included in the fungicide tests, one variety (66MSH2) resistant and another variety (GW 869) susceptible to leaf spot. Various intervals and rates of Du-Ter, Maneb, Benlate, and TBZ were tested and compared with copper and oil. Spraying was accomplished by using three nozzles per row, one over the top of the plants and one on each side of the row of beets.

The results of 1969 indicate that both the resistant and the susceptible varieties were improved in yield and sugar content by fungicidal sprays. With the exception of TBZ at the 38 day interval all spray treatments were effective in improving the sugar content and yields of the resistant (66MSH2) variety. The susceptible variety (GW 869) when sprayed to control the disease yielded six tons above the highest yield of the resistant variety (66MSH2).

In summary TBZ, Benlate and Du-Ter effectively controlled leaf spot in 1969. The results indicate that the 28 day schedule used with Benlate may have been too long of an interval for most effective control with this compound.

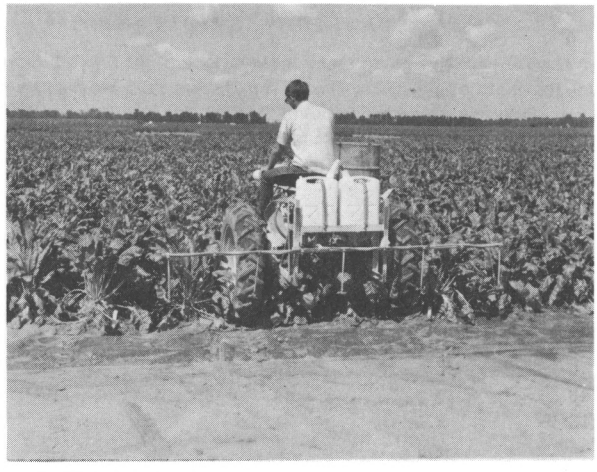
RHIZOCTONIA CROWN ROT FUNGICIDE CONTROL

Eight fungicides were evaluated for their efficiency in control of Rhizoctonia crown rot. These chemicals were incorporated into the soil prior to planting. Planting was delayed so as to encourage the development of root rot.

The results indicate no significant difference in treatments occurred due to the absence of the disease in these plots. The treatments used did not adversly affect the beets.

ROOT KNOT RESISTANCE SELECTION

Sugar beets selected from resistant plants the preceding year were planted at the Clarkton Field from which selections were made for resistance to the root knot nematode. Approximately two hundred beets were found to have no indication of root knot nematode in the field and further screened in the greenhouse. From this screening none of the beets were found to be free of root knot so all were discarded and additional selection will be made in 1970.



Spraying sugar beets with fungicide to control Cercospora leaf spot.

THE INFLUENCE OF FUNGICIDE SPRAYS IN CONTROL OF CERCOSPORA LEAF SPOT ON SUGAR BEETS - 1969
PORTAGEVILLE FIELD - LOAM SOIL

Treatment[1]	Leaf Spot Reading* Aug 25	Sept 22	Beets/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
Variety: 66MSH2 (Resistant)						
No Treatment	2.5 a	4.5 a	133 a	13.7 f	92.1 d	16.2 b
2/Copper 6 lbs and Oil 4 pts/A (14 days)	1.3 c	1.5 bc	144 a	16.2 abcd	94.0 ab	20.5 a
3/Du-Ter 3 oz/A (7 day interval)	1.0 c	1.3 bc	146 a	16.7 a	94.1 a	20.4 a
4/Du-Ter 4.8 oz/A (7 day interval)	1.0 c	1.0 c	145 a	16.4 ab	93.8 abc	19.5 a
5/Du-Ter 4.8 oz/A (14 day interval)	1.0 c	1.3 bc	148 a	16.3 abc	93.9 abc	17.2 ab
6/Benlate 3 oz/A (28 day interval) 4 applications	1.5 bc	1.5 bc	136 a	15.7 cd	93.5 abc	19.4 a
7/Benlate 3 oz/A (28 day interval) 3 applications	1.0 c	2.3 b	144 a	15.5 de	93.2 abc	17.5 ab
8/Benlate 3 oz/A (28 day interval) 3 applications	1.3 c	2.3 b	133 a	15.8 bcd	93.3 abc	17.9 ab
9/TBZ 6 oz/A (14 day interval)	1.0 c	1.5 bc	141 a	16.0 abcd	93.7 abc	20.1 a
10/TBZ 3 oz/A (14 day interval)	1.3 c	1.8 bc	144 a	16.0 abcd	93.7 abc	20.4 a
11/TBZ 3 oz/A (28 day interval)	2.0 a	3.3 a	135 a	14.9 e	93.1 bc	15.4 b
12/Maneb 2.4 lb/A (14 day interval)	1.3 c	1.5 bc	136 a	15.5 de	93.0 c	19.4 a
Minimum Least Significant Range(L.S.D.)(.05)	0.52	0.89	17.5	0.62	0.85	2.88
Maximum Least Significant Range	0.60	1.04	20.5	0.73	1.00	3.38
Coefficient of Variance	26.7%	31.3%	8.6%	2.7%	0.6%	10.7%
Variety: GW869 (Susceptible)						
No Treatment	6.0 ab	7.2 ab	141 ab	9.9 g	88.6 b	18.7 d
Copper 6 lbs and Oil 4 pts/A (14 days)	2.0 de	4.4 de	141 ab	12.2 cd	89.7 ab	22.7 bc
Du-Ter 3 oz/A (7 day interval)	1.2 g	1.8 g	150 ab	14.3 a	91.7 a	26.4 a
Du-Ter 4.8 oz/A (7 day interval)	1.4 g	2.0 g	153 a	14.6 a	91.6 a	26.0 ab
Du-Ter 4.8 oz/A (14 day interval)	2.2 fg	2.6 fg	141 ab	14.1 a	90.9 a	26.8 a
Benlate 3 oz/A (28 day interval) 4 applications	1.8 de	3.4 ef	148 ab	12.6 bc	88.5 b	24.2 abc
Benlate 3 oz/A (28 day interval) 3 applications	2.0 de	7.8 a	134 b	10.8 f	89.8 ab	22.4 c
Benlate 3 oz/A (28 day interval) 3 applications	3.0 cd	5.0 cd	146 ab	12.8 bc	91.5 a	22.2 c
TBZ 6 oz/A (14 day interval)	1.6 e	2.0 g	147 ab	13.2 b	90.5 ab	24.4 abc
TBZ 3 oz/A (14 day interval)	2.2 e	3.4 ef	144 ab	12.3 cd	90.0 ab	22.5 c
TBZ 3 oz/A (28 day interval)	4.6 b	6.8 ab	145 ab	11.3 ef	89.8 ab	22.3 c
Maneb 2.4 lb/A (14 day interval)	3.6 bc	5.6 c	142 ab	11.8 de	90.2 ab	24.5 abc
Minimum Least Significant Range(L.S.D.)(.05)	1.09	1.10	14.4	0.73	1.84	3.0
Maximum Least Significant Range	1.29	1.30	17.0	0.87	2.18	3.6
Coefficient of Variance	32.3%	19.8%	7.8%	4.6%	1.6%	10.0%

Planted: March 15 on beds spaced 26 inches.
Fertilizer: Broadcast 100+100+100+2 Boron March 12 and incorporated into bed before planting.
Herbicide: Incorporated trifluralin granules at rate of 1 pound active ingredient per acre.
Row Irrigated: June 5, 20; July 4, 17; August 15, 27; September 2. 17.
Insecticide: Dylox (1.5 lb ai) sprayed August 12.
Leaf Spot Reading*: 1 - good control: 9 - no control.
Harvested: November 5.

1/ All treatments applied with sprayer equipped with 3 nozzles per row. Copper and oil applied with 80 gallons of water/A at 150 pounds pressure (PSI) and all other treatments with 40 gallons of water/A at 40 pounds pressure.
2/ Copper sulphate and dormant spray oil.
3/ Du-Ter - 3 ounces active ingredient sprayed per acre June 18, 25; July 2, 9, 16, 23, 30; August 6, 13, 20, 27; September 3, 10.
4/ Du-Ter - 4.8 ounces active ingredient sprayed per acre June 18, 25; July 2, 9, 16, 23, 30; August 6, 13, 20, 27; September 3, 10.
5/ Du-Ter - 4.8 ounces active ingredient sprayed per acre June 18; July 2, 16, 30; August 13, 27; September 10.
6/ Benlate - 3 ounces active ingredient plus surfactant sprayed per acre June 18; July 16; August 13; September 10.
7/ Benlate - 3 ounces active ingredient plus surfactant sprayed per acre June 18; July 16; August 13.
8/ Benlate - 3 ounces active ingredient plus surfactant sprayed per acre July 16; August 13; September 10.
9/ TBZ - 6 ounces active ingredient sprayed per acre June 18; July 2, 16, 30; August 13, 27; September 10.
10/ TBZ - 3 ounces active ingredient sprayed per acre June 18; July 2, 16, 30; August 13, 27; September 10.
11/ TBZ - 6 ounces active ingredient sprayed per acre June 18; July 16; August 13; September 10.
12/ Maneb - 2.4 pounds active ingredient plus surfactant sprayed per acre June 18; July 2, 16, 30; August 13, 27 and September 10.

OBJECTIVE: To investigate the effectiveness of various fungicides in controlling Cercospora leaf spot on sugar beets.

PROCEDURE: Sugar beet varieties GW869, susceptible to Cercospora leaf spot and 66MSH2, resistant to leaf spot were planted March 15 on single row beds spaced 26 inches apart. Four fungicides plus copper and oil were used in the test.

Fertilizer (100 N + 100 P_2O_5 + 100 K_2O + 2 Boron) was broadcast and incorporated into the bed prior to planting. Nitrogen (100 pounds) was sidedressed July 1.

Irrigation water was applied eight times during the growing season by the row method. Tensimeters were installed to determine moisture level of the soil during the season.

Herbicide (1 lb Treflan per acre) was applied broadcast and incorporated with a cultivator after beets were thinned to control grasses.

Insecticides were applied as needed to control the garden fleahopper.

The beets were harvested mechanically, yield determined and samples obtained for sugar and purity analysis.

RESULTS: Practically all of the fungicide treatments were effective in reducing the occurance of leaf spot of both the resistant and susceptible varieties. There was evidence that the 28 day interval between spraying of TBZ and Benlate was too long to be most effective.

As compared to the no treatment all of the fungicide treatments resulted in an increase in sugar and purity percentage. In this experiment the susceptible variety produced the highest yield (26.8 tons/acre) when sprayed with 4.8 ounces of Du-Ter at a fourteen day interval.

FUNGICIDE TREATMENTS TO CONTROL RHIZOCTONIA CROWN ROT IN SUGAR BEETS - 1969
PORTAGEVILLE FIELD - LOAM SOIL

Treatment Per Acre[1/] (Pounds of Formulation)		% Live Beets Sept. 23	Beets Harvested Per 100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
Check		94.7 a	147 a	14.1 a	90.5 abc	13.2 a
10 lbs Daconil 2787-Terrazole	(10-2.5% granules)	92.1 a	139 a	14.1 a	90.8 ab	12.8 a
20 lbs Terraclor	(10% granules)	90.6 a	124 a	13.9 a	89.9 abc	12.6 a
10 lbs Terraclor Super X	(10-2.5% granules)	92.2 a	134 a	14.0 a	90.4 abc	13.2 a
30 lbs Vitavax	(5% granules)	93.2 a	134 a	14.0 a	89.6 abc	13.4 a
10 lbs Chemagro 5506	(40% WP)	88.1 a	139 a	14.0 a	90.1 abc	12.6 a
20 lbs Chemagro 5506	(40% WP)	91.3 a	125 a	14.0 a	90.1 abc	12.0 a
10 lbs Bay 78175	(40% WP)	87.7 a	140 a	14.0 a	89.5 bc	13.2 a
1-1/4 lbs TBZ	(60% WP) sprayed 14 day interval	90.4 a	128 a	13.8 a	89.4 c	12.7 a
3/4 lbs Benlate	(50% WP) sprayed 14 day interval	91.1 a	130 a	14.3 a	90.9 a	12.5 a
Minimum Least Significant Range(L.S.D.)(.05)		21.36	21.9	0.57	1.13	2.25
Maximum Least Significant Range		25.00	25.7	0.67	1.33	2.63
Coefficient of Variance		20.7%	14.0%	3.5%	1.1%	15.0%

Planted: Variety - 66MSH2 May 1.

Row Irrigated: July 13, 17; August 4, 15; September 17.

Fertilizer: 100+100+100+2B ($N+P_2O_5+K_2O$+Boron) broadcast incorporated into row. 100 lb N sidedressed July 11.

Fungicide: Six lbs copper and 4 pints dormant spray oil/A applied on all plots (except TBZ and Benlate plots) July 11, 29; August 13, 27; September 12. TBZ and Benlate applied July 2, 16, 30; August 13, 27; September 10.

Herbicide: Twelve lb/A Pyramin Plus in 10" band May 14.

Insecticide: Sprayed for control of garden fleahopper August 12 (Sevin 2 lb ai/A) and August 26 (Dylox 1.5 lbs ai/A).

Harvested: November 5.

1/ All treatments except TBZ and Benlate applied broadcast and incorporated into soil. Rates of application refers to pounds of formulation applied in a 12 inch band.

OBJECTIVE: To determine if fungicide soil treatments and sprays will control rhizoctonia crown rot in sugar beets.

PROCEDURE: Seven treatments including six fungicides were applied broadcast and incorporated into the soil prior to planting. Two systemic fungicides were sprayed bi-weekly after thinning for control of crown rot.

All plots were fertilized and irrigated so as to assure optimum growth. Pyramin herbicide was used in control of weeds. Sevin and Dylox were used to control garden fleahopper.

RESULTS: The results indicate that there was no significant difference between any of the treatments used and the check except in juice purity. The sugar beets were planted late and crown rot did not develop as did in the previous season. The late planting of May 1 will account for the low yields as compared to the other sugar beet experiments.

In some seasons or locations rhizoctonia crown rot has reduced the stand materially.

Rhizoctonia Crown Rot of Sugar Beets

THE EFFECTS OF SOIL FUMIGATION ON SUGAR BEETS - 1969
CLARKTON FIELD - SANDY SOIL

Soil Treatment	Beets Harvested/100 Ft.	% Sugar	Juice Purity %	Yield Tons/A
20 gallons Rotox[1/]	105 a[3/]	15.0 a[3/]	94.9 a[3/]	5.9 a[3/]
Check	49 b	14.5 a	94.3 a	2.6 b
20 gallons Zytox[2/]	91 a	15.2 a	93.7 a	7.2 a
Minimum Least Significant Range(L.S.D.)(.05)	28.3	0.80	1.06	2.66
Maximum Least Significant Range	29.7	0.84	1.10	2.80
Coefficient of Variation	32.4%	5.0%	1.1%	47.4%

Fumigants: Applied April 16.

Planted: Variety - A402-64R May 23.

Irrigated: May 30; June 6, 15, 30; July 10, 18; August 4, 12.

Fertilizer: 100+100+100+2B ($N+P_2O_4+K_2O$+Boron) incorporated before bedding March 31. 50 lbs. N sidedressed June 26 and August 5.

Fungicide: Ten oz/A Du-Ter (4.75 oz ai/A) July 10, 23; August 5. Three lb/A Manzate (2.4 lb ai/A) September 5.

Herbicide: Incorporated 3/4 lb. trifluralin/A before planting May 15.

Insecticide: None

Harvested: November 11.

1/ Methyl Bromide 49.5%, Ethylene Dibromide 49.5%, Inert 1%.

2/ Methyl Bromide 70 0%, Ethylene Dibromide 23.75%, Inert 1.25%.

3/ Duncan's New Multiple Range Test: Results followed by same letters are not significantly different (.05).

OBJECTIVE: To determine the effect of soil fumigants on yields of sugar beets growing on soil infected with root-knot nematode.

PROCEDURE: Fumigants tested were applied and incorporated into the soil. Planting was delayed for thirty days to prevent damage to the seedling sugar beets. Optimum cultural practices were followed.

RESULTS: The late date of planting resulted in very low sugar beet yields. Yields were increased from 2.6 tons on the check to 5.9 and 7.2 tons by the use of fumigants. Many of the beets in the check plot died due to nematode infestation whereas the stand was maintained on the treated plots.

Additional work in 1970 will investigate further the use of fumigants on this sandy soil which is heavily infested with nematodes.

Rotox on the left, Zytox on the right with the check plot between the two treated plots.

SWEET SORGHUM AND CORN VARIETY TESTS

James A. Roth

Sweet stalk corn and sorghum may offer the possibility of another source of sugar products in the event a sugar mill is built in southeast Missouri. These crops may be harvested earlier than sugar beets which would extend the operating season of the plant.

Two variety tests of sweet sorghum and corn were planted with one on the loam soil of the Portageville Field and the other on the sandy soil of the Clarkton Field. The sweet stalk corn at both locations did not produce satisfactory yields of sugar as compared to the sweet sorghum. On the Portageville Field the Rio variety produced 6692 pounds of sugar whereas on the Clarkton Field the DeKalb FS-26 variety produced 5254 pounds. Yields at Portageville compared favorably with sugar beet yields of sugar but at Clarkton yields of sugar from sorghum exceeded sugar beet yields considerably.

The tests were planted in 30 inch rows, irrigated, fertilized, but required no pesticides during the season. Considerable research will be required to determine most favorable cultural practices including fertility, irrigation, insect control, and methods of harvesting.

Sweet sorghum and corn variety test on the loam soil at the Delta Center Farm near Portageville.

SWEET SORGHUM AND CORN VARIETY TESTS - 1969
PORTAGEVILLE AND CLARKTON FIELDS

PORTAGEVILLE FIELD - LOAM SOIL

Variety	Days to Mid-Bloom	Plant Height at Harvest (Inches)	Sugar Based on Fresh Wt. (%)	Sugar Based on Dry Wt. (%)	Purity (%)	Total Sugar/A (Pounds)
NL-2 (Northland Corn)	61	70	10.77	42.35*	84.97	1845
Rio	91	126	12.20*	37.68	83.47	6692
Brawley	72	99	13.27	47.22	89.84	6098*
DeKalb FS-26	99	134	9.44	35.29	78.06	6071*
NC + NB305F	68	93	11.28*	43.17*	84.89	4130
CR-1 (Ross)	65	84	10.02	40.59*	83.55	4352
Pioneer 931	99	165	8.22	25.42	74.12	4110
DeKalb FS-4	68	93	10.04	40.09	85.71	4082
RS (Ross)	63	78	10.35	39.82	85.94	4032
Rudy Patrick Sumax	61	84	9.97	42.04*	83.49	3429
CR-4 (Ross)	65	87	10.47	42.12*	87.31	3267
CR-3 (Ross)	65	83	9.82	37.21	84.29	2731
LSD (.05)			2.00	6.91	ns	1021
C.V. (%)			12.08	11.13	6.98	17.89

CLARKTON FIELD

NL-2 (Northland Corn)	54	66	6.93	25.64	71.43	642
Rio	99	107	11.04	31.51	79.48	4957
Brawley	79	93	12.32	38.02*	78.86	3855
DeKalb FS-26	99	124	10.93	38.88*	78.82	5254
NC + NB305F	79	86	11.27	36.32*	78.92	3208
CR-1 (Ross)	70	83	10.39	35.82*	83.12*	3048
Pioneer 931	99	169	8.38	22.74	72.52	3499
DeKalb FS-4	75	90	10.99	37.83*	81.19*	3595
RS (Ross)	75	70	10.90	34.72	81.20*	2521
Rudy Patrick Sumax	70	79	10.51	32.84	82.46*	2603
CR-4 (Ross)	70	78	10.07	39.61	86.55	2943
CR-3 (Ross)	70	83	9.81	33.26	83.76*	2834
LSD (.05)			1.01	4.80	6.33	809
C.V. (%)			6.21	8.97	5.03	15.82

—— Line drawn under highest mean for each character.
* Statistically equal to highest mean (underscored) at the 5% level of significance.

Planted: Portageville: May 15 - Clarkton: May 16.
Irrigated: Portageville: July 16 - Clarkton: July 10, August 14, 29.
Fertilizer: Portageville: 100-100-100 ($N-P_2O_5-K_2O$) - Clarkton: 116-50-50 ($N-P_2O_5-K_2O$).
Herbicide: Portageville: None - Clarkton - None
Insecticide: Portageville: None - Clarkton: None
Harvest: Portageville: August 30 - CR1, CR3, CR4, Sumax, NL2 - Clarkton: September 5 - CR1, CR3, CR4, Sumax, NL2.
September 8 - Brawley, NB305F, FS4, RS:Clarkton: September 11 - Brawley, NB305F, FS4, RS
September 30 - 931, FS26, Rio - Clarkton October 7 - 931, FS26, Rio.

OBJECTIVE: To determine if sweet sorghum and corn will produce satisfactory yields of sugar on southeast Missouri soils.

PROCEDURE: Twelve varieties of sweet sorghum and corn were planted on two soil types, sandy loam soil at Portageville and sandy soil at Clarkton. Optimum rates of fertilizer was applied broadcast at each location. On the Clarkton field irrigation water was applied as needed by sprinkler whereas on the Portageville field the row method was used.

Heads were removed from the fertile varieties during the growing season.

Each variety was harvested approximately six weeks after date of mid bloom. The stalks were stripped of leaves, heads and corn ear shoots removed before cutting and weighing. Plants were chopped into inch lengths, sampled, frozen and shipped to the Great Western Sugar Company for analysis. Dr. J. N. Widner of the Great Western Sugar Company Experiment Station, supplied the seed, analyzed the samples, and computed the data.

RESULTS: Sugar production per acre compared favorably with that of sugar beets produced at the two locations. On the Portageville field 31.5 tons per acre of fresh material was produced but contained only 9.4% (fresh weight) sugar. The highest percent sugar was 13.3% with 23 tons of fresh material per acre.

Sweet stalk corn did not compare favorably with the sweet sorghum in yield or production of sugar this season.

Production of sweet sorghum would enable the sugar mill to operate over a longer season as could begin harvest of sorghum by September 1 which would be three to four weeks ahead of sugar beets.

Additional research will be needed to refine cultural practices including fertility and irrigation which have not been included this season. Also a mechanical means must be devised to remove leaves from the stalks or a chemical process devised to remove impurities of the leaves.

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