
CANEBRAKE

Agricultural Experiment Station,

Uniontown, Alabama.

BULLETIN NO. 6. - - OCTOBER, 1889.

VEGETABLES,

GRAPES.

METEOROLOGY.

—Soil Temperatures.

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CANEBRAKE
AGRICULTURAL EXPERIMENT STATION,
 UNIONTOWN, ALABAMA.

BULLETIN NO. 6.....OCTOBER, 1889.

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REPORT OF ASSISTANT DIRECTOR.

VARIETIES OF IRISH POTATOES.

Ten varieties of potatoes were planted in rows thirty-five yards long and three feet apart, and thinned to an equal number of vines on each row. The land was top-dressed with stable manure in December, 1888, and broken with two-horse plow in January, 1889. They were attacked by the Colorado beetle in June, and slightly damaged. One application of London purple destroyed them. One pound of purple to 80 gallons of water was used.

The severe drouth in May seriously damaged them, and the per cent. of small potatoes is, consequently, very large. Garfield, White Star and White Elephant produced the greatest yield, Garfield having the smallest per cent. of scab and small potatoes. The yield of each variety is shown in Table I.

TABLE I—PLANTED FEB. 23, DUG JUNE 21.

VARIETIES.	Condition of vines when dug.	Bus. of good potatoes.	Bus. of small.	Bus. of scab.	Total in bushels.
1 Chas. Downing.....	Dead	106.75	68 28	6.56	181.59
2 Early Sunrise.....	Dead	96.50	54.25	18.35	169.10
3 The Thorburn	Dead.....	119 00	56.00	9.65	184.65
4 Garfield.....	75 pr ct. dead.	147 00	49.00	4.35	200.35
5 Great Eastern.....	80 pr ct. dead.	96 50	50.70	8.52	155.72
6 White Star.....	95 pr ct. alive	138 25	55.73	3.05	197.53
7 Empire State.....	90 pr ct. alive.	103.50	66.41	5.25	175.16
8 Morning Star.....	98 pr ct. alive.	119.00	54.75	5.90	179.15
9 White Elephant.....	95 pr ct. alive.	126.00	61.25	4 37	191 62
10 Early Rose.....	Dead	82.08	63.00	10.71	155.79

EXPERIMENT WITH FERTILIZERS ON IRISH POTATOES.

The experiments were planted on "black slough" bottom land, to which no fertilizer had ever been applied. Rows were thirty-five yards long and three feet wide. The land was double plowed and harrowed until in a fine condition. The rows were opened by running two scooter furrows, and the fertilizer was applied and mixed in the soil by running a third scooter furrow. The potatoes were covered with a hoe, and they were cultivated flat the entire season. Early Rose from the Uniontown market was planted. Not any of the fertilizers used alone produced more than the unmanured plots. Cotton seed meal and kainit produced the greatest yield, and cotton seed meal, cotton seed hull ashes, and raw phos. the next, and these two plots were the only ones that yielded more than the unmanured plots.

The severe drouth in May caused the per cent. of small potatoes to be so large. When dug all the vines were dead. There was no difference in the growth of the vines.

Nothing definite can be drawn from these experiments. The yields will be found in Table II.

TABLE II—PLANTED MARCH 9TH; DUG JUNE 22D.

FERTILIZERS PER ACRE.	Bus. of good potatoes.	Bus. of small.	Bus. of scab.	Total in bushels.
1 200 lbs. C. S. meal	38.50	31.50	3.28	73.28
2 80 lbs. C. S. hull ashes	42.00	33.28	5.03	80.31
3 160 lbs. kainit,	33.28	28.00	5.25	66.53
4 400 lbs. raw phos.	40.25	29.66	5.25	75.16
5 200 lbs. stable manure	50.70	35.00	3.71	89.41
6 No manure	54.25	33.28	4.37	91.90
7 200 lbs. C. S. M. and 80 lbs. C. S. H. ashes ...	45.50	31.50	3.50	80.50
8 200 lbs. C. S. M., 80 C. S. H. A., 700 R. phos.	56.00	31.50	5.25	92.75
9 200 lbs. C. S. M., 160 lbs. kainit.	68.25	28.00	5.03	101.28
10 No manure	52.50	31.50	3.71	87.71

TABLE III—PLANTED MARCH 9TH, DUG JUNE 22.

	Bushel of good Potatoes.	Bushel of Small	Bushel of Scab.	Total in Bushels.
1 Planted deep	40.25	26.25	.....	66.50
2 Planted shallow	42.00	24.25	3.28	69.53
3 Planted shallow, and bedded on	35.00	24.25	.....	59.25
4 Planted deep and left flat	38.50	26.25	1.85	66.60

The object of this experiment was to compare deep and shallow planting in one and two, and in three and four, the effect of bedding as compared to level culture.

There was little difference in the yield. The results of this experiment are in favor of flat cultivation, but conclusions should not be drawn from one experiment.

KEEPING QUALITIES OF THE VARIETIES.

On July 3rd, some of each variety were placed in the gin house, which is cool and well ventilated. They were not allowed to touch but were spread out carefully.

To keep a large quantity in this manner would require a great deal of space, but by placing them in the gin house they can be kept until it is cool enough to barrel them.

Some were placed under the house on planks raised six inches above the ground and they kept as well as the ones placed in the gin house. The following table will show the per cent. sound potatoes of those placed in the gin house, October 1st, 1889:

KEEPING QUALITIES OF VARIETIES OF POTATOES.

VARIETIES.		Per cent. Sound.
1	Chas. Downing.....	90
2	Early Sunrise.....	78
3	The Thorburn.....	80
4	Garfield.....	100
5	Great Eastern.....	95
6	White Star.....	95
7	Empire State.....	73
8	Morning Star.....	86
9	White Elephant.....	72
10	Early Rose.....	100

ENGLISH PEAS.

Eight rows, ten feet long, were planted of each variety.

It was necessary to stick three of the varieties, British Queen, Carter's Telephone, and White Marrowfat.

Saxton's Earliest of all was from the U. S. Department, Carter's Anticipation and the Summit were from Northrop Braslen & Goodwin Co. The rest were from Thorburn.

TABLE IV—VARIETIES OF ENGLISH PEAS.

VARIETIES.	When planted.	Ready for table	No. days from planting	Growth.	Productiveness.
1 Alaska.....	Feb'y 4th.	April 12th.	67	small..	prolific.
2 British Queen.....	Feb. 4th.	May 12th.	97	large...	not prolific.
3 Carter's Telephone....	Feb. 4th.	May 3rd.	88	large...	not prolific.
4 First and Best.....	Feb. 4th.	April 13th	68	small..	prolific.
5 McLean's Advancer...	Feb. 4th.	April 23d.	78	small...	prolific.
6 Prince of Wales.....	Feb. 4th.	May 6th..	91	medium	prolific.
7 Rural New Yorker....	Feb. 4th.	April 12th	67	small...	prolific.
8 Saxton's Earliest.....	Feb. 14th.	April 22nd	67	medium	not prolific.
9 Yorkshire Hero.....	Feb. 4th.	May 9th..	94	small...	prolific.
10 White Marrowfat.....	Feb. 4th.	May 9th..	94	large...	not prolific.
11 Carter's Anticipation..	March 18.	Failure.....	.....	.....	.....
12 Summit.....	March 18.	May 4th..	47	small...	not prolific.

RADISHES.

Planted February 22, 1889—Seed from Thorburn.

Early White Turnip.—Ready for table in 23 days; very good, mild and sweet.

Long Purple.—Rough, and ill shaped, not desirable.

Long White Lady Finger.—Ready for table in 32 days; smooth and pretty when first edible, but soon grows rough and pithy.

New Japan Winter.—Inferior, strong and small.

French Breakfast.—Best; very mild, and continues edible for several weeks.

TABLE V—TOMATOES, YIELD OF VARIETIES.

VARIETIES.	1st picking, lbs. and ozs.		2nd picking, lbs. and ozs.		3rd picking, lbs. and ozs.		4th picking, lbs. and ozs.		5th picking, lbs. and ozs.		6th picking, lbs. and ozs.		Total in lbs. and ozs.
1 Acme	1-14	1-7	2-9	4-10	10-4	3-3	23-15						
2 Early Advance	1-10	3-1	5-6	5-12	17-3	11-8	44-8						
3 Golden Queen	1-11	2-14	2-6	9-8	20-12	6-12	43-15						
4 Livingston's Favorite....	1-2	5-4	8-3	10-12	19-7	6-4	51-0						
5 Trophy	2-8	4-9	9-1	3-8	10-12	4-4	34-10						
6 New Paragon	0-8	3-15	5-4	5-8	21-6	6-8	43-4						
7 New Jersey	1-8	1-8	6-6	3-4	13-6	5-0	31-0						
8 Livingston's Beauty	1-12	1-6	4-12	7-13	9-0	2-8	27-3						
9 Essex Hybred	0-0	1-15	2-9	5-10	21-6	1-12	33-4						
10 Conqueror	5-0	4-9	3-1	9-9	6-15	6-12	38-14						

The tomatoes were transplanted to open ground April 4th in rows checked four by four feet. Nine plants of each variety were planted, and a perfect stand of each was obtained.

The time of ripening could not be determined on account of the borer, the first fruit all being destroyed by them. The first picking was on June 25th, and the last Aug. 15th.

Table V gives the yield of each variety at each picking, and the total yield from nine plants of each.

Table VI is a description of the varieties.

Livingston's Favorite and Early Advance produced the greatest yield. Acme, Livingston's Favorite, and New Paragon were the best flavored.

TABLE VI DESCRIPTION OF VARIETIES OF TOMATOES.

	Seedsman.	Average weight in ounces.	Form.	Color.	Core.	Cavity around seed.	Flavor.	Corrugations.
1 Acme	Thorburn.	6	Round.	Pinkish.	Small.	None.	Best.	None.
2 Conqueror	Thorburn.	4½	Flat.	Red.	None.	None.	Good.	Very marked.
3 Early Advance	Thorburn.	3	Round.	Red.	Very small.	None.	Good.	None.
4 Essex Hybred	Landreth.	5½	Round.	Red.	Very small.	Large.	Good.	None.
5 Golden Queen	Thorburn.	3½	Irregular.	Yellow.	Medium.	None.	Good.	None.
6 Livingston's Beauty	Landreth.	5½	Round.	Pink.	None.	Large.	Very good.	None.
7 Livingston's Favorite	Thorburn.	6½	Round.	Red.	Small.	None.	Best.	None.
8 New Jersey	Thorburn.	8	Round.	Red.	Small.	Small.	Good.	None.
9 New Paragon	Thorburn.	7¼	Round flat.	Red.	Large.	Small.	Best.	Slight.
10 Trophy	Landreth.	8½	Round flat.	Red.	Medium.	Small.	Very good.	Slight.

WINTER-GROWN CABBAGE PLANTS.

Table VII contains notes on varieties that were planted in open ground October 11th, 1888, and allowed to remain during the winter.

One row of each variety was protected by inclining a foot plank on the north side, the rows running east and west. There was a marked difference in those protected in this manner; the plants being about three times larger than the unprotected in all the varieties except the Large Late Drumhead and the Bloomsdale Large Late Flat Dutch, which were about five times as large as those not protected. Only about twenty per cent. of the Drumhead Savoy, Landreth's Early Summer, and Green Curled Savoy unprotected, survived the winter.

On February 14th, sixteen plants each of the protected and unprotected were transplanted to rows three by three feet.

For the first month the protected continued to grow and remained larger than the unprotected, but after that the unprotected ones grew rapidly, until finally, no difference could be seen.

Protecting them did not cause them to head any earlier. Bloomsdale Large Late Flat Dutch, and Large Late Drumhead produced fine heads, and nearly all of them headed.

The plants were attacked by the Harlequin bug (*Strachia Histrionica*) as early as the 18th of February. They were destroyed by hand-picking and did not make their appearance again. Only two pickings were necessary to exterminate them.

In April and May they were attacked by the several varieties of cabbage worms, but they did no serious damage.

By carefully hand-picking the first that appeared they were prevented from doing serious injury.

A severe drouth prevailed during the entire month of May when the early varieties should have headed. Before the drouth ended they had run their course. The late varieties were not sufficiently advanced to be so seriously injured and headed in June. The plants thus grown in the open ground from October planting were very stout and

stocky as compared with the spindling specimens grown in the green house.

Green house plants were transplanted April 1st, but failed on account of the drouth in May.

TABLE VII—SEED SOWN OCT. 11, '88; TRANSPLANTED FEB. 14TH, 1889.

VARIETIES FROM LANDRETH.		Average weight per head.	Per cent. headed.
Late Flat Dutch.....	unprotected.	4	80
Late Flat Dutch.....	protected.	4½	75
Drumhead Savoy.....	unprotected.	Failure.	....
Drumhead Savoy.....	protected.	Failure.	....
Early Drumhead.....	unprotected.	2	10
Early Drumhead.....	protected.	2¼	12
Curled Savoy.....	unprotected.	Failure.	....
Curled Savoy.....	protected.	Failure.	....
Landreth's Early Summer.....	unprotected.	Failure.	....
Landreth's Early Summer.....	protected.	Failure.	....
Late Drumhead.....	unprotected.	5	90
Late Drumhead.....	protected.	4½	95

CANTALOUPE, PLANTED MARCH 25TH, 1889.

VARIETIES.	Seedsman.	Average weight in pounds.	Form.	Cavity.	Netting.	Quality.	Color of Flesh.	Size.
1 Baltimore	Thorburn.	4	oblong.	medium	very poor	good	yellowish green.	medium.
2 Hackensack	"	7	round.	large	good	good	sickly green.	large.
3 Nutmeg	"	2	round.	small	perfect	best	green.	small.
4 Nettet Nutmeg	Landreth.	2½	round.	small	perfect	best	green	small.
5 Hybred Bay View	Thorburn.	10	oblong.	medium	poor	good	pale green	large.
6 Pineapple	"	4½	oblong.	small	perfect	best	green	medium.
7 Ward's Nectar	"	2½	round.	small	poor	very good	green	small.

COMMENTS.

The melons were planted in drills on beds four feet apart and 35 yards long, the seed being dropped every eighteen inches in the drill. The crop was injured by the severe drought in May. Pineapple, Nutmeg, and Hybred Bay View, gave the best results. The Pineapple and Nutmeg were the best flavored. Hybred Bay View produced the largest melons.

There was no difference in the time of ripening of edible melons. A few inferior ones of the Bay View ripened early.

GRAPES.

Eleven varieties of grapes were planted in the vineyard March 11th, 1887, not less than two of any variety. The vineyard is on a northern exposure on what is known as "red prairie" land, the rows running east and west. The vines were placed eight feet each way. The land was thoroughly prepared and fertilized with cotton seed meal and cotton seed hull ashes. In February or March of each year they were fertilized with cotton seed meal and cotton seed hull ashes, sown broadcast and plowed in shallow, being careful not to run nearer than two feet to the plants, and not deep enough to break the roots. One row of field peas was planted in each middle and the vines left to decay on the land. The vines lessen the cost of cultivation by shading out the grass and weeds and acting as a mulch. The varieties received the same treatment in planting, fertilizing, pruning and cultivation. The young vines were cut back to two buds when transplanted. The first summer only one main cane was allowed to grow, and that was pinched back when it had attained a growth of three or four feet. All the laterals were pinched back when they were about one foot in length. No trellis was used the first summer, but only a straight, stout stick, to which the main cane was tied.

The following winter the vines were cut back to three or four buds. On the vigorous growing varieties three canes were allowed to grow, and on the weak ones only two. The canes were pinched back when they had attained a growth

of three or four feet, and the laterals when about twelve or eighteen inches. All the fruit was rubbed off as soon as formed. A trellis was used for the second summer's growth, consisting of three wires. The posts were placed between the alternate vines, making them sixteen feet apart. The first wire is two feet from the ground, the second and third twenty inches apart. The vines were spread out fan shape and tied securely to the wires. As soon as any inferior canes appeared they were rubbed off so as to throw all the strength into the main canes and laterals. The second summer's growth was cut back very severely, the vigor of the vines determining the length. If very vigorous longer canes were left, the less vigorous vines being pruned more severely. The laterals when very stout were cut back to two buds, and on some three were left. Only one was left when the lateral was not vigorous. On some of the vines one of the main canes was cut back to two buds to make new wood for the fourth summer. The vines were allowed to bear the third season after transplanting. In the spring of the third season all inferior laterals were rubbed off and only the stout ones allowed to grow. The laterals were pinched back as soon as the fruit had set, and tied up to the wires.

For the fourth summer the vines will be pruned so that new wood will be made for fruit, and enough buds will be left to bear a good crop of fruit.

The new wood bears the fruit. This method of pruning is a combination of the renewal and spur systems. In the table on the description of the varieties the effect of sacking the bunches is also seen. Two pound paper sacks were pinned over the bunches to prolong the season and to protect them from birds, insects, and fungi.

The effect of sacking was very marked on all the varieties of black grapes. The white grapes rotted in and out of sacks, except the Niagara. The Concord, Ives, Hartford, and Norton, lasted from fifteen to thirty days longer when sacked. The Hartford would have been a failure unless sacked.

All the Delawares that were sacked rotted, and those not sacked rotted slightly.

The Pocklington never ripened fully, and is not suited to this latitude. A few berries ripened two or three weeks before the others began to turn.

From this year's experiment we draw the following conclusions so far as they can be drawn from results of one year :

(1st.) That the grape grows and fruits well on "Red Prairie" land.

(2nd.) That the varieties of black grapes rot less than the white.

(3rd.) That sacking the white grapes (except Niagara) and Delaware (red) does not pay.

(4th.) That the Concord, Ives, Nortons Va., Niagara, and Hartford will pay for planting in the Prairie for table use, and are benefited by being sacked.*

The leaves were attacked by the grape leaf folder (*Desmia Maculalis Packard*), but not enough damage was done to injure the vines on the Station, but they destroyed all the foliage in some gardens in the neighborhood. After the fruit has been gathered a slight application of Paris Green or London Purple will check them.

*The rot which occurs in the paper bags seems to be caused by confined heat, since they generally shrink before rotting, and show no signs of fungus growth upon them.

DESCRIPTION OF VARIETIES OF GRAPES.

NAME,	Time of Ripening.	Color.	Size of Berry.	Condition in Bags.	Condition out of Bags.	Quality.	Size and Shape of Bunches.	Growth of Vine.	Prolificness.
1 Delaware.....	July 18.	Red.....	small.....	All rotted.....	Rotted slightly	Best.....	Small, compact, with one shoulder.	Vigorous...	Very prolific
2 Concord.....	July 26.	Blk with bloom.	large.....	Excellent.....	Good.....	Very good.	Large, shouldered.	Very vigor's.	Very prolific
3 Hartford.....	July 12.	Black.....	large.....	Excellent.....	Rotted badly.	Good.....	Medium, sometimes shouldered.	Very vigor's.	Prolific.
4 Ives.....	July 20.	Black.....	medium.....	Excellent.....	Good.....	Good.....	Medium, compact.	Vigorous...	Very prolific
5 Irving.....	August 1.	White.....	large.....	Rotted badly.	Rotted badly.	Very good.	Large, shouldered.	Very vigor's.	Not prolific.
6 Martha.....	July 26.	White.....	medium.....	Rotted slightly	Rotted badly.	Good.....	Small, compact...	Not vigorous	Not prolific.
7 Niagara.....	July 15.	White.....	very large.	Rotted slightly	Rotted slightly	Very good.	Very large, compact, shouldered.	Very vigor's.	Prolific.
8 Nortons.....	August 8.	Black.....	small.....	Excellent.....	Good.....	Good.....	Large, shouldered.	Very vigor's.	Very prolific
9 Prentiss.....	July 15.	White.....	small.....	Rotted badly.	Rotted badly.	Best.....	Small, compact...	Vigorous....	Prolific.
10* Pocklington.	.....	.....	.....	.....	.....	.....	.....	Not vigorous	Prolific.
11 Triumph.....	August 1.	White.....	large.....	Rotted badly.	Rotted badly..	Very good	Large, shouldered.	Very vigor's.	Not prolific.

*Did not ripen; not adapted to this latitude.

METEOROLOGICAL REPORT,

FROM AUGUST 1st, 1888, TO AUGUST 1st, 1889.

	Monthly mean.	Maximum.	Minimum.	Mean of maxima.	Mean of minima.	Monthly range.	Total precipitation	No. rainy days.	Mean relative humidity.	No. cloudy days.	No. fair days.	No. clear days.	Prevailing wind.
1888													
August.....	80.2	96.66	88.5	70.6	33	11.69	12	78.54	14	5	12	S. E.	
September.....	73.7	89.49	80.7	65.7	40	4.22	6	81.32	11	5	14	N. E.	
October.....	64.86	84.45	73.3	53.2	39	4.54	7	76.73	11	3	17	E.	
November.....	56.92	80.29	63.83	47.90	51	2.95	6	79.43	10	6	14	N. E.	
December.....	48.25	67.25	55.77	37.16	42	2.80	5	72.28	10	3	18	N. W.	
1889													
January.....	49.37	66.26	55.77	38.61	40	5.07	11	79.48	18	7	6	E.	
February.....	49.28	79.24	56.50	36.14	55	2.06	5	79.94	17	3	8	N. W.	
March.....	58.40	81.30	66.77	46.54	51	2.43	6	76.50	12	9	10	N. W.	
April.....	67.56	84.41	76.50	55.50	43	5.25	6	71.60	7	1	22	N. W.	
May.....	72.94	90.41	82.06	59.54	49	0.10	1	56.39	5	6	20	N. W.	
June.....	78.75	95.44	86.23	68.44	51	3.57	10	68.73	14	2	14	S.	
July.....	80.86	94.67	88.2	72.5	24	8.73	15	80.39	18	5	8	W.	

SOIL TEMPERATURES,
FROM AUGUST TO DECEMBER, 1888.

MONTHS.	DRAINED.						UNDRAINED.					
	Depth in inches.	Monthly mean.	Monthly range.	Gain in temperature by drainage.	Loss in temperature by drainage.	Maximum.	Minimum.	Depth in inches.	Monthly mean.	Monthly range.	Maximum.	Minimum.
August.	1	79.85	19	1.91	...	89.5	70.5	1	77.94	14.5	85.	70.5
	3	79.05	15	1.43	...	87.5	72.5	3	77.62	11	83	72
	6	79.61	9.5	1.91	...	84.0	74.5	6	77.70	9	82	73
	9	79.25	7.5	1.43	...	83	75.5	9	77.82	7	81.5	74.5
	12	79.34	6.5	1.65	...	82.5	76	12	77.69	6	81	75
	24	79.02	5	2.02	...	81	76	24	77.00	4.5	79.5	75
	36	77.20	5	1.18	...	80	75	36	76.02	2.5	77	74.5
September.	1	72.15	22	0.96	...	78	56	1	71.19	21	77	56
	3	72.09	17.5	0.81	...	77	59.5	3	71.28	17.5	76	58.5
	6	72.55	14.5	0.85	...	77	62.5	6	71.70	14.5	75.5	61
	9	73.40	11.5	1.20	...	76.5	65	9	72.20	12	76	64
	12	73.97	9.5	1.33	...	76.5	67	12	72.64	11	76	65.5
	24	74.97	6	1.67	...	77	71	24	73.30	8	76.5	58.5
	36	74.94	4.5	1.64	...	76.5	72	36	73.30	5	76	71
October.	1	63.73	19.5	3.31	...	72.5	53	1	60.42	18.5	70	51.5
	3	63.42	13.5	1.11	...	70	56.5	3	62.31	12.5	68	55.5
	6	63.94	8.5	0.87	...	68	59.5	6	63.07	8.0	67	59
	9	64.74	6.5	0.73	...	68	61.5	9	64.01	5.5	66.5	61
	12	65.76	5	1.07	...	68	63	12	64.69	5	67	62
	24	67.36	4.5	0.81	...	70.5	66	24	66.55	4	69	65
	36	69.24	4.5	1.67	...	72	67.5	36	67.57	4	70.5	66.5
November.	1	55.56	31	0.61	...	69.5	38.5	1	55.34	29	68.5	39.5
	3	56.11	26	0.51	...	68	42	3	55.60	25.5	67.5	42
	6	57.06	22.5	0.23	...	67.5	45	6	56.83	21.5	67	45.5
	9	58.33	20.5	0.12	...	67.5	47	9	58.21	18.5	67	48.5
	12	59.85	17	0.54	...	67	50	12	59.31	16.5	66.5	50
	24	62.66	11.5	0.80	...	67	55.5	24	61.86	11.5	66.5	55
	36	64.59	7.5	0.90	...	67	59	36	63.69	7.0	66	59
December.	1	45.30	22	0.92	...	56.5	34.5	1	44.38	18	54.5	36.5
	3	45.17	16	0.36	...	53.5	37.5	3	44.81	15	53	38
	6	46.06	15.5	...	...	53.5	38	6	46.06	14	53	39
	9	47.43	12	0.15	...	53	41	9	47.28	12	53	41
	12	48.72	11.5	0.19	...	53.5	42	12	48.53	10	53	43
	24	53.36	4.5	0.35	...	55.5	51	24	53.01	3.5	54	51
	36	56.41	5	0.34	...	59	54	36	56.07	4.5	58.5	54

SOIL TEMPERATURES,
FROM JANUARY TO AUGUST, 1889.

MONTHS.	DRAINED.						UNDRAINED.					
	Depth in inches.	Monthly means.	Monthly range.	Gain in temperature by drainage.	Loss in temperature by drainage.	Maximum.	Minimum.	Depth in inches.	Monthly mean.	Monthly range.	Maximum.	Minimum.
January.	1	46.61	24.5	0.62	...	59.5	35	1	45.99	20	57	37
	3	46.43	16.5	0.19	...	55	38.5	3	46.24	14.5	53.5	39
	6	46.93	12.5	0.02	0.32	53.5	41	6	47.25	11	53	42
	9	47.85	8.5	...	0.06	52	43.5	9	47.91	7.5	52	44.5
	12	48.62	7	0.11	...	52.5	45.5	12	48.51	6	51.5	45.5
	24	50.99	3	1.20	...	52.5	49.5	24	49.79	3	52.5	49.5
	36	53.12	1.5	0.13	...	54	52.5	36	52.99	2	54	52
February.	1	46.31	34.5	0.56	...	67.5	33	1	45.75	29	65.5	36
	3	45.79	27.5	0.04	...	63.5	36	3	45.75	26	63	37
	6	46.11	23	...	0.24	61	38	6	46.35	20.5	60	540
	9	46.93	19	...	0.40	59	40	9	47.33	18.5	58.5	43
	12	47.66	14.5	0.13	...	57	42.5	12	47.53	13.5	56.5	40
	24	49.46	7.5	0.44	...	54.5	47.5	24	49.02	7	54	47
	36	51.49	2.5	0.11	...	53	50.5	36	51.38	3.5	53.5	50
March.	1	54.66	27.5	1.57	...	69	41.5	1	53.09	21	63	42
	3	52.51	18.5	0.05	...	62	43.5	3	52.46	18	61	43
	6	53.45	14.00	0.90	...	60	46	6	52.55	14.5	59	45.5
	9	53.22	11.5	0.32	...	59	47.5	9	52.90	11.5	58.5	47
	12	53.20	9	0.40	...	58	49	12	52.80	8.5	47.5	49
	24	53.59	7	0.48	...	57.5	50.5	24	53.11	6.5	56.5	50
	36	53.88	5	0.21	...	56.5	51.5	36	53.67	4.5	56.5	52
April.	1	63.31	20.5	1.87	...	71.5	51	1	61.44	18	69	51
	3	61.60	14.5	0.35	...	67.5	53	3	61.25	14	67	53
	6	61.95	12.5	0.76	...	67	55.5	6	61.19	11	66	55
	9	61.76	9.5	0.42	...	66	56.5	9	61.24	9.5	65.5	56
	12	61.50	8	0.47	...	65	57	12	61.03	7.5	64.5	57
	24	60.80	6.5	0.42	...	64	57.5	24	60.38	6.5	63.5	57
	36	59.67	6	0.01	...	62.5	56.5	36	59.66	6	62.5	56.5
May.	1	70.49	24	1.72	...	79	55	1	68.77	21.5	77.5	56
	3	68.78	18.5	0.36	...	76	57.5	3	68.42	17.5	74.5	57
	6	68.83	15	0.88	...	74	59	6	67.95	14	73.5	59.5
	9	68.39	12	0.75	...	73	61	9	67.64	12	72.5	60.5
	12	68.22	10.5	0.83	...	72.5	62	12	67.39	10.5	71.5	61
	24	67.24	8.5	0.91	...	71	62.5	24	66.33	8	70	62
	36	65.42	6.5	0.52	...	69	62.5	36	64.90	6	68	62

SOIL TEMPERATURES,
FROM JANUARY TO AUGUST, 1889—Continued.

MONTHS.	DRAINED.						UNDRAINED.					
	Depth in inches.	Monthly mean.	Monthly range.	Gain in temperature by drainage.	Loss in temperature by drainage.	Maximum.	Minimum.	Depth in inches.	Monthly mean.	Monthly range.	Maximum.	Minimum.
June.	1	77.19	28.5	1.95	..	85	56.5	1	75.24	25	81.5	56.5
	3	74.94	21.5	0.90	..	81	59.5	3	74.04	20	579	559
	6	74.47	16.5	1.17	...	79.5	63	6	73.36	16	78	62
	9	74.25	13.5	1.27	....	78.5	65	9	72.98	12.5	77	64.5
	12	73.92	10.5	1.22	....	77.5	67	12	72.70	11	76.5	65.5
	24	72.80	6.5	1.36	....	75.5	69	24	71.44	7	74	67
36	70.86	5	1.02	....	73.5	68.5	36	69.84	5	72.5	67.5	
July.	1	79.44	10	2.26	....	85	75	1	77.18	7.5	81	73.5
	3	77.98	6.5	1.16	....	81.5	75	3	76.82	6	79	573.5
	6	77.97	5	1.41	....	80.5	75.5	6	76.56	4	579	575
	9	77.81	3.5	1.59	...	79.5	76	9	76.22	3	78	75
	12	77.62	3	1.59	...	79.5	76.5	12	76.03	2.5	77	575
	24	76.79	2.5	1.95	...	78	75.5	24	74.84	1.5	75.5	574
36	74.92	2.5	1.48	....	76	73.5	36	73.44	1	574	72.5	
August.	1	78.01	12	2.50	....	83.5	71.5	1	76.51	12	582	69.5
	3	76.84	9.5	.95	....	81.5	72	3	75.88	9	580	571
	6	77.24	6.5	1.28	....	80.5	74	6	75.96	6.5	79	573
	9	77.37	5.5	.98	....	80	75.5	9	76.39	4	79	75
	12	77.60	3.5	1.46	....	79	576	12	76.14	3	578	575
	24	77.61	1.5	1.93	....	78.5	77	24	75.68	2	77	75
36	76.55	1	1.96	....	77	76	36	74.59	1.5	75.5	74	

Two sets of soil thermometers were placed, one on drained and the other on undrained land where the "red prairie" blended with the "black slough bottom." Each set contained seven thermometers with their bulbs placed 1, 3, 6, 9, 12, 24, 36 inches, respectively, below the surface of the soil. The thermometers are closed tubes with a large bulb at the bottom that comes in contact with the soil. The tubes are protected by a tubular piece of wood, the wood being cut away on one side above the surface, and the tube containing the mercury is graduated like the ordinary thermometers. The deep thermometers are made by lengthening the tube, and the wood that protects it. They were protected from the direct rays of the sun by latticed boxes that admitted a free circulation of the air.

The set on drained land was placed between two lines of tile which are thirty-five feet apart and four feet deep.

The set on undrained land was placed eighty feet from the line of tile.

The thermometers were placed eight inches apart in the boxes. They remained in the soil two weeks before regular observations were taken. The soil was not packed, but was allowed to settle gradually, and was filled in as it settled. The observations were commenced on the first of August, 1888.

The observations are taken three times daily, at 7:30, 2:30, and 6:30. On examining the tables it will be seen that there was a gain in the temperature on the drained land, except in January and February on the 6 and 9 inch thermometers, and on the 6 inch one in December, when they were the same.

The greatest gain of the one inch was in October, 1888, when the monthly mean was 3.31 greater than in the undrained land. The least gain was in February, 1889, when it was only .56.

The greatest gain of the three inch bulb was 1.43 in August, 1888, and least was .04 in February, 1889. The gain in the 6, 9, 12, 24, 36, ranged from .67 to 2' in June, July, August, September and October, and in November, Decem-

ber, January, February, March, April and May from .12 to .95, except in February, when the 6 and 9 inch bulbs on the undrained were higher, and when equal in December, 1888.

The *daily* means of the 12, 24, 36 inch bulbs varied in February more than in any other month. The undrained being equal to and sometimes greater than the drained, but the *monthly* means were greater on the drained land. The *daily* mean of the undrained never exceeded the drained more than half a degree at any time during the month, and fell below only half degree.

The monthly mean of the one inch thermometer on the drained land varied but little from the monthly mean of the exposed thermometer in the observatory. The least difference was in August, 1888, when the exposed was only .35 greater, and the greatest was in April, when it was 4.25 greater. The average difference being 2.1.

There was great difference in the monthly range of the one inch soil thermometers and the exposed thermometer, the range of the exposed being often double that of the soil. The air circulated freely in the drained land, as is shown by the one inch bulb. The temperature of the one inch bulb on the drained land, in winter, fell two or three degrees lower and rose two or three degrees higher than the undrained land bulb. In the summer it rose higher, but never fell below that of the undrained land, showing that more evaporation took place on the undrained land.

The daily range of the 12, 24, 36 inch bulbs never exceeded one degree. For a week at a time they registered the same. The effect of a cold wave could be seen on the deeper ones from one to three days after it came. During rainy days in the summer they registered nearly the same, but in winter the drained land one inch bulbs always registered from one to three degrees higher. The effect of rain on the three inch bulb was not so marked, and not perceptible on the 12, 24, 36 inch bulbs.

In April, during three days of rain, they varied; one day the one inch bulbs on the drained and undrained land were

equal, and one day the undrained registered higher, and the next the drained land registered higher.

During four days of rain in October, 1888, the drained bulb registered higher three days, and the undrained only one.