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EXPERIMENTS WITH LIME ON ACID SOILS.

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# Experiments with Lime on Acid Soils.

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The very interesting results obtained with lime on sandy, upland soils in Rhode Island\* suggested to the writer, that a similar acid condition might exist in our sandy Gulf coast soils, and be the cause of the peculiar behavior of some vegetable crops in that region.† Through the cooperation of Mr. A. W. Orr of Deer Park, Washington County, Ala., the Station has been able to make some preliminary investigations on the effect of lime on these soils, the results of which are herewith presented. They are in no sense final, but they seem suggestive and interesting enough to warrant publication at this time. The work so far done includes some experiments in the greenhouse here with soils shipped from Deer Park, and field experiments conducted at Deer Park by Mr. Orr, whose report forms a part of this bulletin.

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## EXPERIMENTS AT AUBURN.

The samples of soil were received here on December 2, 1896. No. 1 was the ordinary upland soil of the coast region, quite sandy, and rather deficient in humus. No. 2, the so called "Savannah Land" was a light gray sandy loam. These "Savannahs" are low lying, level, treeless expanses, usually too wet for cultivation without drainage. They are characteristic of the coast region, and are only considered fit for cultivation to rice or sugar cane. No. 3 was a stiff black soil from a swampy "hammock"—the low lying timbered lands along small streams. The three samples represent the prevailing types of coast soils. All of them gave a prompt and decided acid reaction with litmus paper. A portion of each lot was fertilized with cottonseed meal and placed in a shallow box, 20x36 inches, having a partition dividing it into two equal parts. On one side of the partition in each box a quantity of slacked lime was dug into the soil, the other side being left without lime. The boxes were watered and left on the green

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\* See Bull. 46 of the Rhode Island Experiment Station, and Annual Reports for 1894, 1895 and 1896

† See Bull. 37 of the Mississippi Experiment Station, "Fruits and Vegetables on the Gulf Coast."

house bench till January 1. On again testing with litmus paper the limed ends of the boxes now gave a strong alkaline reaction. The boxes were planted to American Wonder peas. It soon became evident that too much lime had been used, for after coming up, the peas in the limed ends of the boxes all died. They did not seem able to strike root in the soil. The boxes were replanted at intervals, but without success, until about the middle of March, when they were planted to lettuce and radishes. On April 2 it was noted that at last a good stand had been secured in two of the limed boxes. The one containing the upland soil was still a complete failure. In box No. 3. with the hammock soil the lettuce was decidedly best in the limed end, no difference could be noted in the radishes. In box No. 2., the Savannah soil, the lettuce was at least three times as large in the limed end, while the radishes seemed hardly so good with the lime. The radishes continued to grow luxuriantly in both ends of both boxes, but at maturity they were slightly better in each case in the limed ends. With the lettuce the difference was very marked. In the unlimed ends of both boxes it was stunted and sickly, with leaves less than two inches long, but in the limed ends it grew rank and luxuriant. The result was as striking a one as the experimenter could desire, and it is well illustrated by the



accompanying reproduction of a photograph of one of the boxes taken at the close of the experiment. In the limed end (to the right in the cut) the luxuriant lettuce fills the box, almost hiding the radish tops from view, while in the unlimed end the lettuce leaves are so small as to be almost hidden by the sides of the box, and it was necessary to press aside the radish leaves to show them at all.

The results obtained by Mr. Orr are somewhat contradictory, and in interpreting them it should be borne in mind that the lime was applied quite late in the Spring (March 2), and that the greenhouse experiments show that it had not had time to lose its injurious caustic effects by April 1, when most of the planting was done. Then, too, the date of planting was too late for the best success with a number of the crops planted. The strikingly good results with corn, tomatoes, lettuce, and tobacco indicate the advisability of continued experiments with lime in this region, or at any other points in the State where the soil gives an acid reaction. At Auburn our soils seem to be almost or quite neutral, and so far, field experiments with lime have given no striking results. The reaction of the soil can be easily and quickly tested by any one, by pressing into its moistened surface slips of litmus paper such as can be found at most drug stores. If the soil is acid the blue paper will be turned red, if it is alkaline the red paper will be turned blue, and if it is neutral or nearly neutral neither color will be changed.

The freedom of the tomatoes on the heavily limed plot from Blight, or Bacteriosis, a disease that is very prevalent and destructive in our southern counties, is especially noteworthy, since it goes to corroborate the result of some experiments with this disease conducted by the writer at the Ocean Springs branch of the Mississippi Experiment Station.\* In all cases where it has been tried, heavy applications of lime seem to have had a decidedly beneficial effect in preventing this dreaded disease.

F. S. EARLE.

AUBURN, ALA., Feb. 18, 1898.

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\*See 6th Annual Report of the Mississippi Experiment Station, pp. 53-61.

## Field Experiments with Lime at Deer Park.

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A piece of ordinary upland soil measuring 6x7 rods was selected for the experiment. It was divided into four plots each 6 rods long and  $1\frac{3}{4}$  rods wide. On March 2, freshly slacked lime was applied to these plots as follows:—

Plot 1.—3 bbls. or about 45 bbls. per acre.

Plot 2.—2 bbls. or about 30 bbls. per acre.

Plot 3.—1 bbl. or about 15 bbls. per acre.

Plot 4.—No lime.

On March 3 a very heavy rain fell so that it was necessary to replot the land before planting. On March 20 furrows were opened crossing these four plots, and fertilizer consisting of equal parts cottonseed meal, acid phosphate and kainit was dropped in the furrow at the rate of 8 lbs. per row (about 800 lbs. per acre), and bedded on. On April 1 the tops of the beds were leveled down and planting was begun. The following is a list of the crops planted and the results noted with each.

Row 1.—Abundance pea. Seeds did not come as quickly on the limed as on the unlimed land. The plants on plots 3 and 4 had dark green foliage and made a good half crop. On plot 2 the foliage was lighter, and it made about one third of a crop. On plot 1 the plants were scattering and very pale and sickly; crop a failure. In this case the lime did no good. Small applications did no harm, but the heavier ones were very harmful.

Row 2.—White dent corn from Northern Alabama planted in hills two and one half feet apart, and thinned to two plants in the hill. Plot 1 fine, foliage dark green, ears well filled out and of fair size, a good crop. Plot 2, a little lighter

color but nearly as good. Plot 3 almost a failure. Plot 4. a complete failure; it burned out with the drouth. [This corn was evidently planted too thick for good results on thin land, which makes the success with the heavy liming the more gratifying. F. S. E.]

Row 3.—German millet. Plot 4, good stand, fine crop, four feet high. Plot 3, good stand, fair crop, three feet high. Plot 2, poor stand, almost a failure, two feet high. Plot 1, very scattering, a failure, one foot high. [Here, as with the peas, the caustic effect of the freshly applied lime was markedly injurious.]

Row 4.—Mayflower tomato. The plants were transplanted from a seed bed. All grew well at first, but as the plants became older, plot 4 all blighted so badly that no fruit was obtained. Plot 3 was a little better, but two-thirds blighted. Plot 2 was much better; no blight was seen, the crop was fair, but the foliage was a little off color. Plot 1, plants extra fine, good color, and no signs of blight or other disease. The boll-worm did not seem to trouble this plot as badly as the others. A noticeable point in connection with this plot was that the vines remained green till frost, and still carried flowers and fruit, while on the other plots all were dead and dried up.

Row 5.—Early Valentine beans. No difference could be noted with this crop. After the dry weather came on all the plots were a failure.

Row 6.—Ruta Bagas. They did nothing; a failure on all the plots. [Entirely too late for success with this crop.]

Row 7.—Scarlet button radish. Crop good on all plots. The lime seemed to make no difference.

Row 8.—Lettuce; Black-Seeded Simpson. Plot 4, crop fair. Plot 3, good crop. Plot 2, still better. Plot 1, much the best. It was extra good, and the plants remained green all summer.

Row 9.—Egg Plant. Set with transplanted plants. All plots grew much alike till the first fruits set, when the plants on the limed plots blighted badly. The unlimed plot made a fair crop. [It is hard to reconcile this result with that obtained with tomatoes. It is possible that the death of the plants on

the limed plots was due to some other cause than the bacterial blight.]

Row 10.—Abundance pea, fertilized and planted ten days later. A failure. [Entirely too late for this crop.]

Row 11.—Brazilian corn and Florida butter beans. The corn grew fairly well, but had the best ears and the best color on plot 2. The beans were all about alike. They stayed green and bore fruits and blossoms till frost.

Rows 12, 13 and 14.—Amber Sorghum, Northern seed. No difference on the different plots; all small.

Rows 15, 16 and 17.—Stowels Evergreen sweet corn. All failed.

Rows 18 and 19.—Spanish peanuts. The limed land had the largest vines and the most nuts. On the no-lime plot the vines were light and had less fruit.

Row 20.—Seed-leaf tobacco, home-grown seed. Plants set May 12. The limed plots all a good crop, the no-lime plot almost a failure.

Row 21.—Livingston Favorite tomato. Plants transplanted May 12, but owing to the drouth the crop was a failure.

Row 22.—Okra, planted May 12. No difference—a fair crop on all plots.

Rows 24 and 25.—Irish potatoes, planted July 8. The seed seemed immature and came up poorly. No difference in growth of top, but the tubers were largest on plot 1.

Row 26.—Early Valentine beans, planted July 22. Plot 3 gave the best results, better vines and more fruit.

Row 27.—Flax, Northern seed. Complete failure; the seed would not germinate.

Rows 28, 29 and 30.—Kaffer corn, planted August 1. All grew and fruited splendidly, a little the tallest on the limed land.

Rows 31 and 32.—White Spine cucumber, planted July 22. No difference in vine or fruit. All badly injured by insects.

A. W. ORR.

DEER PARK, ALA., February 14, 1898.