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Time of Applying Nitrate of Soda to Cotton

PART I
Experiments at Auburn, 1910-1916

PART II
Experiments in Various Alabama Counties
1914-1919

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and
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SUMMARY

When 140 pounds of nitrate of soda per acre was applied to cotton at different stages of growth,—namely at planting time, first cultivation after thinning, when first squares appear and first blooms are visible,—the largest average increase (80 pounds of seed cotton per acre) came from the application made at the first cultivation after thinning, that is about 40 days after planting. These results were secured at Auburn before the boll weevil did serious damage.

Under the conditions prevailing during the years when 14 experiments with nitrate of soda for cotton were conducted in various counties of Alabama, the average of these fourteen tests indicate: (1) That nitrate of soda at the rate of 100 pounds per acre gave best results when applied by, or before, the time the first squares appeared; (2) That 200 pounds of nitrate of soda per acre when used in two applications, (100 pounds when "dirted" and 100 pounds about three weeks after the first blooms appeared), was more effective and slightly more profitable than was only 100 pounds of nitrate of soda; (3) That 100 pounds of nitrate of soda per acre applied when the plants were first "dirted" was more effective than was 200 pounds of cotton seed meal applied at the same date, each being followed with a later application of 100 pounds nitrate of soda.

The tests at Auburn and in other parts of the State seem to indicate that the best time to apply nitrate of soda to cotton is either before or by the time the first squares appear.

TIME OF APPLYING NITRATE OF SODA TO COTTON

PART I

BY E. F. CAUTHEN

EXPERIMENTS AT AUBURN, 1910-1916

The Experiment Station began in 1910 an experiment to find the results of applying 140 pounds of nitrate of soda per acre to cotton at different stages of its growth. The stages of application were (1) at planting, (2) "dirting" (first cultivation of the plants after they had been thinned to a stand), (3) appearance of first squares, and (4) when first blooms were visible.

This experiment was made in some years on gravelly sandy loam upland and in other years on upland sandy loam with clay subsoil. The land was plowed in the early spring, a home mixed complete fertilizer put in the rows and bedded on. The rows were 3½ feet apart. The plantings during the first five years of the experiment were made in the latter part of April and the first of May, and in the remaining years of the test they were made during the first half of April. Cook or Cleveland was the variety usually planted.

Special effort was made to get a perfect stand of plants, and a uniform stand was secured every year. All yields are based on a good stand at picking time.

At the time of planting, there was applied a mixture of 160 pounds of acid phosphate, 100 pounds of cotton seed meal, (except in 1915 and 1916), and 80 pounds of kainit or its equivalent per acre. Each year 140 pounds of nitrate of soda was applied at the different periods indicated in the table. The cottonseed meal when used tended to obscure the results of nitrate of soda. The facts should be kept in mind that 100 pounds of cottonseed meal were used and that the tests were made on land fairly well supplied with available nitrogen.

Table I.—Increase at Auburn From Applying 140 Pounds of Nitrate of Soda Per Acre to Cotton at Different Stages of Growth (1)

Stage of growth	Av. date	Av. No. days between planting and application	Pounds of seed cotton per acre yearly							Average increase over nitrate applied at planting
			1910	1912	1913	1914	1915	1916	Av.	
		<i>Days</i>								<i>Lbs.</i>
Planting	5- 2		824	1241	1316	578	1185	763	985	
"Dirting"	6-10	29	736	1471	1384	690	1112	874	1065	80
"1st squares"	7-12	50	748	1471	1350	680	1052	790	1015	30
"1st blooms"	6-21	71	760	1478	1264	716	1182	713	1019	34

(1) A complete fertilizer was applied before each planting, except in 1915 and 1916; see page 4.

The above table does not show the total increase from the 140 pounds of nitrate of soda, but only the increases made over the application at planting time. All side applications proved more beneficial than the one made when the cotton was planted. Of the three different side applications the one made at "dirting time," 39 days from planting, was the most effective. It gave an average increase of 80 pounds of seed cotton per acre more than the application at planting time. The later applications were less effective.

The boll weevil reached Auburn in 1915. The infestation in 1916 was not sufficient to do material damage. Thus the results shown in the preceding table were obtained either with slight or no boll weevil infestation. After the boll weevil came, the plantings were made earlier.

The same experiment with some changes was continued through 1917, 1918, and 1919. Although this experiment proved inconclusive, it seemed to indicate that the stages of growth of cotton plants affording the largest increases from the application of 140 pounds of nitrate of soda per acre were planting time and dirting time.

The best time to apply nitrate of soda has changed since the advent of the boll weevil. Before its coming the best time proved to be about 40 or 50 days after planting, but since its coming the best time seems to be at planting or at dirting time.

TIME OF APPLYING NITRATE OF SODA TO COTTON

PART II

BY J. T. WILLIAMSON

EXPERIMENTS IN VARIOUS ALABAMA COUNTIES, 1914-1919

The experiments recorded in Part II of this bulletin were made possible by the Local Experiment Law passed by the Legislature of Alabama in 1911. These experiments were conducted in various Alabama counties by selected farmers. In conducting these tests the writer endeavored so far as possible to have the nitrate of soda and the cottonseed meal used under natural farm conditions. The experimenters were directed to apply the nitrate of soda at certain stages of growth of the cotton. However, in doing so they were expected to make these applications just as they would have made them to much larger areas of their own crops at these particular stages of growth. In other words, an attempt was made to see that these experiments were carried out on a thoroughly practical scale. In some cases weather conditions made it necessary to delay the applications of nitrate of soda beyond the time intended for its application. For the same reason, it was sometimes necessary to make certain applications of nitrate without covering; although the directions specified that it be lightly covered and thoroughly mixed with the soil.

The areas on which the experiments were made were selected and measured by some representative of the Experiment Station. The correct quantity of fertilizer for each plot was weighed and sacked at Auburn and shipped to each experimenter in labeled bags. Uniform directions for applying fertilizers were supplied to each cooperative farmer, and from time to time representatives of the Experiment Station visited each experimenter to assist him in conducting the test and to take notes on the different plots.

In some cases no fertilizer was applied other than the nitrogenous fertilizer sent from Auburn. In all cases where fertilizer was used other than that sent from the Experiment Station, the same quantity was applied to each plot, and the kind and approximate

quantity applied was recorded. It is possible that in some cases better yields would have been obtained had there been made an application of phosphate, or of phosphate and potash, in addition to the nitrogenous fertilizer.

The same strain of cotton was used thruout any single test.

It should be emphasized that all of the experiments were located north of Montgomery, except one which was conducted twelve miles south of Montgomery in 1914. Had these tests been located in territory then heavily infested with boll weevil, it is probable that the earlier applications of nitrate of soda would have been still more profitable in comparison with the later applications.

In calculating the profits, prices nearly up to those prevailing now were assumed as follows:

Seed cotton	12 cents per pound
Nitrate of soda	\$75.00 per ton
Cottonseed meal	\$70.00 per ton

AVERAGE RESULTS ON VARIOUS SOILS OF APPLYING NITRATE OF SODA TO COTTON AT DIFFERENT STAGES OF GROWTH

The following pages record the results of the application of nitrate of soda to cotton at different stages of growth in fourteen experiments on various soils in Alabama. These tests were made on farms of men especially interested in and suited for experimental work of this nature. The two forms of nitrogen were subjected to usual farm practices so far as possible in keeping with directions for time of application.

Table II shows the average yields of seed cotton per acre; the calculated increases and profits due to the application of nitrate of soda to cotton at different stages of growth; the rate, kind, and amount of nitrogenous fertilizer applied; and the dates of application. (See page 8)

Table II.—Average Yield, Increase, and Profit Obtained When Nitrate of Soda Was Applied to Cotton at Different Stages of Growth

Kind and amount of fertilizer per acre, and stages of growth for application.	Average date nitrogenous fertilizers were applied	Average yield s.e.d cotton	Increase over no nitrogen plot	Profit from nitrogenous fertilizers
No nitrogen -----		Lbs. 538	Lbs.	Dollars
100 lbs. nitrate of soda when first dirted just after thinning -----	May 31	659	124	11.13
100 lbs. nitrate of soda when first squares appear -----	June 17	665	134	12.33
100 lbs. nitrate of soda when first blooms appear -----	July 3	644	116	10.17
No nitrogen -----		524		
100 lbs. nitrate of soda three weeks after first blooms appear -----	July 22	643	109	9.33
100 lbs. nitrate of soda when first dirted just after thinning -----	June 3 July 17	719*	175	13.50
100 lbs. nitrate of soda three weeks after first blooms appeared ---				
200 lbs. cottonseed meal when first dirted just after thinning --	May 31 July 18	671	117	3.29
100 lbs. nitrate of soda three weeks after first blooms appeared ---				
No nitrogen -----		564**		

* Average 13 experiments.

** Average 9 experiments.

Average planting date April 23.

SUMMARY OF RESULT FROM AVERAGE OF FOURTEEN EXPERIMENTS WITH COTTON

These experiments with cotton were made on soils of about average fertility, as indicated by the yields of the no-nitrate plots. The average date of planting cotton was April 23. The average date of the first application of nitrate of soda was May 31.

Table II shows that the largest increase in seed cotton (175 pounds per acre) and the largest profit (\$13.50 per acre) were secured when nitrate of soda was applied to cotton at the rate of 200 pounds per acre, half being applied when the plants were first "dirted", just after thinning, and the second 100 pounds being applied about three weeks after the first blooms appeared.

Constrast the above with the less favorable result from substituting cottonseed meal for half the nitrate. Where 200 pounds of cottonseed meal was applied when the plants were first "dirted", and 100 pounds nitrate of soda added to this three weeks after the first blooms appeared, an increase of 117 pounds seed cotton per acre was secured, at a profit of only \$3.29 per acre.

Where 100 pounds of nitrate of soda per acre was used the largest increase (134 pounds seed cotton per acre) and the largest profit (\$12.33 per acre) were obtained where the nitrate was applied by the time the first squares appeared.

Table III.—Experiments With Cotton in Macon, Lamar, and DeKalb Counties

Kind and amount of fert. per acre and stages of growth it was directed to be applied	1919 C. B. Sanders, Notasulga			1919 W. H. Vail, Millport			1919 B. F. Denton, Collinsville		
	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied
	Lbs. 120	Lbs.		Lbs. 432	Lbs.		Lbs. 488	Lbs.	
No nitrate -----									
100 lbs. nitrate of soda when first "dirted" just after thinning --	144	22	June 10	592	168	June 20	680	204	June 14
100 lbs. nitrate of soda when first squares appear -----	128	4	June 10	576	160	July 8	672	208	June 21
100 lbs. nitrate of soda when first blooms appear -----	128	2	July 2	560	152	July 8	728	276	July 18
No nitrate -----	128			400			440		
100 lbs. nitrate of soda three weeks after first blooms appeared ---	128	4	July 23	544	140	July 21	728	244	July 29
100 lbs. nitrate of soda when first "dirted"; and 100 lbs. nitrate of soda three weeks after first blooms -----	128	8	{ June 10 July 23	672	264	{ June 20 July 21	1104	576	{ June 14 July 18
200 lbs. cottonseed meal when first "dirted"; and -----			{ June 10 July 23			{ June 20 July 21			{ June 14 July 29
100 lbs. nitrate of soda three weeks after first blooms appeared ---	120	4	{ June 10 July 23	544	132	{ June 20 July 21	960	388	{ June 14 July 29
No nitrate -----	112			416			616		

Table IV.—Experiments With Cotton in Cherokee and DeKalb Counties

Kind and amount of fert. per acre and stages of growth it was directed to be applied	1919			1918			1918		
	J. J. Green, Cedar Bluff			J. J. Green, Cedar Bluff			J. W. Watson, Collinsville		
	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied
No nitrate -----	Lbs. 720	Lbs.		Lbs. 688	Lbs.		Lbs. 744	Lbs.	
100 lbs. nitrate of soda when first "dirted" just after thinning --	1008	200	June 6	760	88	May 29	968	228	June 12
100 lbs. nitrate of soda when first squares appear -----	976	220	June 20	752	96	June 20	904	168	June 20
100 lbs. nitrate of soda when first blooms appear -----	912	138	July 17	744	104	July 5	832	100	July 3
No nitrate -----	792			624			728		
100 lbs. nitrate of soda three weeks after first blooms -----	920	144	July 28	688	84	July 25	848	116	July 14
100 lbs. nitrate of soda when first "dirted"; and 100 lbs. nitrate of soda three weeks after first blooms appeared ---	1064	304	{ June 6 July 28	688	104	{ May 29 July 8	832	96	{ July 24 ?
200 lbs. cottonseed meal when first "dirted"; and -----			{ June 6			{ May 29			{ June 12
100 lbs. nitrate of soda three weeks after first blooms appeared ---	952	208	{ July 28	688	124	{ July 8	888	148	{ July 24
No nitrate -----	728			544			744		

Table V.—Experiments With Cotton in Chambers, Limestone, and Jefferson Counties

Kind and amount of fert. per acre and stages of growth it was directed to be applied.	1918 B. H. Andrews, Lafayette			1917 N. R. Nichols, Athens			1917 J. R. Greene, East Lake		
	Yield seed cotton per acre	Increase above no n.rogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied
	Lbs.	Lbs.		Lbs.	Lbs.		Lbs.	Lbs.	
No nitrate -----	832			320			496		
100 lbs. nitrate of soda when first "dirted" just after thinning --	992	128	May 15	400	76	June 15	576	84	June 6
100 lbs. nitrate of soda when first squares appear -----	1088	192	June 1	512	184	July 1	600	120	June 27
100 lbs. nitrate of soda when first blooms appear -----	960	32	June 25	608	276	July 15	560	76	June 12
No nitrate -----	960			336			480		
100 lbs. nitrate of soda three weeks after first blooms appeared ---	992	4	July 15	600	260	Aug. 4	568	86	Aug. 1
100 lbs. nitrate of soda when first "dirted"; and 100 lbs. nitrate of soda three weeks after first blooms appeared ---	1040	24	{ May 15 July 15	672	328	{ June 15 Aug. 4	672	188	{ July 12 Aug. 1
200 lbs. cottonseed meal when first "dirted"; and -----			{ May 15			{ June 15			{ June 6
100 lbs. nitrate of soda three weeks after first blooms appeared ---	800	244	{ July 15	608	260	{ Aug. 4	720	234	{ Aug. 1
No nitrate -----	1072			352			488		

Table VI.—Experiments With Cotton in Chilton, Autauga, and Shelby Counties

Kind and amount of fert. per acre and stages of growth it was directed to be applied	1916 John Mims, Clanton			1916 D. L. Yarbrough, Prattville			1916 Claymont Farm, Vincent		
	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied
	Lbs.	Lbs.		Lbs.	Lbs.		Lbs.	Lbs.	
100 lbs. nitrate of soda when plants were dirted -----	400	80	May 20	718	52	April 21	272	96	June 5
No nitrate -----	320			666			176		
100 lbs. nitrate of soda when first squares appeared -----	448	124	June 13	708	61	May 10	304	120	June 20
100 lbs. nitrate of soda when first blooms appeared -----	464	136	June 24	652	24	June 6	240	48	July 1
100 lbs. nitrate of soda three weeks after first blooms appeared ----	480	148	July 15	694	85	June 27	256	56	July 25
No nitrate -----	336			590			208		
100 lbs. nitrate of soda when plants were dirted; and -----	544	208	{ May 20	854	264	{ April 21	304	96	{ June 5
100 lbs. nitrate of soda three weeks after first blooms appeared ---			{ June 10			{ June 21			{ July 25
200 lbs. cottonseed meal when plants were dirted; and ----	544	208	{ May 20	682	92	{ April 21	256	48	{ June 5
100 lbs. nitrate of soda three weeks after first blooms appeared ---			{ June 10			{ June 19			{ July 25

*Table VII.—Experiments With Cotton in Marshall
and Montgomery Counties*

Kind and amount of fert. per acre and stages of growth it was directed to be ap- plied	1915			1914		
	7th Dis. Ag. School, Albertville			Dewitt McGehee, Montgomery		
	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied	Yield seed cotton per acre	Increase above no nitrogen plots	Date nitrate applied
100 lbs. nitrate of soda when plants were dirted -----	<i>Lbs.</i> 888	<i>Lbs.</i> 104	Not given	<i>Lbs.</i> 832	<i>Lbs.</i> 80	May 12
No nitrate -----	784			752		
100 lbs. nitrate of soda when first squares ap- peared -----	792	50	Not given	848	108	June 16
100 lbs. nitrate of soda when first blooms ap- peared -----	760	60	Not given	872	144	June 25
100 lbs. nitrate of soda three weeks after first blooms appeared ----	720	62	Not given	840	124	July 25
No nit. ate -----	616			704		
100 lbs. nitrate of soda when plants were dirted; and -----						} May 21 June 25
100 lbs. nitrate of soda three weeks after first blooms appeared ---	920	304	Not given Not given	680	24	
200 lbs. cottonseed meal when plants were dirted; and ---						} May 12 June 25
100 lbs. nitrate of soda three weeks after first blooms appeared ---	824	208	Not given Not given	800	96	

Table VIII.—Nitrate of Soda Applied to Cotton at Different Stages of Growth; Details Relative to Experiments Conducted in Various Counties of Alabama.

Location, P. O. and distance and direction from	Year	Character of soil and subsoil	Years in cultivation	Previous Cropping		Date of planting	Date of applying first nitrate	Other fertilizer used and rate per acre of applying
				Preceding year	Two years preceding			
Notasulga 1 mi. N. W. of	1919	(a) Gray sandy loam (b) Yellow stiffer	Many	Corn and Velvet Beans	Corn and velvet beans	4-21	6-10	200 lbs. Acid Phosphate
Millport 1 mi. E. of	1919	(a) Gray fine sandy (b) Stiffer yellow	Many	Corn	Cotton	4-28	6-20	No other
Dawson 1 mi. W. of	1919	(a) Gray sandy (b) Yellow stiffer	Many	Corn	Cotton	4-29	6-14	100 lbs. 12-2-2; 100 lbs. Acid Phosphate
Cedar Bluff 1¼ mi. S. E. of	1919	(a) Fine Gray (b) Yellow stiffer	Many	Cotton	Corn and peas	4-24	6- 6	200 lbs. Acid Phosphate
Cedar Bluff 1¼ mi. S. E. of	1918	(a) Fine Gray (b) Yellow stiffer	Many	Corn and peas	Cotton	5- 1	5-29	200 lbs. Acid Phosphate
Collinsville 3 mi. S. of	1918	(a) Fine gray gravelly (b) Red clay	Many	Cotton	Corn	5- 1	6-12	No other
LaFayette 8 mi. S. of	1918	(a) Red sandy loam (b) Stiffer red	About 20	Corn and velvet beans	Cotton	4-10	5-15	400 lbs. Acid Phosphate
Athens 4 mi. S. of	1917	(a) Red clay (b) Red clay	About 10	Oats followed by cowpeas	Corn	5- 1	6-15	200 lbs. Acid Phosphate
East Lake 5 mi. N. W. of	1917	(a) Red clay (b) Red clay	Many	Cotton	Corn	4-18	6- 6	200 lbs. Acid Phosphate
Clanton 4 mi. S. of	1916	(a) Gray sandy (b) Stiffer yellow	Many	Cotton	Corn	4-20	5-20	
Prattville 5 mi. E. of	1916	(a) Gray sandy loam (b) Stiffer red	About 12	Corn and cowpeas	Cotton	4- 7	4-21	Acid Phosphate
Arkwright 3 mi. S. of	1916	(a) Grayish fine (b) Red clay	Many	Corn and velvet beans	Cotton			200 lbs. Acid Phosphate; 50lbs. sulfate of ammonia
Albertville ¼ mi. S. of	1915	(a) Gray sandy (b) Stiffer yellow	Many	Corn	Cotton			
Montgomery 12 mi. S. of	1914	(a) Gray prairie	Many	Corn	Corn	4- 1	5-12	240 lbs. Acid Phosphate 50 lbs. muriate of potash

(a) Character of soil.

(b) Character of subsoil.

