

Agricultural Experiment Station AUBURN UNIVERSITY

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Soil Fertility Experiments with Tomatoes 1971-72

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A COOPERATIVE RESEARCH PROGRAM between tomato growers in Geneva County and Auburn University Agricultural Experiment Station was initiated in 1970 and continued in 1971 and 1972.² Purpose of this continuing research is to define the fertility requirements and to improve soil test calibration for tomatoes.

Three experiments were conducted in 1971. Co-operating growers were Billy Adkison, James Bedsole, Jr., and Leon Keel. Four experiments were conducted in 1972. These experiments were on the farms of James Bedsole, Jr., H. D. Green, Paul Kelly, and Leon Keel. Each grower prepared the land, layed off rows, subsoiled, cultivated, and sprayed for disease and insect control in the experimental test area just as he did in his tomato field. The researchers applied the fertilizer, planted, and harvested tomatoes from the test area.

Each test area was marked off into 24 single-row plots 6 feet wide and 15 feet long and included six treatments replicated four times. Rates of nitrogen (N) from ammonium nitrate were 0, 50, 100, and 160 pounds per acre. Except for one phosphorus (P) "check" treatment that received no P and one potassium (K) "check" treatment that received no K, all plots received 80 pounds P (180 pounds P₂O₅) and 150 pounds K (180 pounds K₂O) per acre. Gypsum and a nematicide were used at recommended rates on all plots.

Approximately one-third of the N, all the P, one-half the K, and all the gypsum were applied before planting. They were applied on a 3-foot strip centered on the row and incorporated with the soil using a rototiller. The remaining N and K were sidedressed about 6 to 7 weeks after transplanting when

plants were well into the fruit set stage and first fruit were about one-half mature size.

During the harvest period, ripe, pink, and mature green tomatoes were picked once each week. Tomatoes were sorted into three marketable size categories, and culls, and weighed. In reporting relative yields in the tables, treatment four was considered as the reference for 100 per cent yield. In some cases, however, it was not the highest yield as lower N rates produced more marketable tomatoes.

INDIVIDUAL EXPERIMENTS—1971

In general 1971 was an unfavorable year for tomatoes and yields were low. Late cold weather with near freezing or light frost on several occasions after planting along with excessive rain resulted in poor growth of plants. In spite of the low yields, however, the relative results showing the benefit of fertilizer were similar to other years.

Adkison farm (Table 1.) Tomatoes at this location were not staked and were not irrigated. There was a large increase in yield from the applied N, P, and K fertilizer. Without N the yield was only 63 per cent; without P the yield was 72 per cent and without K the yield was 73 per cent of top yields for the respective elements. From 50 to 100 pounds of N per acre was adequate for top yields at this location. Most of the benefit from fertilizer appeared to be an increase in the yield of large (size 5 x 6 and larger) size tomatoes.

TABLE 1. YIELD OF TOMATOES AT BILLY ADKISON'S FARM, 1971

No.	Treatment, lb./acre			Marketable fruit per acre					Relative yield
	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total	Pct.	
				Lb.	Lb.	Lb.	Lb.		
1	0	80	150	5,941	3,037	3,086	12,064	63	
2	50	80	150	10,200	4,296	2,868	17,363	91	
3	100	80	150	11,035	4,465	3,400	18,900	99	
4	160	80	150	10,575	4,368	4,102	19,045	100	
5	160	0	150	8,131	3,303	2,311	13,746	72	
6	160	80	0	7,102	3,860	2,856	13,818	73	

Soil test P = "medium"; soil test K = "high."
Variety, Homestead.

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Bedsole farm (Table 2). Even though tomato yields were very low, the results show the benefit from applied fertilizer. Without N the yield was only 32 per cent; without P the yield was 82 per cent; and without K the yield was only 62 per cent of top yields.

TABLE 2. YIELD OF TOMATOES AT JAMES BEDSOLE'S FARM, 1971

Treatment, lb./acre				Marketable fruit per acre					Relative yield
No.	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total		
				Lb.	Lb.	Lb.	Lb.	Pct.	
1	0	80	150	133	314	1,283	1,730	32	
2	50	80	150	912	1,748	2,870	5,530	101	
3	100	80	150	1,343	1,779	2,952	6,074	111	
4	160	80	150	1,209	1,464	2,819	5,492	100	
5	160	0	150	641	871	2,964	4,477	82	
6	160	80	0	508	859	2,062	3,429	62	

Soil test P = "medium"; soil test K = "medium."
Variety, Floradel.

Keel farm (Table 3). Tomatoes at this location were irrigated, yet yields were still low, apparently as a result of the unfavorably cold weather during the early part of the growing season. Before planting about 300 pounds of 15-15-15 fertilizer was ap-

TABLE 3. YIELD OF TOMATOES AT LEON KEEL'S FARM, 1971

Treatment, lb./acre				Marketable fruit per acre					Relative yield
No.	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total		
				Lb.	Lb.	Lb.	Lb.	Pct.	
1	0	80	150	3,715	3,073	4,622	11,410	104	
2	50	80	150	3,570	3,545	3,703	10,817	98	
3	100	80	150	4,211	3,763	4,162	12,136	110	
4	160	80	150	4,465	2,698	3,848	11,011	100	
5	160	0	150	3,279	3,013	5,493	11,785	107	
6	160	80	0	4,780	3,545	3,812	12,136	110	

Soil test P = "high"; soil test K = "high."
Variety, Floradel.

plied broadcast to all of the area. This probably was adequate for tomatoes on this soil as no yield difference was obtained from the additional fertilizer treatment applied to the plots. Generally, yields would not be increased by added P and K fertilizer on soils testing this high in these elements.

INDIVIDUAL EXPERIMENTS—1972

Tomatoes in all the experiments in 1972 were staked and at the Keel farm supplemental irrigation was used. In general, weather conditions were favorable and yields were higher than in 1971. The Floradel variety was used in three of the experiments and Homestead in one.

Bedsole farm (Table 4). Yields ranged from a low of about 14,000 pounds to a high of about 30,000 pounds per acre. Without N fertilizer the yield was 76 per cent of maximum. Yields were about the same for the three rates of 50, 100, and 160 pounds N per acre. Lowest yield was from the treatment that did

TABLE 4. YIELD OF TOMATOES AT BEDSOLE'S FARM, 1972

Treatment, lb./acre				Marketable fruit per acre					Relative yield
No.	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total		
				Lb.	Lb.	Lb.	Lb.	Pct.	
1	0	80	150	6,620	8,160	8,160	22,930	76	
2	50	80	150	10,240	8,170	11,260	29,670	98	
3	100	80	150	9,430	8,200	12,210	29,800	99	
4	160	80	150	9,740	8,580	11,830	30,160	100	
5	160	0	150	3,530	4,420	5,900	13,850	46	
6	160	80	0	7,830	8,230	9,780	25,850	86	

Soil test P = "medium"; soil test K = "high."
Variety, Floradel.

not receive P fertilizer being only 46 per cent of maximum. Without K fertilizer the yield was 86 per cent of maximum.

Green farm (Table 5). Yields of marketable tomatoes ranged from about 8,500 pounds to about 20,000 pounds at this location. Yield was more than doubled by N fertilizer with the highest yield resulting from application of 100 pounds of N. The yields from both 50 and 160 pounds of N were lower and were similar to each other. Without P fertilizer the yield was 75 per cent of maximum and without K fertilizer was 89 per cent of maximum.

TABLE 5. YIELD OF TOMATOES AT GREEN'S FARM, 1972

Treatment, lb./acre				Marketable fruit per acre					Relative yield
No.	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total		
				Lb.	Lb.	Lb.	Lb.	Pct.	
1	0	80	150	2,920	2,230	3,410	8,550	50	
2	50	80	150	6,110	5,290	5,320	16,730	99	
3	100	80	150	8,120	5,390	6,460	19,970	118	
4	160	80	150	6,470	5,090	5,380	16,940	100	
5	160	0	150	4,140	3,590	5,030	12,760	75	
6	160	80	0	5,870	5,030	4,200	15,110	89	

Soil test P = "high"; soil test K = "medium."
Variety, Floradel.

Kelly farm (Table 6). The variety Homestead was used at this location. Yields ranged from about 18,000 to 24,000 pounds of marketable tomatoes. Without N fertilizer the yield was 80 per cent of maximum. Each of the other three rates of N (50, 100, and 160 pounds per acre) resulted in about the same yields. Without P fertilizer the yield was 93 per cent of maximum. Leaving K fertilizer off at this location made little or no difference in the yield.

TABLE 6. YIELD OF TOMATOES AT KELLY'S FARM, 1972

Treatment, lb./acre				Marketable fruit per acre					Relative yield
No.	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total		
				Lb.	Lb.	Lb.	Lb.	Pct.	
1	0	80	150	7,570	4,190	6,380	18,140	80	
2	50	80	150	11,020	6,000	6,350	23,370	103	
3	100	80	150	11,580	5,890	6,460	23,930	106	
4	160	80	150	10,310	5,660	6,670	22,630	100	
5	160	0	150	8,760	5,540	6,720	21,020	93	
6	160	80	0	9,630	5,190	7,700	22,520	99	

Soil test P = "low"; soil test K = "medium."
Variety, Homestead.

Keel farm (Table 7). Harvest of plots was discontinued at this location when about one-half of the tomatoes had been picked; therefore, yields do not include the last part of the harvest season. The yield of marketable tomatoes ranged from about 12,000 to over 17,000 pounds. Without N fertilizer the yield was about 78 per cent of maximum. Lowest yield, 70 per cent of maximum, was from the treatment receiving no P fertilizer. Without K fertilizer the yield was 92 per cent of maximum.

TABLE 7. YIELD OF TOMATOES AT KEEL'S FARM, 1972

No.	Treatment, lb./acre			Marketable fruit per acre				Relative yield
	N	P	K	5 x 6 & larger	6 x 6	6 x 7	Total	
				Lb.	Lb.	Lb.	Lb.	
1	0	80	150	4,860	4,480	4,270	13,610	78
2	50	80	150	6,620	5,060	4,550	16,230	93
3	100	80	150	6,320	3,980	5,300	15,600	90
4	160	80	150	6,240	6,170	4,990	17,400	100
5	160	0	150	4,910	3,680	3,550	12,140	70
6	160	80	0	6,040	4,560	5,330	15,930	92

Soil test P = "low"; soil test K = "medium."
Variety, Floradel.

SUMMARY

Test areas were located on growers fields with most of them on "low" or "medium" P or K soils.

The results showed that yields without P fertilizer were generally only about 70 to 90 per cent of maximum with yield at one location being only 46 per cent. Without K fertilizer the yields were generally about 85 to 90 per cent of maximum and one soil "low" in soil test K yielded only 62 per cent. These results show the importance of applying fertilizer P and K for tomatoes on these soils.

The benefit from nitrogen fertilizer varied from one farm to another but generally 50 to 100 pounds N per acre resulted in maximum yields. Tomatoes are grown in rotation following corn, peanuts or some other well fertilized crop; thus, the value of residual or carryover of fertilizer N from the previous crop or of legume N from peanuts might influence the response of tomatoes to applied N. In most cases the yields for 50, 100, and 160 pounds added N were similar indicating that the grower has a relatively wide range for N fertilization and may safely apply up to 160 pounds without reducing yields. Experiments with higher rates of N at other locations in the State indicate that yields may be reduced by N rates of 180 pounds or more. Also there has been no evidence of a reduction in quality of tomatoes, including storage life and firmness, from rates of N up to 180 pounds per acre.

