

Marketing and Orchard Resource Efficiency for Ohio Pawpaw

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Objectives of research study:

This study will evaluate pawpaw productivity, fruit quality, and disease susceptibility of twelve commercial pawpaw cultivars. Best practices for pawpaw orchard establishment have been determined and implemented at both Columbus and Piketon Ohio.

Scope of Research

This study was conducted at the Ohio State University (OSU) South Centers/Piketon Research & Extension Center at Piketon, Ohio (lat. 39.07° N, long. 83.01° W), elevation 578 feet. The experimental soil is designated as a DoA—Doles silt loam, with 0–3% slopes. It is a deep, nearly level and somewhat poorly drained soil. Typically, the soil surface is a brown, friable silt loam about 20 cm deep and beneath this the subsoil is about 18.5 m.

The study was duplicated at The Ohio State University's Waterman Agricultural and Natural Resource Laboratory. The field consists of a mixture of soil types including: 62.6% Celina silt loam, 2-6 % slopes, eroded; 9.6% Crosby silt loam, Southern Ohio Till Plain, 2-6 % slopes and; 27.8% Kokomo silty clay loam, 0-2% slopes. Drainage ranges from moderately well-somewhat poorly-very poorly drained, respectively. The SE corner of the plot has the coordinates : Lat 40.007208 Long -83.038029 and an elevation average of 779.39 ft. (range: 771.31 ft-791.21 ft).

MATERIALS and METHODS:

Cultivar selections were new releases along with industry standard varieties. Input was received from growers, and industry personnel regarding variety selection and standard comparison. Two one acre pawpaw orchards were established in the spring of 2018. One is at the Waterman Agriculture and Natural Resources Laboratory (Columbus, OH) and the other is at OSU South Centers (Piketon, OH). Trees were planted May 30th (Columbus) and June 6th (Piketon) of 2018. Each Orchard yard consists of two planting types high and low input orchard planting systems. The high input method consists of a raised bed with landscape fabric covering the bed with two irrigation drip lines on each edge of the bed. The low input method is flat planting bed with no irrigation. Soil fertility was applied according to the soil test results for each location. Fertility levels at the Columbus orchard are high at this time so no additional fertility was required at planting. Prior to formation of raised beds 62 pounds of 18-46-0 and 106 pounds of 0-0-60 was applied in row to the Piketon orchard. With very few chemical



options for weed control at this time weeds were controlled with roundup applications, rototilling and hand removal of weeds. Sod was established in between all rows with a fall seeding. There are 27 treatments per planting method for a total of 270 trees per orchard.

Figure 1. Columbus soil test results.

Report Number
F18290-0513
Account Number
87597



3505 Conestoga Dr.
Fort Wayne, IN 46808
260.483.4759
algreatlakes.com

To: TAPLOGIC, LLC
90 SPRUCE ST
MURRAY, KY 42071-3505

For: 109535
Farm: DO NOT ADJUST: WATERMAN D
Field: SOUTH FARM

Date Received: 10/17/2018
Date Reported: 10/19/2018

Attn: LUKE CHOATE

SOIL TEST REPORT

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Sample ID	Lab Number	Organic Matter %	Phosphorus Bray-1 Equiv ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Soil pH (1:1 H ₂ O)	Buffer pH (Sikara)	Cation Exchange Capacity meq/100g	Cation Saturation					Sulfur S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm				
											% K	% Mg	% Ca	% Na	% H										
231-1	59856	6.0	145 VH	538 VH	440 H	2100 M		7.5	15.5	8.9	23.6	67.5													
232-1	59857	7.1	89 VH	231 H	415 H	2250 M		7.5	15.3	3.9	22.6	73.5													
267-1	59858	3.0	113 VH	239 VH	290 H	1450 M		7.0	10.3	6.0	23.5	70.5													
267-2	59859	3.8	92 VH	288 VH	310 H	2150 H		7.3	14.1	5.2	18.4	76.4													
267-3	59860	2.5	96 VH	134 M	385 VH	1500 M		7.0	11.1	3.1	29.0	67.9													
267-4	59861	2.4	147 VH	234 VH	305 VH	1350 M		7.3	9.9	6.1	25.7	68.2													
267-5	59862	3.2	238 VH	931 VH	485 H	2000 L		6.2	6.7	20.0	11.9	20.2	49.9	18.0											
267-6	59863	2.7	153 VH	286 VH	430 VH	1800 M		7.4	13.3	5.5	26.9	67.6													
267-7	59864	2.9	115 VH	207 H	480 VH	1850 M		7.5	13.8	3.9	29.0	67.1													
267-8	59865	3.1	185 VH	240 VH	355 H	1950 M		7.1	13.3	4.6	22.2	73.2													
267-10	59866	3.4	173 VH	322 VH	410 H	1900 M		7.2	13.7	6.0	24.9	69.1													
267-11	59867	3.5	218 VH	373 VH	395 H	2000 M		7.0	14.2	6.7	23.1	70.2													
267-12	59868	3.7	200 VH	256 VH	270 H	1550 M		6.4	6.9	11.9	5.5	19.0	65.4	10.1											
267-13	59869	2.9	110 VH	186 H	310 H	1650 M		7.5	11.3	4.2	22.8	72.9													
267-14	59870	4.9	114 VH	230 VH	355 VH	1650 M		7.1	11.8	5.0	25.1	69.9													
267-15	59871	4.2	95 VH	271 VH	465 VH	1900 M		6.8	14.5	4.8	26.7	65.5	3.0												

VL = Very Low L = Low M = Medium H = High VH = Very High

Figure 2. Piketon soil test results.

Spectrum Analytic
1087 Jamison Road NW
Washington Court House, OH 43160-8748
www.spectrumanalytic.com

Report To: THE OHIO STATE UNIVERSITY SOUTH CENTERS
1864 SHYVILLE RD
PIKETON, OH 45661
Prepared For: OSU SOUTH CENTERS
Sampled: 04-30-2018
Tested: 05-01-2018

Sample Number	Lab Number	pH		Organic Matter %	Phosphorus P	Analysis Result and Rating			CEC	Base Saturation			Sulfur S	Boron B	Mehlich-3 PPM and Rating				
		Soil pH	Burner pH			Potassium K	Magnesium Mg	Calcium Ca		K %	Mg %	Ca %			Zinc Zn	Iron Fe	Copper Cu	Mang. Mn	Alum. Al
PAWPAW	D49741	5.6	6.9	1.0	30 M	79 M	212 G	712 G	5.6	3.0	27.8	47.7							

* P, K, Mg and Ca are extracted by Mehlich-3 (ICP) and are reported in ppm

Sample Number	Lab Number	Year	Crop	Yield Goal	Acres	CaCO ₃ LIME	Nutrient recommendations expressed in broadcast rates of lbs/A except where noted.													
							N	P2O5	K2O	Mg	S	B	Cu	Fe Foliar	Mn Row	Zn				
PAWPAW	D49741	18	PawPaw	0	1	2317	40	103	228	0										

*Lime expressed in 100% pure CaCO₃. Adjust accordingly. D = Dolomitic Lime. C = Calcitic Lime.

Figure 4. Columbus pawpaw orchard.

		High Input																											
	Rep	5	8	13	6	18	12	2	14	20	4	10	27	19	23	17	7	1	21	22	25	24	9	26	14	3	16	11	Rep
	Rep 1	5	8	13	6	18	12	2	14	20	4	10	27	19	23	17	7	1	21	22	25	24	9	26	14	3	16	11	Rep 1
	Rep 2	6	9	8	2	19	13	26	27	21	20	15	3	22	17	12	23	7	5	18	11	14	1	25	4	24	16	10	Rep 2
	Rep 3	19	18	8	12	22	20	16	14	7	13	25	21	11	23	26	4	9	1	6	24	2	15	17	10	27	5	3	Rep 3
	rep 4	13	27	19	9	16	17	6	10	24	25	8	15	21	23	12	18	11	14	26	7	22	1	20	3	5	2	4	rep 4
	rep 5	24	11	27	16	18	5	10	19	25	22	21	4	2	1	6	13	23	7	26	12	14	20	15	9	17	8	3	rep 5
		Low Input																											
	Rep	5	8	13	6	18	12	2	14	20	4	10	27	19	23	17	7	1	21	22	25	24	9	26	14	3	16	11	Rep
	Rep 1	5	8	13	6	18	12	2	14	20	4	10	27	19	23	17	7	1	21	22	25	24	9	26	14	3	16	11	Rep 1
	Rep 2	6	9	8	2	19	13	26	27	21	20	15	3	22	17	12	23	7	5	18	11	14	1	25	4	24	16	10	Rep 2
	Rep 3	19	18	8	12	22	20	16	14	7	13	25	21	11	23	26	4	9	1	6	24	2	15	17	10	27	5	3	Rep 3
	rep 4	13	27	19	9	16	17	6	10	24	25	8	15	21	23	12	18	11	14	26	7	22	1	20	3	5	2	4	rep 4
	rep 5	24	11	27	16	18	5	10	19	25	22	21	4	2	1	6	13	23	7	26	12	14	20	15	9	17	8	3	rep 5

Figure 5. Piketon pawpaw orchard.

High Input														Low Input																	
Guard	5	8	13	6	18	12	2	14	20	4	10	27	19	23	Guard	Guard	26	8	13	6	18	12	2	14	20	4	10	27	19	23	Guard
Guard	17	7	1	21	22	25	1	9	26	14	3	16	11	6	Guard	Guard	5	7	1	21	22	25	24	9	26	14	3	16	11	6	Guard
Guard	9	8	2	19	13	26	27	21	20	15	3	22	17	12	Guard	Guard	17	8	2	19	13	26	27	21	20	15	3	22	17	12	Guard
Guard	23	7	5	18	11	14	24	25	4	24	16	10	19	18	Guard	Guard	9	7	5	18	11	14	1	25	4	24	16	10	19	18	Guard
Guard	8	12	22	20	16	14	7	13	25	21	11	23	26	4	Guard	Guard	23	12	22	20	2	14	7	13	25	21	11	23	26	4	Guard
Guard	9	1	6	24	2	15	17	10	27	5	3	13	27	19	Guard	Guard	8	1	6	24	16	15	17	10	27	5	3	13	27	19	Guard
Guard	9	16	17	6	10	24	25	8	15	21	23	12	18	11	Guard	Guard	9	16	17	6	10	24	25	8	15	21	23	12	18	11	Guard
Guard	14	26	7	22	1	20	3	5	2	4	24	11	27	16	Guard	Guard	9	26	7	22	1	20	3	5	2	4	24	11	27	16	Guard
Guard	18	5	10	19	25	22	21	4	2	1	6	13	23	7	Guard	Guard	14	5	10	19	25	22	21	4	2	1	6	13	23	7	Guard
Guard	26	12	14	20	15	9	17	8	3	X	X	X	X	X	Guard	Guard	18	12	14	20	15	9	17	8	3	X	X	X	X	X	Guard

Figure 3. Cultivars planted within the orchards.

- | | |
|---|--------------|
| KSU Atwood | KSU Benson |
| Kentucky Champion | Mango |
| Potomac | Rappahannock |
| Wabash | Shenandoah |
| Summer Delight | Sunflower |
| Allegheny | Susquehanna |
| Remaining 15 treatments are rootstock to be grafted | |

Trees were purchased from the following nurseries:

England’s Orchard and Nursery
 2338 Highway 2004
 McKee, KY 40447
 606-965-2228

One Green World
 6469 SE 134th Ave
 Portland, OR 97236
 877- 353-4028

