

*Electronic Supplementary Information*

**Table S1.** Effect of soil acidity (Mean  $\pm$  sd) on biometric characteristics (height, diameter, number of leaves, leaf and root area, shoot and root biomass) and physiological characteristics (stomatal conductivity and chlorophyll concentration) for each clone assessed

Treatm ent	clone	Height cm	Diameter cm	Numb er of branch es	Number of leaves	Stem diameter cm	Root length	Leaf Area cm <sup>2</sup>	Root Area cm <sup>2</sup>	Shoot weight g	Root weight g	Total weight g	Shoot/R oot	g <sup>s</sup> mmol m <sup>-2</sup> s <sup>-1</sup>	Chlorophyll SPAD
Lime	AYP-15	49.83 $\pm$ 3.3	13.45 $\pm$ 2.31	7.33 $\pm$ 0.58	43.67 $\pm$ 10.69	44.33 $\pm$ 0.76	70.03 $\pm$ 16.27	860.25 $\pm$ 57.86	208.15 $\pm$ 28.03	37.19 $\pm$ 1.24	10.73 $\pm$ 4.23	47.92 $\pm$ 4.04	26.97 $\pm$ 4.55	120.3 $\pm$ 48.55	10.71 $\pm$ 0.74
Lime	AYP-20	38.5 $\pm$ 3.28	16.76 $\pm$ 1.52	5 $\pm$ 1	28.33 $\pm$ 9.5	41.17 $\pm$ 1.26	56.77 $\pm$ 10.43	701.45 $\pm$ 27.38	151.63 $\pm$ 33.18	21.96 $\pm$ 0.63	5.48 $\pm$ 0.52	27.44 $\pm$ 1.15	25.57 $\pm$ 5.58	171.4 $\pm$ 33.51	16.88 $\pm$ 4.32
Lime	AYP-22	59.9 $\pm$ 9.56	10.97 $\pm$ 1.34	7.33 $\pm$ 4.16	34 $\pm$ 3.61	38.17 $\pm$ 2.02	75.13 $\pm$ 3.12	1111.47 $\pm$ 24.15	325.33 $\pm$ 51.05	29.65 $\pm$ 3.53	10.53 $\pm$ 0.87	40.18 $\pm$ 3.49	22.43 $\pm$ 2.44	214.17 $\pm$ 93.5	14.54 $\pm$ 2.83
Lime	BN-34	50.43 $\pm$ 4.27	11.77 $\pm$ 1.97	11.67 $\pm$ 4.04	62.67 $\pm$ 5.86	43.37 $\pm$ 2.32	79.6 $\pm$ 5.62	1058.05 $\pm$ 20.181	340.96 $\pm$ 34.29	28.7 $\pm$ 1.54	16.48 $\pm$ 2.04	45.18 $\pm$ 3.19	30.2 $\pm$ 2.14	267.1 $\pm$ 19.59	13.47 $\pm$ 1.5
Lime	BS-01	49.43 $\pm$ 7.77	11.61 $\pm$ 0.22	6 $\pm$ 1.73	34.33 $\pm$ 15.04	40.83 $\pm$ 1.26	84.7 $\pm$ 8.93	1017.53 $\pm$ 75.96	433.57 $\pm$ 72.9	27.51 $\pm$ 7.21	12.93 $\pm$ 2.56	40.44 $\pm$ 9.76	46.03 $\pm$ 4.92	253.43 $\pm$ 155.77	10.24 $\pm$ 2.27
Lime	CA-14	53.77 $\pm$ 2.86	11.31 $\pm$ 0.45	10 $\pm$ 1	49.67 $\pm$ 7.57	40.33 $\pm$ 2.08	80.27 $\pm$ 6.1	834.93 $\pm$ 232.93	361.36 $\pm$ 87.1	32.08 $\pm$ 3.88	11.54 $\pm$ 2.07	43.62 $\pm$ 5.88	27.32 $\pm$ 13.33	103.17 $\pm$ 23.44	12.73 $\pm$ 2.5
Lime	CCN-10	39.87 $\pm$ 9.25	13.66 $\pm$ 0.86	13 $\pm$ 3.61	47 $\pm$ 3.61	38.33 $\pm$ 3.06	79.83 $\pm$ 17.86	1184.12 $\pm$ 356.98	533.58 $\pm$ 158.6	34.11 $\pm$ 3.67	16 $\pm$ 1.14	50.11 $\pm$ 3.3	84.16 $\pm$ 38.21	297.53 $\pm$ 74.21	9.97 $\pm$ 1.35
Lime	CCN-51	50.8 $\pm$ 8.09	12.55 $\pm$ 0.55	6.67 $\pm$ 0.58	41.67 $\pm$ 11.5	42.33 $\pm$ 2.52	96.93 $\pm$ 20.43	1471.46 $\pm$ 259.24	494.13 $\pm$ 43.74	33.66 $\pm$ 3.89	18.57 $\pm$ 1.16	52.23 $\pm$ 2.73	49.57 $\pm$ 11.32	253.03 $\pm$ 134.23	10.24 $\pm$ 1.25
Lime	CEPEC-2002	41.97 $\pm$ 1.25	11.91 $\pm$ 0.99	7 $\pm$ 4.36	31.33 $\pm$ 18.61	35 $\pm$ 3.04	85.2 $\pm$ 7.38	828.07 $\pm$ 234.09	297.57 $\pm$ 21.75	27.84 $\pm$ 5.93	12.57 $\pm$ 2.38	40.42 $\pm$ 6.72	58.73 $\pm$ 7.16	390.47 $\pm$ 52.71	14.9 $\pm$ 1.23
Lime	CP-2005-C10	50.8 $\pm$ 6.19	13 $\pm$ 0.8	6 $\pm$ 2.65	50.67 $\pm$ 23.03	42 $\pm$ 2.65	81 $\pm$ 14.73	916.37 $\pm$ 138.99	325.43 $\pm$ 48.54	32.04 $\pm$ 2.17	13.92 $\pm$ 0.79	45.96 $\pm$ 2.97	31.19 $\pm$ 7.02	345 $\pm$ 76.8	11.6 $\pm$ 3.11

Lime	CP-49-C10	45.37±5.54	12.91±1.44	5.33±0.58	32.67±9.61	38.17±1.76	95.8±21.4	1522.56±963.28	392.24±2.98	30.6±1.82	15.17±1.64	45.78±2.56	44.69±2	159±9.66	13.87±1.8
Lime	CP-53-C10	40.07±2.9	12.02±2.39	5±1	35±7.94	40.5±2.18	63.07±10.2	950.53±140.51	343.77±2.6	29.43±2.31	11.29±1.2	40.72±3.48	35.77±2.57	218.6±22.53	12.25±0.52
Lime	EET-400	43.57±5.08	11.52±0.94	9.33±3.51	36.67±10.07	37±1.8	87.97±4.18	965.54±113.58	308.9±20.83	29.19±1.49	13.63±0.91	42.82±1.24	51.59±10.45	207.77±72.63	11.03±0.85
Lime	H-10	54.37±6.4	12.48±0.72	5.33±1.53	36.33±5.86	42.17±2.75	81.43±9.58	1246.87±495.15	435.61±126.61	30.42±8.27	14.9±1.07	45.32±9.33	35.17±7.76	305.33±107.13	11.6±0.29
Lime	ICS-1	49.37±8.12	11.21±0.58	5.67±1.53	37.67±5.69	38±2.18	92.7±17.29	1140.95±51.17	407.49±41.95	23.62±2.12	9.88±1.66	33.5±3.4	40.73±15.17	290.17±188.18	15.35±2.21
Lime	ICS-39	56.3±5.71	10.83±0.26	6±2	48±15.1	39.83±2.36	87.37±30.06	1054.92±216.31	372.95±77.82	35.39±3.05	10.74±1.13	46.13±2.48	34.29±10.91	238.93±40.03	14.59±1.05
Lime	ICS-6	41.67±8.12	11.93±1.3	6±1	40.33±4.62	43±3.61	92.37±8.14	914.53±510.44	437.86±37.35	29.43±3.81	17.16±1.09	46.59±4.84	47.77±3.33	241.1±62.47	13.88±0.77
Lime	ICS-95	53.17±14	11.5±0.25	5.67±0.58	34.67±7.77	44.5±4.77	91.37±9.8	1182.73±99.57	345.16±30.28	33.17±3.79	11.17±2.19	44.34±2.95	36.52±8.6	235.1±61.75	13.58±0.32
Lime	ICT-1026	58.2±13.84	11±0.42	10±3.46	59±10.44	41.67±4.04	62.13±4.39	1246.95±159	376.03±48.42	32.53±2.58	12.11±0.99	44.64±2.98	41.11±6.51	285.37±103.94	12.86±3.05
Lime	ICT-1087	48.9±8.54	12.21±0.55	7±4.36	46.67±8.74	43±4.58	87.23±4.52	1102.92±166.88	496.99±53.96	41.65±2.52	12.78±2.3	54.43±0.51	48.72±6.45	240.1±57.41	14.47±2.82
Lime	ICT-1092	60.4±9.22	11.23±1.79	6±3.61	35.67±10.41	35.73±1.08	65.83±5.92	1202.26±113.49	373.28±17.38	29.9±0.38	10.54±0.72	40.44±0.84	31.27±3.99	431.33±165.13	12.04±0.48
Lime	ICT-1112	54.1±5.32	11.58±0.95	7±3.46	41.33±11.15	36.5±3.04	78.67±13.69	1625.34±480.98	391.44±48.09	29.83±0.55	14.97±0.23	44.8±0.53	38.02±4.06	157.27±74.69	11.02±0.97
Lime	ICT-1189	55.73±7.1	12.96±1.31	7.67±3.51	40.33±22.01	33.83±6.53	69.83±23.38	1253.8±230.88	341.51±92.43	34.43±9.22	11.67±4.93	46.1±14.15	44.44±10.16	95.8±16.8	16.52±2.56

Lime	ICT-1251	42.17±9.39	9.71±0.65	7.33±1.15	39.33±7.02	38.83±3.25	76.33±14.63	1162.32±187.42	416.42±14.62	27.27±2.04	10.03±0.63	37.3±1.64	53.47±7.82	103.03±19.56	12.22±1.29
Lime	ICT-1281	42.17±9.39	11.42±1.42	8.33±1.53	38.33±2.31	39.5±5.63	65.3±7.85	1221.94±166.17	379.81±89.76	28.13±2.44	11.31±2.45	39.44±0.12	52.76±15.06	150.03±53.85	12.2±1.62
Lime	ICT-1292	61.93±3.91	12.76±0.84	9±4.36	53±11.79	41.5±4.77	72.27±16.6	1057.95±259.89	371.26±87.9	30.3±2.43	15.75±1.26	46.05±3.27	22.34±7.13	367.13±112.92	9.94±1.09
Lime	ICT-1506	51.33±7.65	10.68±0.62	8.33±2.52	48.33±10.41	40.83±2.02	84±1.73	1038.42±327.82	460.27±50.59	27.77±1.32	10.47±0.93	38.24±1.24	43.1±9.49	404.73±78.89	9.97±2.59
Lime	ICT-2142	52.77±6.76	12.89±0.71	8.33±0.58	44.67±8.14	38.83±4.04	89.67±24.42	1492.55±585.15	524.48±99.7	29.87±2.17	12.69±0.8	42.55±2.42	55.84±15.09	285.37±83.3	8.74±0.54
Lime	ICT-2161	47.73±9.99	11.85±1.57	4.33±2.08	32.67±6.81	41±3.61	86±36.43	616.93±233.82	472.67±59.35	29.21±1.07	13.7±2.7	42.91±2.55	52.35±11.41	389.73±19.21	11.78±3.82
Lime	ICT-2171	50.9±15.55	12.56±2.59	7.67±3.21	38±12.49	38.67±2.57	90.33±13.05	999.13±221.56	313.66±68.46	35.93±1.55	15.47±2.18	51.4±3.51	37.27±9.9	226.37±26.76	15.49±2.08
Lime	ICT-2172	58.83±2.31	13.63±0.53	5±2.65	33±13.11	40.67±2.08	68.7±15.82	1344.43±398.8	300.61±46.84	36.59±4.69	12.82±3.16	49.41±7.83	32.85±5	186.9±14.14	13.47±0.95
Lime	ICT-2173	65.6±3.32	10.78±0.75	3.67±1.53	26.67±1.15	35.33±4.04	68.87±12.94	1255.67±181.24	349.77±8.27	39.1±0.57	12.48±1.11	51.58±1.14	31.36±4.59	273.57±33.19	12.55±0.82
Lime	ICT-2653	49.83±5.58	12.16±0.43	4±1	29.67±5.69	39±1.5	89±7.54	1292.52±403.33	307.94±102.67	33.13±1.76	11.37±1.54	44.5±1.23	41.97±9.5	420.6±18.12	14.62±0.99
Lime	IMC-67	47.57±8.99	12.29±0.48	10±1.73	45.33±16.44	37.33±3.51	80.27±20.15	1281.34±109.26	472.07±49.46	28.53±2.04	13.36±1.75	41.89±3.64	54.19±3.33	505±72.79	12.33±2.33
Lime	IPIRANG A-1	64.93±5.22	13.02±0.1	6.33±1.53	45.33±6.11	45±3.77	73.77±9.76	1166.97±147.56	345.07±40.91	37.69±4.1	17.8±1.44	55.49±2.66	30.46±7.54	171.6±33.81	10.35±0.82
Lime	NUC-156	48.9±7.23	11.71±1.92	4.67±0.58	29±5.29	40±1	68.53±10.55	1013.29±113.32	255.71±58.2	25.63±0.37	7.94±1.38	33.57±1.74	28.11±10.37	176.93±49.55	11.47±1.78

Lime	PAS-100	48.03±5.33	11.12±0.93	7±1	47.33±14.57	39.1±1.15	57.17±8.81	959.96±283.58	222.01±30.66	29.78±4.44	5.97±1.93	35.75±4.96	26.31±3.71	135.17±10.53	17.62±5.12
Lime	PAS-105	47.4±26.07	12.01±1.99	6.33±0.58	48.67±7.23	46.33±1.53	81.77±13.55	937.02±57.9	388.76±58.02	32.29±7.86	10.21±2.26	42.5±8.63	47.71±26.85	144.87±59.78	9.55±0.99
Lime	PAS-91	64.27±8.63	12.87±0.1	6±1	39.67±11.68	43.5±1.32	68.43±5.19	1228.88±249.21	433.64±32.44	34.99±3.58	12.72±0.53	47.7±4.06	29.15±2.23	322.3±87.06	14±1.28
Lime	PAS-93	47.03±6.54	11.54±0.37	5±1	28.67±0.58	35±2.65	66±16.4	885.76±298.14	303.3±23.63	33.55±6.48	9.43±3.2	42.98±9.15	25.46±3.73	101.7±10.48	13.36±4.01
Lime	PH-09	57.37±1.08	11.67±0.41	3.67±0.58	28.33±5.13	44.17±2.57	99.43±15.31	1014.76±310.62	309.07±85.26	31.09±2.54	13.85±3.28	44.94±1.57	25.56±4.65	128.83±23.56	10.49±0.54
Lime	PH-144	44.3±1.06	12.55±1.88	10.33±2.52	47.67±5.13	37.17±8.13	75.87±5.97	1016.84±314.11	343.32±94.39	34.5±6.71	12.72±0.79	47.22±7.32	29.43±10	152.4±37.46	12.29±0.74
Lime	PH-15	46.33±4.6	11.29±0.31	9±0	38±1.73	44.5±1.32	77±8.26	1076.91±224.41	491±56.45	30.85±4.12	16.74±0.42	47.59±4.53	44.94±7.51	188.53±114.35	11.43±0.71
Lime	PH-16	50.75±7.89	11.57±0.46	9±1	59.33±8.96	40.33±2.36	62.83±3.88	980.65±24.51	371.42±14.46	37.51±4.67	13.45±3.45	50.96±5.22	30.87±5.3	224.63±98.5	15.83±1.87
Lime	PH-17	46.63±4.25	11.69±0.36	7.67±0.58	50.67±13.65	44.17±2.93	62.83±11.55	1022.74±261.84	268.54±39.73	33.96±4.47	10.48±1.35	44.44±3.61	25.26±4.39	240.83±120.34	12.69±1.2
Lime	PH-21	70.67±9.87	11.94±0.6	7±2.65	49±17.44	42.17±4.25	60.9±11.31	1251.28±180.54	235.27±25.39	37.1±3.03	11.91±0.68	49.02±3.6	18.34±0.75	196.47±51.35	11.27±0.64
Lime	PH-990	50.5±10.04	11.41±0.37	6.67±1.53	40.67±4.16	40.33±1.76	76.33±10.15	1185.36±398.31	332.32±103.72	41.05±2.87	13.13±1.25	54.18±2.87	27.33±12.75	139.43±34.98	11.09±1.03
Lime	POUND-12	48.17±7.95	11.33±0.42	8±0	38±1.73	43.5±6.54	72.83±14.58	984.13±449.92	452.9±10.91	27.3±4.3	10.75±2.35	38.05±6.62	49.92±16.87	425.53±78.2	12.67±1.07
Lime	SCA-6	54.4±3.5	10.73±1.16	11.67±5.77	61±21	43.83±0.29	69.1±5.67	1315±480.72	412.5±120.01	36.26±4.54	10.13±1.28	46.38±3.93	37.72±14.97	179.83±43.54	13.31±1.28
Lime	TSH-1188	47.6±10.76	11.65±2.21	8.33±0.58	37.33±0.58	40.33±3.51	87.63±11.57	1054.8±106.63	430.1±27.81	28.37±4.32	12.4±2.17	40.77±2.99	39.25±8.08	379.33±47.73	10.85±1.43

Lime	TSH-565	53.87±4.41	11.73±0.63	7±1.73	49±5.57	41±2.65	69.97±16.67	1262.33±206.56	433.21±39.23	33.69±2.85	15.03±1.68	48.72±4.54	49.71±16.91	305.1±71.08	12.53±0.75
Lime	UF-613	48.6±8.66	10.79±0.69	7±1.73	50±12.49	34.83±10	71.6±13.53	1070.66±24.07	442.48±117.62	28.37±4.32	8.78±3.59	37.15±7.91	41.85±13.41	379.33±47.73	12.2±1.31
Lime	UF-667	44.93±10.46	11.76±0.26	5.67±0.58	37.33±4.93	39.5±1.32	110.1±9.81	1527.33±319.46	434.7±34.83	37±3.53	15.79±2.82	52.79±4.89	64.2±16.94	302.83±57.84	11.58±1.44
Lime	UGU-112	48.73±2.85	11.56±0.44	6.33±0.58	37.67±5.13	40.23±3.53	66.1±10.06	838.7±153.5	337.4±57.85	28.29±3.32	7.28±0.62	35.57±3.69	33.05±6.5	197.03±57.7	21.93±15.55
Lime	UGU-126	48.99±5.73	11.97±0.65	5.33±1.15	47.67±10.69	39.5±3.91	74.5±10.1	1163.52±111.15	238.27±87.27	37.52±3.6	6.56±1.36	44.08±4.36	34.05±8.74	205.67±136.11	10.39±1.16
Lime	UGU-130	40.57±8.27	11.55±0.4	6±1	26.33±2.31	38.83±3.88	67.67±15.01	1012.26±374.34	225.38±51.08	23.36±2.5	5.52±1.64	28.88±3.34	32.01±10.11	156.53±49.5	11.06±0.33
Lime	UNG-53	51.53±12.81	10.95±0.59	6.67±2.08	50±7	38.17±2.47	64.13±12.63	1040.46±373.78	361.67±10.99	33.11±5.22	11.49±1.8	44.6±7.02	35.71±14.58	262.5±142.46	11.67±5.4
Lime	UNG-73	52.53±14.62	12.44±1.17	7.67±1.53	43±2.65	40.43±0.6	59.07±0.49	1235.49±223.01	365.62±73.58	32.88±1.99	14.96±2.29	47.84±3.44	37.79±15.83	285.17±122.74	12.62±1.52
Lime	UNG-76	51.1±6.71	12.55±0.63	7.33±2.31	43.67±6.66	40.17±1.89	62.23±32.94	1155.75±101.96	228.66±55.07	32.95±1.3	10.85±4.35	43.8±4.47	22.92±8.29	277±83.76	14.04±2.22
Lime	UNG-77	48.67±8.55	14.99±1.37	6.33±1.15	35±3	40.17±6.29	86.83±7.41	1300.43±219.97	350.42±37.99	34.4±3.31	15.94±0.51	50.34±3.81	36.39±1.39	157.83±32.13	9.77±2.18
No lime	AYP-15	49.03±3.77	11.37±0.25	7±0	35.33±5.51	37.83±1.89	58.73±3.53	706.92±240.12	239.83±82.5	30.85±2.89	9.39±1.66	40.25±3.46	23.97±6.85	300.1±117.69	13.44±2.3
No lime	AYP-20	36.97±10.25	11.5±1.16	5±1.73	18±5.29	27.17±4.01	43.63±5.7	388.71±29.59	108.34±21.53	14.83±6.01	2.58±0.8	17.41±6.75	24.51±12.83	262.3±66.41	9.87±2.25
No lime	AYP-22	52.8±10.29	10.25±0.6	5±1	34.67±1.53	48.33±3.51	73.53±3.92	1032.92±163.27	306.99±47.37	28.06±0.31	9.35±0.54	37.42±0.79	23.44±7.68	274.87±16.41	9.68±1.26

No lime	BN-34	50.93±11.6	10.37±2.07	14.67±4.04	57.67±10.97	42±7.21	63.43±6.01	763.1±108.65	334.53±45.9	30.84±3.26	13.68±0.93	44.52±3.11	27.3±16.27	287.47±134.22	13.25±1.08
No lime	BS-01	57.5±8.91	11.38±1.05	6.33±1.53	39.33±7.37	35.83±1.89	70.97±12.38	1008.09±159.87	338.36±25.68	31.47±0.33	14.34±4.41	45.82±4.43	24.89±3.11	231.9±62.99	11.37±1.23
No lime	CA-14	38.4±3.86	12.35±1.07	7±1	51.33±4.16	36.83±1.26	65.6±3.05	818.76±261.82	272.47±51.93	32.96±5.27	12.08±1.34	45.04±6.6	35.42±11.76	269.57±47.41	14.38±2.73
No lime	CCN-10	46.93±14.68	14.25±1.4	7±1	49.67±5.51	39.27±1.55	68.77±2.87	984.61±166.67	298.51±36.2	36.36±2.75	15.42±1.66	51.78±1.24	19.56±2.66	296.13±15.67	14.04±0.21
No lime	CCN-51	58.33±13.55	13.24±0.96	11.33±1.53	47.33±10.26	40.97±3	94.33±17.6	1256.04±191.02	404.42±25.23	37.9±1.68	13.63±0.64	51.53±2.27	32.79±14.06	179.97±66.84	13.16±0.64
No lime	CEPEC-2002	51.53±3.22	11.7±0.18	8±2	38.33±1.53	37.67±4.16	63.73±10.89	750.23±249.06	302.44±47.5	33.57±4.44	13.05±2.31	46.62±6.75	25.86±7.42	298.37±69.56	9.2±1.55
No lime	CP-2005-C10	57.3±4.1	11.24±0.11	7.33±1.53	47±8.19	42±9.17	72.8±6.61	852.53±244.08	273.09±9.77	27.49±3.38	10.18±3.78	37.67±6.36	26.04±7.55	234.53±7.11	9.4±1.66
No lime	CP-49-C10	44.67±2.34	11.85±1.34	5±2.65	25.33±3.21	37.67±2.52	80.73±19.55	891.42±139.55	332.71±74.09	32.49±2.09	14.75±1.63	47.24±3.43	31.54±3.2	214.53±79.92	12.29±1.18
No lime	CP-53-C10	45.5±4.88	11.31±0.98	8±2.65	47±4.36	39.33±5.13	59.53±12.62	812.02±367.77	290.11±35.21	31.68±2.63	12.33±0.8	44.01±2.04	33.54±12.06	239.93±24.27	10.37±2.35
No lime	EET-400	54.27±7.64	11.42±0.74	5±0	45±1.73	42.93±3.2	82±11.42	988.93±148.35	240.07±39.15	30.65±4.23	10.5±0.93	41.15±4.97	27.76±5.75	122.63±59.08	12.23±0.99
No lime	H-10	48.73±2.41	10.86±0.57	6±1.73	35.67±5.03	44.17±4.37	72.93±4.61	824.75±280.8	376.4±12.89	26.83±0.42	11.15±1.22	37.98±1.09	29.75±8.43	273.5±111.6	8.51±1.29
No lime	ICS-1	48.4±4.13	11.2±1.51	6±1	45±7.81	42.33±4.07	84.03±11	917.33±207.5	272.13±29.3	29.5±1.83	11.27±2.5	40.77±2.45	21.5±5.01	262±43.91	12.75±2.26
No lime	ICS-39	54.13±12.11	11±0.83	5.33±0.58	33.67±6.11	40.27±2.87	73.77±4.1	816.56±67.3	305.41±67.1	30.82±7.19	10.99±1.96	41.81±9.09	29.55±9.11	268.7±23.83	11.57±3.33
No lime	ICS-6	52.07±4.76	11.72±0.56	3±1	28±6.56	42.03±3.54	89.27±16.06	815.24±66.01	328.02±83.92	28.56±5.87	12.03±1.14	40.59±6.99	33.22±9.6	143.27±31.37	13.1±1.04

No lime	ICS-95	59.6±3.2 2	10.68±0.4	3.33±1. 15	29±6.24	46.17±4.07	82.23±4. 47	967.35±152 .73	284.28±16. 42	37.55±4.87	11.09±0.9 2	48.64±4.7 1	22.71±4. 32	222.13±26. 42	13.91±0.94
No lime	ICT-1026	54.37±10 .08	11.22±1.0 9	7.33±2. 89	44±18.19	38±3	58.53±5. 49	749.85±164 .22	261.78±41. 87	35.6±0.38	13.16±2.8 6	48.76±2.7	23.7±0.5 7	188.87±72. 71	13.09±1.01
No lime	ICT-1087	66.47±3. 76	12.15±1.5 8	9.67±2. 52	46.67±11.37	35.5±1.8	77.07±13 .32	904.52±354 .28	295.09±10. 67	37.46±3.95	12.86±1.9 7	50.32±5.9 1	23.68±6. 29	195.47±67. 83	12.32±1.04
No lime	ICT-1092	47.17±8. 86	9.89±0.72	7±3.61	40.67±10.69	39±2	60.8±3.3	1040.1±143 .69	287.74±20. 63	26.89±4.34	8.45±1.03	35.34±5.2 1	26.1±5.8 1	218.27±74. 93	15.22±2.38
No lime	ICT-1112	58.17±6. 95	11.71±0.6 2	3.67±1. 15	30±2.65	42.33±0.58	77.83±16 .83	985.5±161. 98	342±49.72	29.5±3.16	11.5±0.9	41±3.39	31.68±4. 36	190.2±41.3 8	14.93±5.18
No lime	ICT-1189	47.43±12 .2	11.09±0.7 6	6.33±3. 06	33±13.75	44±4	63.77±10 .08	1207.02±20 7.58	292.81±65. 97	33.63±3.97	10.55±3.6 9	44.17±7.5 3	27.79±9. 07	200.83±19. 16	14.34±0.53
No lime	ICT-1251	39.47±11 .27	8.35±1.04	5±1.73	31.33±8.08	44.33±3.79	73.37±12 .8	812.41±156 .56	346.18±93. 04	28.55±3.99	9.44±0.83	37.99±4.8 2	40.42±5. 72	254.1±13.2 5	15.57±2.68
No lime	ICT-1281	51.8±11. 84	12±1.51	7±2.65	38±3.46	49.5±7.37	57.63±9. 06	656.73±111 .5	360.48±68. 77	28.23±2.18	11.46±2.1 6	39.69±4.1 1	38.93±20 .04	183.63±21. 45	14.55±1.77
No lime	ICT-1292	53.5±1.6	11.34±0.9 1	6±1.73	42±10.58	39±8	67.33±13 .34	968.91±27. 64	293.15±8.2 8	28.55±1.49	13.14±2.7 9	41.69±3.5 4	24.32±7. 33	178.03±41. 01	15.62±1.65
No lime	ICT-1506	56.43±8. 6	10.92±0.3 2	10.67±0 .58	45.67±8.39	40±1	73.7±13. 42	776.12±203 .37	304.42±34. 17	25.24±3.27	13.02±1.5 4	38.26±2.7 2	34.33±4. 29	223.17±25. 14	8.7±1.12
No lime	ICT-2142	49.73±1. 17	11.52±1.0 3	5±1	34.33±5.86	41.67±2.89	83.3±9.5 6	714.19±123 .8	339.7±29.8 6	33.14±2.47	14.49±1.8 8	47.63±3.0 2	41.31±4. 04	222.27±12 1.02	12.29±3.17
No lime	ICT-2161	43.53±1. 56	11.54±0.7 7	5.33±2. 08	36.33±10.02	36±1	83.37±26 .07	983.81±111 .09	257.92±42. 13	27.09±3.29	12.81±1.0 7	39.9±2.56	24.8±15. 42	193.5±37.8 5	15.7±1.63
No lime	ICT-2171	55.13±8. 75	12.39±1.5 2	6.33±0. 58	43±1.73	36.5±3.04	76.83±9. 75	840.24±112 .66	285.55±69. 8	29.25±5.14	12.27±2.5 9	41.52±3.9 4	26.9±6.5 6	278.43±11 4.28	18.31±3.56

No lime	ICT-2172	58.97±8.54	12.41±1.17	5.33±1.53	36±6.24	36.17±2.02	68.47±10.23	1214.25±396.13	249.74±50.7	30.7±4.21	10.36±0.57	41.06±4.38	25.43±4.85	417.8±451.08	13.89±1.36
No lime	ICT-2173	55.83±15.59	11.72±1.8	4±2.65	24.67±8.74	35±4	55.03±5.7	785.07±113.06	277.44±52.88	30.81±2.4	9.69±0.7	40.5±1.75	18.16±2.56	242.07±68.36	12.59±2.33
No lime	ICT-2653	42.5±2.61	11.33±0.89	4.67±2.08	29.67±2.08	42.67±2.52	78.53±27.2	879.42±353.22	337.94±76.68	26.57±2.6	10.16±1.52	36.73±2.81	27.82±7.1	141.93±51.56	14.12±1.6
No lime	IMC-67	44.8±3.5	11.66±0.44	6.67±2.08	38.33±2.52	44±2	66.6±4.5	1022.91±74.07	364.6±107.49	27.59±1.54	12.4±1.02	40±2.52	32.72±3.15	318.1±133.36	9.52±1.49
No lime	IPIRANG A-1	68.9±13.09	11.12±1.84	4.33±1.53	33.33±6.03	41±1	59.57±7.57	1117.13±319.42	340.01±75.46	30.1±5.09	12.32±1.48	42.42±5.57	20.6±3.99	257.97±74.69	11.76±0.33
No lime	NUC-156	34.43±3.81	10.04±0.98	6±1	31.67±6.51	36.83±5.92	63.27±16.78	852.31±102.62	279.31±119.03	22.99±3.13	5.99±2.89	28.97±6.02	35.08±13.96	354.17±132.09	9.05±1.93
No lime	PAS-100	38.97±2.44	12.68±0.58	8±1	41.67±4.51	36.33±5.03	53.27±5.11	845.88±203.03	190.21±41.08	25.53±4.05	5.94±1.69	31.47±5.63	29.84±11.25	144.73±35.03	11.09±0.47
No lime	PAS-105	41.1±1.01	10.96±0.89	4.33±1.53	31.67±4.04	45.77±3.67	65.57±6.31	596.09±151.4	300.61±49.22	25.93±1.19	11.35±1.88	37.28±1.8	27.35±6.88	79.57±18.6	13.89±1.82
No lime	PAS-91	62.27±17.7	12.86±1.44	3±1.73	29±7	48.67±1.53	55.27±5.85	1173.48±144.08	290.09±49.64	34.87±2.58	12.9±0.36	47.76±2.53	24.26±10.45	163.33±67.37	13.54±2.74
No lime	PAS-93	47.8±6.68	11.81±1.33	5±2	37.67±8.5	36.5±5.27	59.93±15.43	867.42±175.33	197.86±32.77	32.15±3.12	10.41±0.43	42.56±3.25	25.84±4.14	212.57±13.12	11.42±0.61
No lime	PH-09	59.97±8.9	11.46±0.8	4±1	27.67±2.52	37.33±1.53	76.83±10.28	855.92±263.79	307.15±29.94	33.05±3.6	12.63±1.13	45.68±4.38	24.19±6.6	190.3±51.72	10.68±0.74
No lime	PH-144	51.27±13.44	11.29±0.87	8.33±1.53	31±4.58	37.67±3.21	65.27±8.05	977.8±345.81	252.06±47.67	35.55±2.7	13.86±1.18	49.41±2.54	21.87±6.51	213.2±25.78	11.54±3.06
No lime	PH-15	49.7±6.61	10.57±0.92	5.33±1.15	42.67±12.42	43.67±8.08	76.4±14.24	886.47±73.05	436.03±86.07	30.51±2.7	14.07±0.18	44.59±2.66	34.53±3.36	242±82.94	12.77±2.26



No lime	PH-16	47.23±3.03	11.01±0.52	9.33±3.51	45±3.61	43±7.21	59.47±12.45	817.56±64.43	368.82±92.05	30.61±5.28	13.32±2.34	43.93±6.09	21.44±4.09	288.87±86.38	11.31±0.95
No lime	PH-17	40.27±0.81	11.05±0.26	11±1.73	52±6.56	33.33±1.53	56.97±6.85	629.7±262.86	251.8±72.76	27.49±3.38	10.18±3.78	37.67±6.36	29.5±6.76	297±94.92	10.39±1.95
No lime	PH-21	59.3±12.95	11.03±1.04	8.33±2.52	57.67±8.02	43.67±4.04	49.33±2.2	1043.26±101.37	302.73±22.73	36.2±0.9	11.49±0.17	47.69±0.95	21.1±7.44	157.57±51.37	10.2±1.32
No lime	PH-990	50.87±5.78	10.96±1.29	8±4.36	38±6.08	40.33±8.39	64.93±9.51	943.25±131.86	318.69±43.38	32.96±1.33	10.98±0.92	43.94±0.67	22.12±10.78	146.63±43.41	11.72±1.21
No lime	POUND-12	54.23±5.68	10.28±0.78	8±1	39.33±5.51	40.33±2.89	65.7±6.95	939.7±250.98	233.15±6.54	23.78±5.52	10.43±1.98	34.21±7.28	20.66±1.03	223.07±53.68	10.18±1.9
No lime	SCA-6	55.2±4.07	11.12±0.48	11.33±3.51	63±14.11	47.33±2.52	68.33±8.78	943.69±104.98	269.91±33.02	32.07±4.86	12.1±0.71	44.17±5.51	22.35±6.01	185.4±21.97	12.03±1.44
No lime	TSH-1188	43.8±2.33	12.63±0.67	6±3	35.33±11.15	39.33±4.51	72.73±7.35	737.38±245.39	345.92±62.91	27.96±3.01	13.21±1.19	41.17±3.98	34.42±7.49	311.5±8.09	14.75±3.65
No lime	TSH-565	50±6.9	12.19±1.65	5±1	47.67±7.37	39.67±2.02	65.1±9.91	902.88±140.78	289.53±48.57	34.02±2.86	14.77±1.09	48.78±3.83	24.07±6.75	317±43.39	14.31±1.78
No lime	UF-613	44.83±3.89	11.49±1	6.33±1.15	29.33±6.43	38.33±3.06	60.83±27.95	815.09±219.47	303.36±123.5	31.14±1.01	9.56±2.52	40.69±2.02	27.9±3.92	283.1±33.16	14.14±3.89
No lime	UF-667	51.47±9.71	11.08±0.53	5.33±2.08	47±13.08	45.07±4.31	109.6±7.02	1319.35±87.38	395.79±74.33	37.51±1.46	9.99±1.66	47.51±0.47	36.84±5.25	327.1±77.07	14.53±1.47
No lime	UGU-112	50.83±4.92	10.59±0.36	8.67±3.21	46.67±15.5	36±2.65	53.6±5.5	531.56±143.4	239.69±43.73	27.18±3.16	8.22±2.15	35.4±5.3	27.73±1.42	274.87±12.76	9.54±1.1
No lime	UGU-126	39.57±3.6	12.54±1.45	5±2.65	27.33±6.66	37.17±2.47	51.43±14.42	718.3±121.84	210.6±41.72	20.07±5.61	6.01±2.22	26.08±7.82	29.33±10.53	166.07±30.52	10.58±0.77
No lime	UGU-130	35.37±1.21	10.06±1.07	4±0	18.67±3.06	32±6	60.6±14.91	613.58±99.04	214.62±96.59	15.47±6.47	5.93±3.19	21.39±9.02	32.04±11.33	162.83±96.45	8.45±1.73

No lime	UNG-53	56.17±10 .96	10.04±0.2 9	6.33±1. 53	36.33±4.93	45.27±3.16	63.71±7. 32	990.34±129 .27	251.17±17. 05	28.46±2.43	9.29±1.07	37.75±2.2	22.96±4. 72	325.17±11 9.44	10.46±0.82
No lime	UNG-73	47.3±2.4 6	11.43±0.6 1	7.67±0. 58	38.33±3.06	41.5±3.28	46.9±7.5 8	658.56±94. 99	324.58±75. 52	21.72±4.04	11.44±1.2 5	33.16±4.2 5	28.19±8. 97	243.27±80. 91	14.79±2.39
No lime	UNG-76	32.27±1. 17	12.59±0.9 9	4.67±1. 53	22.33±7.64	30.17±5.75	47.27±24 .47	483.67±143 .19	174.68±13. 15	11.5±5.44	1.82±0.91	13.32±6.3 4	31.27±11 .94	162.47±17. 57	11.02±3.69
No lime	UNG-77	45.83±6. 82	12.12±1.1 7	7±2	30±2	38.67±6.81	74.4±6.1 2	1108.74±41 2.89	314.03±51. 52	28.73±4.43	11.34±1.9 2	40.07±6.3 1	29.04±5. 83	189±81.34	13.77±2.67

**Table S2.** Effect of soil acidity (Mean  $\pm$  sd) on the concentration and uptake of macronutrients (N, P, K, Ca, Mg) and micronutrients (Cu, Fe, Mn and Zn) for each cacao genotype assessed

Treat ment	Genotyp e	N	P	K	Ca	Mg	Cu	Fe	Mn	Zn	N uptake	P uptake	K uptake	Ca uptake	Mg uptake	Cu uptake	Fe uptake	Mn uptake	Zn uptake
Units		%					mg kg <sup>-1</sup>				mg plant <sup>-1</sup>								
Lime	AYP-15	1.09± 0.12	0.15± 0.15	1.97± 0.16	1.89± 0.08	0.89± 0.01	1.4±0.0 5	96.96±11 .92	114.08±40 .1	30.78±2 .69	406.67±4 6.67	54.13±5 5.19	605.58±40 .42	703.98±3 3.45	332.23±1 2.94	0.52±0. 01	36.15±5 .66	42.32±14. 25	11.47±1 .4
Lime	AYP-20	1.16± 0.07	0.06± 0.02	2.41± 0.12	2.17± 0.17	1.02± 0.03	11.96± 3.09	111.86±3 6.31	206.78±82 .93	71.54±1 5.42	254.32±2 1.51	13.85±2 .93	354.54±12 9.89	476.85±2 8.17	223.3±9.7 5	2.61±0. 61	24.53±7 .81	45.48±18. 71	15.76±3 .75
Lime	AYP-22	0.68± 0.03	0.03± 0.02	2.32± 0.13	1.18± 0.77	0.63± 0.35	6.9±1.2 6	101.53±1 2.41	211.54±82 .23	72.74±2 0.5	201.01±1 5.95	8.5±5.2 8	650.96±34 .23	366.5±28 3.01	193.98±1 33.08	2.03±0. 33	30.35±7 .17	63.08±25. 67	21.23±4 .57
Lime	BN-34	1.21± 0.02	0.04± 0.01	1.87± 0.07	0.41± 0.11	0.27± 0.02	6.36±0. 24	152.53±3 3.72	166.35±8. 49	47.44±1 .34	346.41±2 2.55	11.4±2. 49	575.35±41 .68	117.47±2 6.6	76.41±5.0 2	1.82±0. 06	43.77±9 .72	47.77±4.2 1	13.61±0 .79
Lime	BS-01	1.19± 0.07	0.06± 0.01	2.24± 0.15	1.54± 0.2	0.9±0. 05	5.73±2. 81	102.52±1 4.77	97.2±43.9 5	42.79±5 .14	329.58±1 01.26	17.49±5 .01	706.06±47 .76	414.26±6 3.26	249.26±7 3.01	1.44±0. 38	28.91±1 1.06	28.54±16. 61	11.58±2 .34
Lime	CA-14	1.13± 0.04	0.08± 0.03	1.81± 0.2	1±0.0 7	0.68± 0.06	5.76±1. 75	110.45±3 3.62	67.06±17. 93	32.98±4 .86	362.65±3 1.24	26.85±1 0.26	594.44±89 .7	318.08±1 8.29	215.85±1 2.73	1.81±0. 4	34.6±7. 28	21.42±5.3 8	10.48±0 .79
Lime	CCN-10	1.11± 0.03	0.08± 0.01	2.02± 0.11	1.49± 0.28	0.7±0. 09	4.06±1. 53	143.72±9 3.58	65.68±30. 51	33.18±2 .49	377.53±4 3.58	25.95±2 .53	731.4±17. 91	503.21±7 1.64	237.07±1 6.72	1.36±0. 41	47.23±2 6.77	21.82±9.1 5	11.27±0 .8
Lime	CCN-51	1.18± 0.03	0.08± 0.03	2.55± 0.18	1.6±0. 13	0.8±0. 04	2.48±0. 95	142.98±4 2.42	86.43±17. 17	29.9±4. 9	395.32±3 6.8	26.69±8 .94	968.71±98 .78	540.16±8 1.54	269.94±4 1.09	0.83±0. 36	48.04±1 5.85	29.49±8.6 2	10.01±1 .64

Lime	CEPEC-2002	1.16±0.06	0.04±0.01	1.88±0.3	1.62±0.07	0.84±0.1	4.71±1.22	102.43±16.69	141.54±35.07	45.42±9.04	319.81±54.46	12.21±3.86	621.55±24.01	447.22±77.53	234.23±53.36	1.36±0.59	28.41±7.19	38.95±11.47	12.97±4.99
Lime	CP-2005-C10	1.19±0.13	0.04±0.01	1.66±0.04	0.54±0.11	0.3±0.04	2.54±1.22	92.27±27.21	175.09±24.63	39.79±3.18	379.47±14.31	13.77±3.22	454.77±47.62	171.61±35.7	95.87±10.49	0.83±0.42	29.19±6.47	56.1±9.04	12.71±0.4
Lime	CP-49-C10	1.18±0.05	0.06±0.01	1.66±0.12	1.75±0.14	1.02±0.03	5.61±3.37	69.95±11.8	82.92±12.12	33.76±4.64	362.73±36.62	17.4±2.61	539.47±52.33	533.69±38.89	312.48±27.44	1.68±0.92	21.28±2.65	25.44±4.4	10.27±0.83
Lime	CP-53-C10	1.24±0.04	0.07±0.01	2.65±0.19	1.42±0.11	0.67±0.06	4.15±4.86	94.06±9.24	86.48±88.82	27.76±4.77	363.88±29.59	20.66±4.06	838.93±67.51	419.86±56.96	197.57±13.96	1.28±1.56	27.72±4.08	25.57±26.38	8.2±1.71
Lime	EET-400	1.11±0.09	0.04±0.01	2.31±0.18	0.64±0.27	0.36±0.09	8.52±0.19	141.05±72.54	110.13±20.25	44.84±3.2	323.93±43.48	11.77±3.52	707.14±100.67	188.45±90.65	106.96±33.15	2.49±0.09	41.81±22.96	32.17±6.27	13.1±1.31
Lime	H-10	0.91±0.12	0.06±0.01	2.36±0.28	2.24±0.42	1.61±0.2	4.08±0.86	101.96±8.17	106.05±69.86	30.4±4.68	282.01±114.82	18.66±7.96	632.71±79.3	691.71±280.32	496.44±180.08	1.24±0.43	31.42±10.89	36.1±32.5	9.45±3.98
Lime	ICS-1	1.13±0.04	0.07±0.01	2.35±0.06	1.42±0.13	0.61±0.05	6.85±2.32	123.33±48.79	67.59±29.31	20.54±7.67	267.45±34.38	15.8±2.52	692.91±38.87	334.29±26.15	143.67±10.3	1.62±0.53	28.72±10.3	16.38±8.67	4.95±2.31
Lime	ICS-39	1.08±0.07	0.04±0	2.02±0.22	0.62±0.13	0.38±0.06	4.27±1.45	112.56±23.96	209.96±38.91	45.72±4.52	384.01±50.8	14.16±1.22	610.98±71.57	219.42±48.84	135.21±20.71	1.54±0.64	39.91±9.34	73.85±11.85	16.26±2.89
Lime	ICS-6	0.96±0.21	0.07±0.02	2.36±0.05	1.81±0.64	1.16±0.17	5.32±2.37	123.16±49.92	165.85±47.59	54.91±5.6	276.89±36.9	21±7.27	673.51±129.1	546.32±258.14	344.6±92.76	1.55±0.7	37.42±18.26	49.69±20.04	16.29±3.57
Lime	ICS-95	1.1±0.14	0.04±0.02	2.2±0.24	1.38±0.16	0.88±0.05	5.14±1.37	110.7±102.55	201.62±148.49	42.26±8.98	369.42±89.6	13.99±6.3	825.27±125.14	452.63±12.22	291.9±19.2	1.67±0.28	34.91±29.83	70.56±59.96	14.12±4.05
Lime	ICT-1026	1.1±0.13	0.07±0.04	1.91±0.04	1.99±0.61	1.29±0.4	6.68±1.25	123.75±24.42	203.77±155.29	42.55±14.5	359.15±60.77	22.49±11.88	680.12±21.4	645.44±190.54	418.74±128.42	2.15±0.24	39.95±6.25	68.77±57.43	13.8±4.58
Lime	ICT-1087	1.09±0.1	0.05±0.01	2.24±0.53	1.31±0.16	0.65±0.09	17.26±6.7	127.96±12.72	92.34±6.87	23.01±4.4	455.03±59.52	20.66±2.9	837.18±193.99	542.38±46.55	270.65±24.48	7.08±2.38	53.11±2.56	38.35±0.64	9.56±1.75
Lime	ICT-1092	0.89±0.1	0.07±0.01	3.53±0.21	1.72±0.19	0.79±0.1	3.47±3.18	73±18.33	48.34±7.49	29.93±5.27	267.05±29.28	19.92±3.29	946.79±153.11	514.91±52.34	236.01±26.19	1.04±0.94	21.78±5.24	14.44±2.08	8.93±1.47

Lime	ICT-1112	1.18±0.05	0.05±0.02	2.87±0.32	1.68±0.11	0.91±0.02	2.69±1.17	95.36±27.6	86.47±56.35	30.46±6.18	352.89±8.95	15.96±6.41	841.43±59.17	501.98±28.71	271.42±0.25	0.81±0.36	28.49±8.4	26.01±17.46	9.11±2
Lime	ICT-1189	1.13±0.02	0.06±0.02	1.88±0.41	0.36±0.15	0.25±0.04	11.18±4.76	175.16±76.97	166.61±29.86	50.8±6.8	388.41±101.25	18.25±1.78	621.27±59.68	128.87±76.83	87.34±33.42	4.02±2.46	56.8±21.25	56.45±14.99	17.1±3
Lime	ICT-1251	1.1±0.04	0.04±0.01	2.04±0.38	0.48±0.02	0.28±0.01	9.29±2.88	114.2±47.96	97.58±15.34	50.41±12.7	299.04±25.07	10.78±1.94	573.22±50.46	131.79±10.48	76.46±7.8	2.5±0.6	30.49±10.28	26.42±2.69	13.57±2.31
Lime	ICT-1281	1±0.26	0.09±0.01	3.21±0.31	1.4±0.18	0.94±0.1	5.54±0.29	109.05±42.05	64.83±15.63	34.95±6.5	284.31±88.38	26.21±2.06	901.94±61.15	397.04±81.1	265.45±46.05	1.56±0.19	31.34±14.93	18.4±5.52	9.93±2.77
Lime	ICT-1292	1.17±0.08	0.04±0.01	2.17±0.16	0.47±0.05	0.35±0.05	6.08±2.86	102.09±8.27	193.24±56.96	43.12±1.72	353.06±31.96	12.25±3.76	618.22±27.36	143.28±26.78	106.72±22.07	1.8±0.68	31.05±4.66	59.45±21.05	13.06±1.08
Lime	ICT-1506	0.91±0.11	0.09±0.03	2.94±0.31	1.93±0.42	0.88±0.17	3.86±2.13	127.08±85.38	89.89±24.83	32.85±10.79	253±24.31	25.19±9.42	748.49±172.81	536.9±131.51	246.33±56.77	1.08±0.63	36±25.93	25.17±8.1	9.14±3.05
Lime	ICT-2142	1.14±0.1	0.06±0.01	2.72±0.22	1.77±0.29	0.86±0.12	3.06±1.57	97.27±30.83	87.38±28.68	27.6±4.51	340.24±13.94	18.97±2.86	899.09±14.54	526.55±88.44	254.99±31.98	0.94±0.53	29.04±9.67	26.46±10.26	8.29±1.83
Lime	ICT-2161	1.04±0.02	0.06±0.01	2.23±0.34	1.56±0.1	0.84±0.1	4.19±1.76	89.18±16.79	76.78±33.99	26.76±1.28	303.64±7.54	18.52±2.05	602.77±120	454.97±14.31	246.17±29.49	1.23±0.52	25.93±3.97	22.61±10.61	7.82±0.56
Lime	ICT-2171	1.18±0.03	0.09±0.03	2.15±0.22	1.45±0.18	0.67±0.12	4.84±0.63	89.47±7.89	152.73±31.98	18.89±1.7	422.56±11.04	33.48±8.63	634.35±163.07	520.25±55.59	239.29±39.61	1.75±0.31	32.11±2.45	54.66±9.89	6.8±0.92
Lime	ICT-2172	1.09±0.08	0.09±0.01	2.04±0.08	1.21±0.06	0.91±0.01	4.53±0.31	108.64±11.32	226.43±113.28	36.55±9.51	401.74±75.83	33.01±6.02	628.8±105.48	442.84±46.45	333.02±43.62	1.66±0.33	39.99±8.33	79.31±33.5	13.09±2.21
Lime	ICT-2173	1.22±0.25	0.08±0.02	3.04±0.29	3.26±0.2	1.84±0.17	5.41±0.42	101.11±7.58	247.42±165.95	33.35±5.94	477.92±102.26	30.04±6.39	937.79±126.87	1275.2±59.74	718.89±56.15	2.12±0.16	39.51±2.39	96.65±64.98	13.04±2.33
Lime	ICT-2653	1.18±0.14	0.06±0.01	2.39±0.15	1.24±0.08	0.86±0.08	6.61±2.04	113.61±26.2	79.58±12.06	30.83±1.78	388.43±30.14	19.94±3.92	634.78±58.74	410±11.71	284.52±40.14	2.17±0.61	37.72±9.29	26.36±4.21	10.21±0.83
Lime	IMC-67	1.15±0.05	0.07±0.01	2.48±0.79	1.12±0.09	0.75±0.03	11.25±6.04	126.2±12.07	56.37±1.39	34.81±6.89	327.31±30.23	21±3.21	685.13±225.3	318.37±6.57	215.36±24.81	3.14±1.57	35.86±1.7	16.07±1.08	9.86±1.47

Lime	IPIRAN GA-1	1.08± 0.08	0.07± 0	1.87± 0.1	1.52± 0.17	0.85± 0.11	3.2±1.4 6	96.69±12 .64	114.28±42 .2	27.42±1 .16	406.88±6 5.6	26.38±2 .87	560.88±78 .88	570.03±6 9.9	321.61±5 2.79	1.19±0. 49	36.21±3 .37	43.15±16. 06	10.37±1 .59
Lime	NUC- 156	1.23± 0.08	0.08± 0	2.19± 0.17	1.72± 0.19	1.03± 0.04	5.3±2.1 1	106.81±1 7.17	82.95±13. 59	38.06±3 .32	315.4±23. 08	20.5±0. 29	499.09±29 .7	440.44±4 1.83	263.93±7. 92	1.36±0. 52	27.42±4 .81	21.26±3.5 .	9.75±0. 72
Lime	PAS-100	1.05± 0.06	0.1±0. 03	3.32± 0.15	2.17± 0.12	0.85± 0.06	3.49±0. 95	72.95±26 .93	75.57±20. 02	35.84±7 .34	313.92±5 2.9	31.38±1 1.93	847.83±13 0.98	646.28±1 04.92	253.79±5 5.54	1.02±0. 15	21.98±9 .76	23.06±9.7 .	10.7±2. 9
Lime	PAS-105	1.19± 0.11	0.09± 0.03	1.93± 0.24	2.24± 0.37	0.92± 0.08	5.88±1. 52	136.83±3 0.05	193.54±87 .29	50.01±1 1.09	378.78±5 9.23	28.23±6 .16	502.59±78 .48	703.88±6 4.69	294.12±4 5.91	1.85±0. 41	42.79±5 .18	67.06±45. 83	16.29±6 .21
Lime	PAS-91	1.16± 0.03	0.09± 0.02	1.87± 0.14	2.48± 0.19	1.69± 0.05	5.43±0. 84	98.7±18. 29	96.93±23. 75	37.22±4 .46	405.65±4 0.17	31.82±9 .08	651.92±47 .79	871.23±1 40.11	592.46±7 7.63	1.91±0. 45	34.59±8 .06	33.35±4.6 1	13.01±2 .04
Lime	PAS-93	1.1±0. 08	0.09± 0.02	1.87± 0.14	2.44± 0.54	1.42± 0.18	5.92±2. 16	143.75±4 3.05	190.32±13 5.6	43.77±1 1.99	368.89±8 5.05	30.89±4 .76	599.61±23 .88	797.78±9 7.13	469.07±3 9.66	1.92±0. 47	47.54±1 3.85	63.69±45. 75	14.19±1 .95
Lime	PH-09	1.13± 0.03	0.04± 0.01	1.96± 0.27	0.37± 0.1	0.23± 0.05	4.63±0. 51	55.62±38 .79	130.76±18 .83	59.04±2 8.47	349.85±2 1.63	11.54±4 .41	655.26±16 3.9	114.88±3 1.73	72.68±18. 35	1.45±0. 27	17.61±1 3.35	40.64±6.6 8	17.88±7 .01
Lime	PH-144	1.26± 0.04	0.06± 0.01	2.24± 0.12	1.34± 0.37	0.93± 0.24	7.77±5. 48	119.24±5 1.18	106.5±16. 55	33.85±6 .03	434.93±8 5.64	21.65±2 .94	796.21±48 .81	446.55±4 0.82	313.03±3 6.89	2.58±1. 77	43.43±2 6.71	36.17±4.0 3	11.54±2 .02
Lime	PH-15	1.15± 0.05	0.07± 0.01	1.79± 0.2	1.34± 0.29	0.73± 0.15	1.51±0. 31	105.05±6 2.2	89.16±28. 14	31.53±6 .72	356.55±5 8.58	21.32±0 .37	544.09±30 .99	414.91±1 09.41	225.92±5 2.16	0.46±0. 04	32.13±1 8.16	26.93±6.9 .	9.63±1. 65
Lime	PH-16	1.16± 0.06	0.16± 0.14	2.55± 0.63	2.02± 0.46	1.04± 0.32	3.34±2. 45	116.17±2 2	117.57±33 .37	29.22±3 .83	436.67±7 5.62	57.42±4 7.34	760.53±84 .1	763.52±2 14.18	399.1±17 0.33	1.33±1. 14	42.89±3 .42	44.18±13. 26	10.95±1 .77
Lime	PH-17	1.08± 0	0.06± 0.01	2.57± 0.36	1.53± 0.06	0.96± 0.1	6.79±1. 25	104.13±2 6.27	141.46±46 .36	42.42±6 .62	366.81±4 8.25	19.07±0 .43	705.15±13 1.65	517.03±5 0.62	322.2±16. 37	2.28±0. 25	35.23±8 .65	46.72±10. 8	14.29±1 .74
Lime	PH-21	0.97± 0.25	0.1±0. 05	2.11± 0.39	1.71± 0.23	0.8±0. 06	2.37±0. 87	86.66±40 .54	86.05±18. 57	28.96±5 .2	361.47±1 07.2	36.64±2 0.81	763.19±14 6.99	637.17±1 36.07	296.69±4 4.49	0.89±0. 36	32.89±1 7.08	32.29±9.4 1	10.83±2 .79
Lime	PH-990	1.15± 0.17	0.06± 0.01	2.83± 0.57	1.98± 0.37	1.13± 0.17	4.3±1.3 7	130.97±3 5.97	146.51±39 .95	39.36±9 .63	474±84.8 3	25.89±4 .28	933.25±19 8.9	808±120. 27	459.81±4 6.58	1.78±0. 66	53.71±1 5.49	60.27±18. 15	16.29±4 .8

Lime	POUND-12	1.09±0.02	0.09±0.01	2.44±0.3	1.61±0.06	1.02±0.05	6.04±4.25	111.39±2.54	108.51±25.9	32.35±0.47	297.43±45.75	23.83±5.15	573.64±117.63	439.59±64.11	279.04±56.6	1.53±0.82	29.81±2.55	30.32±10.91	8.83±1.39
Lime	SCA-6	1.01±0.03	0.15±0.03	1.88±0.11	1.53±0.18	0.74±0.06	1.49±0.18	151.13±3.97	85.58±41.08	27.85±1.14	368.1±55.1	52.74±8.48	600.71±56.62	559.97±137.47	268.75±54.8	0.53±0.04	54.8±7.05	31.71±17.16	10.13±1.65
Lime	TSH-1188	1.08±0.05	0.07±0	3.49±0.29	1.24±0.3	0.68±0.17	3.3±1.9	92.86±30.39	63.57±45.35	26.17±5.94	307.46±50.79	19.86±3.03	971.22±82.69	358.25±129.75	198.3±74.36	0.95±0.55	27.17±13.06	16.88±9.71	7.26±0.78
Lime	TSH-565	1.05±0.11	0.07±0.01	1.96±0.24	1.61±0.13	0.88±0.07	2.21±1.51	78.86±13.25	62.69±17.91	26.5±6.75	354.23±38.54	24.79±3.86	672.34±135.05	542.12±41.42	296.67±38.26	0.76±0.58	26.44±4.3	21.27±7.3	9.01±2.93
Lime	UF-613	1.15±0.02	0.1±0.02	3.03±0.35	1.35±0.03	0.83±0.05	8.23±2.62	118.48±35.47	71.04±15.34	38.43±5.41	324.75±44.15	27.85±8.38	942.9±104.46	381.57±53.19	233.6±28.68	2.4±1.13	32.69±5.16	20.25±5.51	10.92±2.22
Lime	UF-667	1.04±0.02	0.08±0.02	1.97±0.2	1.55±0.11	0.7±0.05	2.98±1.4	175.34±74.42	96.71±77.88	29.97±2.59	383.76±40.26	29.5±6.12	740.35±80.92	573.12±42.01	256.75±13	1.07±0.43	63.7±22.48	35.61±27.73	11.04±0.6
Lime	UGU-112	0.8±0.04	0.2±0.04	2.28±0.23	1.7±0.15	0.81±0.05	2.01±0.74	140.74±32.83	100.97±57.18	30.94±4.28	226.58±18.36	57.25±9.38	618.84±74.49	481.35±63.71	228.82±37.3	0.56±0.15	39.89±10.76	27.44±12.96	8.7±1.06
Lime	UGU-126	0.57±0.03	0.09±0.02	2.07±0.07	1.92±0.05	0.81±0.06	4.14±1.68	102.27±4.71	136.84±67.14	32.38±5.06	213.37±14.67	34.82±4.8	414.27±108.02	720.73±75.83	302.58±7.67	1.59±0.79	38.3±2.81	52.82±29.76	12.26±3.01
Lime	UGU-130	0.71±0.05	0.11±0.04	2.21±0.29	2.07±0.46	0.85±0.09	6.31±2.39	133.82±90.49	52.99±27.19	44.09±8.96	165.4±14.23	26.53±9.6	330.74±101.43	483.39±118.69	198.78±31.46	1.47±0.53	30.47±18.67	12.6±7	10.35±2.67
Lime	UNG-53	1.1±0.09	0.05±0.01	2.57±0.07	1.79±0.53	1.23±0.33	5.12±2.23	144.34±64.14	211.36±132.93	51.29±13.38	363.37±63.96	16.74±4.86	731.57±50.58	599.06±214.83	411.21±133.26	1.76±0.91	47.16±21.02	70.72±45.27	17.04±5.19
Lime	UNG-73	1.04±0.04	0.1±0.02	2.18±0.28	1.65±0.25	0.96±0.05	7.68±1.23	102.91±11.01	102.22±22.07	43.19±3	343.55±33.17	31.98±6.74	469.44±67.26	542.31±77.55	316.09±5.88	2.54±0.51	33.86±4.58	33.65±8.04	14.16±0.19
Lime	UNG-76	0.67±0.05	0.09±0.02	2.42±0.2	1.69±0.21	0.93±0.15	5.52±3.98	48.71±38.61	83.45±101.22	25.46±15.23	220.39±6.24	28.67±5.89	276.81±128.79	557.36±88.46	308.76±60.43	1.84±1.35	16.22±13.34	28.07±34.68	8.4±5.15
Lime	UNG-77	1.12±0.11	0.05±0.01	2.48±0.15	0.49±0.12	0.4±0.07	5.77±1.33	159.77±23.37	162.58±36.27	92.99±71.55	387.36±70.89	17.24±4.26	707.25±71.13	169.25±55.91	136.66±20.67	1.99±0.54	54.47±3.57	56.42±16.03	33.01±27.52

No lime	AYP-15	1.13±0.12	0.06±0.01	1.71±0.05	1.28±0.23	0.53±0.06	5.85±0.67	186.43±1.97	1166.11±286.9	58.9±11.17	351.93±67.22	17.57±4.44	636.78±9.45	394.36±84.39	162.43±23.9	1.79±0.05	57.5±5.05	361.27±104.15	18.2±4.13
No lime	AYP-20	1.2±0.07	0.11±0.02	1.48±0.04	1.46±0.05	0.65±0.09	11.33±1.53	143.33±40.2	1197±276.44	83.67±12.22	180.45±81.81	16.55±9.02	325.77±12.31	216.11±87.91	97.72±50.26	1.69±0.71	22.01±11.34	182.24±88.42	12.18±4.12
No lime	AYP-22	0.69±0.04	0.06±0.01	1.97±0.19	1.22±0.16	0.64±0.04	6±2	93.67±31.79	1564.67±504.68	60.67±4.93	194.65±13.67	17.78±3.29	579.07±24.53	342.65±49.43	179.64±13.07	1.68±0.55	26.35±9.26	440.04±146.95	17.03±1.51
No lime	BN-34	1.25±0.02	0.05±0.01	1.51±0.18	0.93±0.05	0.57±0.04	5.33±1.53	123.67±18.61	1652.33±196.23	66±1	385.57±42.29	16.35±1.11	435.1±65.4	285.87±35.41	174.21±13.45	1.62±0.3	38.37±8.97	512.68±109.96	20.35±2.08
No lime	BS-01	1.23±0.07	0.06±0.02	1.54±0.51	1.36±0.03	0.63±0.02	4.62±2.46	120.61±39.51	1133.21±277.72	50.98±4.43	385.98±18.74	17.81±4.69	401.39±62.53	429.12±11.33	198.24±4.31	1.46±0.78	38.04±12.79	356.98±89.28	16.05±1.55
No lime	CA-14	1.17±0.04	0.04±0.01	2.07±0.08	0.93±0.14	0.46±0.05	6.18±2.19	278.34±51.24	1079.69±149.06	43.79±1.39	384.4±49.92	11.91±1.08	666.62±101.3	305.27±46.82	150.03±9.89	2±0.61	89.94±2.31	351.88±38.79	14.39±1.93
No lime	CCN-10	1.15±0.03	0.07±0.01	1.55±0.02	1.08±0.04	0.49±0.02	7.78±0.37	163.29±56.68	1076.42±223.67	30.4±16.33	416.41±20.94	24.06±2.6	526.97±48.83	393.29±17.12	179.21±10.91	2.83±0.21	58.63±16.75	387.54±51.6	10.76±5.22
No lime	CCN-51	1.22±0.04	0.05±0.01	1.51±0.08	1.17±0.41	0.68±0.15	4.88±0.51	117.38±10.09	1047.73±126.89	44.77±2.18	462.45±26.12	17.74±2.82	508±73.99	444.22±154.71	258.85±57.69	1.84±0.16	44.38±1.95	398.07±60.55	16.98±1.38
No lime	CEPEC-2002	1.05±0.16	0.05±0.02	1.79±0.07	1.18±0.15	0.66±0.1	2.67±1.53	76.33±29.37	1356±229.19	60.33±7.77	351.11±62.22	17.52±3.09	495.22±93.27	398.77±92.88	223.23±60.87	0.87±0.45	26.28±12.88	461.69±129.58	20.45±5.06
No lime	CP-2005-C10	1.23±0.13	0.05±0	1.84±0.09	1.22±0.02	0.66±0.02	2.67±1.53	123±29.1	2018.67±198.49	56.33±2.52	340.16±72.96	13.75±1.69	589.4±12.83	335.89±36.3	182.03±18.34	0.7±0.35	33.2±3.92	553.47±72.71	15.52±2.44
No lime	CP-49-C10	1.23±0.06	0.04±0.02	1.89±0.3	1.12±0.1	0.6±0.05	4.47±1	129.75±19.26	749.4±324.97	44.07±7.65	398.43±28.08	12.04±5.53	581.76±127.99	361.7±17.86	193.71±16.34	1.44±0.24	41.99±5.03	239.11±94.32	14.26±2.12
No lime	CP-53-C10	1.28±0.04	0.06±0.01	1.33±0.06	1.27±0.06	0.63±0.03	3.65±0.8	120.29±12.04	910.94±92.29	47.96±5.72	404.74±20.48	18.07±4.75	390.53±36.24	402.76±26.93	198.01±7.84	1.14±0.16	38.07±4.71	290.13±51.23	15.09±0.47
No lime	EET-400	1.15±0.09	0.07±0.01	1.97±0.12	1.18±0.16	0.77±0.06	7.33±2.08	131.33±17.56	2141±235.77	59.33±6.51	350.95±49.22	20.29±1.52	574.72±56.77	359.12±31.1	233.43±15.5	2.24±0.65	40.53±9.19	656.15±119.49	18±0.52



No lime	H-10	0.94±0.12	0.03±0.01	3.12±0.38	1.06±0.03	0.56±0.04	6.42±1.34	214.31±98.15	1084.36±162.17	49.97±1.27	251.93±28.79	8.97±3.2	966.57±378.88	283.59±11.54	151.25±12.97	1.72±0.37	57.26±25.32	291.27±46.27	13.41±0.47
No lime	ICS-1	1.17±0.05	0.05±0.01	1.76±0.03	1.08±0.17	0.62±0.05	5.33±1.53	111.67±14.84	1770.67±287.63	53.33±4.73	346.42±30.99	13.85±4.04	416.37±36.61	315.56±28.34	182.82±17.81	1.56±0.35	32.76±2.3	521.29±84.23	15.69±0.96
No lime	ICS-39	1.12±0.08	0.07±0.01	1.78±0.07	0.95±0.05	0.61±0.04	5.33±0.58	104±35.51	1369.33±423.08	51±5.29	344.73±82.15	22.87±7.24	630.87±72.84	295.45±81.61	189.76±51.3	1.64±0.35	33.2±16.32	440.32±227.33	15.95±0.41
No lime	ICS-6	1.12±0.03	0.09±0.01	2.09±0.19	0.94±0.09	0.74±0.16	7.67±5.03	75±7.81	1336.67±626.08	53.67±4.16	319.87±59.63	26.43±4.04	620.93±135.5	268.64±68.83	209.97±54.91	2.25±1.79	21.12±2.43	405.78±235.35	15.31±0.36
No lime	ICS-95	1.14±0.15	0.05±0.01	1.51±0.24	1.11±0.05	0.65±0.07	5±1	104±43	1614.67±526.26	54.67±4.93	432.77±110.32	17.69±4.19	495.06±45.83	415.36±56.15	244.64±34.63	1.9±0.51	40.45±21.22	606.05±217.83	20.54±0.49
No lime	ICT-1026	1.14±0.14	0.06±0.01	2.26±0.61	1.21±0.17	0.56±0.04	7.47±0.49	173.78±7.23	980.4±116.98	54.02±7.96	405.55±44.93	21.38±3.67	733.16±198.62	431.13±63.9	200.6±15.59	2.66±0.2	61.89±3.12	349.3±44.98	19.25±0.01
No lime	ICT-1087	1.13±0.1	0.07±0.01	1.5±0.14	1.18±0.36	0.56±0.08	6±1	77.67±68.79	1000±618.47	45±18.19	424.35±66.02	27.44±3.16	621.29±29.21	436.57±120.1	206.41±13.89	2.26±0.48	30.74±28.17	388.3±259.01	17.23±0.02
No lime	ICT-1092	0.93±0.11	0.09±0.03	1.41±0.25	1.12±0.04	0.41±0.06	4.72±1.62	88.04±15.11	1078.98±251.31	53.08±0.71	247.57±33.65	25.28±8.09	423.1±79.65	301.56±44.6	112.82±34.06	1.22±0.26	24.04±7.45	295.94±105.64	14.28±0.34
No lime	ICT-1112	1.22±0.05	0.05±0.01	1.96±0.04	1±0.05	0.54±0.01	5.56±0.99	123.09±29.49	954.13±291.55	46.8±1.36	360.72±38.54	15.69±1.75	584.89±23.89	293.98±33.56	160.41±18.98	1.66±0.48	35.93±6.6	275.85±60.99	13.83±0.79
No lime	ICT-1189	1.17±0.02	0.06±0.02	1.92±0.47	1.01±0.2	0.58±0.09	8.67±1.15	105.67±32.87	1656.67±132.31	51.33±7.51	393.87±51.71	19.05±7.53	632.75±77	335.92±35.7	191.77±18.92	2.94±0.7	36.31±15.03	554.44±45.48	17.07±0.72
No lime	ICT-1251	1.15±0.06	0.11±0.03	2.04±0.04	1.12±0.07	0.77±0.07	8.33±0.58	109.33±40.77	1908.33±275.01	65±10.44	327.66±50.55	30.93±11.03	556.76±51.28	320.18±41.7	218.31±15.69	2.4±0.51	30.22±8.63	539.05±47.27	18.43±0.71
No lime	ICT-1281	1.04±0.27	0.07±0.01	1.93±0.16	1.13±0.08	0.58±0.08	8.99±1.33	78.6±5.91	1058.48±113.53	51.08±9.43	298.53±96.24	20.63±3.06	540.52±16.67	319.21±45.44	164.59±31.46	2.53±0.33	22.18±2.24	298.16±32.12	14.39±0.8
No lime	ICT-1292	1.21±0.09	0.06±0.01	1.74±0.05	1.1±0.1	0.67±0.07	7.33±2.31	104.33±18.88	1909±131.53	62±5.29	345.78±18.84	17.06±2.31	526.42±27.09	314.21±18.53	189.64±10.16	2.11±0.76	29.6±3.75	543.72±9.37	17.67±0.24

No lime	ICT-1506	0.94±0.11	0.07±0.02	1.69±0.11	1.41±0.14	0.59±0.04	7.56±0.22	83.68±8.38	997.57±12.7.16	62.19±9.1	239.84±5.6.59	17.6±4.35	470.99±49.86	357.06±6.5.1	149.03±1.3.4	1.91±0.19	20.99±1.81	251.22±3.8.75	15.77±3.7
No lime	ICT-2142	1.18±0.1	0.06±0	1.28±0.47	1.09±0.1	0.5±0.01	4.79±1.33	70.53±7.66	871.19±16.4.75	52.59±3.58	393.11±5.3.26	19.88±1.48	379.82±12.7.28	362.17±5.3.76	165.79±1.4.5	1.57±0.36	23.48±4.21	290.76±7.0.1	17.38±0.84
No lime	ICT-2161	1.07±0.02	0.06±0.01	1.25±0.28	1.01±0.07	0.55±0.03	6.9±0.47	157.11±1.7.42	963.33±33.1.84	49.19±5	290.51±3.2.4	15.11±1.26	366.75±92.0.4	274.97±5.0.14	150.49±2.6.05	1.88±0.35	42.9±9.32	268.23±1.17.55	13.37±2.56
No lime	ICT-2171	1.22±0.04	0.09±0.02	1.44±0.06	0.97±0.13	0.5±0.01	13.33±0.58	108.67±3.9.88	1081.33±7.25.31	51±15.39	355.64±5.4	27.36±7.14	518.55±27.33	286.75±7.9.49	147.01±2.4.37	3.88±0.54	33.01±1.5.89	337.6±24.6.6	15.41±6.6
No lime	ICT-2172	1.13±0.08	0.05±0.01	2.36±0.26	0.84±0.04	0.45±0.02	8.65±1.72	120.24±1.5.22	648.11±14.0.23	41.08±1.96	347.57±5.7.92	16.53±4.1	856.1±39.79	258.08±2.7.54	137.8±15.42	2.66±0.7	36.59±3.0.4	196.49±3.0.07	12.61±1.84
No lime	ICT-2173	1.26±0.26	0.06±0.01	3±0.11	1.44±0.18	0.66±0.1	5.25±0.76	77.68±4.75	987.92±20.3.89	50.26±6.45	384.88±5.9.18	18.6±4.12	1172.7±33.61	444.65±7.7.24	204.53±3.6.32	1.62±0.34	23.9±1.82	301.78±4.8.22	15.38±0.83
No lime	ICT-2653	1.22±0.14	0.07±0.02	2.05±0.17	0.97±0.05	0.56±0.05	10.24±2.61	124.94±8.87	991.72±19.1.45	45.54±5.45	326.35±6.5.21	19.1±4.01	681.75±83.84	256.09±1.4.49	147.41±1.2.03	2.68±0.4	33.07±1.8.9	261.53±4.1.1	12.14±2.3
No lime	IMC-67	1.19±0.05	0.08±0.01	2.64±0.16	1.19±0.19	0.61±0.01	5.08±1.48	75.66±9.62	865.96±13.4.31	43.43±3.19	326.95±7.59	23.04±2.75	752.12±15.0.4	328.08±4.1.04	168.38±1.1.23	1.39±0.32	20.78±1.48	240.18±4.9.79	12.02±1.53
No lime	IPIRAN GA-1	1.12±0.08	0.05±0.01	0.8±0.28	1.02±0.19	0.46±0.1	6.78±1.9	154±44.16	866.33±24.6.03	50.84±6.91	337.47±7.3.37	14.13±3.53	293.62±82.19	311.4±10.8.94	141.69±5.4.85	2.01±0.42	46.78±1.6.92	261.34±8.4.62	15.39±3.93
No lime	NUC-156	1.18±0.03	0.06±0.03	1.94±0.13	1.5±0.09	0.54±0.08	8.69±0.48	212.58±4.1.18	1265.59±6.3.04	73.95±5.78	272.21±4.0.32	13.27±4.72	496.65±37.8	345.26±5.4.03	125.6±33.1	1.99±0.18	49.39±1.5.27	290.5±38.51	17.07±3.16
No lime	PAS-100	1.34±0.03	0.08±0.01	1.81±0.12	1.58±0.2	0.52±0.1	5.9±1.03	86.77±3.31	997.56±13.1.1	47.83±5.83	341.39±4.7.08	19.35±2.0.4	538.42±93.43	407.38±1.12.46	135.32±4.0.79	1.48±0.09	22.17±3.8.9	253.69±4.1.83	12.3±2.96
No lime	PAS-105	1.5±0.04	0.14±0.03	1.58±0.15	1.52±0.04	0.66±0.06	4.67±3.06	116.33±1.7.04	2084.67±6.4.05	90±9.85	389.84±2.2.81	35.2±6.34	507.69±11.1.46	395.28±2.9.03	171.34±1.9.32	1.19±0.74	30.15±4.43	540.38±2.7.04	23.26±1.59
No lime	PAS-91	1.13±0.08	0.06±0.02	3.08±0.37	1.27±0.15	0.61±0.06	6.18±0.21	215.42±6.9.29	1082±136.33	55.36±4.05	396.59±5.7.35	21.82±3.57	1082.45±2.17.38	443.21±5.4.51	213.94±2.6.95	2.16±0.21	74.61±2.3.43	376.84±5.1.8	19.23±0.53

No lime	PAS-93	1.13±0.08	0.06±0.02	2.31±0.18	1.27±0.15	0.61±0.06	6.18±0.21	215.42±69.29	1082±136.33	55.36±4.05	364.71±49.85	20.27±4.82	767.49±91.11	406.27±10.57	196.03±5.07	1.99±0.16	67.85±16.29	345.03±9.67	17.81±2.26
No lime	PH-09	1.17±0.03	0.07±0.02	1.54±0.32	0.92±0.05	0.55±0.05	6±3	66±20.07	1265±77.02	43.67±4.04	385.04±34.95	23.22±7.1	479.41±121.16	304.44±40.77	183±25.56	2±0.99	21.68±6.02	419.8±71.13	14.49±2.63
No lime	PH-144	1.3±0.04	0.04±0	1.99±0.35	1.08±0.08	0.58±0.07	5.39±0.76	128.58±16.19	823.76±255.95	50.05±3.72	463.77±44.88	14.22±1.08	673.08±51.11	383.95±55.41	207.36±39.35	1.92±0.33	45.99±9	296.02±108.98	17.83±2.36
No lime	PH-15	1.19±0.05	0.03±0	1.22±0.57	1.01±0.02	0.54±0.03	4.27±1.59	177.33±52.93	1036.5±115.56	44.29±6.04	364.82±44.26	9.16±0.81	364.96±131.58	308.12±26.84	163.26±6.84	1.3±0.52	54.44±19.18	316.33±47.45	13.41±0.83
No lime	PH-16	1.2±0.06	0.04±0.02	1.98±0.44	1.08±0.1	0.59±0.04	5.07±1.02	102.69±7.91	937.59±127.16	50.38±5.68	365.63±48.55	13.24±4.66	754.95±258.74	326.47±30.4	178.37±20.06	1.52±0.2	31.18±3.13	282.87±18.79	15.24±1.14
No lime	PH-17	1.12±0	0.06±0.01	1.87±0.11	1.1±0.05	0.68±0.03	5.67±3.79	62.33±67.66	956.33±623.52	31±20.07	307.93±37.88	17.41±2.53	631±48.26	302.46±41.23	188.12±27.87	1.48±0.82	16.79±18.6	249.35±148.43	8.45±5.47
No lime	PH-21	1.16±0.04	0.07±0.05	1.6±0.02	1.14±0.17	0.62±0.1	4.04±0.69	152.85±39.75	1065.72±74.62	50.67±1.93	420.93±9.21	23.9±16.38	594.84±47.87	414.52±67.6	225.15±32.89	1.46±0.26	55.51±15.63	385.88±30.75	18.35±0.94
No lime	PH-990	1.19±0.17	0.06±0.02	2.1±0.18	1.25±0.05	0.48±0.04	4.2±1.35	118.42±3.03	1204.63±44.97	50.81±5.72	394.29±69.27	18.72±5.41	858.19±51.25	412.22±28.94	158.56±19.55	1.38±0.4	39.03±1.72	397.21±26.35	16.79±2.5
No lime	POUND-12	1.14±0.01	0.05±0.01	1.8±0.02	1.39±0.35	0.66±0.08	7.69±1.78	181.76±10.83	821.15±519.15	66.27±2.81	271.94±63.64	11.86±3.68	489.96±71.97	318.36±6.83	155.78±31.25	1.87±0.73	42.94±8.68	214.27±152.12	15.83±4.13
No lime	SCA-6	1.05±0.03	0.04±0.02	1.74±0.05	1.07±0.06	0.49±0.04	6.82±0.88	193.61±32.41	1073.26±81.74	52.34±6.93	338.63±59.58	13.39±7.96	629.82±66.92	342.38±32.64	157±10.9	2.16±0.06	61.26±6.07	341.81±28.05	16.59±1.08
No lime	TSH-1188	1.12±0.05	0.05±0.02	1.18±0.16	0.99±0.05	0.51±0.02	5.1±0.84	83.45±4.61	964.55±135.24	44.76±5.96	313.37±24.47	15.29±8.11	340.24±96.14	276.2±35.22	141.99±19.38	1.41±0.2	23.26±1.64	272.23±63.77	12.57±2.49
No lime	TSH-565	1.1±0.11	0.09±0.1	1.32±0.14	1.12±0.02	0.58±0.04	6.82±1.64	131.01±43.13	1241.73±124.9	50.54±3.48	372.74±46.13	29.84±30.18	448.53±84.22	381.91±29.28	198.09±30.32	2.3±0.39	45.19±17.91	421.23±41.44	17.19±1.82
No lime	UF-613	1.19±0.02	0.05±0.02	2.55±0.07	1.1±0.04	0.55±0.01	5.04±0.51	117.79±10.06	1013.96±197.75	45.5±4.08	369.63±18.5	16.7±6.73	721.34±98.47	341.31±9.33	172.29±5.7	1.57±0.14	36.66±3.1	316.31±65.7	14.14±0.83

No lime	UF-667	1.07± 0.02	0.02± 0.01	1.68± 0.15	1.13± 0.06	0.62± 0.03	7.1±2.0 2	175.17±4 9.31	829.31±15 3.97	37.67±2 .53	402.51±1 0.52	6.29±2. 31	622.99±10 9.14	424.31±3 5.85	231.37±1 5.18	2.65±0. 7	65.27±1 6.58	310.59±5 4.7	14.15±1 .38
No lime	UGU- 112	0.7±0. 06	0.06± 0.01	2.23± 0.21	1.19± 0.21	0.52± 0.06	7.46±1. 68	239.28±4 1.27	1097.48±2 26.79	49.14±1 0.99	189.83±2 3.54	17.02±2 .14	630.71±10 4	321.46±4 4.69	141.64±1 7.05	2.04±0. 55	64.19±4 .5	296.67±6 1.25	13.18±2 .27
No lime	UGU- 126	0.62± 0.06	0.05± 0.03	1.01± 0.27	1.5±0. 06	0.61± 0.08	5.41±0. 21	171.81±3 1.07	829.18±52 .97	44.48±5 .31	123.54±2 9.12	10.4±7. 36	382.49±13 0.1	302.76±8 9.38	124.55±4 6.71	1.09±0. 32	34.77±1 2.83	167.28±5 1.29	9.12±3. 37
No lime	UGU- 130	0.76± 0.05	0.05± 0.02	1.32± 0.19	1.48± 0.16	0.54± 0.03	6.27±1. 79	202.77±4 7	1025.67±1 57.66	55.22±3 .13	119.48±5 6.4	7.48±3. 61	309.5±63. 71	222.09±6 7.45	81.92±30. 35	0.91±0. 24	30.65±1 0.87	164.01±8 6.32	8.41±3. 05
No lime	UNG-53	1.14± 0.09	0.05± 0.02	2.26± 0.59	1.31± 0.11	0.84± 0.05	7±1	90±19.92	1595±281. 57	68.33±4 .04	323.56±3 7.79	12.95±4 .63	756.53±24 9.03	372.14±1 3.93	237.33±8. 48	1.98±0. 27	25.33±3 .54	452.17±7 6.57	19.39±0 .64
No lime	UNG-73	1.08± 0.04	0.07± 0.01	1.8±0. 05	1.29± 0.17	0.56± 0.09	9.69±2. 21	168.4±26 .21	802.87±39 4.72	59.23±1 0.37	234.98±4 2.47	15.92±3 .03	591.27±22 .92	277.55±4 7.64	119.95±1 7.2	2.05±0. 24	36.52±8 .04	169.97±8 1.44	12.66±1 .73
No lime	UNG-76	1.16± 0.11	0.07± 0.01	1.52± 0.2	1.18± 0.09	0.42± 0.04	9.63±3. 4	163.16±1 0.82	638.57±15 9.41	45.49±3 .96	130.61±5 1.48	8.08±5. 3	499.45±50 .79	139.06±7 5.58	49.61±27. 92	1.08±0. 52	19.15±1 0.32	75.56±43. 04	5.35±2. 93
No lime	UNG-77	1.04± 0.04	0.08± 0.02	1.85± 0.04	1.03± 0.05	0.61± 0.04	7±3.61	166.67±5 9.16	1516.67±2 72.13	70.67±3 .79	300.75±5 6.09	22.43±2 .79	635.36±64 .67	295.43±4 2.79	175.3±36. 15	1.92±0. 7	46.14±8 .33	427.95±2 4.57	20.19±2 .12



**Table S3.** Results of Acid Tolerance Index (ATI), Corrected Acidity Tolerance Index (CATI) and Genotypic Tolerance Index (GTI) in % of 60 cacao clones submitted to soil acidity

Genotypes	ATI %	CATI %	GTI %
AYP-15	83.99	68.37	107.97
AYP-20	63.45	24.83	26.74
AYP-22	93.13	68.95	84.17
BN-34	98.54	80.18	112.60
BS-01	88.26	73.28	103.73
CA-14	96.85	84.22	109.98
CCN-10	96.77	92.84	145.25
CCN-51	98.66	98.66	150.66
CEPEC-2002	86.70	63.69	105.49
CP-2005-C10	81.96	59.45	96.92
CP-49-C10	96.91	78.24	121.06
CP-53-C10	92.52	71.85	100.32
EET-400	96.10	77.72	98.64
H-10	83.80	59.33	96.35
ICS-1	82.17	51.21	76.46
ICS-39	90.64	73.70	107.97
ICS-6	87.12	65.65	105.86
ICS-95	91.16	90.32	120.73
ICT-1026	91.55	78.58	121.85
ICT-1087	92.45	91.38	153.32
ICT-1092	87.39	62.00	80.00
ICT-1112	91.52	71.23	102.82
ICT-1189	95.81	85.02	113.99
ICT-1251	98.18	70.65	79.32
ICT-1281	99.37	74.02	87.63
ICT-1292	90.53	68.20	107.47
ICT-1506	99.95	73.23	81.90
ICT-2142	89.33	70.41	113.45
ICT-2161	92.99	66.46	95.84
ICT-2171	80.78	62.34	119.47
ICT-2172	83.10	67.31	113.57
ICT-2173	78.52	63.83	116.94
ICT-2653	82.54	57.86	91.50
IMC-67	95.49	69.51	93.80
IPIRANGA-1	76.45	60.71	131.77
NUC-156	86.30	52.35	54.44
PAS-100	88.03	59.30	62.98
PAS-105	87.72	60.01	88.69
PAS-91	99.87	91.89	127.53
PAS-93	99.02	84.00	102.40
PH-09	98.38	80.70	114.92
PH-144	95.57	86.99	130.61
PH-15	93.70	75.43	118.79
PH-16	86.20	69.62	125.32

PH-17	84.77	61.48	93.71
PH-21	97.29	92.92	130.87
PH-990	81.10	70.53	133.27
POUND-12	89.91	56.41	72.87
SCA-6	95.24	80.59	114.68
TSH-1188	99.03	73.06	93.96
TSH-565	99.88	88.78	133.04
UF-613	91.30	68.34	84.62
UF-667	90.00	89.07	140.40
UGU-112	99.52	71.37	70.49
UGU-126	59.17	31.33	64.35
UGU-130	74.07	30.23	34.58
UNG-53	84.64	63.56	94.25
UNG-73	69.31	39.72	88.80
UNG-76	30.41	9.23	32.66
UNG-77	79.60	60.34	112.92

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