

# C A M C O R E

## ANOVA AND MULTIPLE COMPARISONS FOR PROVENANCE AND FAMILY VOLUME

### FIVE YEAR MEASUREMENTS

TEST IDENTIFICATION: 05-04-06A  
SPECIES: Pinus caribaea  
COMPANY: CONARE/PROFORCA  
SITE NAME: Coloradito  
LATITUDE: 8° 50' N  
LONGITUDE: 63° 15' W  
ELEVATION: 70 m  
ANNUAL PRECIPITATION: 920 - 1250 mm

DATE PLANTED: November 1984  
DATE MEASURED: February 1990

### ANALYSIS OF VARIANCE

DEPENDENT VARIABLE: Five Year Volume (cubic meters)

<u>SOURCE</u>	<u>DF</u>	<u>SUM OF SQUARES</u>	<u>F VALUE</u>
REP	8	0.05542467	4.77 **
PROV	7	0.02183273	2.15 ns
REP*PROV	56	0.08125132	3.10 **
FAM(PROV)	36	0.11648018	6.92 **
REP*FAM(PROV)	288	0.13471022	1.11 ns
ERROR	1955	0.82116849	
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CORRECTED TOTAL	2350	1.28683398	

ns: Not significant

\*\* Significant at  $p < .01$

TEST MEAN  
0.05600 m<sup>3</sup>

C.V. (%)  
36.60

## \*\*\*\*\* MEANS BY PROVENANCE \*\*\*\*\*

WALLER-DUNCAN MULTIPLE COMPARISONS FOR FIVE YEAR PROVENANCE VOLUME

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

<u>Waller Grouping by Five Year Volume</u>		<u>Mean Volume</u>	<u>N</u>	<u>Mean Height</u>	<u>Provenance</u>	
	A	0.07040	54	9.0	* Cachipo	(CAC)
	A					
B	A	0.05731	852	9.0	Poptun	
B						
B		0.05660	429	9.0	Los Limones	
B						
B		0.05613	432	8.8	Gualjoco	
B						
B		0.05435	54	8.4	* San Esteban	(80)
B						
B		0.05238	424	8.6	Santa Cruz de Yojoa	
B						
B		0.05044	53	8.5	* Los Limones	(81)
B						
B		0.05040	53	8.1	* San Nicolas	(79)

## \*\*\*\*\* QUALITY TRAITS BY PROVENANCE \*\*\*\*\*

<u>Prov</u>	<u>Mean Volume</u>	<u>% Surv</u>	<u>% Fork</u>	<u>% Brok Top</u>	<u>% Fox Tail</u>	<u>% Mech Damg</u>	<u>% Pests</u>
CAC	0.07040	100.00	48.15	3.70	27.78	0.00	1.85
4	0.05731	98.61	51.27	3.36	49.07	0.12	0.58
3	0.05660	99.31	30.79	1.16	16.44	0.00	0.93
2	0.05613	100.00	42.82	2.31	39.81	0.23	0.23
80	0.05435	100.00	38.89	3.70	20.37	0.00	0.00
5	0.05238	98.15	40.51	3.01	38.43	0.00	0.23
81	0.05044	98.15	31.48	0.00	16.67	0.00	0.00
79	0.05040	98.15	46.30	3.70	11.11	0.00	0.00

\* Control lots: 79 = Pinus caribaea, San Nicolas, Honduras  
 80 = Pinus caribaea, San Esteban, Honduras  
 81 = Pinus caribaea, Los Limones, Honduras  
 CAC = Pinus caribaea, Cachipo, Venezuela

## \*\*\*\*\* MEANS BY FAMILY \*\*\*\*\*

<u>Fam</u>	<u>Prov</u>	<u># Trees</u>	<u>% Surv</u>	<u>Mean Height (m)</u>	<u>C.V. (%)</u>	<u>Mean D.B.H. (cm)</u>	<u>Tree Volume (cubic m)</u>
44	4	54	100.00	9.7	12.28	15.8	0.07474
CAC	*	54	100.00	9.0	18.11	15.8	0.07040
21	4	53	98.15	10.3	11.26	14.8	0.07001
261	3	54	100.00	10.2	16.43	14.4	0.06694
6	4	52	96.30	9.6	13.69	14.9	0.06626
273	3	53	98.15	9.5	17.84	14.5	0.06444
64	4	53	98.15	9.1	15.77	14.9	0.06284
284	2	54	100.00	9.2	12.74	14.9	0.06279
292	2	54	100.00	8.9	15.42	15.0	0.06262
29	4	53	98.15	9.2	18.41	14.6	0.06166
38	4	53	98.15	9.1	19.05	14.7	0.06112
26	4	53	98.15	9.0	17.30	14.4	0.06029
4	4	54	100.00	8.9	15.75	14.6	0.06005
304	2	54	100.00	9.5	15.64	14.2	0.05968
227	3	54	100.00	9.2	19.35	13.9	0.05889
198	5	54	100.00	9.3	16.05	14.0	0.05866
248	3	54	100.00	8.8	17.39	14.3	0.05857
11	4	54	100.00	9.0	18.48	14.3	0.05844
297	2	54	100.00	9.2	12.11	14.3	0.05800
207	5	54	100.00	9.0	18.28	14.3	0.05744
212	5	53	98.15	8.7	18.44	14.4	0.05655
290	2	54	100.00	8.9	15.85	14.3	0.05640
36	4	52	96.30	9.4	13.71	14.0	0.05629
189	5	53	98.15	9.1	19.70	13.9	0.05554
60	4	53	98.15	8.3	17.52	14.6	0.05479
80	*	54	100.00	8.4	18.87	14.2	0.05435
247	3	54	100.00	8.9	14.71	13.9	0.05399
211	5	51	94.44	8.7	17.43	13.9	0.05393
322	2	54	100.00	8.3	16.41	14.0	0.05220
235	3	53	98.15	8.9	15.75	13.8	0.05217
231	3	54	100.00	8.3	19.77	14.0	0.05212
81	*	53	98.15	8.5	16.23	13.6	0.05044
79	*	53	98.15	8.1	22.80	13.9	0.05040
58	4	53	98.15	8.8	14.56	13.4	0.05002
315	2	54	100.00	8.4	16.51	13.7	0.05000
61	4	54	100.00	8.6	17.87	13.5	0.04999
192	5	53	98.15	8.3	15.00	13.5	0.04821
285	2	54	100.00	8.1	18.50	13.6	0.04737
53	4	54	100.00	8.4	12.70	13.2	0.04608
243	3	53	98.15	8.5	16.40	12.9	0.04556
217	5	54	100.00	7.9	16.12	13.5	0.04544
65	4	54	100.00	7.9	18.70	13.3	0.04521
190	5	52	96.30	8.0	16.70	13.0	0.04305
52	4	53	98.15	8.1	17.23	12.5	0.03947

## \*\*\*\*\* MEANS BY FAMILY \*\*\*\*\*

	<u># Trees</u>	<u>% Surv</u>	<u>Mean Height (m)</u>	<u>C.V. (%)</u>	<u>Mean D.B.H. (cm)</u>	<u>Tree Volume (cubic m)</u>
OVERALL	2137	98.94	8.9	17.47	14.1	0.05595

Note: Tree volume with bark was calculated using a formula for juvenile trees: Volume (cubic meters) =  $0.0003 \cdot D^2 \cdot H$ , where D=DBH in centimeters and H = total height in meters.  
The overall means do not include control lots.

## \*\*\*\*\* QUALITY TRAITS BY FAMILY \*\*\*\*\*

<u>Fam</u>	<u>Prov</u>	<u>N</u>	<u>Mean Volume</u>	<u>% Surv</u>	<u>% Fork</u>	<u>% Brok Top</u>	<u>% Fox Tail</u>	<u>% Mech Damq</u>	<u>% Pests</u>
44	4	54	0.07474	100.00	38.89	0.00	48.15	0.00	0.00
CAC	*	54	0.07040	100.00	48.15	3.70	27.78	0.00	1.85
21	4	53	0.07001	98.15	37.04	0.00	57.41	0.00	0.00
261	3	54	0.06694	100.00	24.07	0.00	24.07	0.00	0.00
6	4	52	0.06626	96.30	42.59	0.00	40.74	0.00	0.00
273	3	53	0.06444	98.15	24.07	0.00	1.85	0.00	1.85
64	-4	53	0.06284	98.15	48.15	5.56	57.41	0.00	0.00
284	2	54	0.06279	100.00	33.33	0.00	29.63	1.85	0.00
292	2	54	0.06262	100.00	27.78	3.70	31.48	0.00	0.00
29	4	53	0.06166	98.15	51.85	3.70	44.44	0.00	1.85
38	4	53	0.06112	98.15	46.30	11.11	68.52	0.00	1.85
26	4	53	0.06029	98.15	44.44	1.85	48.15	1.85	1.85
4	4	54	0.06005	100.00	53.70	5.56	48.15	0.00	0.00
304	2	54	0.05968	100.00	53.70	1.85	55.56	0.00	0.00
227	3	54	0.05889	100.00	38.89	0.00	11.11	0.00	0.00
198	5	54	0.05866	100.00	24.07	0.00	18.52	0.00	0.00
248	3	54	0.05857	100.00	25.93	0.00	33.33	0.00	3.70
11	4	54	0.05844	100.00	62.96	1.85	42.59	0.00	1.85
297	2	54	0.05800	100.00	51.85	3.70	70.37	0.00	0.00
207	5	54	0.05744	100.00	35.19	1.85	50.00	0.00	0.00
212	5	53	0.05655	98.15	44.44	3.70	46.30	0.00	0.00
290	2	54	0.05640	100.00	29.63	1.85	29.63	0.00	0.00
36	4	52	0.05629	96.30	55.56	5.56	57.41	0.00	0.00
189	5	53	0.05554	98.15	22.22	5.56	59.26	0.00	0.00
60	4	53	0.05479	98.15	44.44	7.41	57.41	0.00	0.00
80	*	54	0.05435	100.00	38.89	3.70	20.37	0.00	0.00
247	3	54	0.05399	100.00	46.30	0.00	18.52	0.00	0.00
211	5	51	0.05393	94.44	40.74	3.70	14.81	0.00	0.00
322	2	54	0.05220	100.00	44.44	0.00	29.63	0.00	0.00

## \*\*\*\*\* QUALITY TRAITS BY FAMILY \*\*\*\*\*

<u>Fam</u>	<u>Prov</u>	<u>N</u>	<u>Mean Volume</u>	<u>% Surv</u>	<u>% Fork</u>	<u>% Brok Top</u>	<u>% Fox Tail</u>	<u>% Mech Damg</u>	<u>% Pests</u>
235	3	53	0.05217	98.15	12.96	5.56	12.96	0.00	1.85
231	3	54	0.05212	100.00	38.89	1.85	12.96	0.00	0.00
81	*	53	0.05044	98.15	31.48	0.00	16.67	0.00	0.00
79	*	53	0.05040	98.15	46.30	3.70	11.11	0.00	0.00
58	4	53	0.05002	98.15	57.41	3.70	46.30	0.00	0.00
315	2	54	0.05000	100.00	55.56	1.85	40.74	0.00	1.85
61	4	54	0.05000	100.00	55.56	1.85	42.59	0.00	0.00
192	5	53	0.04821	98.15	61.11	0.00	25.93	0.00	0.00
285	2	54	0.04737	100.00	46.30	5.56	31.48	0.00	0.00
53	4	54	0.04608	100.00	53.70	0.00	14.81	0.00	0.00
243	3	53	0.04556	98.15	35.19	1.85	16.67	0.00	0.00
217	5	54	0.04545	100.00	46.30	5.56	40.74	0.00	0.00
65	4	54	0.04521	100.00	59.26	0.00	40.74	0.00	1.85
190	5	52	0.04305	96.30	50.00	3.70	51.85	0.00	1.85
52	4	53	0.03947	98.15	68.52	5.56	70.37	0.00	0.00
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OVERALL	2137		0.05595	98.94	43.33	2.64	38.56	0.09	0.51

Provenance code: 2 = Gualjoco, Honduras  
 3 = Los Limones, Honduras  
 4 = Poptun, Guatemala  
 5 = Santa Cruz de Yojoa, Honduras

## \*\*\*\*\* QUALITY TRAITS BY REPLICATION \*\*\*\*\*

<u>Rep</u>	<u>Mean Volume</u>	<u>% Surv</u>	<u>% Fork</u>	<u>% Brok Top</u>	<u>% Fox Tail</u>	<u>% Mech Damg</u>	<u>% Pests</u>
1	0.04989	99.62	31.44	2.65	35.98	0.38	1.14
2	0.05135	99.62	31.82	0.38	32.58	0.38	0.00
3	0.04828	100.00	33.71	1.14	29.17	0.00	0.38
4	0.04584	100.00	49.62	4.55	36.36	0.00	0.00
5	0.05861	100.00	50.38	2.65	35.61	0.00	1.52
6	0.05950	98.86	43.18	1.89	39.02	0.00	0.38
7	0.06370	99.24	51.89	3.41	42.05	0.00	0.76
8	0.06492	98.11	50.00	4.17	42.80	0.00	0.00
9	0.06243	95.08	46.21	3.03	37.50	0.00	0.38