

# C A M C O R E

## ANOVA AND MULTIPLE COMPARISONS FOR PROVENANCE AND FAMILY VOLUME FIVE YEAR MEASUREMENTS

TEST IDENTIFICATION: 06-04-17A  
SPECIES: Pinus oocarpa  
COMPANY: CONARE/PROFORCA  
SITE NAME: Coloradito  
LATITUDE: 8° 50' N  
LONGITUDE: 63° 15' W  
ELEVATION: 70 m  
ANNUAL PRECIPITATION: 1060 mm

DATE PLANTED: September 1984  
DATE MEASURED: March 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	0.03158372	1.94 ns
PROV	9	0.08029384	4.39 **
REP*PROV	71	0.14419404	9.88 **
FAM(PROV)	48	0.03524925	3.57 **
REP*FAM(PROV)	384	0.07894196	0.83 ns
ERROR	2131	0.52782472	
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CORRECTED TOTAL	2651	0.92904594	

ns: Not significant

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

TEST MEAN  
0.02776 m<sup>3</sup>

C.V. (%)  
56.70  
98

## \*\*\*\*\* 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	0.05680	38	9.2	* Mt. Pine Ridge (202)
	A				
B	A	0.04521	45	7.9	* Nirgua (FUD)
B					
B		0.04217	44	8.8	* Las Crucitas (H/5/77)
B					
B					
	C	0.03498	376	8.4	San Marcos de Colon
	C				
	C	0.02903	355	7.6	San Luis
	C				
	C	0.02725	360	7.6	Guaimaca
	C				
	C	0.02425	377	7.6	Las Crucitas
	C				
	C	0.02394	334	7.4	La Lagunilla
	C				
	C	0.02390	369	6.9	La Campa
	C				
	C	0.02355	354	6.9	Camotan

## \*\*\*\*\* 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 Damq</u>	<u>% Pests</u>
202	0.05680	70.37	5.56	0.00	5.56	0.00	1.85
FUD	0.04521	83.33	35.19	0.00	1.85	0.00	0.00
H/5/77	0.04217	81.48	24.07	0.00	0.00	0.00	0.00
8	0.03498	87.04	27.31	0.00	0.00	0.00	0.69
4	0.02906	94.18	23.02	0.79	0.53	0.00	0.53
7	0.02725	83.56	31.02	0.00	0.23	0.00	0.46
6	0.02425	87.27	30.79	0.23	0.23	0.00	0.69
3	0.02394	77.31	42.13	0.00	0.23	0.00	0.00
5	0.02390	85.42	33.10	0.23	0.23	0.00	1.16
1	0.02355	81.94	23.84	0.69	0.93	0.00	0.23

## \*\*\*\*\* 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>
202	*	38	70.37	9.2	17.98	13.6	0.05680
FUD	*	45	83.33	7.9	17.67	12.9	0.04521
H/5/77	*	44	81.48	8.8	13.69	12.3	0.04217
253	8	46	85.19	8.6	21.70	11.5	0.03909
348	7	43	79.63	8.0	21.42	11.7	0.03874
339	7	39	72.22	8.4	20.45	11.4	0.03740
224	8	39	72.22	8.8	13.90	11.4	0.03667
239	8	44	81.48	8.6	24.08	10.9	0.03657
96	4	50	92.59	8.3	21.83	11.7	0.03607
243	8	50	92.59	8.8	13.78	11.4	0.03595
248	8	51	94.44	8.2	18.96	11.4	0.03553
293	6	48	88.89	8.4	16.56	11.2	0.03544
231	8	50	92.59	8.5	19.47	11.2	0.03524
104	4	49	90.74	7.9	22.80	11.1	0.03298
237	8	50	92.59	7.7	23.90	10.9	0.03210
330	7	48	88.89	7.6	23.19	10.5	0.03112
265	6	47	87.04	7.8	14.51	10.9	0.02953
84	1	47	87.04	7.2	21.09	10.8	0.02937
110	4	52	96.30	7.6	25.39	10.4	0.02930
235	8	46	85.19	7.8	18.06	10.5	0.02910
102	4	51	94.44	8.0	18.65	10.6	0.02907
8	3	44	81.48	7.5	23.45	10.4	0.02825
3	3	37	68.52	7.4	24.45	10.1	0.02747
374	5	40	74.07	7.2	22.08	10.7	0.02717
94	4	51	94.44	7.4	20.54	10.4	0.02708
372	5	44	81.48	7.3	25.85	9.9	0.02682
365	5	48	88.89	7.2	17.39	10.8	0.02662
97	4	53	98.15	7.6	19.98	10.3	0.02623
120	3	44	81.48	7.1	26.87	10.0	0.02590
79	1	45	83.33	6.9	23.87	10.3	0.02566
335	7	47	87.04	7.7	20.22	9.9	0.02543
92	1	44	81.48	6.8	25.21	10.2	0.02468
394	5	39	72.22	6.9	23.23	10.1	0.02424
269	6	48	88.89	7.7	16.93	9.6	0.02409
381	5	51	94.44	7.0	22.85	10.0	0.02406
131	3	34	62.96	7.3	21.88	10.0	0.02362
86	1	45	83.33	7.0	22.65	10.0	0.02338
107	4	50	92.59	6.6	25.37	9.7	0.02294
315	7	44	81.48	7.4	20.49	9.5	0.02275
130	3	32	59.26	7.7	10.55	9.8	0.02263
359	7	45	83.33	7.5	21.68	9.5	0.02262

## \*\*\*\*\* 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>
304	6	54	100.00	7.5	16.60	9.5	0.02250
82	1	46	85.19	6.8	27.96	9.4	0.02232
90	1	38	70.37	7.2	23.32	9.4	0.02226
127	3	47	87.04	7.4	18.71	9.5	0.02211
296	6	46	85.19	7.1	20.12	9.5	0.02197
384	5	47	87.04	6.6	22.76	9.6	0.02158
162	3	53	98.15	7.5	20.73	9.2	0.02122
75	1	42	77.78	6.8	28.46	9.6	0.02122
363	7	47	87.04	7.0	26.95	9.1	0.02115
361	7	48	88.89	7.6	21.60	9.0	0.02113
133	3	43	79.63	7.0	22.88	9.3	0.02107
369	5	49	90.74	6.6	20.97	9.6	0.02100
267	6	46	85.19	7.3	16.80	9.4	0.02090
282	6	42	77.78	7.4	17.31	9.1	0.02076
377	5	51	94.44	6.6	23.19	9.7	0.02075
72	1	47	87.04	6.8	21.29	9.1	0.01915
308	6	46	85.19	7.2	20.42	8.6	0.01819
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OVERALL		2527	85.08	7.5	22.44	10.2	0.02676
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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.

Provenance code: 1 = Camotan, Guatemala  
3 = La Lagunilla, Guatemala  
4 = San Luis Jilotepeque, Guatemala  
5 = La Campa, Honduras  
6 = Las Crucitas, Honduras  
7 = Guaimaca, Honduras  
8 = San Marcos de Colon, Honduras

\* Control lots: 202 = P. oocarpa, Mt. Pine Ridge, Belize  
FUD = FUDECO, P. oocarpa, Las Crucitas, Honduras  
H/5/77 = P. oocarpa, Nirgua, Venezuela

## \*\*\*\*\* 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>
202	*	38	0.05680	70.37	5.56	0.00	5.56	0.00	1.85
FUD	*	45	0.04521	83.33	35.19	0.00	1.85	0.00	0.00
H/5/77	*	44	0.04217	81.48	24.07	0.00	0.00	0.00	0.00
253	8	46	0.03909	85.19	22.22	0.00	0.00	0.00	0.00
348	7	43	0.03874	79.63	18.52	0.00	0.00	0.00	1.85
339	7	39	0.03740	72.22	27.78	0.00	0.00	0.00	0.00
224	8	39	0.03667	72.22	33.33	0.00	0.00	0.00	0.00
239	8	44	0.03657	81.48	33.33	0.00	0.00	0.00	1.85
96	4	50	0.03607	92.59	18.52	0.00	0.00	0.00	0.00
243	8	50	0.03595	92.59	14.81	0.00	0.00	0.00	1.85
248	8	51	0.03553	94.44	37.04	0.00	0.00	0.00	0.00
293	6	48	0.03544	88.89	24.07	0.00	1.85	0.00	0.00
231	8	50	0.03524	92.59	18.52	0.00	0.00	0.00	1.85
104	4	49	0.03298	90.74	25.93	1.85	0.00	0.00	0.00
237	8	50	0.03210	92.59	40.74	0.00	0.00	0.00	0.00
330	7	47	0.03112	88.89	50.00	0.00	0.00	0.00	0.00
265	6	47	0.02953	87.04	24.07	0.00	0.00	0.00	0.00
84	1	47	0.02937	87.04	20.37	1.85	0.00	0.00	0.00
110	4	52	0.02930	96.30	11.11	0.00	0.00	0.00	0.00
235	8	46	0.02910	85.19	18.52	0.00	0.00	0.00	0.00
102	4	51	0.02907	94.44	16.67	0.00	0.00	0.00	3.70
8	3	44	0.02825	81.48	51.85	0.00	0.00	0.00	0.00
3	3	37	0.02747	68.52	29.63	0.00	0.00	0.00	0.00
374	5	40	0.02717	74.07	27.78	0.00	0.00	0.00	1.85
94	4	51	0.02709	94.44	31.48	1.85	1.85	0.00	0.00
372	5	44	0.02682	81.48	27.78	0.00	0.00	0.00	0.00
365	5	48	0.02662	88.89	16.67	1.85	0.00	0.00	0.00
97	4	53	0.02623	98.15	27.78	0.00	0.00	0.00	0.00
120	3	44	0.02590	81.48	42.59	0.00	0.00	0.00	0.00
79	1	45	0.02566	83.33	24.07	0.00	1.85	0.00	0.00
335	7	47	0.02543	87.04	24.07	0.00	0.00	0.00	0.00
92	1	44	0.02468	81.48	20.37	0.00	0.00	0.00	0.00
394	5	39	0.02424	72.22	29.63	0.00	0.00	0.00	0.00
269	6	48	0.02409	88.89	37.04	0.00	0.00	0.00	0.00
381	5	51	0.02406	94.44	42.59	0.00	0.00	0.00	0.00
131	3	34	0.02362	62.96	31.48	0.00	0.00	0.00	0.00
86	1	45	0.02338	83.33	31.48	0.00	1.85	0.00	0.00
107	4	50	0.02294	92.59	29.63	1.85	1.85	0.00	0.00
315	7	44	0.02275	81.48	18.52	0.00	0.00	0.00	0.00
130	3	32	0.02263	59.26	29.63	0.00	1.85	0.00	0.00
359	7	45	0.02262	83.33	29.63	0.00	0.00	0.00	0.00
304	6	54	0.02250	100.00	27.78	0.00	0.00	0.00	1.85

## \*\*\*\*\* 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>
82	1	46	0.02232	85.19	24.07	0.00	0.00	0.00	0.00
90	1	38	0.02227	70.37	14.81	0.00	0.00	0.00	0.00
127	3	47	0.02211	87.04	59.26	0.00	0.00	0.00	0.00
296	6	46	0.02197	85.19	29.63	1.85	0.00	0.00	0.00
384	5	47	0.02159	87.04	31.48	0.00	0.00	0.00	0.00
162	3	53	0.02122	98.15	42.59	0.00	0.00	0.00	0.00
75	1	42	0.02122	77.78	31.48	3.70	3.70	0.00	0.00
363	7	47	0.02115	87.04	33.33	0.00	1.85	0.00	1.85
361	7	48	0.02113	88.89	46.30	0.00	0.00	0.00	0.00
133	3	43	0.02107	79.63	50.00	0.00	0.00	0.00	0.00
369	5	49	0.02100	90.74	35.19	0.00	0.00	0.00	0.00
267	6	46	0.02090	85.19	48.15	0.00	0.00	0.00	0.00
282	6	42	0.02076	77.78	29.63	0.00	0.00	0.00	1.85
377	5	51	0.02075	94.44	53.70	0.00	1.85	0.00	7.41
72	1	47	0.01915	87.04	24.07	0.00	0.00	0.00	1.85
308	6	46	0.01819	85.19	25.93	0.00	0.00	0.00	1.85

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OVERALL	2526	0.02676	85.08	30.30	0.27	0.34	0.00	0.54
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## \*\*\*\*\* 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 Damq</u>	<u>% Pests</u>
1	0.03573	95.98	38.79	0.29	0.29	0.00	0.29
2	0.02932	89.08	27.01	0.29	0.86	0.00	0.86
3	0.02750	85.34	29.89	0.29	0.57	0.00	1.72
4	0.02726	84.48	28.74	0.00	0.00	0.00	0.00
5	0.02380	83.62	31.03	0.29	0.57	0.00	0.00
6	0.02573	84.20	26.44	0.29	1.44	0.00	0.29
7	0.02715	72.99	24.71	0.57	0.29	0.00	0.86
8	0.02473	76.44	26.72	0.00	0.00	0.00	0.00
9	0.02708	90.52	35.34	0.29	0.00	0.00	0.86