The summary given here demonstrates the major impediments to successful trunk-shaking will be eliminating trunk damage and increasing the final fruit removal efficiency. These two factors, as well as the more technical aspects of trunk-shaker performance evaluation are addressed in Sergio Castro's report. This report was submitted as part of the 2008 Annual Report to the California Olive Committee by Louise Ferguson, Jackie Burns, J.-X. Guinard and Uriel Rosa.

Evaluation of MacTeq Colossus

by Sergio Castro

Procedures:
Date: 12 September 2008
Location: Ranch 'Rabadoa', Baleizao, Portugal
Harvester: MacTeq Colossus with rod drum modification and padded frame
Olive: 'Hojiblanca' cultivar, 5 years old, 7 x 4.8 m tree spacing

Harvesting tests in the AM:
At 12:20 pm. Five trees. Harvester used the highest drum speed, hardest conditions. Harvesting efficiency estimation (visual) = 90%.

Harvesting tests in the PM:
At 3.55 pm: Five trees. Harvester used the regular working conditions. Harvesting efficiency estimation (visual) = 60%.

Fruit removal force (FRF) was measured (cN) before and after harvesting, both in the AM and PM tests.

Collected Sample Classifications:

A = Belt.
Olives from the bottom belt; collected before fruit transport system. These olives show the damage from detachment system by canopy shaking and catch frame.

B = Belt.
Olives from the shortest conveyor belt after the transport system; collected from rear of the harvester. They came from the left bottom belt. These olives include a part of the fruit damage from the transport system.

C = Bin.
Olives from the longest conveyor belt after the transport system; collected from the rear of the harvester. They came from the right bottom belt. These olives include all fruit damage caused by the transport system.

D = Hand Control.
Hand-harvested olives.

Visual Damage Classification after 24 h.

- Sound: Fruit without damage. Fruit looks similar to those in the tree canopy.
- Bruised: Fruit with > one bruise, compression or abrasion without skin being cut. Olives from this classification could be processed. These olives have visual damage after 24 h of postharvest storage.
- Cut: Fruit with skin damage, primarily deep cuts.
- Mutilation: Fruit deformed and unsuitable for processing.

Fruit Detachment Force Evaluation:

Description of data collected. FRF is measured in centiNewton (cN)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
FRF Control Morning Before Harvest	110	380.00	1040.00	627.55	131.97
FRF Morning After Harvest	47	200.00	880.00	565.11	171.31
FRF Control Evening Before Harvest	49	160.00	860.00	485.71	135.09
FRF Evening After Harvest	52	180.00	860.00	499.62	146.94
Valid N (listwise)	47				

T-tests with paired samples.

Differences between control measurements in AM and PM.: There were significant differences between mean values; FRF decreased from early AM through late PM.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FRF Control Morning Before Harvest	656.12	49	143.50	20.50
	FRF Control Evening Before Harvest	485.71	49	135.09	19.30

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	FRF Control Morning Before Harvest - FRF Control Evening Before Harvest	170.41	158.34	22.62	124.93	215.89	7.53	48	0.00

Differences between FRF before and after harvesting: There are differences between the AM test when olives had a higher FRF and the harvesting process was more aggressive. However, this difference is not a good representation because the harvester removal efficiency was very high (90%) and the olives were located only on the lower branches, close to the ground. Also, FRF is less than earlier FRFs. Fruit removal doesn't depend totally on FRF; fruit location appears to be more important.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FRF Control Morning Before Harvest	654.68	47	143.87	20.99
	RF Morning After Harvest	565.11	47	171.31	24.99
Pair 2	FRF Control Evening Before Harvest	485.71	49	135.09	19.30
	RF Evening After Harvest	504.08	49	149.72	21.39

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	FRF Control Morning Before Harvest - FRF Morning After Harvest	89.58	213.26	31.10657	26.96	152.19	2.88	46	0.06
Pair 2	FRF Control Evening Before Harvest - FRF Evening After Harvest	-18.37	181.51	25.93055	-70.50	33.77	-0.71	48	0,48

DAMAGE EVALUATION

AM (Hardest conditions)

Numbers (#) of fruit classified by type of damage

	SOUND	BRUISE	CUT	MUTILATION	ALL
A	75	344	26	2	447
B	66	675	52	13	806
C	53	581	119	3	756
D	830	12	9	0	851

Weights (g) of fruit classified by type of damage

	SOUND	BRUISE	CUT	MUTILATION	ALL
A	213.1	912.9	75.9	3.3	1205.2
B	183.9	1774	149.5	32.1	2139.5
C	134.9	1573.9	324.7	4.3	2037.8
D	2102.4	28.3	19.4	0	2150.1

Percentages (%) of fruit classified according with type of damage

	SOUND	BRUISE	CUT	MUTILATION
A	16.8	77.0	5.8	0.4
B	8.2	83.7	6.5	1.6
C	7.0	76.9	15.7	0.4
D	97.5	1.4	1.1	0.0

PM (Regular conditions)

Numbers (#) of fruit classified by type of damage

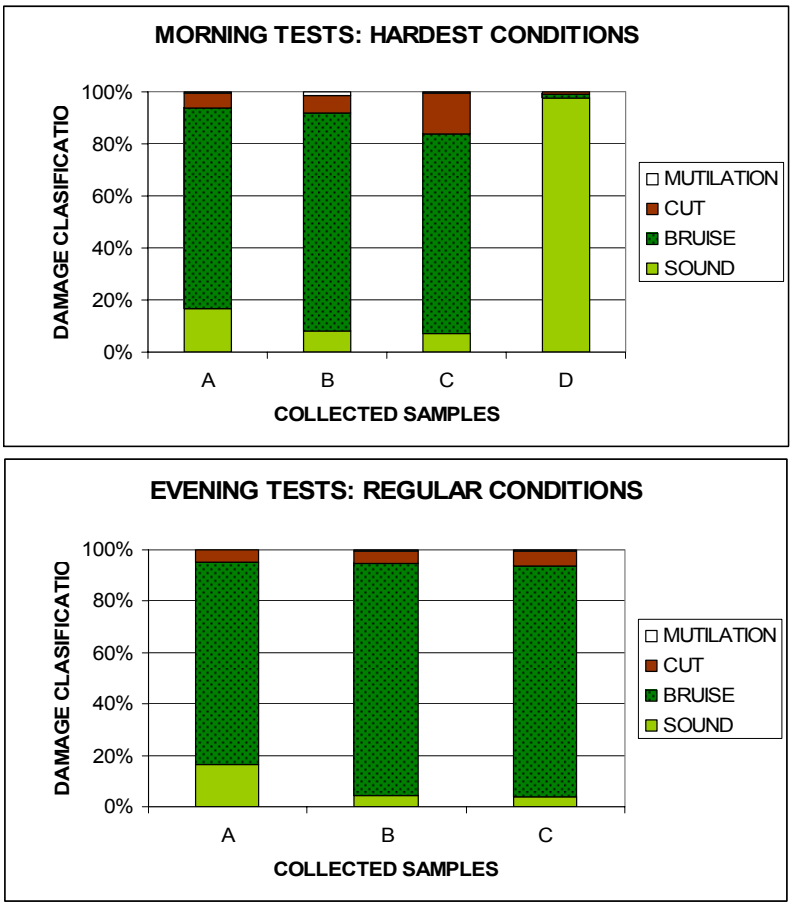
	SOUND	BRUISE	CUT	MUTILATION	ALL
A	101	494	28	1	624
B	33	680	36	4	753
C	33	797	51	3	884

Weights (g) of fruit classified by type of damage

	SOUND	BRUISE	CUT	MUTILATION	ALL
A	265.6	1265.2	71.5	1.9	1602.3
B	91.3	1788.3	96.8	6.4	1982.8
C	83.8	2013	143.6	5	2245.4

Percentages (%) of fruit classified according with type of damage

	SOUND	BRUISE	CUT	MUTILATION
A	16.2	79.2	4.5	0.2
B	4.4	90.3	4.8	0.5
C	3.7	90.2	5.8	0.3



Conclusions

Very similar results were obtained in Argentina with 'Manzanillo' olives in February 2008. The MacTeq Colossus harvester can harvest table olives with efficiencies over 90%, but produces totally unacceptable fruit damage. The harvester will need major adaptations to its picking head, catch frame, and conveying system to be viable for table olive harvest.