

CONTINUING PROJECT REPORT

YEAR: No-Cost Extension

Project Title: Survey of pear packers on storage and handling of Anjou Pears

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Cooperators: PNW packers

Budget: \$15,975 Year 1: \$15,975 Year 2: \$0 Year 3: \$0

Other funding sources

Cost-sharing: \$24,360

Notes: Funds for 0.3 FTE (Co-PI) (\$16,560/yr) and 0.05 FTE (P.I) from the Tree Fruit Endowment funds to WSU.

Budget 1

Organization Name: Washington State University Contract Administrator 1: Katy Roberts

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Item	2021
Salaries	\$8,640
Benefits	\$835
Supplies	
Travel	\$6,500
Miscellaneous	
Total	\$15,975

Footnotes:

Salaries: Temporary personnel to assist in fruit evaluations.

Benefits: \$835 are requested for benefits tied to the temporary personnel.

Travel: \$6,500 for mileage and associated travel costs at a rate of \$0.535/mi and adhering to all university policies for per diem associated with overnight travel.

OBJECTIVES

1. Obtain information about varied storage and handling practices of Anjou pears from multiple warehouses.
2. Correlate different storage and handling practices with fruit quality.

SIGNIFICANT FINDINGS

- Overall quality including appearance and texture was uniform and optimum in all sampled lots across warehouses.

Objective 1. Obtain information about varied storage and handling practices of Anjou pears from multiple warehouses.

Activities:

Five commercial pear packinghouses were surveyed selected from 3 distinct growing regions NCW (1), Mid-Columbia (3), and Yakima (1). Storage information requested included: Harvest date, receiving firmness, receiving defects, bin type, bin drenching chemical, storage unit (bin, boxes), packing date, storage type, storage temperature, gases levels in CA, storage duration, postharvest chemical treatments, packing defects

This information will be mapped to illustrate logistical differences between warehouses.

RESULTS

We received the completed survey from 4 warehouses. In each of them they individualized each sampled lot throughout the storage season. Flow charts of different packing procedures are shown in Fig. 1.

Only 1 out of 4 packers still use wood bins. None of the surveyed lots were treated with drenched chemicals. Hundred-percent of them were thermofogged with ethoxyquin and fungicide (pyrimethanil or fludioxonil). Three out of five packers stored in bins and boxes. Before shipping four out of 5 packers conditioned their fruit in a room using forced air or fans, one did not respond. None of the packers released their O₂ and CO₂ concentration on their controlled atmosphere storage.

None of the surveyed packers used 1-MCP on their sampled lots. Nevertheless, some indicated that they could use it for late stored fruit for certain markets.

Regarding decision-making about postharvest storage and handling, packers can use firmness and orchard history. Quality control makes the storage decision.

Passive cooling less 7 days...

My understanding is that fruit are conditioned post-storage (e.g. warmed and treated with ethylene post-storage) only when requested, it's not a standard practice; but the packinghouses I spoke will do the conditioning in a room, not a trailer, which is good

All use ethoxyquin for scald control as an insurance policy; whether it's thermofogged or a line spray varies with handling practices and storage duration

Pre-size lines can sort fruit to remove major defects, damaged fruit, and learn exact size distributions going into storage (although not all fruit going into storage goes over the pre-size line, some goes into storage as field run); Commit-to-pack lines that store field run fruit prior to packing handle the fruit less – so both work for different reasons

Some years fruit finish can be an issue; I'm new enough it's hard for me to gauge but I believe this year there was more marking on some fruit than would be preferred due to untimely wind/storms, and psylla ended up being more of an issue than expected

Objective 2. Correlate different storage and handling practices with fruit quality.

Activities:

Anjou pears from 5 different warehouses and lots were collected and fruit quality recorded at sampling day 1, 7 and 14 days after at 68°F. Fruit maturity (weight, flesh firmness, soluble solids content (SSC) and chlorophyll degradation (DA meter-Sintelia, Italy; I_{AD} units), and visual color rating (green-yellow scale; 1-4) and defects were evaluated

RESULTS

In general, fruit had good eating quality since the first sampling period (throughout this period. Table 1 shows the averages for flesh firmness, soluble solids, chlorophyll degradation (I_{AD} index), and visual color assessment. The latest can also be observed in Figure 1's pictures from some of the lots sampled.

Table 1. Average quality parameters for Anjou pear fruit, from five different warehouses (A,B, C, D and, E) and lots, after 1, 7 and, 14 days at 68F. Color scale used for visual evaluation is showed in fig 1.

Table 1. Fruit maturity in d’Anjou pears from different commercial lots and packers sampled in October thru December 2021.

Warehouse	Lot	Weight (g)			Firmness (lb)			SSC (°Brix)			I _{AD} (0-2)		
		Day 1	Day 7	Day 14	Day 1	Day 7	Day 14	Day 1	Day 7	Day 14	Day 1	Day 7	Day 14
A (MC)	1517	179.9±6.0	179.7±7.8	174.8±5.3	5.4±0.6	2.1±0.4	0.9±0.3	17.4±1.6	16.8±1.3	16.7±1.1	1.5±0.2	1.5±0.2	0.8±0.3
	2134	181.6±5.6	181.7±5.0	174.9±5.1	5.1±0.7	1.6±0.5	0.5±0.1	13.9±1.0	13.5±1.3	13.8±1.2	1.6±0.1	1.4±0.1	0.7±0.2
B (MC)	49	234.4±9.9	236.0±7.3	220.2±8.6	4.2±0.5	0.7±0.1	0.4±0.0	14.3±0.9	14.1±0.8	14.6±0.9	N/A	1.0±0.2	0.4±0.2
	466	240.1±8.7	229.1±10.9	226.9±7.6	4.8±0.6	0.6±0.2	0.5±0.1	15.1±0.9	14.6±0.9	14.7±1.4	1.5±0.2	1.1±0.2	0.4±0.2
C (YV)	741	201.9±10.7	200.9±10.5	194.5±7.2	4.6±0.5	0.6±0.1	0.5±0.1	14.7±0.7	15.0±0.7	14.5±0.7	1.5±0.1	0.7±0.2	0.3±0.2
	5303	205.9±9.1	201.9±7.3	188.8±27.7	5.1±0.6	0.6±0.1	0.6±0.1	14.0±0.7	14.6±0.9	14.2±1.2	1.6±0.1	0.9±0.2	0.5±0.3
	5405	205.7±11.3	200.2±8.5	197.0±9.6	4.7±0.5	0.8±0.4	0.5±0.2	13.0±0.9	13.4±1.0	13.2±0.9	1.5±0.1	0.9±0.4	0.3±0.2
D (MC)	111	266.9±43.0	278.4±10.6	271.1±13.5	5.3±0.4	1.1±0.2	0.7±0.1	13.7±0.8	13.6±0.9	13.0±0.7	1.6±0.1	0.8±0.3	0.3±0.2
	653	279.6±17.9	286.2±17.0	274.5±16.3	4.9±0.8	1.2±0.3	0.7±0.1	13.6±0.8	13.8±0.6	13.2±0.8	1.3±0.3	1.0±0.3	0.4±0.2
	663	285.0±15.4	274.3±15.7	272.5±13.6	1.6±0.4	0.9±0.1	0.7±0.1	13.6±0.7	13.5±0.7	12.7±0.5	0.9±0.4	0.5±0.2	0.3±0.1
E (NCW)	7260	229.5±26.7	240.1±13.2	240.2±12.6	4.3±1.0	0.9±0.2	0.6±0.1	13.1±0.6	13.4±0.9	13.4±0.5	1.2±0.3	0.7±0.3	0.3±0.2
	7650	255.2±17.8	242.9±12.8	230.1±41.6	3.0±0.8	1.0±0.1	0.8±0.2	14.2±0.9	13.7±0.6	13.5±0.8	0.7±0.3	0.3±0.2	0.0±0.0
	7056	238.5±17.2	229.4±15.9	226.8±12.4	3.7±0.6	1.2±0.2	0.8±0.2	13.9±1.4	15.3±1.2	14.8±1.2	1.0±0.3	0.8±0.3	0.3±0.2

Table 2. Fruit maturity in d’Anjou pears from different commercial lots and packers sampled in February 2022.

Warehouse	Lot	Weight (g)			Firmness (lb)			SSC (°Brix)			I _{AD} (0-2)		
		Day 1	Day 7	Day 14	Day 1	Day 7	Day 14	Day 1	Day 7	Day 14	Day 1	Day 7	Day 14
A (MC)	8259	199.9±7.4	196.5±6.9	194.3±5.8	10.8±0.6	2.3±0.6	2.2±0.4	14.7±1.3	13.9±1.0	12.3±0.7	1.5±0.2	1.4±0.2	0.4±0.3
	2134	199.9±7.9	198.4±7.3	199.0±12.2	11.4±1.2	1.9±0.5	1.9±0.7	14.6±0.7	14.4±1.1	13.9±1.3	1.5±0.2	1.0±0.3	0.3±0.2
	1661	197.7±7.1	193.0±19.3	201.4±16.4	10.2±0.6	2.2±0.4	1.7±0.5	13.8±1.0	13.9±1.1	14.6±1.4	1.2±0.4	1.1±0.2	0.3±0.2
B (MC)	8109	232.9±9.9	227.2±11.3	224.3±11.9	10.9±0.8	1.5±0.2	1.2±0.2	14.8±1.0	14.6±0.8	15.0±1.2	1.5±0.2	0.9±0.2	0.2±0.2
	2134	242.1±10.0	238.0±13.1	231.6±10.8	4.4±0.3	4.4±0.3	1.6±0.4	13.2±0.5	13.5±0.9	13.9±1.0	1.6±0.1	1.2±0.2	0.3±0.2
	221	242.0±12.8	238.4±10.5	240.7±11.6	9.7±0.9	2.2±0.4	1.6±0.4	13.5±0.6	14.2±1.2	13.7±0.9	1.6±0.1	0.8±0.2	0.3±0.2
C (YV)	741	203.3±10.9	196.4±9.1	191.3±9.0	5.2±0.8	N/A	1.5±0.3	16.2±1.3	15.4±0.8	14.6±0.7	0.7±0.3	0.7±0.2	0.2±0.2
	5101	201.1±7.5	199.0±10.0	192.2±6.7	6.1±1.4	N/A	1.0±0.3	14.4±0.9	15.2±0.7	13.2±1.0	0.7±0.3	0.8±0.2	0.1±0.2
	852	199.0±10.1	193.5±7.8	192.7±10.7	4.9±0.8	N/A	1.0±0.2	14.4±1.1	14.4±0.7	14.1±0.8	1.0±0.5	0.9±0.1	0.1±0.1

D (MC)	2020	176.0±7.3	177.3±4.2	176.5±7.1	5.4±0.4	3.2±0.8	1.2±0.2	13.9±0.8	12.9±0.9	13.6±0.9	1.7±0.1	1.3±0.3	0.1±0.0
	6611	253.5±25.2	276.4±21.3	282.6±19.9	5.6±0.2	2.6±0.3	1.5±0.2	15.6±1.0	15.4±0.9	15.6±1.0	1.7±0.1	1.1±0.4	0.3±0.0
	6610	277.9±23.5	250.9±12.4	253.4±11.1	5.6±0.2	2.1±0.4	1.3±0.2	13.2±1.0	13.1±0.9	12.7±0.8	1.6±0.3	1.4±0.2	0.2±0.0
	0059	197.2±8.2	198.3±6.6	N/A	12.7±0.7	2.5±0.7	1.2±0.3	12.4±0.5	12.8±0.9	13.5±1.0	1.6±0.2	0.8±0.4	0.2±0.0

Table 3. Fruit maturity in d’Anjou pears from different commercial lots and packers sampled in April thru May 2022.

Warehouse	Lot	Weight (g)			Firmness (lb)			SSC (°Brix)			IAD (0-2)		
		Day 1	Day 7	Day 14	Day 1	Day 7	Day 14	Day 1	Day 7	Day 14	Day 1	Day 7	Day 14
A (MC)	2552	198.0±7.5	186.4±42.3	186.6±42.4	12.2±0.9	2.7±0.5	1.5±0.3	14.6±0.9	14.4±0.8	14.8±0.7	1.6±0.1	N/A	0.4±0.0
	1110	198.0±7.7	196.3±8.5	187.4±42.5	12.6±0.7	2.3±0.3	1.7±0.5	14.1±0.8	14.9±1.0	14.2±0.8	1.7±0.1	N/A	0.3±0.0
	2125	198.7±7.6	195.6±8.2	196.0±8.9	11.7±1.1	2.6±0.7	1.6±0.3	14.6±1.0	14.9±0.6	14.1±1.0	1.6±0.2	N/A	0.5±0.0
B (MC)	49	237.2±7.5	236.9±10.1	237.2±10.3	7.1±1.1	1.7±0.4	1.6±0.4	13.8±0.7	13.2±0.8	12.7±2.4	1.4±0.2	0.6±0.2	0.3±0.0
	30	239.4±13.1	236.3±10.0	236.2±8.8	8.3±0.8	1.8±0.2	1.9±0.6	14.4±0.6	14.8±0.6	13.9±0.5	1.6±0.3	1.2±0.3	0.5±0.0
	369	235.9±10.0	235.1±10.0	231.8±10.2	7.5±0.7	1.6±0.3	1.5±0.4	20.0±28.5	13.2±0.5	13.3±0.6	1.4±0.2	0.7±0.2	0.3±0.0
D (MC)	6610	225.8±7.3	212.5±48.7	228.0±8.5	12.2±0.9	2.1±0.7	1.8±0.4	13.2±0.7	13.2±0.5	13.1±0.8	1.7±0.1	1.1±0.2	0.5±0.0
	6611	285.5±15.4	281.2±11.4	279.7±16.1	9.9±0.8	2.1±0.4	1.6±0.4	14.9±0.9	14.9±0.5	14.3±0.6	1.5±0.2	0.8±0.2	0.3±0.0
	0168	196.7±4.9	197.6±6.1	196.2±6.1	12.2±0.7	2.5±0.5	1.3±0.2	14.4±1.0	15.0±0.9	14.3±0.7	1.7±0.1	1.3±0.2	0.5±0.0

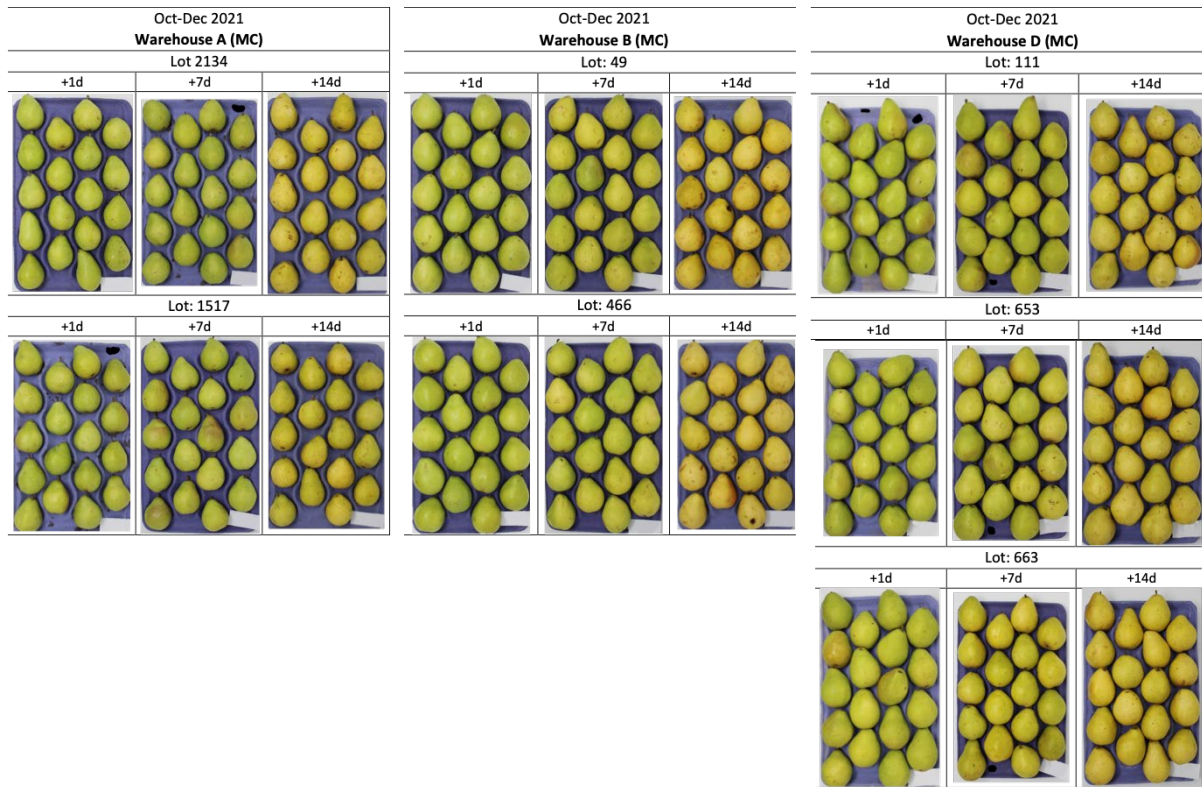


Fig 1. Anjou pear samples from five different warehouses (A, B, C, D and, E) after 1, 7 and 14 days at 68F. Color scale for visual evaluation is showed at the bottom.