

## INFLUENCE OF HARVEST TIMING ON ONION BULB TRAITS

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### Introduction

- Onions grown in New Mexico are harvested manually at 80% tops down.
- Rising labor cost and shrinking workforce made mechanical harvesting an urgency.
- Adoption of mechanical harvesting depends on harvest timing and bulb traits.
- The harvest timing can impact onion bulb traits such as firmness.

### Research Hypothesis

- Delay in harvest timing (80% tops down and one week later) would result in higher bulb firmness.

### Materials and Methods

- Planting material: Two selected onion entries (Dulciana and OSYS22-0834).
- Selected two entries with contrasting bulb firmness and matched maturity.
- Locations: Fabian Garcia Research Center, Las Cruces, NM, October, 2024.
- Split-plot design with entries as whole plots and harvest time as subplots (3 whole-plot and 6 subplot replicates).
- For every plot, 10 bulbs were randomly selected and data taken on compression & penetration force and durometer. (Figure 1, 2 and 3).
- Data collected on bulb firmness, harvest date, bulb weight & height, thickest fleshy scale and soluble solids.



Figure 1. Digital force gauge (Chatillon, Model: DFS3-50N)

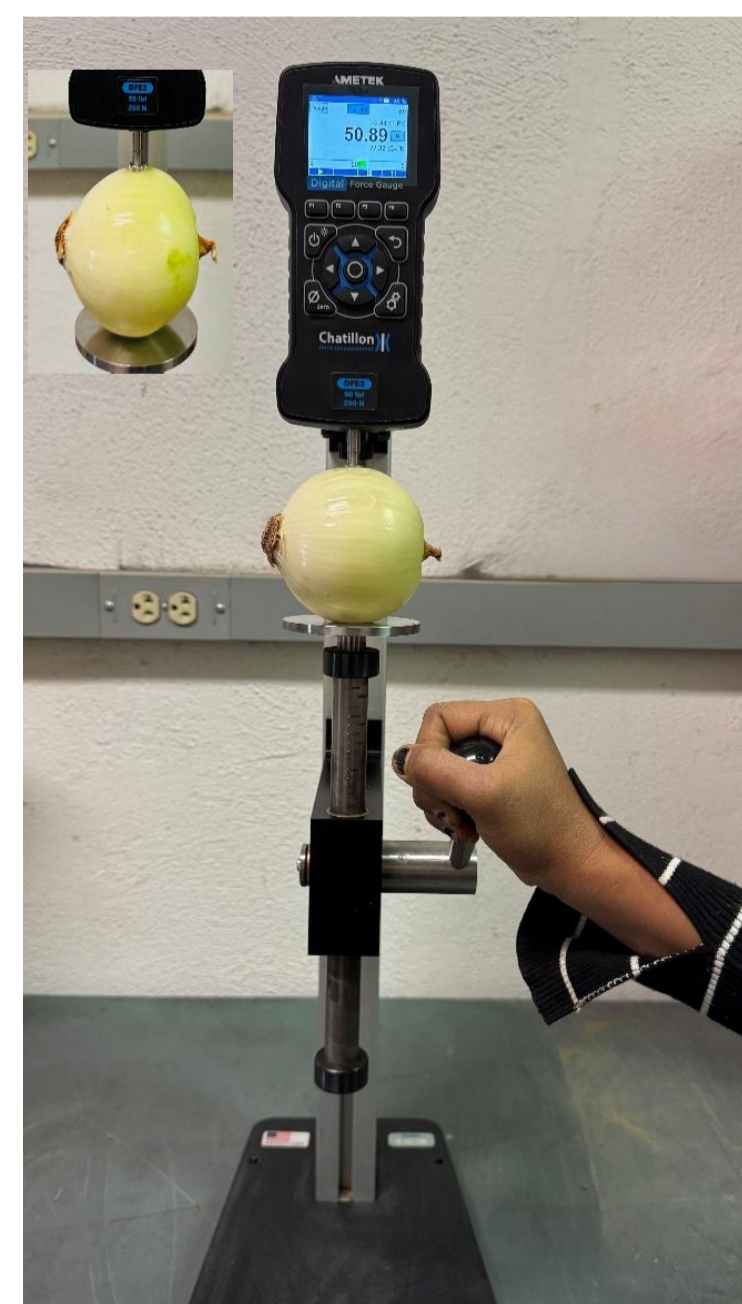


Figure 2. Digital force gauge (Chatillon, Model: DFE3-250N)



Figure 3. Durometer (Bareiss, Model: HPE II Shore OO)

- Statistical analysis: ANOVA was performed using PROC MIXED in SAS, and correlation heatmaps were generated using the METAN in Rstudio.

### Results

- Dulciana's firmness improved with delayed harvest, whereas OSYS22-0834 remained unaffected. (Table 1)
- Both cultivars are comparable overall, with OSYS22-0834 displaying higher bulb height and compression force. (Table 2)
- Puncture force and durometer reading, bulb weight and thickness of fleshy scale increased, while soluble solids decreased with delay. (Table 2)
- Firmness positively correlated with puncture & compression force, durometer measure, fleshy scales, harvest time (Fig. 4) and dry scale (Fig. 5)
- Puncture force positively correlated with compression force, durometer measure and harvest date, while negative with soluble solids. (Fig. 6 and 7)

Table 1. Bulb firmness for genotype and harvest time interaction

	Bulb firmness rating
Dulciana x 80% Tops Down	7.01 ± 0.15
Dulciana x One week later	7.55 ± 0.15
OSYS22-0834 x 80% Tops Down	6.63 ± 0.15
OSYS22-0834 x One week later	6.58 ± 0.15
	**

(Significance levels: \*\* p < 0.01)

Table 2. Mean performance of onion bulb traits for 'Dulciana' and 'OSYS22-0834' at two harvest timings with significance levels.

	Harvest date (DAS)	Bulb weight (g)	Bulb height (cm)	Thickest fleshy scale layer (mm)	Soluble solids (%)	Average Puncture force (N)	Average Compression force (N)	Average Durometer measurement
Entry								
Dulciana	235.08	352.89	7.63	7.73	6.74	38.22	115.79	66.06
OSYS22-0834	241.69	394.14	8.66	7.59	6.38	42.26	124.19	66.79
	ns	ns	*	ns	ns	ns	*	ns
Treatment								
80% tops down	235.58	362.70	8.15	7.54	6.70	37.61	120.28	65.76
One week later	241.19	384.33	8.15	7.78	6.42	42.87	119.71	67.09
	***	*	ns	*	*	***	ns	*

(Significance levels: ns = non-significant, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001)

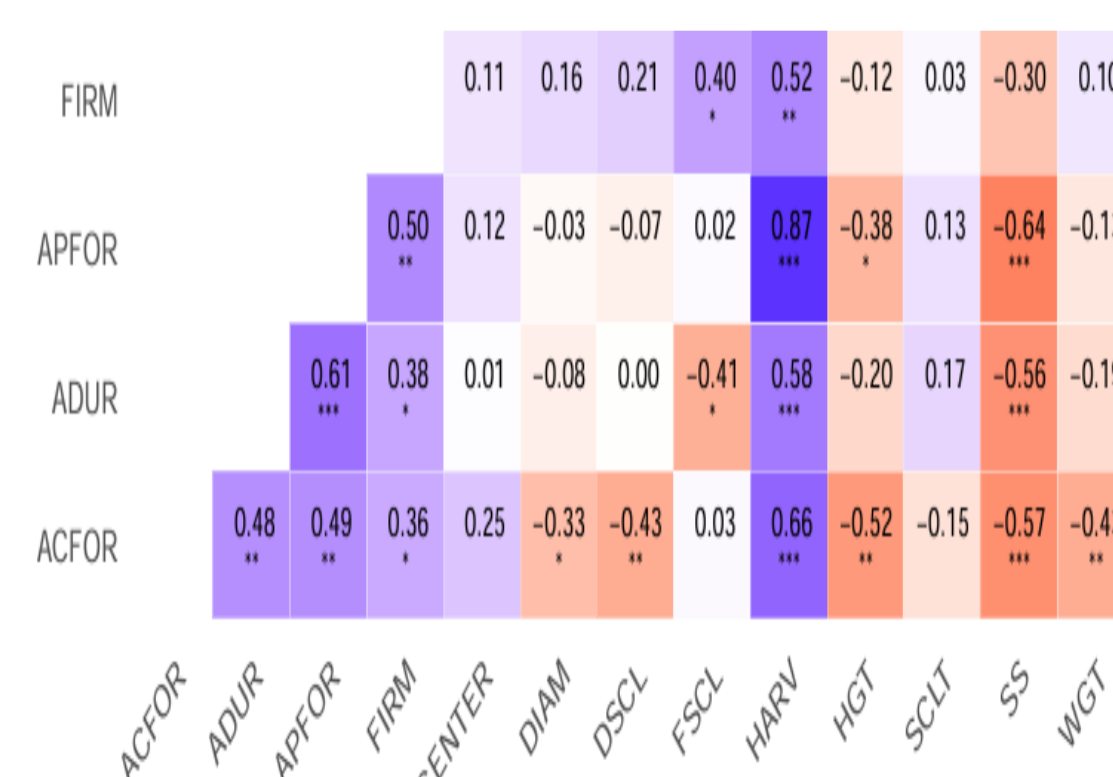


Figure 4. Correlation heatmap for Dulciana (n=360)

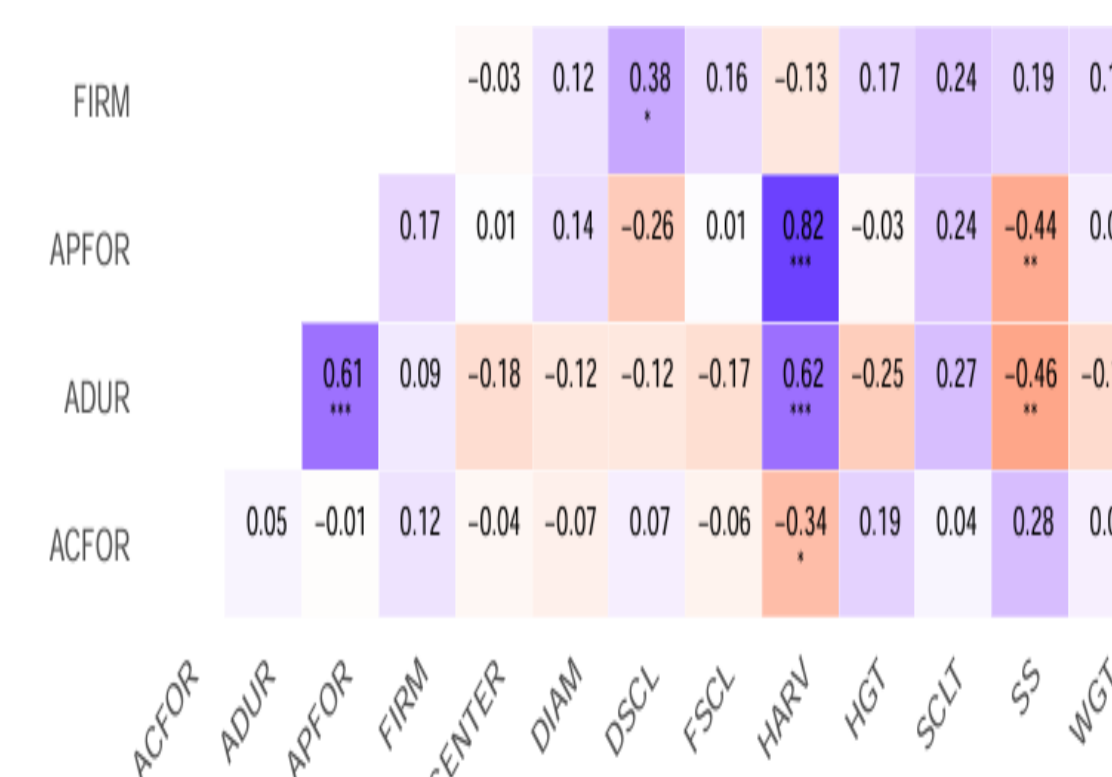


Figure 5. Correlation heatmap for OSYS22-0834 (n=360)



Figure 6. Correlation heatmap for 80% tops down (n=360)

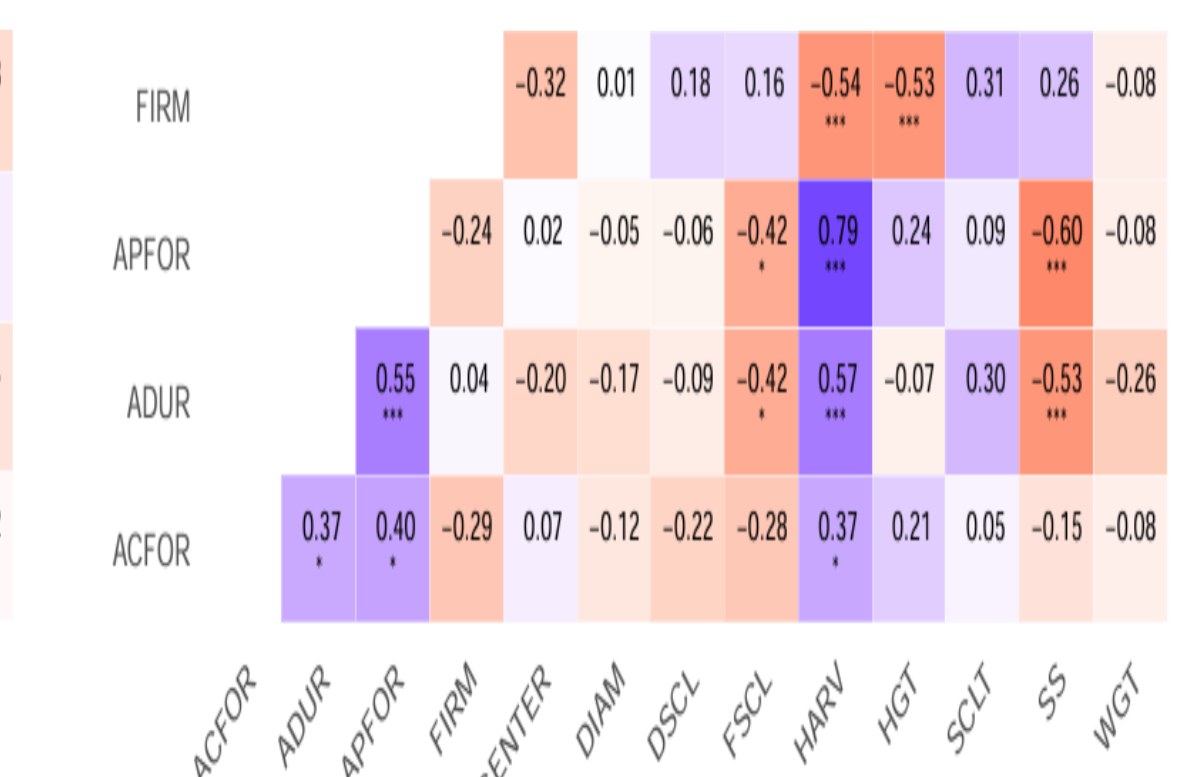


Figure 7. Correlation heatmap for one week later (n=360)

### Conclusions

- The harvest timing influenced the two onion entries differently.
- Firmness improved in Dulciana but remained unaffected in OSYS22-0834 with delay.
- Correlations between firmness rating and mechanical measures shows these parameters indicates bulb firmness.

### Acknowledgments

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