

## EVALUATION OF ONION HARVESTING METHODS 1997

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### Introduction

Onion growers would like to reduce harvesting costs yet still achieve high quality onions out of storage. Decay and weight loss from all sources during storage was compared for sweet Spanish onions harvested five different ways.

### Methods

Vega sweet Spanish onions were planted March 15 on the farm of Ken Teramura, Ontario, Oregon at 4-inch spacing in two double rows on 40-inch beds. The planting rate was 156,800 seeds/acre and the actual stand achieved was about 80 percent or 125,000 plants/acre.

The soil had a cation exchange capacity of 20 meq/100 g and received fall fertilization of 80 lb N/acre and 100 lb/acre of phosphate as 16-20-00. Spring N fertilization consisted of 170 lb N/acre as ammonium nitrate.

Onions were lifted September 8, and the onions were harvested from September 18 through 20, 1997.

Treatments were as follows all out of the same field of Vega onions, 6 bins stored per treatment:

1. *Topper/loader*: Harvest September 19 with a topper loader (Top Air, Parma, ID) to a truck and from there to bins.
2. *Topper/windrower*: Harvest September 20 with a topper windrower (Top Air, Parma, ID). Onions were loaded with the topper loader to a truck and from the truck to bins.
3. *Flailer*: Top onions September 7 with a flailer (Slyter Flailer, Weiser, ID). Onions were loaded September 19 with the topper loader to a truck and from the truck to bins.
4. *Hand-topped*: Onions were topped by hand September 18 and poured directly into bins.
5. *Untopped*: Onions were placed untopped into topping baskets and poured directly into bins on September 18.

Harvesting treatments were to have been split between heat-treated to a bulb pulp temperature at 1 cm of 90 °F and non heat-treated. Hot mid-September weather heat-treated all the onions in the field after lifting, making heat treatment at harvest of little additional value. Malheur Experiment Station weather station air temperature reached 90 to 93 °F on September 8, 9, 10 and 11 after lifting the bulbs and the soil temperature at 4 -inch depth reached 80 to 82 °F each of these days.

All onions were stored in the same storage at the Malheur Experiment Station. Onions were graded out of storage on January 7, 8, and 9, 1998. Onions were separated by mechanical injury, *Botrytis* infection including neck rot, black mold, plate rot, sprouted onions, and healthy onions. The healthy onions were graded into split double onions, and by diameter into small, medium, jumbo (3-4 inches) and colossal sized onions. Onions were rated subjectively for color, top retention, and skin retention out of storage.

### Discussion

In the 1997 topping trial, defective onions averaged a moderate 6.4 percent (Table 1). Defective onions averaged 5.5 percent *Botrytis* gray mold in the onion neck and on the shoulders, but the topping and handling methods did not significantly affect *Botrytis* in this trial. Mechanical injuries differed significantly between every treatment, with untopped onions suffering the least mechanical injury and topper/windrower resulting in the greatest amount of mechanical injury (Table 1, Figure 1).

Untopped onions had 1.07 percent tops out of storage and less total pack out in terms of weight per bin because there were 13 percent fewer onions in each bin. Untopped onions held their skins well, had the lowest percent of mechanical injury and a low amount of black mold. Untopped, hand topped, and topper/loader treatments were among the best in percentage of pack out (Table 2).

The topper/loader treatment had only 5.2 percent defective onions (Figure 1) and was among the lowest total shrink losses and was among the best in percentage pack out, 90.2 percent (Table 2). It would be desirable for growers to be able to reduce harvest cost while retaining onion quality in storage and pack out. One-time-over mechanical harvest with the topper/loader reduced onion damage without affecting storability as compared to onions that were windrowed then further cured before loading. This trial could be repeated over several years for a higher level of confidence in application of the experimental results to commercial production.

Over all bins, independent of topping and loading, the percent of loss to black mold tended to occur in the same bins with the highest percent of mechanical injuries recorded on different onions. This may be a factor of wider importance to the industry: rough handling and the loss of skins through handling could predispose onions to greater risks of losses from decomposition in storage.

At pack out, onions from each topping and handling treatment were set aside for subjective evaluations of color and skin retention (Table 2). Topper/windrower onions that were windrowed then loaded appeared lighter in color because less skin was retained. These onions suffered more damage in the grading process than the other treatments and were not as attractive a commercial product as the onions in the other four treatments.

Figure 1. Percentages of defective or mechanically injured onions after five topping and handling treatments in the 1997-1998 onion topping trial, LSD (0.05) = 2.6 and LSD (0.05) = 0.04 percent respectively. Malheur Experiment Station, Oregon State University, and Teramura Farms, Ontario, Oregon.

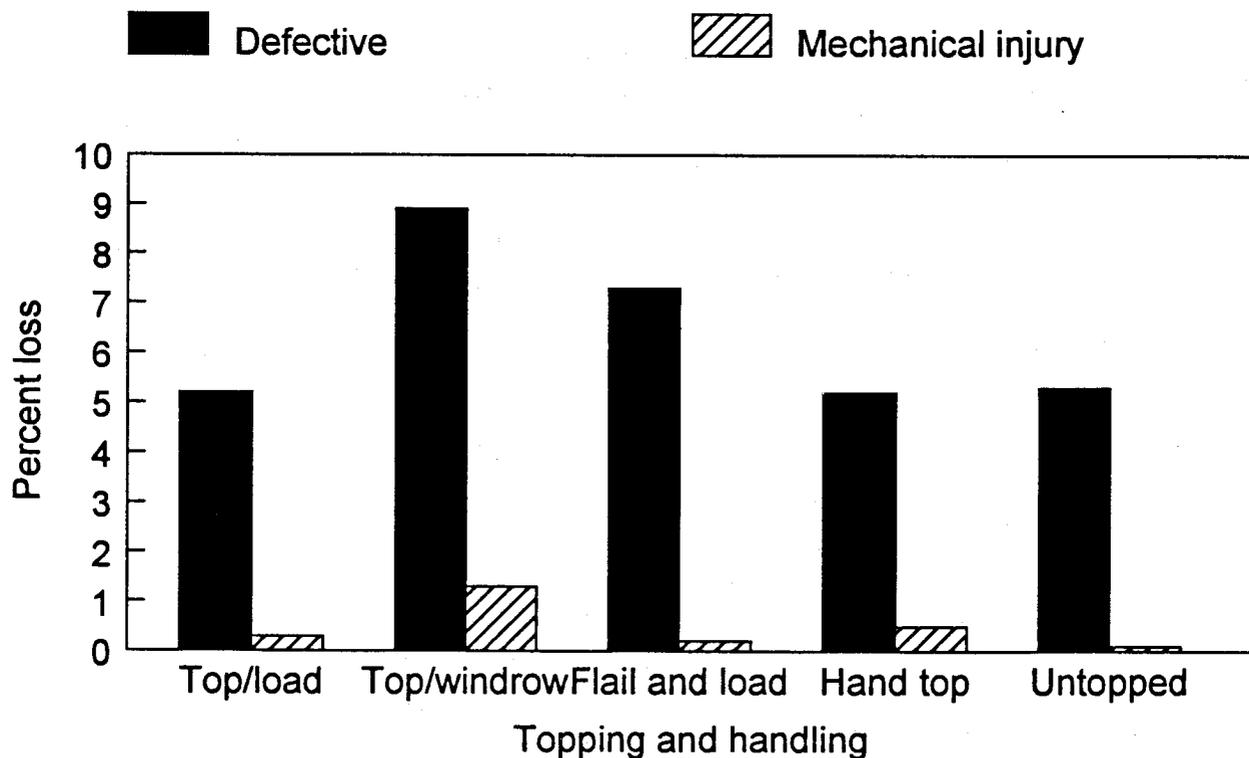


Table 1. Percentages of infected, defective, or injured onions from five topping and handling treatments in the 1997-1998 onion topping trial, Malheur Experiment Station, Oregon State University and Teramura Farms, Ontario, Oregon.

Treatment	<i>Botrytis</i>	Plate	Black	No. 2	Sprouted	Mechanical	Defective
	mold	rot	mold			injury	
-----%-----							
Topper/loader in one pass	4.4	0.11	0.39	0.01	0.01	0.3	5.2
Topper windrower then loader	6.63	0.09	0.86	0.05	0	1.3	8.9
Flail then loader	6.94	0.01	0.19	0	0	0.2	7.3
Hand topped then hand load	4.49	0.03	0.2	0.02	0	0.5	5.2
Untopped then hand load	5.12	0.04	0.01	0	0	0.1	5.3
Mean	5.52	0.06	0.33	0.02	0	0.5	6.4
LSD (0.05)	NS	0.06	0.53	NS	NS	0.04	2.6

NS: not significant

Table 2. Total pack out and shrink of onions after five topping and handling treatments in the 1997-1998 onion topping trial, Malheur Experiment Station, Oregon State University and Teramura Farms, Ontario, Oregon.

Treatment	Percent by weight				Subjective evaluations	
	Leaves	Total shrink	Small onions	Pack out	Color	Skin retention
	-----%-----				0-5	0-10
Topper/loader in one pass	0	9	0.8	90.2	3.5	4
Topper windrower then loader	0	12.8	0.4	86.8	2	3
Flail then loader	0	11.2	0.9	87.9	3.5	4
Hand topped then hand load	0	9	0.9	90.1	4	4.5
Untopped then hand load	1.07	10.2	0.7	89.1	4	5
Mean	NA	10.5	0.7	88.8	NA	NA
LSD (0.05)	NA	2.6	0.3	2.5	NA	NA

NA: not applicable