

(3) (2) (1)

*Malus domestica* Bork

1±0

%1.75 220 %1.85  
%5.22 .(%4.93)

:

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30621 . . (2) (1)  
113 . . (3)

# Effect Of Harvest Date and Packaging In Polyethylene Films on Quality and Weight Loss In 'Golden Delicious' Apples During Cold Storage

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## ABSTRACT

Apple Fruits (*Malus domestica* Bork. cv. 'Golden Delicious') were harvested at three successive dates with intervals of one week between each date. The fruits were packaged with polyethylene films and then stored at  $0\pm 1$  °C to study the effect of these factors on the quality of the fruits and their role to reduce weight loss after harvest. The natural loss of the fruit weight and quality indices: fruit firmness, total soluble solids, titrable acidity and starch content were studied.

The results showed a significant effect of packaging in reducing weight loss percentage as it didn't exceed 1.85% in the packaged fruits after 220 days of storage. Whereas, it was 4.93% (more than a double) in the control (unpackaged) fruits. At the end of the storage period, the lowest weight loss percentage was 1.75, on the packaged fruits which were harvested at the third date. The highest weight loss percentage was 5.22 in the control fruits harvested at the second date. Generally, the third date fruits had the lowest weight loss during storage. Packaging had no significant effect on total soluble solids (TSS) changes during storage. TSS varied according to harvest date and it increased in late harvest dates. The control fruits had higher firmness than the packaged fruits during storage. The third date fruits had the highest firmness value. Packaging had significant effect on the changes of titrable acidity as it was higher in the packaged fruits during the storage period, but by the end of the storage period there was no difference between the packaged and the control fruits.

**Key words:** Apple, Golden Delicious, harvest date, storage, packaging, polyethylene, weight loss, quality.

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12

(Schulz, 2000)

-67

%7-5

(Duckworth, 1979) %89

.(Osterloh, 1980)

Modified

Polyethylene

Atmosphere

/

(Pala and Damarli,

/

.1994)

Modified Atmosphere Packaging (MAP)

(Kader and Watkins, 2000)

(Pala and Damarli, 1994)

(Wills *et al.*, 1998)

Granny Smith

(Hewett *et al.*, 1989)

PVC

O<sub>2</sub>

(Watkins *et al.*, 1989)

Cox's

Orange Pippin

O<sub>2</sub>

CO<sub>2</sub>

(Full ripe)

(Bitter bit)

(Scald)

(DeLong *et al.*, 1999)

(Senescence breakdown)

(Wills *et al.*, 1998)

(Kader, 1992)

(Juan *et al.*, 1999)

Golden Delicious

(Johnston *et al.*, 2002)

((Abbott *et al.*, 1984) )

.(Harker *et al.*, 2002)

(Mitropoulos, 2005)

*Malus domestica* Bork.  
25 15

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40

1±0

.%95

60

:

-1

20

:

$$100 \times \frac{\quad}{\quad} =$$

:

-2

.Ft327 Effegi

TSS :

TSS

-3

:

-4

NaOH

:(1990 )

$$\frac{100 \times 67 \times 0.1 \times \text{NaOH}}{1000 \times} =$$

-5

1

10-1

10 ( )

ANOVA

CoStat V6.024

.0.05

LSD

.(Weichmann, 1993; Schulz, 1996)

.(Osterloh, 1980)

220 (1)  
%1.998 %1.774 %1.753

%4.47 %5.1 %5.224

(1)

. 1±0

3	2	1	3	2	1	( )
0.000	0.000	0.000	0.000	0.000	0.000	0
1.456	1.940	2.090	0.270	0.324	0.432	60
2.374	3.014	3.166	0.608	0.702	0.706	120
3.552	4.360	4.506	1.215	1.236	1.404	180
4.470	5.224	5.100	1.753	1.774	1.998	220

× 0.114 × 0.169 × 0.061 0.094 0.076 :(.0.05) LSD  
.0.254 × × 0.136

<sup>2</sup> / 8.14

220 <sup>2</sup> / 5.59 .(2 ) 7.78 8.04  
<sup>2</sup> / 7.98

( ) ( 220 ) (1993 )  
 .%6.157

. 1±0 (2)  
 (² / )

3	2	1	3	2	1	( )
8.144	7.779	8.038	8.144	7.779	8.038	0
7.267	6.979	7.138	7.213	6.723	6.754	60
6.400	6.025	6.321	6.344	5.565	5.592	120
6.308	5.823	5.915	5.833	5.467	5.540	180
6.127	5.679	5.469	5.254	5.363	5.621	220

.0.327 × × 0.189 × 0.084 0.134 0.103 :(.05) LSD  
 .( " " " " " " " " )

**TSS**

(3)  
 %16.97 %17.58 %18.17  
 %16.24 %17.35 TSS  
 %16.07  
 %7  
 .(Schulz, 2000)



TSS %17.45 %17.57  
 TSS %16.59

.%16.56

.(Osterloh, 1980; Schulz, 1996, 2000)

(3)

. 1±0

3	2	1	3	2	1	( )
18.167	17.583	16.971	18.167	17.583	16.971	0
17.967	17.075	17.354	17.833	16.908	17.596	60
18.242	16.283	15.213	17.067	16.467	16.238	120
16.788	17.075	15.492	16.788	16.483	16.042	180
17.758	16.308	16.217	16.950	15.833	16.267	220

.0.472 × × 0.207 × 0.331 × 0.189 0.146 :(0.05) LSD  
 .( " × " " " )

(4)

5.7 5.8 6.2

(4)

. 1±0

3	2	1	3	2	1	( )
6.200	5.700	5.800	6.200	5.700	5.800	0
9.900	9.700	9.900	9.850	9.500	9.950	60
10.000	10.000	10.000	10.000	10.000	10.000	120
10.000	10.000	10.000	10.000	10.000	10.000	180
10.000	10.000	10.000	10.000	10.000	10.000	220

" × " " " ) .0.249 × 0.144 0.111 :(0.05) LSD  
 .( " × " " " )

9.8 5.9  
( ) 10

(Streif, 2002)

( 220 )  
(5)  
%0.535 %0.54  
(%0.493)  
%0.19 %0.20  
%0.16  
%0.544  
220 %0.184

(5)

1±0

						( )
3	2	1	3	2	1	
0.493	0.535	0.540	0.493	0.535	0.540	0
0.312	0.257	0.487	0.392	0.355	0.563	60
0.233	0.247	0.298	0.222	0.265	0.273	120
0.158	0.187	0.363	0.208	0.167	0.328	180
0.202	0.153	0.192	0.183	0.167	0.210	220

0.019 × 0.023 × 0.008 0.013 0.010 : (0.05) LSD  
( " × " ) .0032 × ×

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196 .
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