



## Introduction

One of the largest costs in producing fresh-cut apple slices is the anti-browning solution. Therefore, the elimination or any reduction in the amount of solution required would be very beneficial to the producer.

Some apple varieties brown more quickly and severely than others upon cutting, depending on the inherent amount of responsible enzymes and antioxidant levels.

## Objective

The objective of this work has been to evaluate the browning potential of several new apple varieties, including 'Ambrosia', 'Aurora Golden Gala', 'Galarina', 'Gold Rush', 'Honeycrisp', and two recent selections from Quebec (incl. 'Eden').

## Materials and Methods

Fruit from each variety were harvested either in Ontario and/or British Columbia during commercial harvest and stored at 0-1°C for 1-3 months. Several fruit were then removed periodically throughout the storage duration and sliced within 1 hour. After cutting, the slices were rinsed in running tap water, allowed to drip dry, and placed into zip-lock bags. Slices in bags were held at 4.5-5°C for 1-3 weeks and then assessed for browning.

Flesh and core tissue browning were determined subjectively on a 1 to 3 scale, where 3 = moderate to severe browning in localized areas or over the whole slice, 2 = slight browning, and 1 = no browning (Tables 1 and 2).

Overall browning and decay were evaluated using 1 to 9 scales (University of California, Davis), where 1 = extremely poor, fungal decay, 3 = poor, limit of usability, 5 = fair, deterioration evident but not serious, limit of marketability, 7 = good, minor symptoms, and 9 = excellent, no deterioration (Table 3)\*.



Photo 2: 'Ambrosia' apple.

Table 1: Browning of core and flesh tissue of apples evaluated in British Columbia.

Variety	Province Grown	Browning of Core	Browning of Flesh
Honeycrisp	BC	3.0 a	2.0 b
Aurora Golden Gala	BC	3.0 a	2.0 b
Red Delicious	BC	2.9 a	2.7 a
Quebec selection - yellow	Quebec	2.5 b	2.0 b
Ambrosia	BC	2.0 c	1.1 e
Eden	Quebec	1.9 c	1.5 d
Eden	BC	2.0 c	1.7 c
Eden (at harv)	BC	2.0 c	1.0 e
SPA493	BC	2.0 c	1.4 d
Gold Rush	BC	2.0 c	1.4 d

Table 2: Browning of core and flesh tissue of apples evaluated in Ontario.

Variety	Province Grown	Browning of Flesh	Browning of Core
Aurora Golden Gala	Ontario	2.5	2.9
Gold Rush	Ontario	2.5	2.8
Galarina	Ontario	2.5	2.7
Ambrosia	Ontario	2.1	2.4
Honeycrisp	Ontario	2.0	2.2
Quebec selection - yellow	Quebec	1.9	2.5
Eden	Quebec	1.8	2.3



Photo 1: 'Eden' slices immediately after cutting.

Table 3: Firmness, soluble solids content (SSC), browning, and decay of slices made from Ontario and BC-grown 'Ambrosia' apples stored for 1 month at 0-1°C in 2006. Slices were treated with either NatureSeal (to control browning), NatureSeal + 1-MCP, or NatureSeal + New Technology (AAFC-developed formulation) and held for 21 days at 5°C in Ontario.

		NatureSeal	1-MCP + NatureSeal	New Technology + NatureSeal
Firmness (lb)	Ambrosia BC	21.4 ± 0.2	22.6 ± 0.9	23.0 ± 0.5
	Ambrosia ON	19.3 ± 0.2	24.4 ± 0.6	24.4 ± 0.6
SSC (%)	Ambrosia BC	12.3 ± 0.2	12.4 ± 0.3	12.6 ± 0.1
	Ambrosia ON	12.7 ± 0.3	12.0 ± 0.3	11.8 ± 0.1
Browning*	Ambrosia BC	7 ± 0	1 ± 0	1 ± 0
	Ambrosia ON	7 ± 0	1 ± 0	1 ± 0
Decay*	Ambrosia BC	7.6 ± 0.1	3.9 ± 0.1	1 ± 0
	Ambrosia ON	7.1 ± 0.1	3.1 ± 0.3	1.1 ± 0.1

## Results and Discussion

Overall, 'Eden' and the other Quebec selection showed the least amount of browning, with slight to none. The other varieties all exhibited some degree of moderate to severe browning at one or both locations (Ontario and BC).

When post-cutting treatments were evaluated for ON and BC-grown 'Ambrosia', results on quality retention were similar for both growing areas.



Photo 3: 'Honeycrisp' slices immediately after cutting.

## Conclusions

- Differences exist in the browning potential of slices, among the various apple varieties
- New selections from Quebec appear to be more resistant to browning
- Growing location may be a factor in the degree of browning, but not consistently so
- 'Ambrosia' responds similarly to post-cutting treatments whether they are grown in ON or BC

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