

# Best Handling Practices to Export McIntosh Apples from Massachusetts to Central America

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In the previous articles of this series, we have suggested that there are currently opportunities for apple growers to export McIntosh apples to Central American markets. In this article, we wish to emphasize how best to handle apples from the grower through the Central American consumer such that apple export can be the most profitable.

Best handling practices (BHP) are known as the selection of the best technologies to be applied among a range of available pre-harvest and post-harvest technologies. When choosing technologies, the most significant factors mentioned by many researchers are the product characteristics, the market distance and requirements, and the social and economic conditions of the actors involved. This article analyzes BHP for exporting McIntosh apples to Central America and how the actions of participants in the supply chain can affect the quality of McIntosh apples in Central America. In order to conduct this analysis, a commercial container of McIntosh apples was shipped to the primary importers in Central America to assess quality along the supply chain. During this study, it was observed that perceived quality is dependent on experience and knowledge of each actor participating in the whole

chain; however there are some unavoidable practices that will affect apple quality in the final markets.

## Growers, Packers, and Wholesalers

International shipping of apples is challenging to the quality of the fruit, and our experience with shipping to El Salvador was no exception. Therefore, the apples to be shipped should be optimally treated to assure the best quality in the market. Calcium applications should be a regular part of the growing season activities. Harvest should occur before a significant amount of ripening has occurred. Once harvested fruit should be cooled quickly, treated with SmartFresh™, and kept in controlled atmosphere storage (if at all possible).

Firmness is an extremely important criterion for apple evaluation, as retailers and wholesalers in Central America require apples to have at least 12 pounds of flesh firmness to be accepted as high quality.

## Apples Size

Retailers and wholesalers in Central America require apples to have at least 12 lbs of flesh firmness to be



**HARVEST TIME**  
September to mid-October.

**AVAILABILITY**  
September to April

Christmac Products | McIntosh Apples

### HANDLING PRACTICES FOR GROWERS AND PACKERS

#### PRE-HARVEST PRACTICES

Develop Integrated Pest Management.

Optimize nutrient elements that influence storage life of the fruit: Nitrogen (N), calcium (Ca), potassium (K), magnesium (Mg), phosphorus (P), and Boron (B). Calcium is the nutrient element, which can dramatically affect apple quality after harvest, so calcium application often improves postharvest quality.

Harvest McIntosh apples when they are physiologically mature but not ripe.

Pick apples by hand.

Area	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUGO	SEP	OCT	NOV	DEC
MASSACHUSETTS												



**TOLERANCES**

Be aware that International markets do not tolerate defects; however, in some markets, for example, Central America, some buyers have the following tolerance scale which is divided in three damage categories.

MINOR Damage	MAJOR Damage	CRITICAL Damage
When apples have slight scratches, spots, or small insect bites.	When apples have evidences of bitter pit, bruises, cracks, disorders caused by inappropriate atmospheres during storage and related to harvest of over mature fruit and other minor defect covering an area greater than 10% but less than 20%.	When apples have evidences of advance disorders such as senescent breakdown, chilling disorders and disorders associated with inappropriate atmospheres during storage.

**TOLERANCES**

Defects	Tolerance
Accumulated defects	10 %
CRITICAL	1 %
MAJOR	3 %
MINOR	7 %

**HANDLING PRACTICES OF MCINTOSH APPLES DURING THEIR SHIPMENT AND RETAIL SALES**

Avoid disorders that develop during storage by keeping the appropriate atmospheres during storage. The major disorders on McIntosh are senescent breakdown. Some symptoms can be seen in the following pictures.

**SHIPPERS**

To reduce the development of senescent breakdown on McIntosh, keep the optimum storage temperature and humidity at the following levels:

Optimum storage temperature	0°C (32) °F
Optimum storage humidity	90% to 100 %

accepted as high quality. Smaller apples from 125-count had significantly greater firmness than apples from the 80-count fruit. It is strongly recommended to export smaller and firmer apples to Central America markets

**Weight per Box of McIntosh Apples**

The standard apple box in commerce is considered to be 40 pounds of fruit, and buyers in Central America require 40 pounds per box.

**Temperature**

The most important technique for controlling the loss of quality along the supply chain is temperature reduction, therefore while exporting McIntosh apples to Central America it is recommended to store at as close to 32°F as possible. Our experience suggested that there is the potential for a great deal of variation imposed during the supply chain in El Salvador. It is extremely important to emphasize to buyers the importance of temperature control throughout the supply chain.

**Packing**

Furthermore, packing must be carefully planned to provide uniformity and consistency from box to box in order to increase buyer and consumer confidence in the quality. During the packing process, growers must also follow the USDA grade standards: (U.S Extra Fancy, U.S Fancy, and U.S No.1) based firstly upon color, but also on freedom from decay, disorders and blemishes, as well as the firmness of the fruit.

McIntosh apples should also be packed according to the size of the apple, standard industry requirements, and requirements of buyers. Central American buyers use the following size categories: Large = 90-64 count; Medium = 138-100 count; and Small = 198-150 count. We do not recommend exporting large apples since they are more prone to storage deterioration and are not preferred in the Central American markets.

**Inspection**

During this study, officers from the Massachusetts

**PRACTICES FOR LONG-TERM STORAGE**

- Refrigerate McIntosh apples as soon as possible after harvest.
- Treat McIntosh apples with SmartFresh per label recommendations.
- Establish controlled atmosphere levels as soon as possible after apples have been cooled to the desired temperature.
- Storage McIntosh Apples with the following regimen:

Cultivar	Regime	O2 (%)	CO2 (%)	Temperature(°F)	Storage Info
Regime	Standard CA + SmartFresh 1	2.5	2.5	37	5-7

Source: (Watkins & Miller, 2004)

Monitor the room atmosphere daily and take corrective action as needed.

Work very carefully to accurately separate the lots from each harvest date classifying fruits with similar characteristics.

Provide uniformity and consistency from box to box, increasing consumer confidence in the quality.

Follow USDA grade standards: U.S Extra Fancy, U.S Fancy, U.S No.1 (based primarily on color, freedom from decay, freedom from disorders and blemishes, as well as firmness of fruit).

**HANDLING PRACTICES TO EXPORT MCINTOSH APPLES**

Pack McIntosh apples according to size and the requirements of buyers. For example, Central American buyers use the followings size categories.

Size	Apples per Box
Big	64, 70, 72, 80, 88, 90
Medium	100, 113, 125, 138
Small	150, 163, 175, 198

Be sure that red color predominates.

Verify that firmness or texture is greater than 12 lbs.

Make sure that soluble solids are greater than 11 ° Bx

Make sure that apples are freedom from decay, disorders, and blemishes.

Department of Agriculture came to the packinghouse to inspect the apples for the export certificates to Central America. At this point, key factors such as appearance quality were assessed by the inspector. However, firmness and weight were not assessed for the export certificates. Taking into account their importance on the final markets, these factors should be part of the criteria used for determining the suitability of apples for export.

## Shippers, Exporters, and Importers

The main goal of shippers, exporters and importers is to avoid losses due to disorders that develop during storage by keeping apples at the lowest possible temperature. The major problem affecting apples during transport is softening, so to reduce the softening of McIntosh apples, keep the storage temperature at 32°F and humidity 90-100%.

During this study, temperature and humidity through the ocean freight were kept at the recommended levels, and there was not any mismanagement observed during the transportation of the apple container from the port of loading to the port of discharge. As a result, this study found that shipping companies understand the handling practices of apples.

Once the apples arrive at customs, they must keep at the right temperature. It is highly recommended to negotiate FOB (Free On Board) price in order to avoid delays and excessive payments in this part of the process.

## Distributors

Apples must be kept at the right temperature in the distributor's warehouse. Workers should avoid handling the apples too often, as sometimes workers are unaware of how to

handle the apples appropriately.

## Retailers

Once the apples are delivered to the supermarket, apples must be kept at as close to 32°F as possible, and workers must be trained in the best handling practices for apples before the McIntosh delivery.

Some other recommendations for retailers and distributors are not to overlap more than 7 boxes of 40 pounds in order to avoid compression bruising, to handle the apples carefully and always arrange them by hand, and to keep damaged or bruised apples off the shelf.

## Consumers

The practices for consumers are very similar to those for retailers; however, it is strongly recommended to store the apples in a refrigerator when possible, and if there is no refrigerator, consumers should place the apples in a cool area.

## Conclusions

Throughout the supply chain for McIntosh apples from Massachusetts to Central America, it was determined that each one of the actors forming this supply chain has an important role in maintaining apple quality.

Factors of particular importance that affect apple quality include the apple source, fruit size, and proper temperature maintenance.

These results and conclusions are only part of the picture. To make the decision to export McIntosh apples to Central America, there needs to be an economic analysis indicating that it is profitable for growers in Massachusetts.



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On June 10, 2014 Rutgers Cooperative Extension held a Horticultural Twilight Meeting at the at Donaldsons Farm, Hackettstown, NJ. Professors Peter Nitzsche and Bill Hulibk presented an Update On The Rutgers NJAES Project To Release New Strawberry Varieties For Eastern US and NJ growers. Farmer Greg Donlandson had extensive plots of our Rutgers strawberry selections on site. He has worked closely with Rutgers for the past 4 years in their testing. "This project is funded by a grant from the Walmart Foundation and administered by the University of Arkansas System Division of Agriculture Center for Agricultural and Rural Sustainability." Forty-two growers were in attendance. Photo credit: Peter Nitzsche.



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