

Controlling Moisture Loss in Produce During Storage

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Sometimes, we can learn a lot from even the most fundamental experiments. While many of you may have seen what we are going to discuss at school science fairs, don't let the apparent simplicity fool you. There are things going on that could help you understand how to better handle the produce that you purchase.

In the photograph on the left, a leafy stalk of celery has been placed in a glass of blue-coloured water. The leaves are a yellowish-green and somewhat wilted. The wilting was due to moisture loss during storage and handling after it was purchased. Now, look at the photograph on the right. After ten or twelve hours, the leaves have begun to spread and have taken on a darker blue colour which has obviously come from the water. How it got there is where the science comes into play.

At peak quality, cells making up the plant tissue are fully hydrated - so they are plump and firm. As moisture is lost, the tissues lose their firmness and become limp, or flaccid. That's what was starting to happen with the celery in the left photo.

To replenish moisture lost through the leaves, plants draw water upwards through their stems by capillary action bringing essential dissolved nutrients along for the ride. This is the driving force that keeps things going. Celery stalks provide an ideal way to illustrate what is occurring.

Conditions are ideal when there is a balance between the loss of moisture through the leaves and the replacement of this moisture by capillary action. Once produce is harvested, the balance is totally upset, since there is no longer an opportunity to replace the lost water naturally. To address this deterioration in quality, remedial action should be taken immediately.

Growers and grocers understand the need to keep their produce fresh and firm by minimizing moisture loss. To accomplish this, they often arrange the produce as a single layer in chilled display cases. Cool temperatures slow the rate of respiration of produce and lower the rate at which moisture is lost.

You may also have noticed that the produce display cases are equipped with nozzles that spray a fine mist of cold water at regular intervals. The fine spray accomplishes two things. First, it adds a thin coat of water to the surface of the produce. Having a wet surface reduces the amount of water lost by the plant tissues, which helps preserve its freshness. Second, the fine droplets of water provide evaporative cooling to help chill the product and further slow the rate of deterioration.

You may be familiar with evaporative cooling in another situation. When using a garden hose on a hot summer day, you may have set the nozzle to a fine mist and sprayed it into the air over your head. Walking through this cloud of fine water droplets provides a welcome coolness due to the water taking heat from the air as it evaporates. Even though you feel cool, you probably don't get very wet because the tiny water droplets vaporize into the hot air quite rapidly.

Leafy greens and other produce that likes to be chilled also needs to be kept in a humidity-controlled environment. Most often, 95% relative humidity at a temperature between four and ten degrees Celsius is recommended. The high relative humidity creates a situation where there is enough water vapour in the air to minimize evaporation of moisture from the produce, and once again, the low temperatures help slow the overall spoilage.

When it comes to proper storage conditions for produce, you might want to follow the lead of the supermarkets and try to duplicate the conditions they use. Having your refrigerator crisper set to the correct conditions is one way to do this.



These two photos illustrate the uptake of moisture for hydration with celery. The photo on right shows how the blue water has been drawn up into the leaves of the celery.