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In The Process

By Diane M. Barrett

Vegetable Blanching: How Long Is Too Long?

PEAK production of many vegetables occurs during a short window of time, and unless some way of preservation is used, the fruits — or in this case vegetables — of a grower's labors may be lost. There are a multitude of techniques for preserving vegetables. Here's a look at how processors are using blanching, a fairly mild heat treatment usually applied prior to freezing, and sometimes canning.

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Why Blanch?

Typical blanch times and temperatures might be about 190° to 212°F for 1 to 10 minutes. One of the main reasons to blanch is to deactivate enzymes, natural compounds which aid or initiate undesirable changes in vegetable color, texture, and flavor. If processors did not blanch vegetables prior to freezing, these enzymes would remain active even during storage and destroy the product quality — particularly causing a very noticeable off-odor and flavor. Blanching also:

- Reduces the microbial population on the surface of vegetables.
- Reduces the tissue gases. (A decrease in oxygen lessens chemical reactions which affect color and flavor. Gas displacement also reduces strain on containers.)

• Shrinks or wilts vegetables such as spinach for packaging.
• Aids peeling and cleaning.
• Stabilizes color.

The Peridoxase Paradox

Food scientists and vegetable processors have needed to find some factor that could help them discern the difference between underblanched and overblanched products — a factor which could be tested quickly and inexpensively in a processing facility.

In the 1940s, the enzyme peroxidase was identified as a potential indicator. Scientists realized that in order for peroxidase to serve as a good indicator of blanching effectiveness, its activity must be related to keeping quality. Even though peroxidase activity could be correlated with heat treatment, if this enzyme did not affect vegetable quality, there would be little reason for using it.

But there is no direct evidence that peroxidase activity is directly associated with loss in quality of vegetables, except in asparagus.

How About Another Enzyme

Since the early 1980s, several scientists have questioned the use of peroxidase. And though they haven't found a single enzyme which could serve as the universal indicator of quality for all vegetables, it may be possible to target specific enzymes based on the quality attribute they affect.

In green beans, for example, off-flavor and off-odor are the major quality problems in frozen storage. These unwanted changes are catalyzed by an enzyme called lipoxygenase.

Perfect Blanching Time Benefits

Recent studies show that targeting the specific enzymes responsible for quality changes improve quality and offer tremendous savings in energy and water use. How? Remember that one of the reasons for selecting peroxidase as an indicator was that it is resistant to destruction by heat. By inactivating peroxidase, the processor could be sure that all other enzymes which were less resistant to heat would also be inactivated.

However, using peroxidase as an indicator also meant the processor was drastically overblanching vegetables. This overkill demands more energy and water, and results in greater loss in nutrients, color, texture, and flavor.

In our lab, we have found that by targeting lipoxygenase rather than peroxidase in green beans and sweet corn, blanch times could be cut almost *in half* and sensory quality after 9 months of freezing was as good as or better than the longer blanch.

More studies to confirm these findings in other vegetables and different varieties of the same vegetable are needed. We have found that even different varieties of green beans and sweet corn may have very different enzyme activities and, hence, require very different blanch times. The bottom line: Simple methods for measuring new quality-relevant enzymes right in processing facilities need to be developed. □