Modified-Atmosphere Packaging Gives New Life To Produce

COLLEGE PARK, MD — ...tional Agriculture Week, March 13-20, celebrates the accomplishments of an industry that has weathered droughts, freezes, increasing regulation and changing tastes to remain one of America's largest and most successful industries. The week-long event also presents an opportunity to focus on the trends that will determine the future course of American agriculture.

One of those trends involves a desire for fresh produce. Consumers are eating more fresh fruits and vegetables than ever before and are even choosing their supermarkets based on the quality of the produce.

"Consumers want fresher, less processed food," says Dr. Donald Schlimme, associate professor of horticulture at the University of Maryland College Park. "And they want it year 'round.

"These demands influence not only the marketing strategies of food retailers, but also the direction of food processing and packaging research. As per capita consumption of canned food dwindles, scientists search for new ways to provide acceptable, high quality alternatives."

One technology that looks promising is modified-atmosphere packaging, which extends the storage and distribution life of both raw and prepared products. Dr. Schlimme explains how the process works:

"All fruits and vegetables take in oxygen and release carbon dioxide. If you can retard the rate of this transfer, or respiration, and the associated metabolic activities, you can extend shelf life.

"One way of doing this is by cooling the items through refrigeration, which works because the various chemical reactions involved in the aging of fruits and vegetables are temperature dependent."

Another way of extneding shelf life, he continues, is to limit the amount of available oxygen. This is done by wrapping and sealing the items in plastic film.

As they respire, they use up oxygen within the sealed package at a rapid rate; this ultimately retards the respiration rate until a balance is achieved, with the packaged items using up oxygen at a rate equivalent to that replaced by natural diffusion through the plastic barrier.

Together, refrigeration and modified-atmosphere packaging are more effective than either technique used alone.

"You must have a partnership of temperature and atmosphere controls," explains Schlimme.

The ideal amount of oxygen inside the plastic seal, he adds, is between 2 and 5 percent. That range appears to offer the greatest benefits in terms of extending the life of fruits and vegetables. Below 1 or 2 percent oxygen, the items tend to deteriorate rapidly.

Achieving the proper atmospheric conditions is anything but simple. Different fruits and vegetables respire at different rates, so the plastic film used to seal them must be selected on an item-by-item basis.

The size of the package also must be correct because too few or too many items can cause a respiration imbalance. And, of course, temperature is always a factor.

Despite the complexities involved, Schlimme believes the benefits of modified-atmosphere packaging justify the time and effort involved in developing the technology.

"I really think you'll see an improvement in the quality of many fruits and vegetables over the next decade as a result of modified-atmosphere packaging," he says, using tomatoes to illustrate his point:

"The vast majority of tomatoes in eastern U.S. supermarkets during the winter months come from southern Florida or Mexico and are shipped great distances. Ripe red tomatoes won't withstand the rigors of transportation; they'll be mush by the time they get to the supermarket. Consequently, the tomatoes are picked when they're at what's called the mature green stage of developent. They ship well because they're hard as bullets."

Upon delivery, the tomatoes are exposed to ethylene gas, a plant hormone that triggers ripening. They are offered for sale once they have achieved a sufficient red color.

But as you may have noticed, that red isn't the same true red of tomatoes that have ripened on the vine, and the taste leaves something to be desired.

"Some people go so far as to call them cardboard tomatoes," said Schlimme.

But modified-atmosphere packaging can improve the quality of such tomatoes. Left on the vine longer, they develop more flavor but are still firm enough to hold up during shipping.

Proper plastic wrapping and refrigeration retard the already initiated ripening process and extend the tomatoes' high-quality shelf life to a minimum of 21 days while eliminating the need for ethylene gas, according to research conducted by Schlimme and his colleague, Professor Theophanes Solomos.

Modified-atmosphere packaging also offers great potential benefits for Delmarva farmers who produce sweet corn, according to Schlimme.

"A lot of farmers sell quite a bit of sweet corn at roadside stands during the summer," he says. "But that's peanuts compared to what they could make selling minimally processed corn to retailers in the Baltimore-Washington corridor." (By minimally processed, Schlimme means corn that has been picked, shucked, desilked, washed, cooled and then packaged in the appropriate plastic film and refrigerated.)

Last summer, Schlimme began evaluating several sweet corn varieties as potential candidates for modified atmosphere packaging. The best performer in preliminary studies achieved a satisfactory shelf life of 31 days when properly sealed and stored at a temperature of 34 F.

Encouraged by these preliminary results, Schlimme will continue his corn research this summer.