Life Without Alar

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In August, 1985, the controversy began regarding the safety of Alar™ residues on apples. Since that time, many discussions and arguments have occurred. A recent "60 Minutes" program fueled the controversy by presenting claims made by the Natural Resources Defense Council that Alar is a potent carcinogen. The scientific data available certainly do not support that view; however, the widespread publicity likely will eliminate Alar-use as a horticultural practice. Apple growers must look toward a future without Alar. In this article I shall present some of the ways that may help reduce the need for Alar.

Before discussing specific activities, we must be clear on what benefits are received from Alar. The first and foremost function of Alar is to act as a "stop-drop." This function allows a grower to harvest most of his crop before it drops to the ground. By allowing fruit to remain on the tree longer they are able to color more fully, giving higher grade fruit. One reason why fruit stay on the tree longer is that Alar delays the beginning of fruit ripening, which results in less-ripe fruit for storage, which then allows the fruit to retain high quality for a longer time. In particular, the apples stay firm for a longer period of time.

Alternative approaches to the use of Alar must address these benefits that Alar provides. Approaches will be divided into two types: short-term practices and long-term changes. Short-term practices include several activities, but in general these are practices which may be undertaken this season to reduce the losses associated with the non-use of Alar. Long-term changes require more time and capital to implement. It must be understood that Alar provided a great deal of benefit, and no practices are real alternatives; they only assist in reducing the losses associated with non-use of Alar.

Short-Term Practices

Pruning

Several *Fruit Notes* articles [52(3):7-8; 53(1):12-13; 53(2):1; and 53(3):1-2] have discussed the effects of pruning, particularly summer pruning, on the production of high quality fruit. Removal of upright, hanging, and shade-causing wood in the summer can result in a dramatic increase in light penetration, fruit coloration, and packout. Additionally, it causes earlier coloration and thus allows earlier harvest, hopefully reducing some of the need for Alar while

not reducing average fruit quality. Dormant pruning also is important, specifically in improving light penetration to the fruit. For more specific information about summer pruning practices, see *Fruit Notes* 53(2):1, and for more information about dormant pruning to improve packout, see *Fruit Notes* 53(1):12-13.

Chemical Treatments

There are no chemical alternatives to Alar. However, there are two chemicals that can be used to expand the harvest season: Ethrel and NAA. The problem with both chemicals is that they may render the fruit unusable for long-term storage by advancing ripening. Ethrel is used to advance the harvest season by breaking down to ethylene and triggering ripening. Treatment with Ethrel results in marketable fruit early in the season, but also fruit that probably must be consumed immediately, because they are too ripe to store. NAA is a "stop drop." It will significantly delay premature fruit drop, but it also advances fruit ripening. NAA can expand the season, but treated fruit must be sold relatively quickly. Details on the use of both of these chemicals are given in the *New England Apple Spray Guide*.

Harvest and Storage Management

Without Alar the fruit in storage probably will be riper than what growers are used to. To maintain fruit quality throughout the storage period, the fruit must be handled with greater attention to details than if they had been treated with Alar. This additional care includes more accurate attention to cooling and to the rapid establishment and maintenance of optimal temperature and atmosphere conditions, as well as to application of the appropriate postharvest chemical treatments. No longer will sloppy storage management be acceptable, since the fruit will show the quality of storage management more readily than before. In addition to storage management, the intensity of harvest management must be increased. Growers must accurately manage their harvest so that the most appropriate fruit are placed in long-term storage. This practice may include the more frequent use of the starch-iodine test for maturity assessment.

Increased Labor

Increasing harvest labor so that more fruit can be picked in a shorter period of time is one way to reduce the impact of the non-use of Alar; however, growers must be able to handle the increased quantity of fruit. Specifically, the orchard operation must be able to move the fruit quickly from the orchard to the storage, stack them in the storage, cool them quickly, and seal the storage (if CA is used) if the increased labor is going to pay off. Beside the availability of additional labor, one problem which may prevent this practice from being feasible is the size of the refrigeration plant. If there is not adequate refrigeration to cool the high quantity of fruit being placed in the storage per day then the additional labor is not truly reducing the impact of the non-use of Alar.

Long-term Changes

Changes in Cultivars

One of the characteristics of the New England apple industry which has increased the problems related to the loss of Alar is the large proportion (60 %) of the production devoted to McIntosh. A relatively simple way of reducing the need for Alar is to replace McIntosh with other cultivars which allow an expansion of the harvest season or do not require a chemical "stop-drop." Several cultivars have potential in New England, such as Gala, Mutsu, Libe1ty, Jonagold, and Red Fuji. Older cultivars like Cortland and Macoun also may deserve a greater role in the industry. Obviously, several years are required to change cultivars, and several years are required to develop markets for new cultivars.

Changes in Strains

Several McIntosh strains are now available. Marshall McIntosh has been the most planted strain over the last few years, primarily because of its higher coloring potential. Additional benefits which come from Marshall McIntosh are given by its earlier coloring and earlier ripening. It colors approximately 10 days prior to Rogers McIntosh and ripens approximately a week earlier. These two differences allow an advance-

ment of the McIntosh harvest season without the kind of quality loss found with the use of a chemical such as Ethrel. However, planting entirely to Marshall McIntosh will not reduce the losses associated with the non-use of Alar, because the entire harvest season will be earlier and just as concentrated as with a standard strain of McIntosh. Future orchards should have a mix of Marshall McIntosh with other strains to allow the maximum expansion of the harvest season.

Pioneer Mac (recently named by Adams County Nursery) technically is not a strain of McIntosh but actually is a seedling of McIntosh and thus a new cultivar; however, its fruit are virtually indistinguishable from McIntosh and undoubtedly will be accepted as McIntosh. Its reported advantage over standard McIntosh is that it ripens 2 weeks later. In 1988 at the University of Massachusetts Horticultural Research Center we established a replicated trial to compare Pioneer Mac to Marshall McIntosh and Rogers McIntosh. When information is available it will be reported through *Fruit Notes*. The benefits of Pioneer Mac may be great, but as with Marshall McIntosh it will be necessary to include earlier-ripening strains of McIntosh to provide a true expansion of the harvest season.

Rootstocks

Changes in rootstocks must occur to give benefits in two areas. First, more dwarfing rootstocks must be used. Large plantings of McIntosh as semi-dwarf trees will not be feasible to maintain without Alar. Growers must consider moving into the dwarf category, using M.9, M.9 EMLA, M.26, Mark, and possibly Ott.3 as rootstocks. Trees on these rootstocks are much easier to prune, require less spray material, and most importantly, in the context of this article, are much easier to harvest than are semi-dwarf or standard trees. Nearly all the fruit are harvestable from the ground, and the harvesting process can be done more rapidly. Because of high light penetration into the canopy, more of the fruit are highly colored, making selective harvesting less of a priority while improving packout. For more general information on these dwarfing rootstocks see *Fruit Notes* [51(4):22-24; 52(1):1-4; 53(1):4-7; 53(3):3-6; and 54(1):11-15].

The second potential benefit of a change in rootstocks is their effect on ripening. For three years we have been conducting research at the University of Massachusetts Horticultural Research Center on the effects of rootstocks on apple fruit quality and ripening [see *Fruit Notes* 52(2):5-10], and have found that Mark can delay ripening of Delicious and McIntosh fruit by as much as 5 days when compared to fruit from trees on M.26 EMLA and Ott.3. The use of rootstock to expand the harvest season should complement the use of different strains to expand further the McIntosh harvest season.

Conclusions

We do not have any easy answers to the question of what an apple grower can do to reduce the losses associated with the non-use of Alar. Short-term approaches, obviously, are stop-gap measures which may somewhat reduce the losses. The long-term changes will take time and capital to implement but should go far to eliminate the need for Alar. The New England apple industry has rough seas ahead, but if growers look to the future and begin to make some changes, it should be able to weather this storm.

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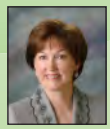
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