

## **A Five Year Summary of Preharvest Drop Control and Suggestions for Use in 2014**

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Retail sales continue to be an important component in the overall business model for growers in the Northeast. The pick-your-own component of this model is playing an increasingly important role. Three of our most important apple varieties, McIntosh, Macoun and Honeycrisp, have moderate to severe preharvest drop that may exceed 50%. ReTain is our most important drop control compound to help control this problem. When ReTain was introduced the primary goal was to aid in harvest management by keeping fruit on the tree and in good condition until an orderly harvest could be completed. Growers are now attempting to keep fruit on the tree longer and the strategies developed when ReTain was first introduced needs to be revised to meet the changing demand with the current emphasis on retail sales.

The emphasis the past few years has been to develop a drop control strategy that will extend drop control well into the fall. Weekends in late September and early October are especially important to retail stand operators so our goal and measure of success has been gauged having good drop control to the Columbus Day weekend in the second week in October. We have attempted to do this by: applying greater amounts of Retain, using split applications of ReTain, and by including NAA in the ReTain drop control program. The purpose of this article is to review drop control research done over the past 5 years, interpret these results and then make drop control recommendations or suggestions for the 2014 season and beyond.

The ReTain label offers two different scenarios for use. The first is for a single harvest option where one pouch per acre is applied 3 to 4 weeks prior to the anticipated start of harvest. This is intended to delay ripening as well as provide early season drop control. Drop control is achieved early in the season but its effectiveness is diminished later. The second scenario is intended for growers who choose to do multiple picks in a block. One pouch per acre of ReTain is applied one to two weeks prior to harvest. It requires 7 to 10 days following application for ReTain to become effective so early drop control will be limited with this option. The results reported in this report are variations on the above application objectives but within limits outlined on the label. In these experiments ReTain treatments contained either Silwet or Breakthru surfactants at a final concentration of 0.05% or 0.1%, spray volume was the calculated TRV dilute rate and the base treatment was 1 package (333g) ReTain per acre. McIntosh/M.9 was used in all experiments.

### **ReTain- Standard Treatment**

Each year is different and the anticipated time of harvest over the 5-year period reported spanned 12 days. In order to compare results from year to year the starting point for all calculations was based on an estimate of 3 weeks before the anticipated start of

harvest. Admittedly, this is an educated guess, but one that all growers must make as well. In Figure 1 we are showing cumulative drop for 5 individual years following application of one 333g package of ReTain. There is some variation from year to year, as one might expect, but the basic pattern of drop is quite similar. In general, there is very good drop control for about the first 30 days after application and then the rate of drop slowly increases. On average, there was about 20% drop 37 to 40 days after application. In comparison, drop under control trees averaged 20% about 21 days after application or on the date we estimated to be the harvest date (Figure 1).

### ReTain- Split Applications

The standard treatment of ReTain lost some ability to control drop generally at the end of September. Three half rates (167g) were applied at 3 weeks, 1 week before and 1 week after the start of anticipated harvest is an attempt to get additional drop control later in the season. This strategy was successful about half of the time (Table 1). If you look at the kinetics of drop you can see that drop control was very similar to the standard treatment for about the first 40 days and then the split applications worked slightly better at controlling drop (Figure 2).

### ReTain Plus NAA

We used several different NAA combinations but the one reported on here is one application of 10 ppm NAA with the standard ReTain treatment. Drop control when NAA was included with ReTain was very similar to ReTain alone. Drop control was improved in 1 of the 4 years tested (Table 1). The improvement in drop was manifest late in the season (Figure 2). When tested, 2 applications of 10 ppm NAA or one application of 20 ppm NAA with ReTain was no more effective than one.

### ReTain Rates

In the past we have not tested high rates of ReTain because of the perceived cost involved and because there was some ambiguity in interpreting the label. In 2013 we tested higher rates of ReTain and these are shown in Figure 3. The 333g (single pouch rate) was applied 3 weeks before anticipated harvest; the split half rate applications were made 3 and 1 week before and 1 week after, totaling 1.5 pouches per acre. The 2X rate of ReTain was applied at full rates of 333g 3 weeks and 1 week before anticipated harvest (2 pouches total). Drop control was essentially rate related. The standard ReTain treatment was less effective than the 3 half-rates of ReTain, and the two full rates of ReTain applied 3 and 1 week before anticipated harvest was most effective. This treatment kept the majority of McIntosh on the tree until the Columbus Day weekend, a major goal of this investigation.

It was not too surprising to see this rate response. ReTain research has been going on for over two decades and in essentially all published peer reviewed reports, the response to ReTain is linear with the amount applied. The more ReTain you apply the better drop control you can expect. The major decision orchardists must make is if the

additional drop control late in the season is cost effective and this is an individual decision.

#### ReTain and NAA Combinations- Fruit Maturity

It is well known that when NAA is used as a drop control compound advanced fruit ripening can be expected. This is especially true with McIntosh types. Over the course of these studies, we tried various combinations with ReTain ranging from one NAA application at 10 ppm to 3 application of NAA at 20 ppm. When ReTain was included with NAA, the ReTain could modify or even negate any ripening response to NAA, but the ratio of NAA to ReTain was very important. If the amount of ReTain applied was reduced too much the accompanying NAA could advance ripening. We saw no drop control advantage in using 20 ppm NAA to enhance drop control. One or two applications of 10 ppm NAA if combined with a full rate of ReTain generally showed no signs of advanced ripening compared with ReTain alone. Three half rates of ReTain with 1 or 2 applications of 10 ppm NAA generally showed minimal or no advance ripening. However if the three one third rates of ReTain were used with 1 or 2 applications of 10 ppm NAA signs of early ripening were noted. Therefore, it is not advisable to reduce the amount of ReTain very much when using NAA to compensate for lost drop control.

#### An Ancillary Drop Control Study

Preharvest drop appears to be a random event. Drop occurs over a relatively long period of time. Why do these fruit drop, what triggers this event and is there a way to identify characteristics of the fruit that do drop? Recently we published a paper where the objective was to identify the characteristics of the fruit that drop. In this study we determined that only fruit that are climacteric abscise. (The climacteric is when an apple has a sharp increase in ethylene and CO<sub>2</sub> production and the starting point of this is generally recognized as the start of ripening). ReTain inhibits ethylene biosynthesis, the major hormone stimulating ripening and nudging fruit to enter the climacteric. This information provides insight and allows us to interpret the 2013 drop control results. Higher rates of ReTain will retard ripening, and if this is reinforced by another ReTain application more drop control will be achieved than when lower rates of ReTain are used earlier.

#### Recommendations for 2014 or McIntosh

The earlier you apply ReTain the greater the delay in ripening, but additional ReTain must be applied if you wish to have effective drop control 35 to 40 days after the initial application. Initially we suggest applying one full rate of ReTain (333g/ acre) 3 weeks before the anticipated start of the harvest season. Follow this application two weeks later with another ReTain application if longer drop control is required. Use a half rate for some additional control or a full rate if much longer drop control is desired.

We have not discussed drop control of Honeycrisp. This is a low ethylene producing variety. Experience has shown that using half to a third the rate of ReTain is

generally sufficient. Although we have not tested it, it seems logical that a one third to half rate application 4 weeks before harvest followed by another one third to half rate 2 to 3 weeks later may achieve good drop control without having too much of an effect on delaying ripening and delaying color development.

### Cumulative Drop ReTain- 333g/acre

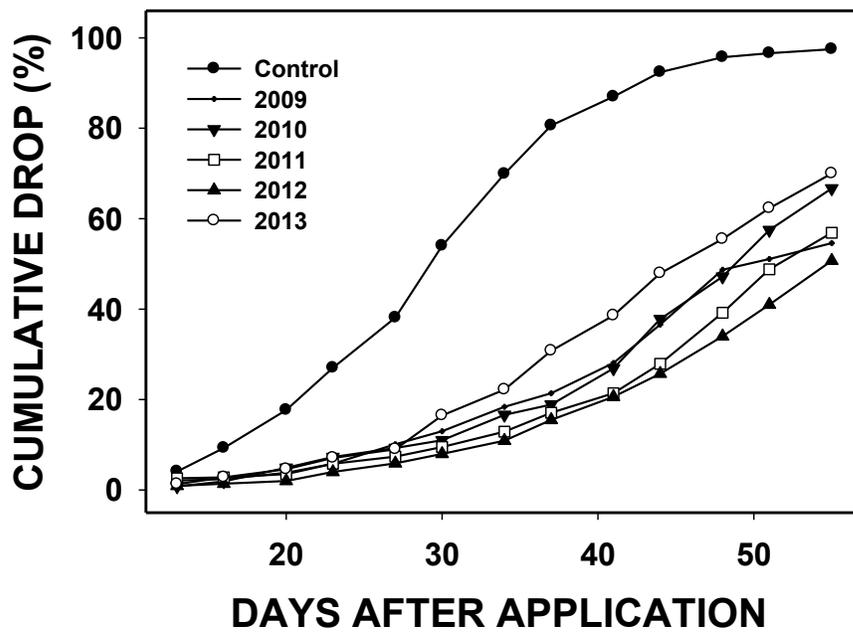


Figure 1. Cumulative drop of McIntosh apples over a 5-year period following application of 333g/acre ReTain three weeks before the anticipated start of harvest. The 5-year average of untreated control trees is included for comparison.

## Drop Control Options with ReTain

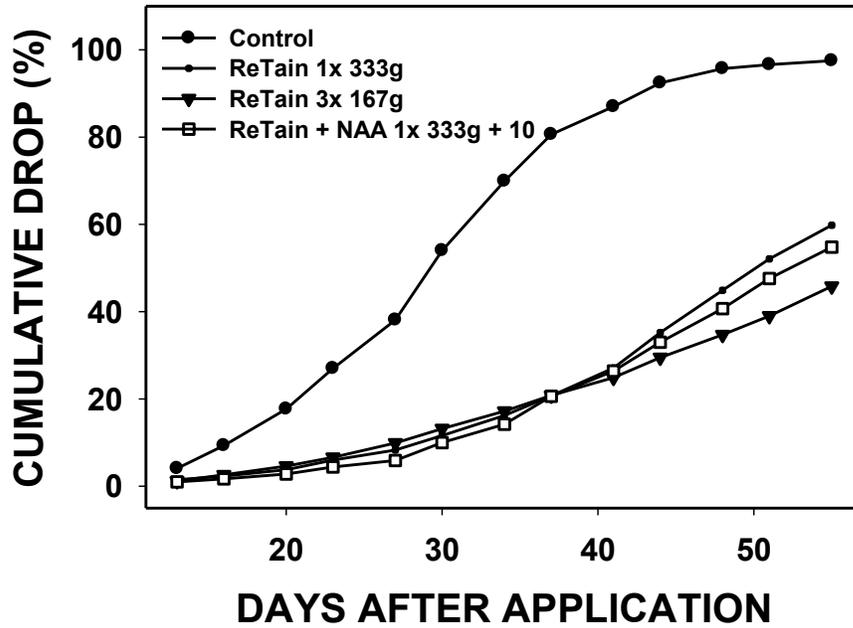


Figure 2. A 5-year average of cumulative drop following application of a. 333g/ acre ReTain at 3 weeks prior to anticipated harvest b. Three split applications of 167g/acre at two week intervals starting 3 weeks before harvest and c. Application of 333g/acre ReTain with 10 ppm NAA 3 weeks before the start of harvest. The 5-year average of untreated control trees is included for comparison.

## RETAIN RATES

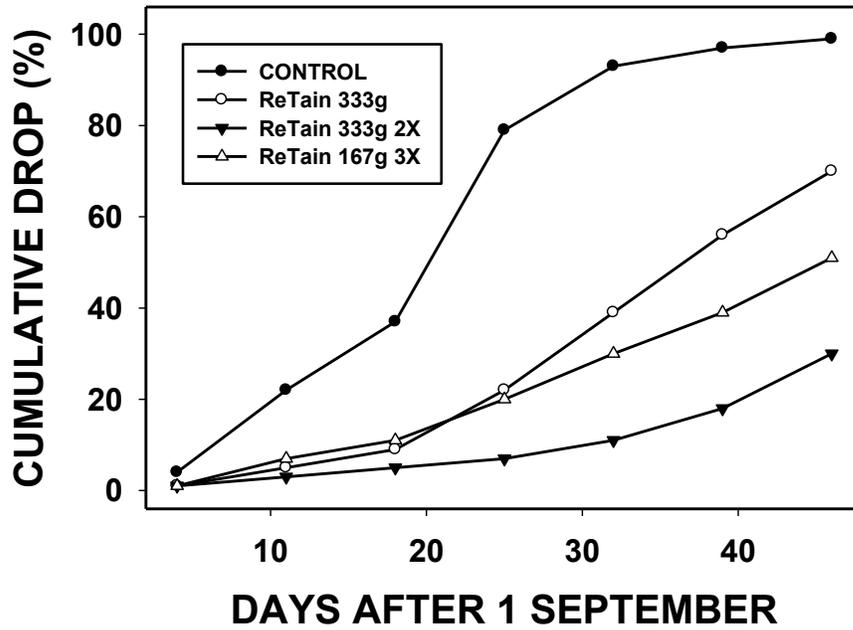


Figure 3. Influence of different rates of ReTain on cumulative drop of McIntosh apples. a. 333g/acre ReTain applied at 3 weeks prior to harvest, b. Three split applications of 167g/acre at two week intervals starting 3 weeks before harvest, c. Two split applications of a full at of ReTain (333g/acre) one at 3 weeks before harvest and the second 2 weeks later.

Table 1. Drop control effectiveness of ReTain options compared with the standard ReTain treatment (ReTain 333 g/acre applied 3 weeks before anticipated harvest)	
ReTain option	Number of years when significantly better than the standard ReTain treatment
ReTain 166g/acre 3 times applied 3 weeks before harvest and twice more at 2 week intervals.	2 of 4 years
Standard ReTain treatment (333 g/acre applied 3 weeks before harvest) plus 10 ppm NAA.	1 of 4 years