PBR's to Improve Quality of Apples

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Background

- This morning I will be talking talk about the use of PBRs to influence ripening and fruit quality at harvest and following storage.
- The PBR that I will be first talking about will be ReTain and 1-MCP or SmartFresh.

Background

- Cortland is an important cultivar in New England.
- Because of harvest priorities, harvest is often delayed.

Background

- ‘McIntosh’, Gala and Honeycrisp are very popular cultivars that ripen before Cortland.
- Cortland harvest is frequently delayed which often compromises fruit quality.
- When Cortland is harvested it is often over mature. Consequently is not know as a high quality dessert apple.

Background

- I have been doing preharvest drop work on McIntosh for a number of years
- Recent experiments involved doubled the amount of ReTain (AVG) applied.
- In the main research block Cortland serves as the pollinizer for McIntosh.
- When some high-rate treatments were applied the Cortland pollinizers were sprayed as well.

Background

- While evaluating high rates of ReTain on McIntosh I noted significant improvements on Cortland quality in the same block where they acted as pollinizers and guard trees.
- For two years Cortland trees that received 2 pouches of ReTain were the best quality Cortland on our farm.
- Ripening was delayed, allowing fruit to remain on the tree to ripen under more favorable weather conditions.

Background

- The positive results prompted doing an experiment using both ReTain and 1-MCP.
- ReTain would be used to delay fruit maturity and the 1-MCP would be applied after immediately harvest to delay ripening in storage and preserved fruit quality gains.

Experiment Details

- One pouch of ReTain was applied 3-3.5 weeks and one week before anticipated harvest.
- Fruit were harvested on October 6, about 1 week after normal harvest of untreated fruit.
- One group of control fruit and one that received ReTain were treated with 1-MCP and placed in regular air storage.
- Samples were removed from storage on December 1 and January 5 and evaluated.

Influence of ReTain on Fruit Quality of Cortland harvested Oct. 6			
Treatment	Flesh firmness	Red color	Starch
	(lb)	(%)	(1-8)
Control ReTain 2X	11.2 b 14.2 a	84 a 73 b	5.7 a 4.0 b

Influence of ReTain and 1-MCP on flesh firmness of Cortland after regular air storage.		
Treatment	Flesh firmness (lb)	
	December 1	January 5
Control	9.5 c	8.9 c
ReTain	9.8 c	8.8 c
1-MCP	10.1 b	9.7 b
ReTain + 1-MCP	12.1 a	11.2 a
Significance		
ReTain	**	***
1-MCP	**	***
ReTain X 1-MCP	**	***

Fruit quality form used to assess Cortland following storage

Figure 1. Quality Evaluation Form

R & T _____

Visual and sensory evaluation:

Skin	tough	_____	_____	tender	_____
Crispness	low	_____	_____	high	_____
Acidity	bland	_____	_____	tart	_____
Flavor	dislike	_____	_____	like	_____
Desirable	dislike	_____	_____	like	_____

Influence of ReTain and 1-MCP on fruit sensory evaluation of Cortland apples after 10 weeks in air storage.					
Treatment	Sensory evaluation (1-10)				
	Crisp	Desirable	Flavor	Skin	Acidity
Control	1.5 c	2.2 c	2.4 c	2.1 c	3.6 c
ReTain (R)	2.5 b	2.8 c	2.7 c	2.2 c	4.3 bc
1-MCP	3.3 b	4.1 b	4.1 b	3.1 b	4.8 ab
R + MCP	7.0 a	6.6 a	6.7 a	4.2 a	5.7 a
Significance					
ReTain (R)	***	***	***	NS	*
1-MCP	***	***	***	***	*
R + MCP	**	*	**	NS	NS

Conclusion-Harvest

- The 2X application of ReTain reduced red color but it was not very apparent, especially on the second harvest, when temperatures were favorable.
- Ripening was significantly delayed.
- Taste evaluation was not done, but it would have been useful.

Conclusion

- It Is not my intention to convince you to grow Cortland with the aid of ReTain and 1-MCP.
- Rather I am suggesting that these tools may be used on other cultivars to delay ripening until more favorable weather arrives later in the fall. Gala and Honeycrisp would be good candidates to use?

Conclusion

- Similar results might be obtained for other cultivars if ripening can be delayed and occur under more favorable weather circumstances.
- Pink application of Apogee or Kudos would help to improve color- light penetration.
- A word of caution or concern. The erratic weather may make this difficult in unseasonably hot years or during very warm falls.

Use of high rate of ReTain on Honeycrisp

High Rates of ReTain- Honeycrisp

- Honeycrisp ripens with McIntosh and Gala thus making harvest management very challenging.
- Honeycrisp is the most popular during harvest, but due to the time of ripening and drop problems, few are available on the tree for pick-your-own in October when demand is frequently highest.

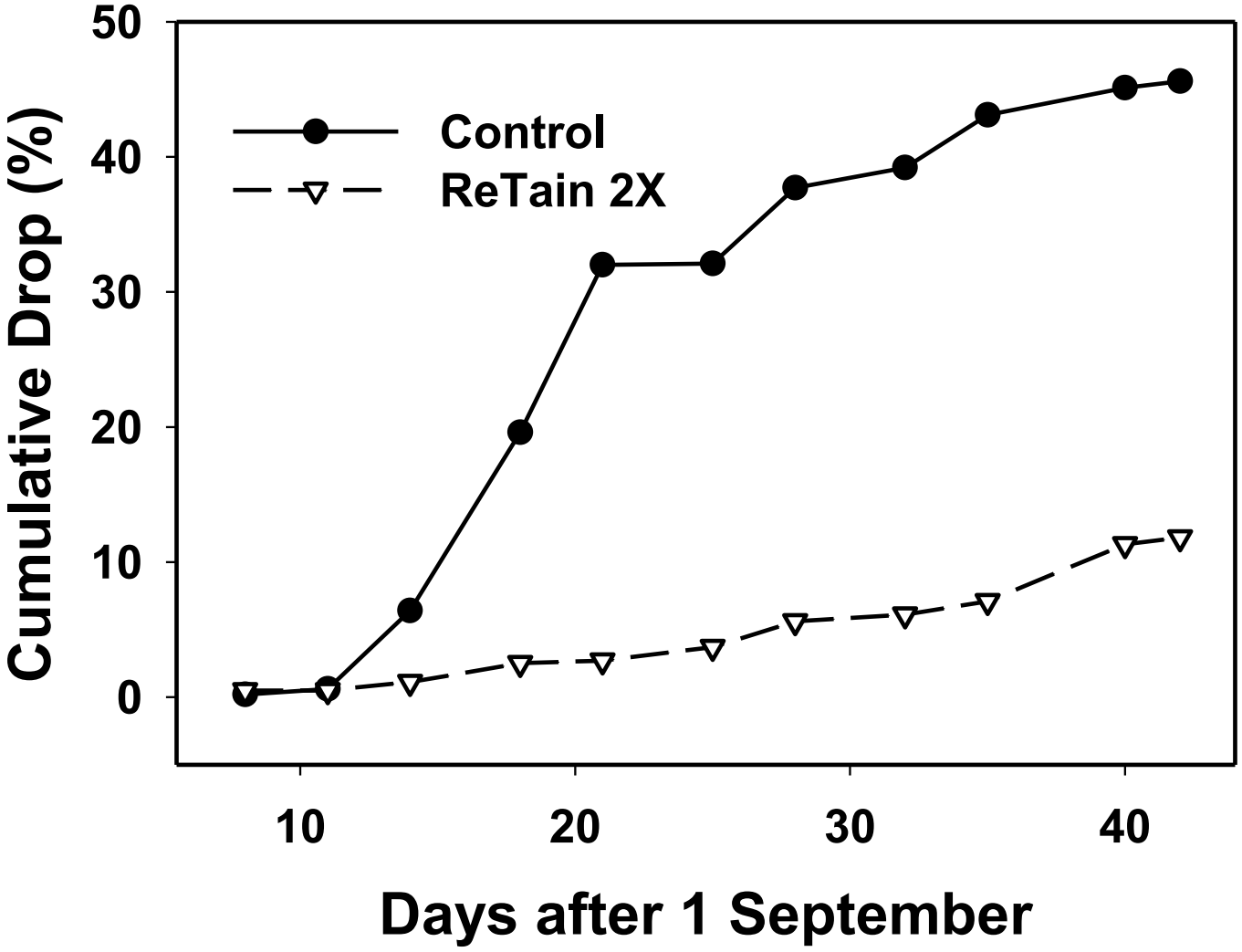
Objective

- Can ReTain can be used effectively to extend the harvest season and manage the harvest without adversely affecting fruit quality at harvest and following a period of cold storage?
- Phil has also done work in this area.
- I will show my results this morning from work done in New England.

Methods

- In a block of 8-year old Honeyrisp on M.9 rootstock one pouch of ReTain per acre was applied using a commercial airblast sprayer on August 21 and again on Sept. 7
- Starting on Sept 6 all fruit were picked up under drop trees 2 times per week.
- Fruit were harvested and evaluated 4 times over at 7 to 11 day interval.

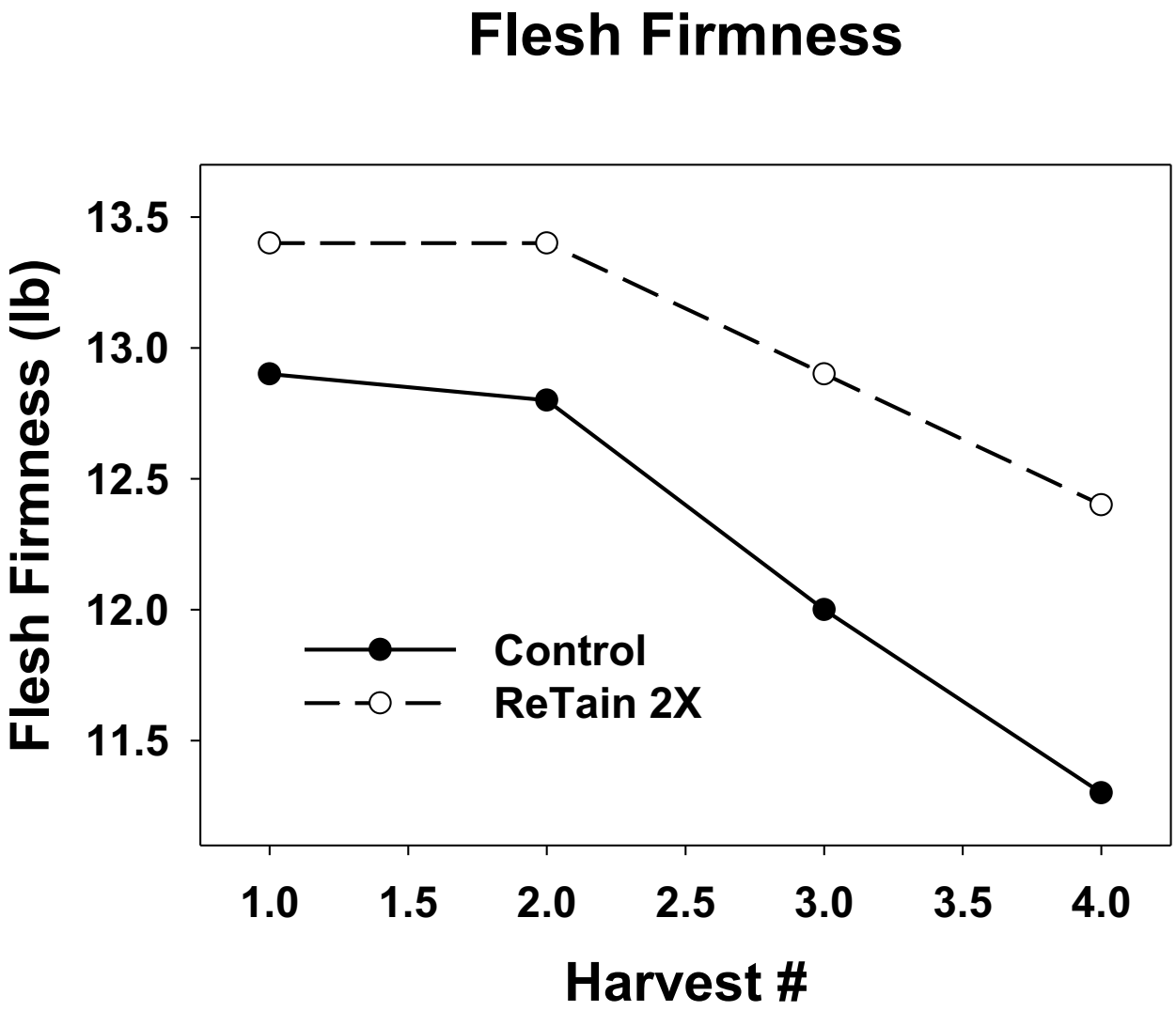
Preharvest Drop



Flesh Firmness

Treatment	Flesh firmness (lb)
Control	12.5
ReTain	13.3
Significance	
ReTain	*
Harvest	***
ReTain X Harvest	*
Mean of Harvests on 9-15, 9-25, Oct 5 and Oct. 12	

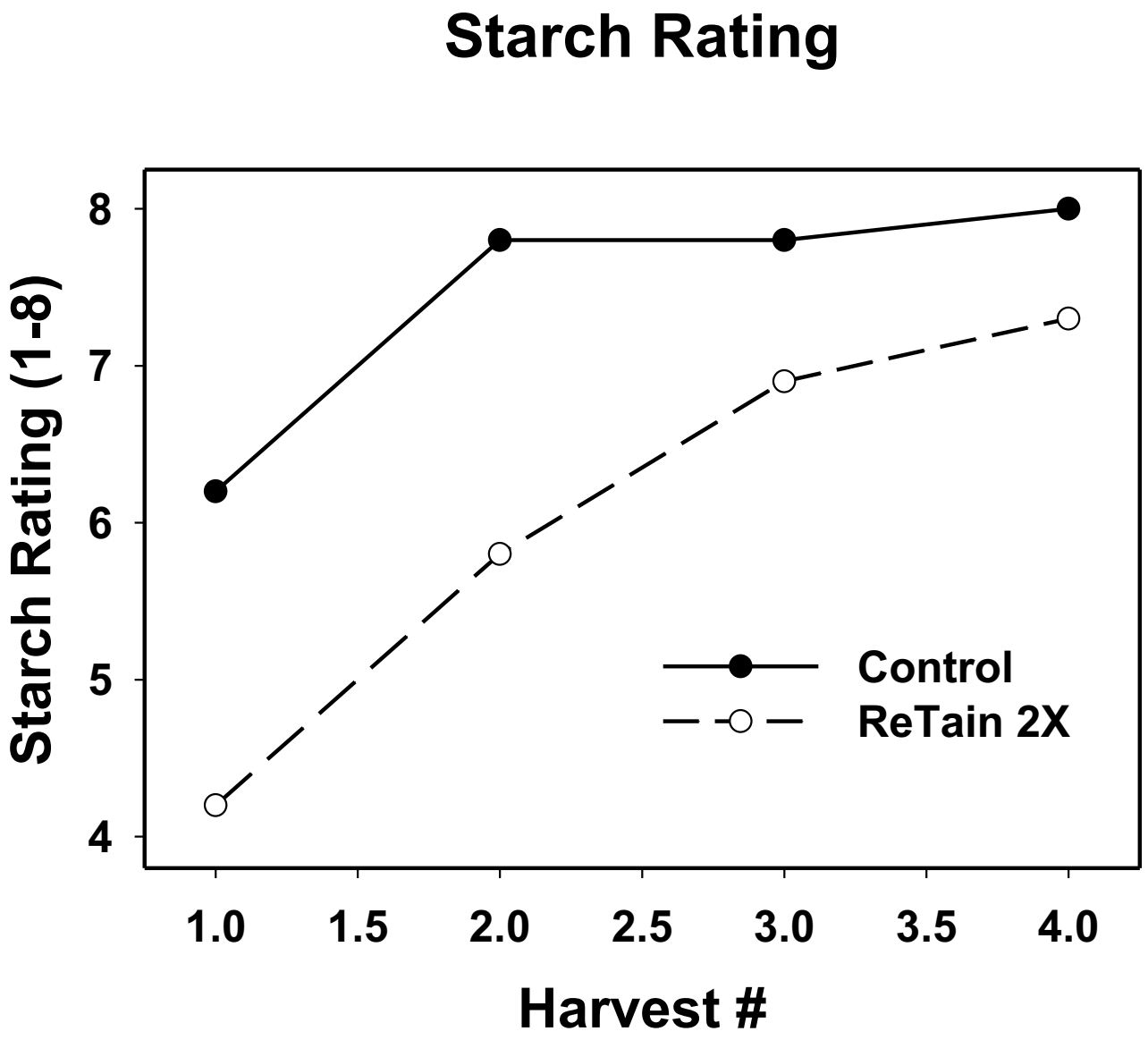
Flesh Firmness



Starch Rating

Treatment	Starch rating (1-8)
Control	7.4
ReTain	6.1
Significance	
ReTain	***
Harvest	***
ReTain X Harvest	***
Mean of Harvest on 9-15, 9-15, 10-5 and 10-12.	

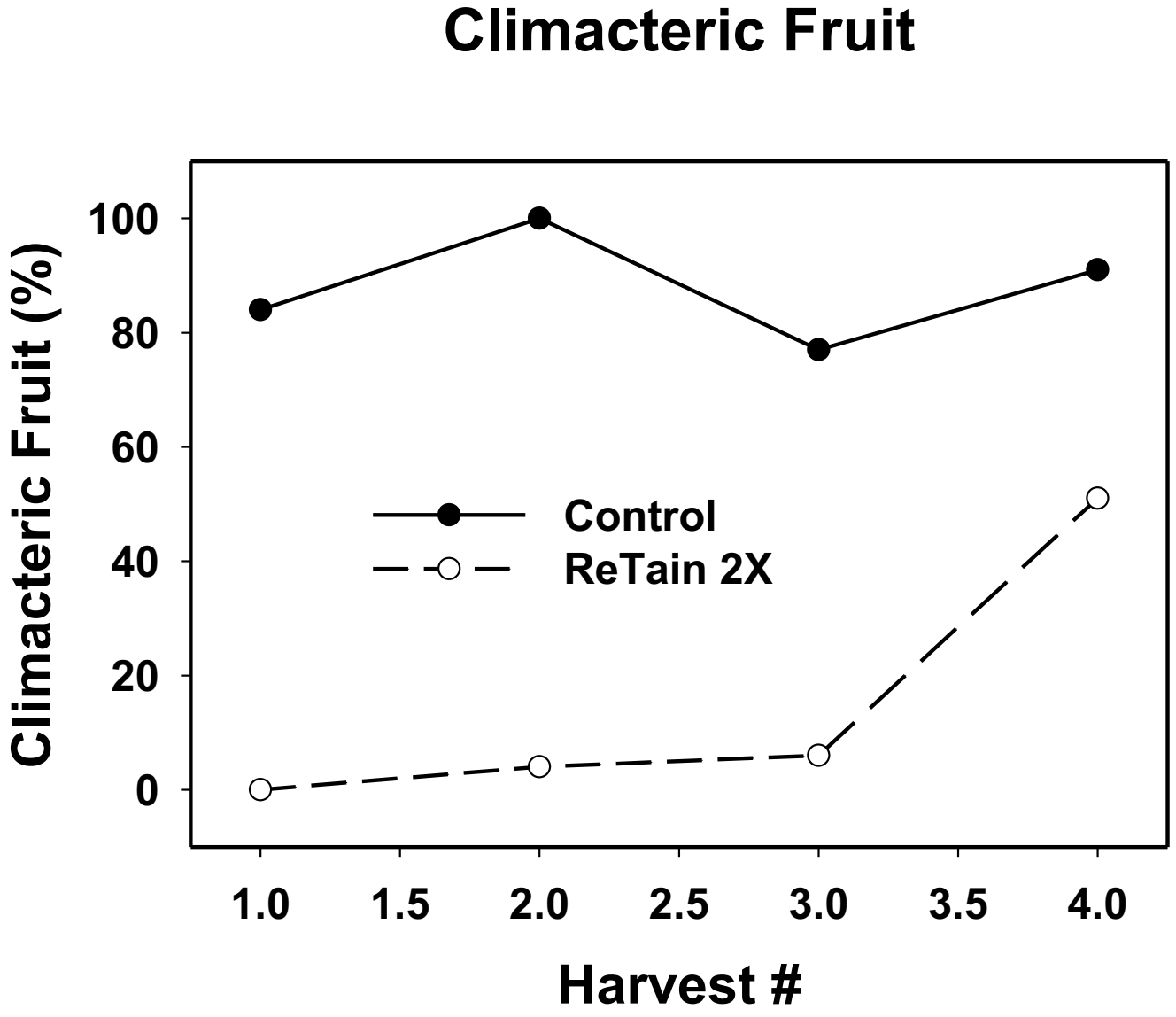
Starch Rating



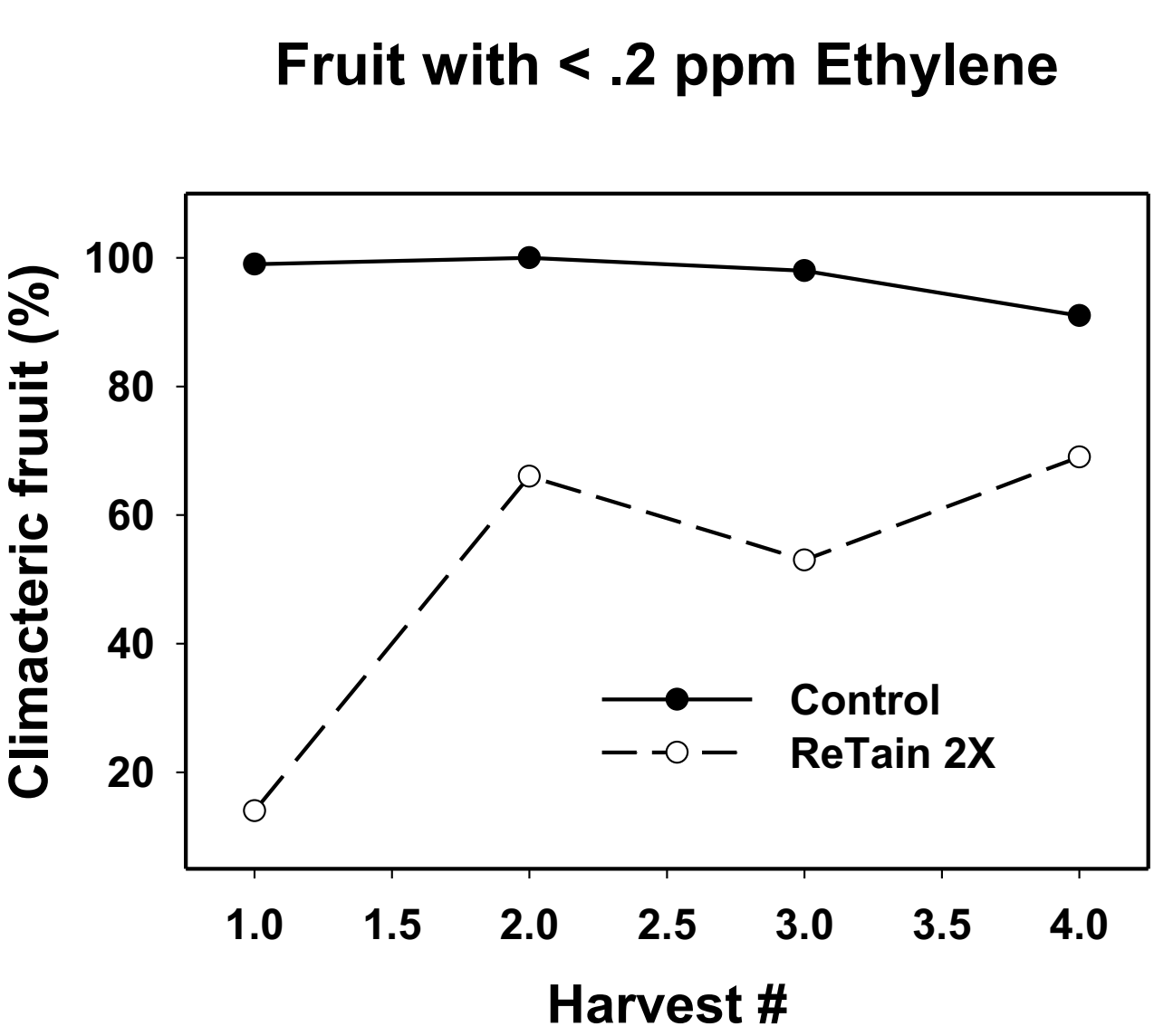
Climacteric Fruit

Treatment	Climacteric Fruit (%)
Control	88
ReTain	15
Significance	
ReTain	***
Harvest	***
ReTain X Harvest	***
Mean of harvests on 9-15, 9-25, 10-5 and 10-12.	

Climacteric Fruit



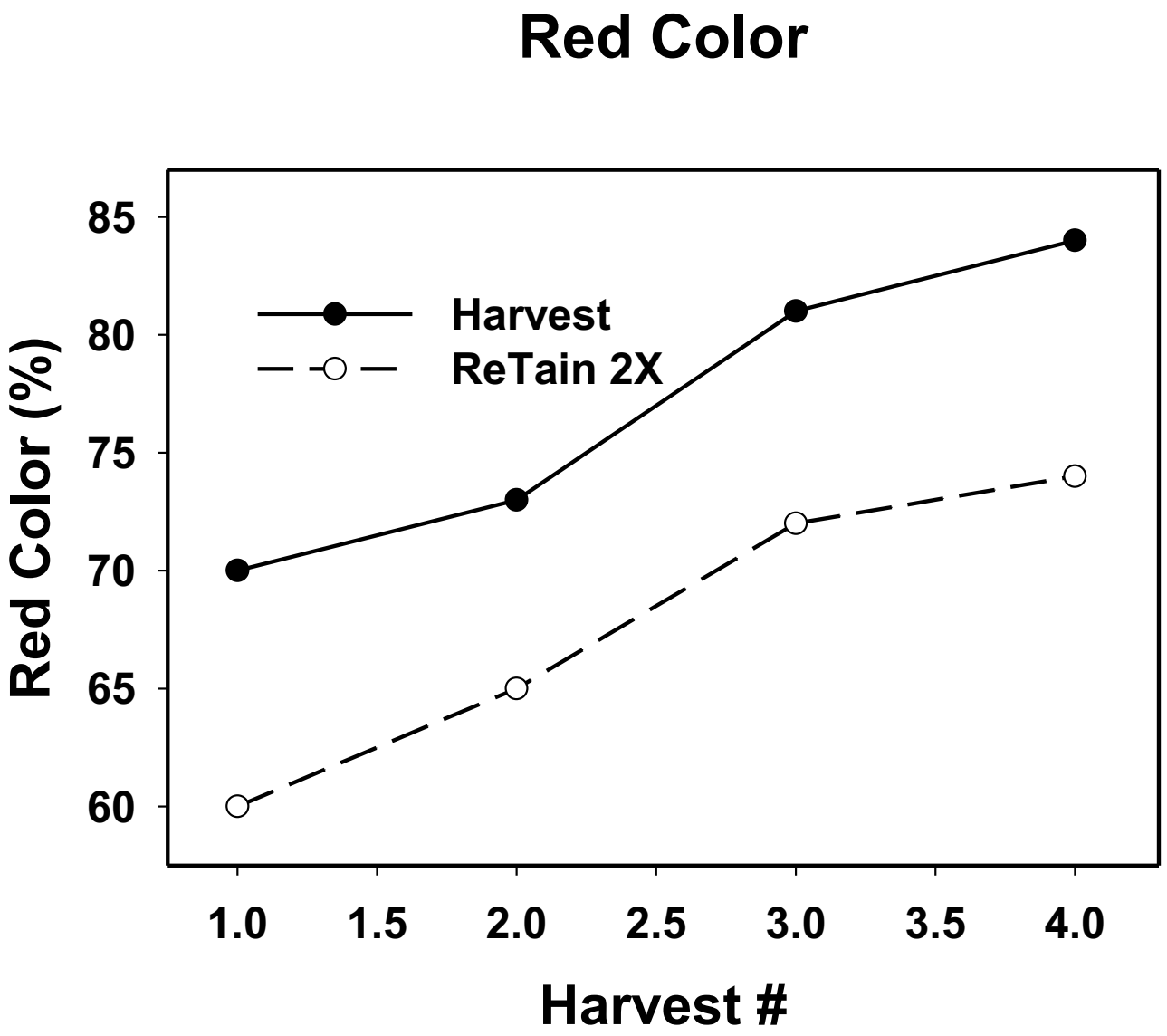
Climacteric Fruit



Red Color

Treatment	Red Color (%)
Control	77
ReTain	68
Significance	
ReTain	**
Harvest	***
ReTain X Harvest	NS
Mean of harvests on 9-15, 9-25, 10-5 and 10-12.	

Red Color


Red Color
Red Color (%)
85
80
75
70
65
60
Harvest
ReTain 2X
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Harvest #

Influence of regular cold storage on the postharvest responses of Honeycrisp apples treated with 2 full rates of ReTain (2 333g pouches).		
Treatments	Bitter pit (%)	Soft Scald (%)
6 weeks of storage		
Control	0.3	0.3
ReTain	0.0	6.0
Significance	NS	NS
13 weeks of storage		
Control	0.6	2.1
ReTain	0.3	21.1
Significance	NS	**

Influence of a period in regular air storage on the postharvest responses of Honeycrisp apples treated with 2 full rates of ReTain (2 333g pouches/ acre)		
Treatment	Flesh firmness (lb)	Fruit Rot (%)
6-weeks storage		
Control	-----	4.9
ReTain	-----	1.4
Significance	-----	**
13 Weeks Storage		
Control	10.3	13.6
ReTain	12.3	3.0
Significance	*	**

Conclusions

- ReTain effectively retarded preharvest drop of Honeycrisp and limited it to 12% by October 12.
- If one compares ripening parameters of ReTain-treated and control Honeycrisp at the same stage of maturity (starch test) high rates of ReTain do not inhibit red color development.
- If 73% red color is acceptable on Sept 15 then 73% should be acceptable on Oct 5 and 12?

Conclusions

- ReTain-treated Honeycrisp harvested in October were comparable to or better than Honeycrisp harvested during the normal harvest window of opportunity.
- Honeycrisp fruit treated with ReTain and harvested in October had good storage potential, at least until Thanksgiving.