

Effects of Simulated Hail Damage on the Response of McIntosh Apples to a Chemical Thinner

Duane W. Greene, James Krupa, and Maureen Vezina

Department of Plant, Soil & Insect Sciences, University of Massachusetts

All aerial portions of a plant are covered with a protective cuticle. The cuticle acts as a barrier that limits the entry of foreign substances into a leaf, flower or fruit. The composition of the cuticle is influenced by environmental factor and under some conditions movement of any substance dissolved in water or a spray droplet may be quite limited. Chemical thinners are one of the most commonly used plant growth regulators in apple production. The amount of a thinner applied is dependent upon a number of things including chemical characteristic of the growth regulator, the weather that influence cuticle composition and the biological activity of the thinner. Through extensive testing in the registration process and by experience in the orchard effective ranges of rates of chemicals are well known when applied to uninjured trees.

During the chemical thinning season is not uncommon to have weather conditions where strong contrast in warm and cold air can lead to severe thunder storms that often contains cells with hail that may injure leaves and fruit. Hail may impale leaves and fruit, damaging the protective cuticle thus leading to the potential of substantially more uptake of chemical thinners if applied after the damage has occurred. This injury may also results in the production of wound ethylene. Some thinning chemicals, especially naphthaleneacetic acid (NAA) and 2-chloroethylphosphonic acid (ethephon) stimulate the production of ethylene.

This pilot study was initiated to determine if damage caused by simulated damage to leaves and fruit could increase chemical thinning activity above the level of

abscission cause on uninjured leaves and fruit.

Methods

In a block of mature Pioneer McIntosh/M.9 15 trees were selected that had the potential to set a moderate crop. Fifteen similar spurs with a good initial set were selected and tagged on 25 May when fruit size averaged 7.2 mm. The leaves and fruit on 5 spurs per tree were damaged. Fruit were injured by puncturing each fruit 4 times with a 2mm wide pen tip to a depth of about 3 mm. All large leaves in the spur were punctured with the pen 4 times, medium sized leaves were punctured 2- 3 times and small leaves received one puncture. The diameter of the area damaged by each puncture was about 1/4 inch. On 30 May a second group of 5 spurs on each tree were similarly damaged. Fruit size at this time was 11.7 mm. Five spurs on each tree were left uninjured and served as the uninjured control spurs. On 31 May all trees in the block received a thinning spray containing 8 ppm NAA and 1.0 lb/100 gal carbaryl applied at a tree row volume dilute rate of 100 gal/ acre. At the end of June drop all persisting fruit on the tagged spurs were counted and recorded.

Results & Discussion

On the day of thinner application the temperature reached a high of 72°F, which is considered an appropriate temperature to promote uptake into the plant. The high temperature on the 5 days after application ranged from 75° to 90°F with an average of

Table 1. Effects of simulated hail injury on fruit set of Pioneer McIntosh treated on May 31, 2006, with 8 ppm NAA + 1.0 lb carbaryl /100 gal. The treatment was applied as a dilute spray with a tree-row volume of 110 gal./acre.

Date of simulated damage	Fruit size at time of injury	Fruit set (no. fruit/spur)
Control	---	0.91
Injury May 25	7.3	0.88
Injury May 30	11.7	0.91
Significance		NS

81°F. These temperatures are favorable for at least moderate thinning. Injury to fruit and leaves, regardless of the time prior to thinner application the injury was sustained (1 and 6 days prior) had no influence on the response to the thinner application. Two times of injury were selected to see if injured tissue might callus over thus uptake through injured tissue might be reduced. Since no additional thinning occurred in injured spurs one may conclude that injury to fruit and leaves does not influence the uptake of chemical thinners or that the injury level used in this investigation was not severe enough to alter uptake sufficiently to affect fruit abscission. A practical extension of the results reported here is that moderate hail damage is unlikely to modify thinner response and any significant way. Thus, is not necessary to alter chemical thinning practices if trees are damaged by moderate hail.

