

Black Rot Development in Royal Gala Apples in Response to Chemical Thinning

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Introduction

Black rot on apples, caused by the fungal pathogen *Botryosphaeria obtusa*, has increased in incidence over the last decade. The pathogen causes Frogeye leaf spot, limb and trunk cankers, as well as Black rot on mature apple fruit (Figure 1). The disease can cause significant losses in production and fruit quality. The fruit rot appears a few weeks before harvest and is often associated with mummified immature fruitlets that do not abscise after fruit set. Thinning apple fruits to maximize fruit size is a profitable horticulture management practice that can be labour intensive if done manually by hand. Chemical thinners are therefore widely used to reduce the crop load and maximize fruit. Fruitlets that fail to abscise after the natural abscission period in June are rapidly colonized by the Black rot fungus. These fruitlets, which later become 'mummified', provide an important source of inoculum for maturing ripe fruit.

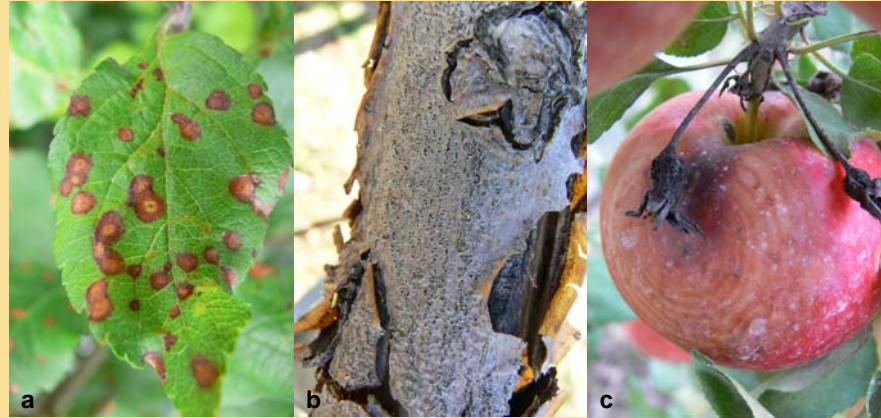


Figure 1. Symptoms of (a) Frogeye leaf spot, (b) Black rot stem canker and fruit rot caused by *Botryosphaeria obtusa* in apple.

Objective:

The objective of this study was to investigate the timing and rates of chemical thinners on the number of mummified immature fruit, the incidence and severity of Black rot on mature apple fruit, and the number of mummified fruit observed at harvest.

Material and Methods:

Prior to flowering, mummified fruitlets were removed from all trees in a 5 year old block of Royal Gala. Naphthaleneacetic acid (NAA, Fruitone-N, Amvac Chem. Corp.) at 5 and 25 ppm and 6 benzyladenine (6BA, Maxcel, Valent Laboratories) at 50 and 100 ppm was applied to separate trees either at petal fall, 9 mm or 14 mm king fruit diameter. The NAA and 6BA treatments were tank mixed with carbaryl (Sevin XLR, Bayer CropScience Inc.) at 500 ppm and Regulaid (0.05% v/v) and applied to the drip point to individual apple trees replicated 4 times and arranged in a Randomized Complete Block Design (RCBD). All fruit from each tree were harvested, counted, weighed and assessed for black rot incidence and severity using a scale of 0-5, where 0=healthy fruit, 1=very small black rot lesion > 1cm; 2=small black rot lesion >1-3 cm; 3=expanding black rot lesion 3-4 cm; 4=fruit with multiple black rot lesion with at least on lesion expanding 3-4 cm, and; 5=black rot lesions expanding > 5 cm).

Results and Discussion:

The number of fruit per tree and average fruit weight was affected by the thinners products, rate and application timing. The total number of fruit per tree tended to be lower in trees that received treatments containing high rates of NAA than with high rates of 6BA (Figure 2). The average fruit weight was greatest from trees that received a high rate of NAA

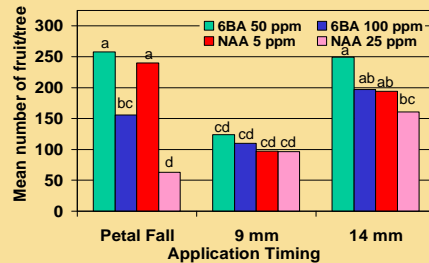


Figure 2. Effect of rate and application timing of 6BA and NAA on the total number of apples per tree at harvest.

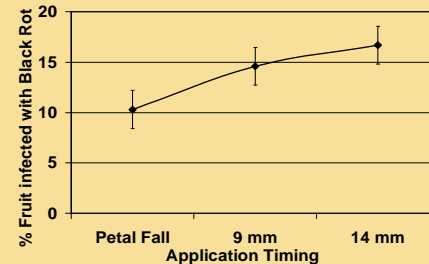


Figure 4. The effect of thinner application timing on the incidence of Black rot infected apple fruit at harvest.

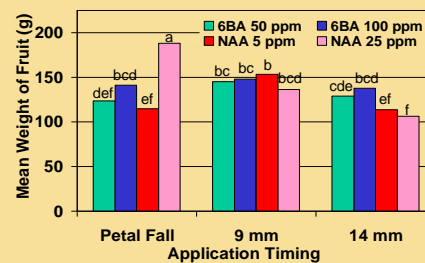


Figure 3. Effect of rate and application timing of 6BA and NAA on the mean fruit weight of apples per tree at harvest.

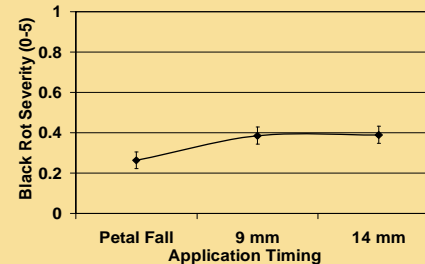


Figure 5. The effect of thinner application timing on the severity of Black rot infected apple fruit at harvest.

fall also resulted in significantly fewer fruit left in the trees (Figure 2).The best fruit number to fruit size was observed where thinning treatments were applied at 9 mm king fruit diameter. At harvest the incidence of Black rot was lower on fruit from trees that received chemical thinners at petal fall than on trees treated when fruit diameter was 9 mm or 14 mm (Figure 4). Black rot severity was also significantly lower on fruit from trees when chemical thinners were applied at petal fall in comparison with applications made at either 9 mm or 14 mm (Figure 5). The number of mummified fruitlets per tree were also lowest when thinners were applied at petal fall (Figure 6).

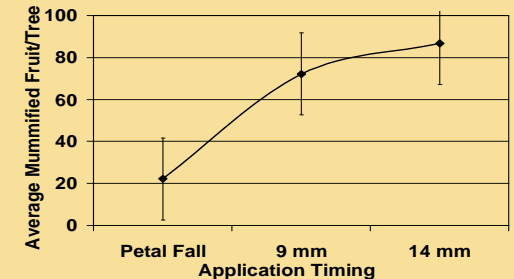


Figure 6. The effect of chemical thinner application timing on the number of mummified fruit per tree.

Conclusion:

In Ontario, thinning sprays for Royal gala would typically be when king fruit reach between 6 to 8 mm in diameter. Research at Cornell University has shown that applying thinners to Gala when the king fruit is approximately 12 to 14 mm in diameter maximizes fruit size and quantity when Black rot is not a problem in the orchard. Results from this preliminary experiment indicates that the incidence and severity of black rot on mature fruit and number of mummies left in trees tends to be lower when thinners are applied at petal fall. In particular, the chemical thinner 6BA at 100 ppm applied at petal fall resulted in acceptable thinning with marketable fruit size, and the lowest incidence and severity of black rot on fruit. Thinners applied when king fruit reached 9 mm in diameter, also provided similar results, however only 6BA at 100 ppm and NAA at 5 ppm applied when king fruit reached 9 mm in diameter resulted in a reduction of the incidence and severity of black rot. Further experiments are required to verify these results and to look at seasonal climatic effects on Black rot incidence, as well as the number of Black rot infected fruitlets that might persist on trees until the next cropping season.