to the summer diseases (Table 1). 'Redfree,' 'Nova Easygro,' and 'Williams Pride' were most susceptible to fruit rot infection caused by all pathogens and at both inoculation times (H and S). The other cultivars varied in susceptibility to each individual pathogen.

Conclusions

The disease resistant apple cultivars tested varied in their susceptibility to three summer diseases under laboratory inoculations performed in 1992. This study is being repeated again this year.

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Disease Resistant Apple Cultivars: Twelve Years of Observations

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In 1980, eight disease resistant apple varieties were planted at the Western Maryland Research and Education Center located near Keedysville, Maryland. Over the past twelve years these varieties have been evaluated for fruit quality.

The Western Maryland Research and Education Center is located in the west, central part of the state and is subject to extremes of heat and cold. Low temperatures in the winter from 0° to 10° are common. High temperature in the summer range well into the 90s and can reach 100°. From 15-20 days above 90° in the summer is not unusual. In 1988 there were 30 days where the recorded high was above 90°. These temperatures typically occur in July and August, and some years into the first two weeks of September. This variation in temperature makes it a challenge to grow apple cultivars that were bred in cooler climates. The following is a description of each variety and how it has performed over the years.

'Freedom': poor tree habit, precocious late season, poor appearance, flesh quality is good.

'Jonafree': moderate tree size, good color, tart flavor, very hard flesh, fruit size is small.

'Liberty': moderate tree size, fruits are small to medium, must be thinned. Good color with sub-acid flavor, best fruit quality of those tested.

'Macfree': moderate tree size, poorly colored fruit, small fruit size but rather nice semi-acid flavor similar to 'Mac.'

'Nova Easygro': moderate to large tree size, overall fruit quality is good, but color is poor.

'NY18491': large, vigorous tree, large fruit, soft and poorly colored.

'Prima': precocious, early maturing, fruit surface is rough, fruit is soft, quality is poor most years.

'Redfree': low vigor, very early, highly colored, small fruits, high sugar.

For the reasons indicated in the descriptions, 'Prima' and 'NY18491' are not recommended in Maryland. 'Redfree' matures in late July and has good qualities when compared to other apples that are harvested at the same time. 'Nova Easygro' and 'Macfree' are both 'MacIntosh' types. In years where the fall is warm, red color is poor. 'Jonafree' is similar to 'Jonathan' in flavor but like other red varieties does not develop good color in warm seasons. 'Liberty' is the best all around apple of those tested so far. The flavor,

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size, and color are superior to the others mentioned although it is susceptible to mites. At Keedysville, 'Liberty' typically ripens in mid-September. 'Freedom' is the latest of all the varieties tested but has very poor color and skin surface quality even in cool seasons.

The thrust for breeding programs such as PRI and Cornell has been to control fire blight and apple scab by breeding resistance into new cultivars. In areas where late season temperatures are warm the need exists to breed new cultivars resistant to summer diseases which also produce less ethylene. This way pre-harvest drop and poor color problems might be dealt with while breeding for disease resistance. Hopefully some of the late maturing cultivars that are being released, i.e., 'Enterprise' and 'GoldRush,' may meet these criteria for production in Appalachia.

Crop	Problem	Genetic Solution
Apple	Diseases	PRI Releases Cornell Releases
	Pre-harvest Drop	Low-ethylene (in fruit) Needed
	Summer Rots	Resistance Needed

Home fruit growers and hobbyists have taken interest in the disease resistant apple cultivars. Serious attention has also been given by organic apple growers who are very limited as to the pesticides they can apply. Apple processors are recently beginning to test varieties such as 'Liberty' to see how they hold up under various processing treatments. There is little question that disease resistance will continue to be an important factor in the future as new apple varieties are being bred.

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Evaluation of Certain Scab-Immune Apple Cultivars

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We planted four trees of the following apple cultivars in 1985: 'Redfree,' 'Chehalis,' 'Prima,' 'Priscilla,' 'Nova Easygro,' 'Sir Prize,' 'Jonafree,' 'McShay,' 'Liberty,' 'Freedom,' and 'MacFree.' The trees were grown without fungicide sprays. High levels of infestation by powdery mildew were observed on 'MacFree,' moderate levels on 'Redfree,' 'Liberty' and 'Freedom,' and low levels on the others. A few fruits of 'Chehalis' did show some scab. Fruits of 'Freedom' in two of four seasons showed small black spots which might have been caused by *Venturia inaequalis* (scab) or from some other cause. Large taste panels rated the stored fruits in four seasons. Mean ratings for 'Liberty,' 'Jonafree,' and 'Florina' were sometimes as high as for the popular new scab susceptible cultivar 'Empire.' Generally they were not rated as highly as 'Braeburn,' 'Fuji,' 'Jonagold,' or 'Gala.'

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