

The OrganicA Project: Organic Disease Management in Orchards with ‘Newer’ Cultivars



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Abstract

Although there is significant interest in organic apple production in the New England region of the USA, there are few certified organic orchards, in part, because of disease challenges associated with ‘McIntosh’, the predominant cultivar grown in the region. However, recent shifts in consumer preference for ‘newer’ cultivars have led to the planting of different apple cultivars which have different disease susceptibility. A long-term research project was initiated in 2006 to examine the opportunities and challenges of organic apple production within the two production systems growers are using to change to new cultivars: planting a new orchard with young trees purchased from a nursery and/or “top-grafting” an established, older orchard to new cultivars. Cultivars being studied in replicated plots in each orchard system include: ‘Zestar!’, ‘Ginger Gold’, ‘Honeycrisp’, ‘Macoun’, and ‘Liberty’, a scab-resistant cultivar. Both orchard systems are being managed with approved, organic practices and materials. Standard disease assessments for apple scab, caused by *Venturia inaequalis*, and other diseases are being conducted to determine differences in disease incidence and severity among the cultivars. Based on foliar disease assessments, ‘Honeycrisp’ appears more resistant to apple scab than the other scab-susceptible cultivars ‘Zestar!’, ‘Ginger Gold’, and ‘Macoun’, but appears more susceptible to cedar apple rust, caused by *Gymnosporangium juniperi-virginianae*, than ‘Liberty’ and ‘Zestar!’. This research is on-going and will document disease challenges along with the overall economic costs, returns, and risks associated with these five cultivars being grown under organic production practices within the two orchard systems.

Experimental Design

Two orchards, located at the University of Vermont Horticultural Research Center in South Burlington, Vermont, USA, are involved in this research project. Orchard 1 is an orchard planted in April 2006 with ‘Ginger Gold’, ‘Liberty’, and ‘Macoun’, and ‘Zestar!’ on Bud. 9 rootstock and ‘Honeycrisp’ on M.26; cultivars are arranged in a completely randomized design with three-tree replications. Orchard 2 was an existing orchard planted in 1988 with ‘McIntosh’ and ‘Liberty’ trees on M.26 rootstock which was ‘top-grafted’ in April 2006 to the same five cultivars. Since the original cultivar (i.e., original ‘McIntosh’ or ‘Liberty’ interstock) may affect growth of the new ‘top-grafted’ scion, a randomized complete block experimental design, with two-tree replications, was used to block any effect on new scion growth. In each growing season, weather conditions were monitored with a Davis Vantage Pro Wireless Weather Station (Davis Instruments Corp.) and primary scab infection periods were determined using “revised” Mills criteria, with the exception that all wetting periods including those starting at night were used in infection period determinations. In 2006, 2007, and 2008, there were six primary infection periods of varying durations per growing season and numerous secondary infection periods during the remainder of each growing season. In each of these growing seasons, multiple applications of lime sulfur and/or sulfur at standard label rates were used for disease management (see Tables). Disease incidence was assessed on all leaves on two vegetative terminals per tree on at least five three-tree replications per cultivar in Orchard 1 and on four vegetative terminals per tree on eight two-tree replications per cultivar in Orchard 2 in August of each year. Analysis of variance and mean comparisons using Tukey’s HSD Test ($P \leq 0.05$) were performed on the data. Since the orchards are in the ‘establishment phase’, no apples were produced in 2006 and 2007, with a very minimal crop being produced in 2008. Future disease evaluations will include fruit.

Organic Apple Orchards



Orchard 1: Planted with five cultivars in 2006

Orchard 2: An eighteen old orchard was “top-grafted” with five cultivars in 2006

Results

2006 Orchard 1

% Veg. Terminal Leaves Infected
August 9-11, 2006

	SCAB	RUST	NECROTIC LEAF SPOT
Ginger Gold	41.3 a	25.6 a	5.4 bc
Honeycrisp	2.7 c	13.5 b	3.8 c
Liberty	0.0 d	0.3 c	3.1 c
Macoun	28.4 b	1.5 c	10.8 a
Zestar!	34.1 ab	0.7 c	10.2 ab

2007 Orchard 1

% Veg. Terminal Leaves Infected
August 7, 2007

Cultivar	SCAB	RUST	NECROTIC LEAF SPOT
Ginger Gold	0.3	24.8 ab	2.3 b
Honeycrisp	0.0	39.9 a	2.3 b
Liberty	0.0	14.7 b	2.2 b
Macoun	0.9	25.2 ab	8.9 a
Zestar!	0.2	14.5 b	6.5 ab

2007 Orchard 2

% Veg. Terminal Leaves Infected
August 8-14, 2007

Cultivar	SCAB	RUST	NECROTIC LEAF SPOT
Ginger Gold	0.4	35.5 a	10.2 bc
Honeycrisp	0.1	36.6 a	7.1 c
Liberty	0.0	17.9 b	9.4 bc
Macoun	0.8	18.6 b	20.8 a
Zestar!	0.1	12.6 b	14.2 ab

2008 Orchard 2

% Veg. Terminal Leaves Infected
August 20-26, 2008

Cultivar	SCAB	RUST	NECROTIC LEAF SPOT
Ginger Gold	11.2 a	39.6 a	15.1
Honeycrisp	0.6 c	22.2 ab	14.7
Liberty	0.0 d	7.1 b	14.6
Macoun	1.2 bc	8.6 b	25.0
Zestar!	2.1 b	5.4 b	20.1

Fungicide applications: In 2006, a combination of liquid lime sulfur and sulfur was applied on June 22 and July 1 and sulfur on July 14. In 2007, seven sprays of liquid lime sulfur and five sprays of sulfur were applied. Eight liquid lime sulfur and five sulfur applications were made in 2008.

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