

Effectiveness of organic fungicides in reducing the prevalence of *Venturia inaequalis* in 'McIntosh' apples

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INTRODUCTION

Apple scab disease is caused by the fungal pathogen *Venturia inaequalis* and is particularly destructive to Ontario apple orchards. Mature ascospores can be spread by rainfall causing damage to leaves and the developing fruit (Hirst *et al.*, 1962). Treatments are often ineffective due to the development of fungicide resistance by *V. inaequalis* (Errampalli, 2004). This study aims to employ organic fungicides as a means to control apple scab disease in McIntosh apples in the orchard.

OBJECTIVES

To test the effectiveness of organic fungicides against apple scab (*Venturia inaequalis*) on 'McIntosh' apples in the orchard.

METHODS

McIntosh apple trees located at AAFC research farm in Jordan Station, Ontario were used. In the 2014-2015 growing season, all treatments were arranged in a randomized block design. A water and chemical control along with three different organic treatments were reapplied every week. The chemical control used was 50% N-trichloromethylthio-4-cyclohexene-1,2-dicarboximide (Captan). The organic treatments used were 80% Sulphur (Kumulus), 0.25% *Reynoutria sachalinensis* and 0.75% post bloom *R. sachalinensis* (Regalia #1 and Regalia #2). Observation of disease progression on leaves were taken on a weekly basis and were rated according to the qualitative rating scale (Figure 1). Presence of apple scab on fruits was also rated using the same rating scale (Figure 1). Weekly apple scab ratings were taken over three months for every treatment. Two way ANOVA tests were also performed to determine the statistical differences between and among all treatments.

Foliar apple scab rating scale

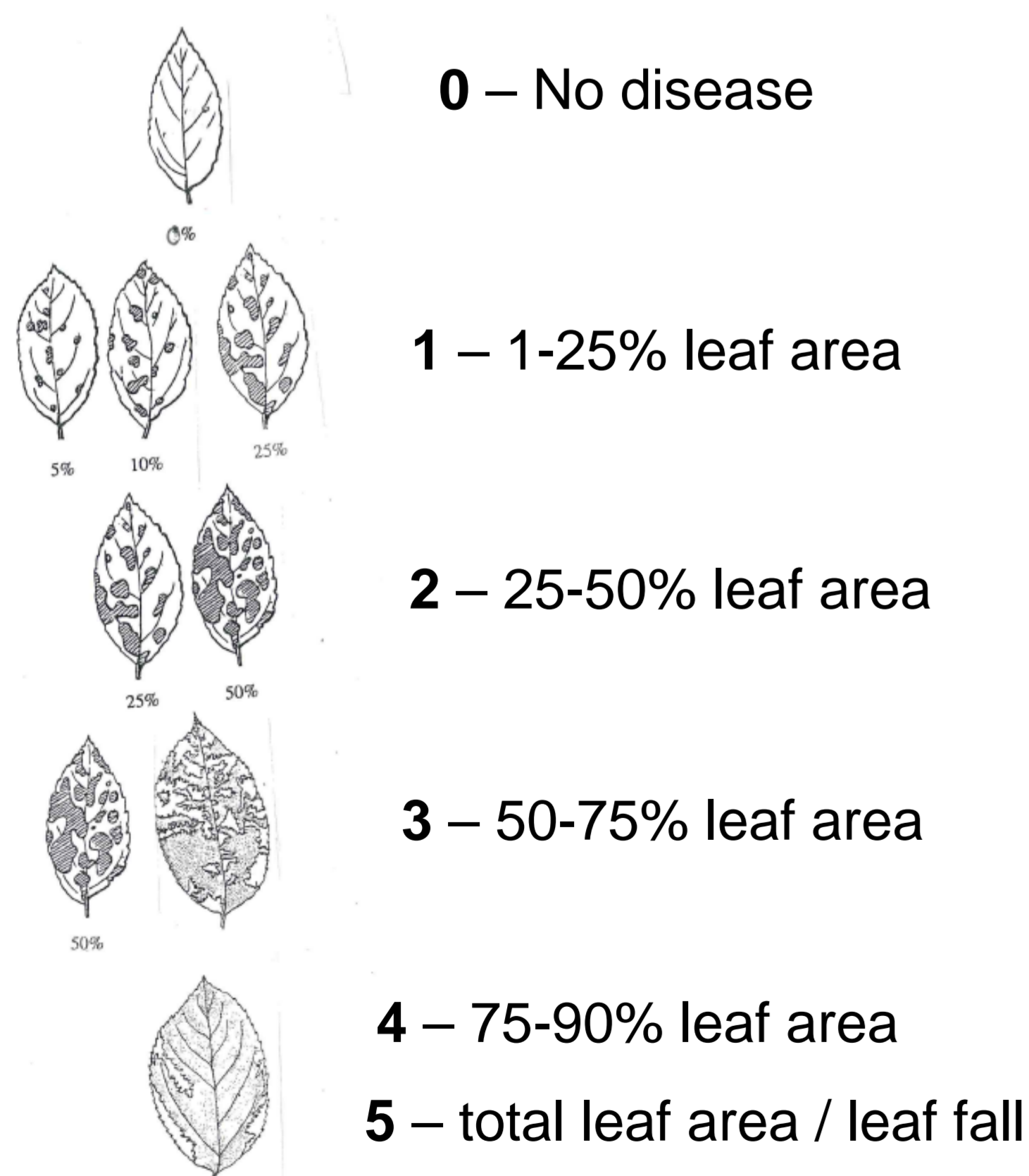


Figure 1: Rating scale for foliar apple scab.



Figure 2: McIntosh fruit with apple scab rating level 1 (0-25% infection on surface area).

RESULTS AND DISCUSSION

Apple scab disease is seen as black lesions covering the surface area of 'McIntosh' apple leaves or fruits (Figure 2). The results indicated that the presence of apple scab disease on 'McIntosh' leaves and fruits increased over the three month evaluation period in 2014 and 2015 (Figure 3). At the end of the 2014 and 2015 evaluation period, the most effective organic fungicide was Sulphur (Kumulus), due to the reduced presence of apple scab disease on apple leaves and fruit. This was followed by the organic fungicide *R. sachalinensis* (Regalia).

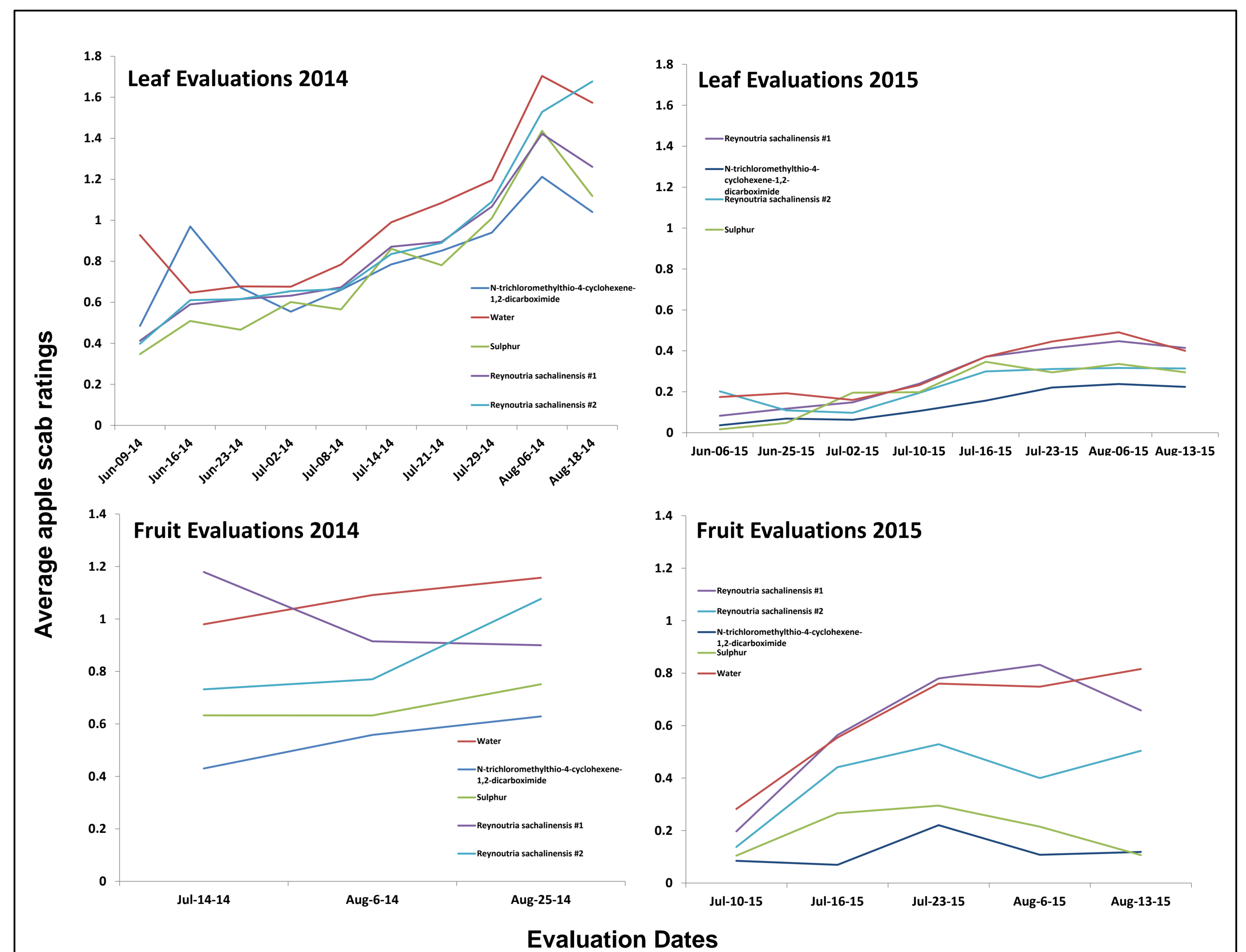


Figure 3: Comparison of average apple scab ratings in 2014 and 2015 growing seasons showing the effects of organic fungicides and two control treatments on 'McIntosh' leaves and fruits.

Evaluation dates	Comparison of treatments for leaves	Comparison of treatments for fruits
2014		
July 14	--	* <i>Reynoutria sachalinensis</i> #1 and Captan
July 21	* Water and Sulphur	N.T.
July 29	--	N.T.
August 6	* Water and Captan * <i>Reynoutria sachalinensis</i> #2 and Captan	* Water and Captan
August 18	* Water and Captan * Water and Sulphur	N.T.
August 25	N.T.	* Water and Captan * <i>Reynoutria sachalinensis</i> #2 and Captan
2015		
July 23	---	* <i>R. sachalinensis</i> #1 and Captan and Sulphur
August 6	* Water and Captan and <i>R. sachalinensis</i> #2 * <i>R. sachalinensis</i> #1 and Captan	* <i>R. sachalinensis</i> #1 and Captan and Sulphur, * <i>R. sachalinensis</i> #1 and <i>R. sachalinensis</i> #2
August 13	---	* <i>R. sachalinensis</i> #1 and Captan and Sulphur
August 2	* <i>R. sachalinensis</i> #1 and Captan * Water and Captan	* <i>R. sachalinensis</i> #1 and Captan and Sulphur

Figure 4: ANOVA table showing statistical differences of apple scab disease for different fungicide treatments.

ANOVA tests showed a statistical difference in apple scab disease when leaves were treated with water versus sulphur (Figure 4). Statistical differences for apple scab in fruits were seen between *R. sachalinensis* and chemical control. ANOVA tests also showed the chemical control (Captan) to be the most effective at reducing apple scab disease in 'McIntosh' leaves and fruits. Thus Sulphur was shown to be the most effective organic fungicide treatment in reducing apple scab disease.

CONCLUSIONS

- ❖ Sulphur was the most effective organic fungicide against apple scab disease on leaves and fruits in 'McIntosh' apples.
- ❖ *Reynoutria sachalinensis* organic fungicide treatment also significantly reduced presence of apple scab in 'McIntosh' apple fruits.

REFERENCES:

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