RESEARCH PROTOCOL: DISEASE & PEST CONTROL 2018
Organic disease management for Black Walnut

Farmer-researchers
Joseph Imre, Seven Fields Farm & Orchard
Jazmin Bansagi, Seven Fields Farm & Orchard

This document outlines the steps that Joseph and Jazmin will follow to execute their research project, *Organic disease management for Black Walnut*, including design, execution, data collection and data sharing. It also serves as a Memorandum of Understanding between Joseph, Jazmin and EFAO.

Experimental Design
Joseph and Jazmin will compare two methods of disease management in their black walnut orchard, with the goal of discovering the best sustainable and organic approach for caring for their black walnuts.

Specifically, they will compare:

1. Neem oil as a dual purpose insecticide and fungicide, along with mulching and clearing of weeds and tall grasses, to
    - Botanic Planet Neem Oil ORGANIC which is certified USDA Organic
2. Fungicides and insecticide sprays, along with mulching and clearing of weeds and tall grasses
    - Green Earth BORDO Copper Spray (organic alternative)
    - Safers BTK (Bacillus thuringiensis) Biological Insecticide (organic alternative)

Predications
Compared to certified organic insecticides and fungicides, Joseph and Jazmin predict the neem oil will be as effective and more affordable method for controlling pests and fungus.

Spray Details. One gallon per 50 trees

Treatment	Code	Spray Concentration
Neem oil	NO	4 tsp per gallon
Green Earth BORDO Copper Spray	Cu	4 tsp per gallon (1 gallon = 3.7 litres)
Safers BTK (Bacillus thuringiensis) Biological Insecticide	BT	10ml per gallon

Design. Numbers in brackets refer to the # of trees in each section; Plot codes are N = neem or C = combination spray/control followed by the replicate. Example: N2 is neem treatment, replicate 2.

	Storage container					
	Row 1	Row 2	Row 3	Row 4		
Tree line	(6)	(4)	(5)	(4)	Nut orchard continued	
	N1 (21)	C2 (17)	N3 (22)	N4 (17)		
	(5)	(5)	(5)	(5)		
	C1 (21)	N2 (17)	C3 (22)	C4 (17)		
	(4)	(3)	(5)	(3)		
Total	57	46	59	46	208	
	Road					

Joseph and Jazmin have observed that Row 1 is most affected by fungus, tent caterpillars and excessive rain.

Spray protocol

1. Joseph and Jazmin will mark the middle of each row at the beginning of the season (with a stake, etc)
2. For spraying, they will mix up and spray 2 gallons of neem for plots N1, N3, N4 (98 trees total); then mix up and spray 0.5 gallon and spray N2 (27 trees total)
3. For each of the copper and BTK sprays, they will mix up and spray 2 gallons for plots C1, C3, C4 (96 trees total); then mix up and spray 0.5 gallons for C2 (27 trees) total
4. This is a total of 1 spray for the neem plots and 2 sprays for the other plots.

General management

Joseph and Jazmin will only spray on dry days so that rain will not dilute or completely wash off spray applications.

April:

- Remove tree guards
- Drill well and install irrigation system
- Potential first application of treatment sprays (weather dependent)

May:

- Begin to manage tent caterpillar pests throughout entire orchard (vegetable oil + water + soap mix)
- **First application of treatment sprays** (weather dependent)
- Regular maintenance of weeds/grass (cutting/trimming/etc.)
- Watering (as required)

June:

- **Second application of treatment sprays** (early June)
- **First observation** of health of leaves and overall tree health (mid-June)
- Regular maintenance of weeds/grass (cutting/trimming/etc.)
- First scheduled mulching (half orchard)
- Watering (as required)

July:

- **Third application of treatment sprays** (early July)
- **Second observation** of trees
- Regular maintenance of weeds/grass (cutting/trimming/etc.)
- Second scheduled mulching (second half of orchard)
- Watering (as required)

August:

- **Additional spraying if required**
- **Third observation of trees**
- Regular maintenance of weeds/grass (cutting/trimming/etc.)
- Watering (as required)

September:

- Regular maintenance of weeds/grass (cutting/trimming/etc.)
- **Observation of trees**

October:

- **Observation of trees** (if leaves are still on trees)

Emergency management

The past 2 years the orchard hasn't needed external water. If the trees need water, Joseph and Jazmin will could pay for a watering truck to irrigate.

Measurements (use Data Collection Sheet)

For the middle 10 trees in each section, Joseph and Jazmin will measure:

1. The ratio of healthy leaves compared to infected leaves per tree and assign as value as follows:
    1: >75% infected
    2: >50% infected
    3: >25% infected

4: <25% infected

Where healthy is defined as (Figure 1):

- No presence of anthracnose (fungus), i.e. black dots or yellowing of leaves
- No blight
- Leaf is in tact, whole

To help with consistency, they will count infected leaves on trees to find representations of each category and take photos. These photos will be brought to the field to use as references for categorizing each tree.

Figure 1. Example of a healthy Black walnut leaves.

Figure 2. Examples of unhealthy Black walnut leaves.

Statistical test
Paired t-test, two-tailed with 4 replicates for each measurement.

Materials and Research Expense Budget. Prices are approximate; NA or in-kind for any materials that you already own or have access to. Please indicate if you intend to give any of the supplies to EFAO's Tool Library for others to use after you are finished with them.

Material	Quantity	Unit	Total Cost	EFAO's Tool Library (Y/N)
Neem oil	500	ml	$34.30	N
Copper Spray	200	g	$18.63	N
BTK	100	ml	$11.99	N
Sprayer	2	gallons	$29.99	N
Notebooks (for infield observations)	2	$9.29	$18.44	N
Total				

Deadline for data and photo submission:
October 31, 2018

Acknowledgements
We thank members of the Advisory Panel, Jason Hayes, Rebecca Ivanoff, Ken Laing, Annie Richard, Darrell Roes,Steven Wolgram and Dr. Ralph Martin, for their support for this trial.

Memorandum of Understanding
Please refer to **efao.ca/research-mou** for Memorandum of Understanding.

Contact
Sarah Hargreaves, sarah@efao.ca

Funding
Funding for this project was made possible by support from the Ontario Trillium Foundation and George Weston Limited and Loblaw Companies Limited.

Ontario Trillium Foundation
Fondation Trillium de l'Ontario
An agency of the Government of Ontario
Un organisme du gouvernement de l'Ontario

WESTON SEEDING stronger communities™