

**FINAL PROJECT REPORT****YEAR:** 1 of 2**Project Title:** Rootstock Sensitivity to X disease**PI:** Ashley Thompson**Organization:** Oregon State University Extension Service**Telephone:** 541-296-5494**Email:** ashley.thompson@oregonstate.edu**Address:** 400 E. Scenic Dr. Ste. 2.278**City/State/Zip:** The Dalles, OR, 97058**Cooperators:** Stacey Cooper, Steve Castagnoli**Total Project Request: Year 1:** \$35,450**Year 2:** \$34,658**Other funding sources:** None**WTFRC Collaborative Expenses:** None**Budget 1****Organization Name:** OSU ARF**Contract Administrator:** Dan Arp**Telephone:** (541)737-4066**Email address:** [Dan.j.arp@oregonstate.edu](mailto:Dan.j.arp@oregonstate.edu)**Supervisor:** Nicole Strong**Email address:** [Nicole.strong@oregonstate.edu](mailto:Nicole.strong@oregonstate.edu)**MCAREC Director:** Steve Castagnoli **Email address:** [steve.castagnoli@oregonstate.edu](mailto:steve.castagnoli@oregonstate.edu)

Item	2020	2021
Salaries <sup>1</sup>	\$8,112	\$8,112
Benefits <sup>2</sup>	\$3,245	\$3,245
Wages <sup>3</sup>	\$8,320	\$8,320
Benefits <sup>4</sup>	\$5,824	\$5,824
Equipment		
Supplies <sup>5</sup>	\$5,693	\$4,901
Travel <sup>6</sup>	\$756	\$756
Miscellaneous		
Plot Fees	\$3,500	\$3,500
<b>Total</b>	<b>\$35,450</b>	<b>\$34,658</b>

**Footnotes:**<sup>1</sup> 1 month salary for Dr. Thompson<sup>2</sup>OPE is calculated at 40%<sup>3</sup>Wages for a BioScience II technician calculated at \$16/hr for 40 hours a week for 13 weeks<sup>4</sup>OPE is calculated at 70%<sup>5</sup>150 trees at \$15 each = \$2,250; Grafting infected bud wood \$500; pot-in-pot supplies \$1985; Screen House; X disease molecular identification in 2020 20 samples at \$35 + \$258 set up fee = \$958, X disease molecular identification in 2021 \$3,500 + \$258 set up fee; Pot-in-pot upkeep \$1,143.<sup>6</sup>Travel was calculated at \$0.55/mile for 25 trips to the MCAREC from the Wasco County Extension office, which is 55 miles round trip.**OBJECTIVES:**

1. Evaluate the response of five rootstocks, 'Maxma 14', 'Gisela 5', 'Gisela 6', 'Krymsk 5', 'Krymsk 6', 'Lake' and, 'Clinton' to the X disease phytoplasma.
2. Identify hypersensitive rootstocks that can be used to reduce X disease inoculum in cherry orchards.

*2021 Goals:*

March: Inoculate trees by grafting with X-disease infected buds in March.

July: Test all trees for X-disease and check for pits and grooves at the graft union.

October: Assess tree vigor by measuring the trunk cross sectional area and leader growth of each tree. Report findings from the X-disease molecular and physical tests to OSCC.

*Deviation from original schedule:*

*2020:*

I was unable to hire any additional staff due to COVID-19 restrictions put in place by OSU. This made it challenging to plant trees and obtain nursery materials (pots and soil) in a timely fashion. Due to these challenges, I decided to graft trees in March of 2021 to ensure good bud take and the best possible results. I will likely ask for a no-cost extension for this grant for 2022 to make sure we have enough time to observe infection in these trees. In addition, I have been unable to source ‘Maxma 14’, and I continue to look for this rootstock.

*2021:*

Scions grafted to ‘Mahaleb’ died (Figure 1) and the ‘Mahaleb’ rootstocks were infested by borers (Figure 2). Pits and grooves were not identified at the graft union of any ‘Mahaleb’ tree. Over half of the young trees grafted to ‘Mazzard’, ‘MaxMa 14’, and ‘Lake’ planted in Ellepots died during the 2021 heat wave, when temperatures at MCAREC registered 116 F (Figure 3). Pits and grooves were not identified at the graft union of these young trees.



**Figure 1 and 2.** The scion of the ‘Mahaleb’ grafted tree died over winter. The rootstock survived the cold conditions, but the above ground portion was infested with a borer.



**Figure 3.** Despite watering and a shade cover, this ‘MaxMa 14’ rootstock died due to heat stress.

### **SIGNIFICANT FINDINGS:**

- Based on survey results from a study funded by Columbia Gorge Fruit Growers the following rootstocks are susceptible to X-disease, and will show symptoms:
  - Gi.12
  - Gi.6
  - K.6

### **METHODS:**

Ten of each rootstocks grafted with sensitive varieties (Table 1.) were planted as a completely randomized design in 10-gallon pots filled with general purpose growing medium on 2 June, 2020 at the Mid-Columbia Agricultural Research and Extension Center. Rootstocks were uniformly watered three times weekly. A netted hoop house covering was erected over the trees to prevent the potential movement of X-disease to the surrounding orchard following X-disease infection.

**Table 1.** Rootstock treatments for this study were selected based on virus susceptibility characteristics and use in the Pacific Northwest.

<b>Rootstock Treatments</b>	<b>Notes</b>
‘Mahaleb’	Positive control- exhibits a hypersensitive response (death) to X disease
‘MaxMa 14’	Related to ‘Mahaleb’
‘Mazzard’	Negative control- Susceptible to X disease
‘Gisela 12’	Negative control- Susceptible to X disease
‘Gisela 6’	Susceptible to pollen-borne viruses, but experiences reduced shoot growth when infected

'Krymsk 5'	Hypersensitive response (death) to pollen-borne viruses
'Krymsk 6'	Hypersensitive response (death) to pollen-borne viruses
'Lake'	Open pollinated with parental parent unknown
'Clinton'	Open pollinated with parental parent unknown

Late summer of 2020, all scions tested negative for X-disease.

In March of 2021, half of the rootstocks will be infected by grafting three infected buds from confirmed X-disease infected trees will be grafted onto the scion. Uninoculated trees will serve as a control. To insure that the infected buds contain adequate X-disease phytoplasma to create an infection, bud wood was collected in the form of semi-hardwood stem cuttings from confirmed X-disease positive trees was collected in late summer of 2020 when higher levels of X-disease phytoplasma are expected to be detected. Wood was rooted in a mixture of perlite and sphagnum moss using Hormodin rooting compound. Cuttings are being cared for indoors at the MCAREC.

## **RESULTS AND DISCUSSION:**

Young trees, particularly those in Ellepots, are very susceptible to temperature fluctuations. In 2021, damage from frost and an extreme heat dome severely injured many of the young trees in our outdoor pot-in-pot planting. Trees killed or significantly damaged included the positive control, 'Mahaleb', the negative control, 'Mazzard', and the rootstock I was most interested in testing, 'MaxMa 14'. Future studies like this should be completed in a greenhouse so the temperature can be controlled.

In addition, we can rely on X-disease survey data to rule out rootstocks that are susceptible and symptomatic to X-disease infection. Based on my survey study, we should not include 'K.6', 'Gi.12', or 'Gi.6' in future studies. Data from WSU may have insights into the susceptibility of 'K.5' and 'Gi.5'. I believe it would be more efficient and effective to focus on newer rootstock and more infrequently used rootstocks, like 'MaxMa 14'.