

**IMPACT AND EPIDEMIOLOGY OF X-DISEASE IN PRUNE
(1991/92)**

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ABSTRACT

Mycoplasma-like organisms (MLOs) cause significant losses in several California tree fruit crops. In 1987 we found that a large percentage of french prune trees in a Suisun Valley orchard were infected with the MLO that causes X-disease of cherry and peach. During the next two years we tested approximately 150 older french prune trees located in Tehema, Yuba, Sutter, and El Dorado counties for the X-disease MLO (MLO). No X-MLO-infected trees were found in Tehema County; approximately 5% of the trees in Yuba and Sutter Counties tested positively for the X-MLO and all of the small number of trees from El Dorado County tested positively. The X-MLO-infected trees in Suisun Valley and El Dorado had significant limb dieback, small yellowish leaves and smaller than normal fruit. However most of the trees from the other regions which tested positively were similarly in appearance to trees that tested negatively. The most consistent symptom of the X-MLO-infected trees was poor terminal growth.

During 1990 we developed a very sensitive test that detects the ribosomal RNA (rRNA), rather than the DNA, of many diverse types of MLOs. The rRNA test showed us that at least two very different types of MLOs cause peach yellow leaf roll disease. During 1991 we used the rRNA and the standard X-MLO DNA assay to test 137 prune trees from 23 orchards for MLOs. All of the samples were taken from older orchards that had some problems with limb dieback and/or poor terminal growth. None of 26 trees from Sutter County were MLO positive; 10 of 61 trees in Butte County tested positive; and 22 of 44 trees in San Joaquin County tested positive. Nearly all samples were positive by both the rRNA and the DNA test suggesting that X-MLO-like pathogens are the main type of MLOs that infect prune. We will finish our testing of other prune growing districts in 1992.

In order to clearly determine what effect MLOs have on prune tree growth and productivity we planted 100 trees on myrobalan and Marianna rootstocks at UC Davis. During the next two years these trees will be graft inoculated with prune-infecting MLOs. Growth parameters and productivity of the inoculated trees will be compared with uninoculated controls.

OBJECTIVES

1. Plant 100 french prune trees on myrobalan and Marianna 2624 rootstocks. Graft inoculate these trees during 1992 and 1993 with X-MLO-infected scion wood from experimentally inoculated trees growing at UC Davis. Compare tree growth parameters and

fruit quantity and quality of the inoculated trees with uninoculated controls.

2. Test approximately 200 prune trees for the presence of MLOs using rRNA, X-MLO and PYLR-MLO DNA diagnostic assays.

3. Extract high quality DNA from those samples that test positively and determine whether the genetic "fingerprints" of the prune-infecting MLOs are the same or different from the MLOs that infect cherry and peach.

PROCEDURES AND RESULTS

Objective 1: In January 1991, virus-certified french prune trees on myrobalan and marianna rootstocks were purchased from Smith Nurseries and planted in the Plant Pathology orchard at UC Davis. All of these trees survived the first growing season and have been pruned in a standard commercial manner. Approximately 1/2 of these trees (less uninoculated controls) will be graft inoculated with X-MLO-infected scion wood in June, 1992. The other half will be inoculated in 1993. Trunk diameter and average shoot length will be determined for 5 years following inoculation. Yield data will be determined once fruiting begins.

Objective 2: All of the samples tested in 1991 were examined by both X-MLO-specific DNA hybridization tests as well as rRNA hybridization test that detect a broad-range of MLOs. The results of the 1991 MLO test are summarized in the attached Table.

Janine Hasey, Farm Advisor, helped us sample 26 trees from 5 older orchards in Sutter County. None of these trees tested positively by either MLO diagnostic test.

Bill Olson, Farm Advisor, helped us locate 8 older prune orchards in Butte County and we located 2 additional orchards. Of the 61 trees that were tested 10 were positive by the DNA and rRNA test and 2 more samples were positive by only the rRNA test. The majority of the MLO-positive samples came from 3 orchards.

Joe Grant, Farm Advisor, helped us locate 5 prune/plum orchards in San Joaquin County. Many of the samples from two of these orchards were fresh market plums rather than french prunes. One of the orchards (orchard B in the Table) was organically managed and it had a particularly high amount of MLO-infected trees. Two of the other orchards that contained MLO-infected trees were adjacent to cherry orchards that contained several X-MLO-infected cherry trees.

One of 6 trees from a prune planting located at UC Davis tested positively for the X-MLO.

Objective 3: We will examine the DNA "fingerprints" of the prune-infecting MLOs in the coming months.

CONCLUSIONS AND FUTURE DIRECTIONS

Nearly all of the prune trees that tested positively by the broad-range rRNA test also tested positively by the X-MLO-specific test. This result suggests that the vast majority of prune-infecting MLOs are genetically similar to the X-MLO. The large amount of epidemiological information gained in our previous studies should be directly applicable to the X-MLOs infecting prune.

Most of the MLO-infected prune tree in Butte County were located in 3 of the 10 orchards that were sampled. We will test additional trees from these orchards in 1992 and try to determine if there are any common features, such as adjacent tree crops or orchard weeds, among these orchards.

The majority of the X-MLO-infected trees located in San Joaquin County were found in either an organically managed orchard or in orchards adjacent to cherry orchards with X-MLO-infected trees. Our previous leafhopper vectors studies clearly showed that infected sweet cherry trees are an excellent reservoir of the X-disease pathogen. It is quite possible that the prune trees were infected by X-MLO-infectious leafhoppers that migrated out the adjacent cherry orchard. Our previous studies also found that one of the major X-MLO vectors, Fieberiella florii can live and reproduce in prune trees. It is possible that populations of this leafhopper vector may be responsible for the high incidence of X-MLO-infected trees in the organically managed orchard. If we receive the grower's permission we will monitor the abundance and infectivity of leafhoppers in this orchard during 1992.

During 1992 we will complete our survey of the remaining prune growing districts in California. Approximately 150 samples from orchards in San Joaquin, Yolo, Napa, Sonoma, Santa Clara and San Benito counties will be tested by both MLO diagnostic assays. We will seek the assistance of county Farm Advisors in locating prospective, older orchards.

The next major phase of MLO research on prune will focus on quantifying what effect, if any, MLO-infection has on french prune tree growth and productivity. Initial phases of this study on tree growth characteristics will require comparatively little funding. Assessment of possible effects on fruit yield and quality will involve more work and cost. We hope that some scientists in the Department of Pomology will be interested in collaborating with us on this phase of the project.

RESULTS of FRENCH PRUNES TESTED FOR MLOs - 1991

<u>County</u>	<u>Orchard</u>	<u>Trees Tested#</u>	<u>Number Positive by</u> <u>DNA</u>	<u>rRNA</u>
Sutter				
	A	5	0	0
	B	2	0	0
	C	6	0	0
	D	6	0	0
	E	3	0	0
	F	<u>4</u>	<u>0</u>	<u>0</u>
Total	5	26	0	0
Butte				
	A	12	2	5
	B	6	0	0
	C	8	4	3
	D	5	3	3
	E	5	0	0
	F	4	0	0
	G	3	0	0
	H	6	0	0
	I	6	0	0
	J	<u>4</u>	<u>1</u>	<u>1</u>
Total	10	61	10 (16%)	12 (20%)
San Joaquin				
	A*	4	4	4
	B*	19	14	14
	C	3	2	2
	D	8	1	1
	E	2	0	0
	F	<u>6</u>	<u>1</u>	<u>1</u>
Total	6	44	22 (50%)	22 (50%)
Yolo				
	A	6	1	1
Grand Total	23	137	33 (24%)	35 (26%)

* Over 1/2 of test samples were fresh market plums.

Samples shown were suspect orchard trees. Healthy controls were also included in all tests.