

## Research Progress Report

### Plum Bud Gall Mite (PBGM) host range trials on almonds and plums in California

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#### Abstract

The plum bud gall mite *Acalitus phloeocoptes* (PBGM) has been reported on almonds in Europe and the Middle East. To date, the mite has not been found on almonds in the United States. We conducted a host range and symptom expression study of five commercially important almond varieties and two plum varieties exposed to the invasive gall-forming mite. Only one plum variety (Mariposa) developed galls during the 8-month observation period. The other plum variety (Santa Rosa), as well all five almond varieties (Nonpariel, Monterey, Carmel, Butte, and Padre) remained healthy.

#### Introduction

The plum bud gall mite *Acalitus phloeocoptes* (family Eriophyidae) is a tiny invasive insect pest for which only very limited information is available. *A. phloeocoptes* is known to be present in Southern and Central Europe and the Middle East, which might be its native range, but has also been found in China and North and South America (Li et al. 2021). Although the mite has been reported from the Eastern US several decades ago, no official confirmation is available. *A. phloeocoptes* was detected on a plum tree in Santa Clara County in early 2019 and has since spread to several other counties in the Bay Area and beyond (Diekmann and Grothe 2019). Adult females emerge in spring from galls and feed on newly developing buds, inducing the formation of new galls with a size between 1.3 and 1.8 mm. During summertime, several generations of the mites hatch within the gall. Dispersal seems to be caused mainly by wind, but insect vectors and movement of infested wood might also play a role. Infested trees are damaged by gall formation, and deformation of fruit spurs, which leads to fruit yield reductions. In rare cases, plant death has been reported. The host range is restricted to trees belonging the genera *Prunus* and *Cotoneaster*, with most reports from plums, almonds, and

apricots. Varieties of stone fruits seem to differ in their susceptibility to the mite. Almonds (*Prunus dulcis*) are among the most important agricultural crops in California. Approximately 80% of the almonds worldwide are grown in California on an estimated 1,500,000 acres, using 13 commercially relevant varieties (CDFA 2020).

The aim of this study was to test, if plum bud gall mite can induce gall formation or other disease symptoms on five of the most commonly planted varieties of almonds. Two of the most commonly sold CA plums varieties were used as controls.

### Materials and Methods:

In January 2020, budwood of plum trees (*Prunus domestica*) infested with PBGM was collected from plums in five residential locations in Contra Costa County. The CDFA Diagnostic lab confirmed the presence of viable mites in the new galls, but no mites were present in the prior year's galls. In February 2020 125 PBGM-infested budwood twigs were collected from plum trees in the two locations that exhibited the most galls the prior month in San Ramon, CA. Each twig was inserted into a water tube in the field to preserve the mite-infested twig. Infested twigs were budded and some were flowering at the time of collection.



**Figure 1:** Plum Bud Galls (left: current year, right: prior year)



**Figure 2:** Flowering PBGM-infested twigs in water tubes

On the same day the twigs were collected, the infested twigs in the water tubes were attached to the healthy test plants in the NORS-DUC greenhouse, San Rafael, CA. Water was added to the tubes on a weekly basis.

The following trees were used:

*Prunus dulcis* (almond) varieties Nonpariel, Monterey, Carmel, Butte, and Padre grafted on Krymsk rootstock; five of each variety in 5-gallon containers (test plants).

*Prunus domestica* (plum) varieties Mariposa and Santa Rosa; five of each variety in 5-gallon containers (control plants).



**Figure 3:** Galls were placed in direct contact with healthy branches to ensure emerging mite transfer. A portable fan was used in the greenhouse to assist in mite movement.



**Figure 4:** Almond and plum trees in the NORS-DUC greenhouse

All 35 containerized plants in the greenhouse were randomly arranged in three rows. Plants were drip irrigated for 5-10 minutes daily. Based on samples taken to the CDFA Diagnostic Lab, mites were emerging from the galls early February through April 2020 (over a three-month period) from the infested twigs in water tubes. In May, CDFA Diagnostic Lab determined that mites were no longer emerging from the galls.

All 35 containerized plants in the greenhouse were inspected on a month basis (starting in March 2020) for the presence of galls. No galls were seen on the healthy plants until early July, when galls were found on Mariposa plum only. Gall development on this plum variety took approximately 5 months.

The monitoring was continued until September 2020 for a total of 8 months. During this period:

- No galls were found on the almonds
- Only the Mariposa plum developed galls on all five plants
- No galls were found on the Santa Rosa plums

The experiment was dismantled in September 2020. Infested material was steamed using the NORS-DUC portable steaming unit. Temperatures under the steaming tarp reached 100<sup>o</sup> C in less than an hour, at which time the unit was turned off but the temperature remained at 50<sup>o</sup>C for four hours as the steaming unit cooled.

CDFA Diagnostic lab found that the pre-steam gall samples from the 5G Mariposa plum trees had live mites whereas the post-steaming samples did not have live mites.

### **Results and Conclusions**

- Plum varieties differ in their susceptibility to PBGM; var. Mariposa is a potential host of *A. phloeocoptes*, var. Santa Rosa did not develop symptoms
- No symptoms and mite activity were found on any of the five almond varieties studied (Nonpariel, Monterey, Carmel, Butte, and Padre)
- PBGM emerge over a three-month period from infested plum twigs (February-April) in northern CA
- Old galls (from the prior year) do not harbor mites
- Galls take approximately five months to form on Mariposa plum
- Steaming kills mites in the galls

Control strategies for this new pest in California are still being developed, a short overview on possible options is presented in Diekmann and Grothe (2019).

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