Lower limb Dieback 2010

Bruce Lampinen, Jim Adaskaveg, Greg Browne, Joe Connell, Roger Duncan, Brent Holtz, Themis Michailides and Samuel Metcalf

Introduction

Growers in the Sacramento and San Joaquin Valleys have been noticing increasing dieback of lower limbs on almond trees.

Usually beginning in late April, leaves on lower limbs begin to yellow and then turn brown and by late summer, substantial lower canopy dieback can occur

Lower limb dieback (LLDB) has been observed on Butte, Padre, Aldrich, Fritz, NePlus Ultra, Nonpareil, Sonora, etc., usually starting at about 7-8 years of age. Several growers have indicated that the problem is worse in heavily shaded blocks although this does not always seem to be the case, particularly in Butte County orchards.

Data collected in 2004-2008 did not show any clear connection with any disease causing organisms.

Materials and Methods

Five orchards were selected for study in 2009. Three Stanislaus County orchards with a history of lower limb dieback were selected for study in 2009.

- Orchard #1- Flood irrigated Butte/Padre planting
- Orchard #2- Flood irrigated Butte/Padre planting
- Orchard #3- Flood irrigated Butte/Padre planting

In addition, two orchards in Butte County were studied.

- Orchard #1- Double line drip plus microsprinkler irrigated Aldrich, Butte, Nonpareil and Peerless planting
- Orchard #2- Solid set sprinkler irrigated Butte, Carmel, NePlus Ultra, Nonpareil and Sonora planting

All of the Stanislaus and Butte County orchards studied in 2009 were the same ones that were studied in 2008. Midday stem water potential was measured on bagged lower canopy shaded leaves between 1:00 and 3:30 pm. Orchard midday canopy light interception was not monitored in 2009 since data collected in 2008 suggested it was not a major causative factor.

In 2010, differential irrigation sections were set up in two orchards in Stanislaus County. The goal was to attempt to alleviate or minimize lower limb dieback symptom expression by minimizing stress cycles. The first trial was in Stanislaus Orchard #1 (the same used in previous years) and the second was in Stanislaus Orchard #4 (a new site) which is also a flood irrigated Butte/Padre orchard with a history of severe lower limb dieback symptoms. Differential irrigation was only set up in the Padre rows at Stanislaus Orchards #4 but was set up in both varieties at Orchard #1. All trees were rated for lower limb dieback symptoms through the season. A rating of zero indicated no lower limb dieback was observed and a rating of one indicated one limb of approximately one inch diameter was exhibiting symptoms

Results

Stanislaus Orchard #1.

The micro-irrigation system was installed in early spring and the first irrigation was carried out on 5/12/10. The first yellowing of lower canopy leaves appeared the week before the micro-irrigation system was started. By early July, it became very difficult to keep up with plant needs with the micro-sprinkler system. This was due to a number of factors including an inadequately sized fuel tank used to power the pump, the need to make many visits to the site during each irrigation cycle to add fuel and maintain the system, and the difficulty in meeting plant demands with the abrupt switch from flood to micro-sprinkler irrigation. The decision was made to flood the entire orchard in early July and start running the micro-sprinkler irrigation system from the beginning of the irrigation season in the 2011 season. Problems with the irrigation system will also be addressed before the start of the 2011 season.

Symptom expression over the season was not significantly different between the flood and microsprinkler irrigated sections except on the late June evaluation date when the symptom expression was worse on the microsprinkler irrigated section (Fig. 1).

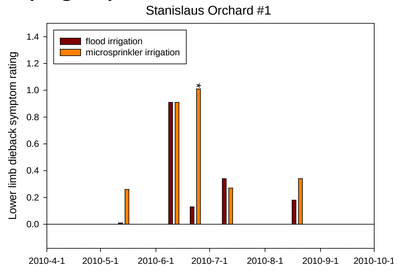

Fig. 1. Lower limb dieback symptom expression for Stanislaus Orchard #1 in 2010.

Stanislaus Orchard #4

In Stanislaus orchard #4, stress levels were excessive and even with supplemental irrigation, the trees still developed significant stress in May, June and July (see midday stem water potential data in Fig. 2). Further investigation of soil moisture data from this site is needed determine if this is due to shallow rooting (i.e. deeper water is present but not available to tree due to shallow rooting) or actual water shortages. Unfortunately, several of the dataloggers had problems a number of times so there are gaps in data at both sites in 2010 (Fig. 3). There were no significant differences in symptom expression Stanislaus Orchard #4 in 2010 (Fig. 2).

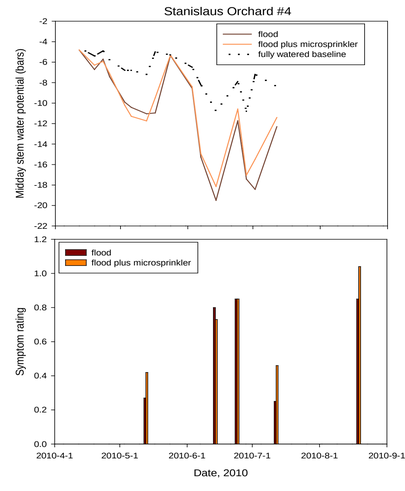

Fig. 2 Midday stem water and lower limb dieback symptom expression for Stanislaus Orchard #4 in 2010.

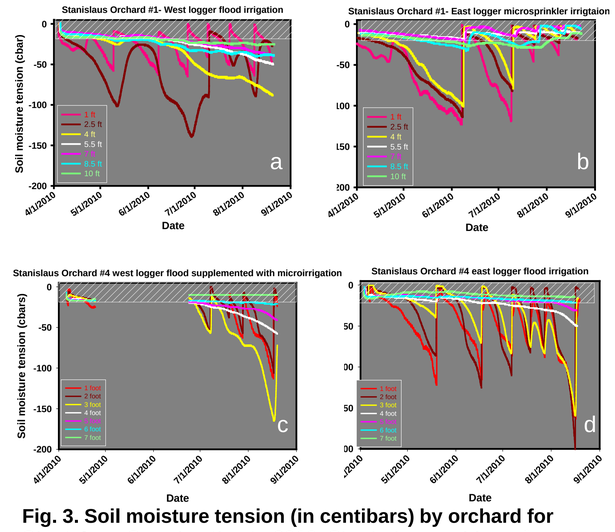

Fig. 3. Soil moisture tension (in centibars) by orchard for Stanislaus County sites in 2010. Shaded area at top of each graph indicates approximate area above field capacity.

Overall summary

Both of the study orchards in Stanislaus County in 2010 had moderate to severe lower limb dieback symptoms. However, problems with the irrigation systems and dataloggers in the 2010 season lead to inconclusive results. The plan in 2011 is to modify the irrigation systems to allow plant demands to be met in order to clarify the role of irrigation in the development of lower limb dieback.