

Improving Almond Shell Seal with Cultural Practices to Reduce Kernel Damage by Insects

Project No.: 99-MF-o0

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Almond shell seal has been identified as a major factor determining resistance to Navel Orangeworm (NOW) and ant feeding on almond kernels. Poorer shell seal quality (SSQ) is associated with an increase in the shell opening (maximum width) near the suture line or “wing”. Our project has three main objectives:

1. To identify cultural factors that cause shell seal quality to vary within a variety, and determine the range of that variability.

A nitrogen/potassium/irrigation trial from Colusa County supplied 91 samples of nuts from the 1998 harvest and we found significant differences between the nitrogen and irrigation treatments. In particular, we found that higher rates of nitrogen were associated with a poorer SSQ. In 1999, we received nut samples from research plots involving differential potassium rates (Stanislaus), pruning treatments (Kern), and ant control treatments (Fresno). Results are not available yet. Overall, shell seal was excellent in many Nonpareil orchards where we sampled nuts and differences were not noted.

2. To determine how shell seal quality affects damage potential from NOW and ants.

We exposed almonds in shell with variable SSQ to ants (in the field) and to NOW larvae (hatched from eggs in the laboratory). We found that NOW larvae can enter nuts with a SSQ equal to or greater than 0.005 inches (figure 1). There was an increasing amount of damage from NOW as SSQ decreased, however. Ant damage did not occur below a SSQ of 0.030 inches, and SSQ above 0.030 inches did not appear to effect the level of damage (figure 2). We plan to further test these minimum damage levels and then use them in developing economic thresholds for ant control.

3. To determine if shell seal quality can be predicted after shell hardening but before hull split, and to develop a field method of rating SSQ.

A hand held digital caliper appears to work very well for measuring SSQ in the field. All nuts that are measured for SSQ or width of suture opening, are also measured for overall shell width and length. We are looking for correlations between SSQ and shell width and length.

This spring, we followed the development of Nonpareil and Mission almonds using chemical stains in the laboratory. The two varieties showed different patterns of lignin deposition. With Nonpareil nuts, there are also more tendencies for the hull to adhere to the shell. With some nuts, some outer shell layer was removed when the hull was detached, causing a larger shell leak or poorer SSQ.

Figure 1. The Effect of SSQ on Amount of NOW Infestation

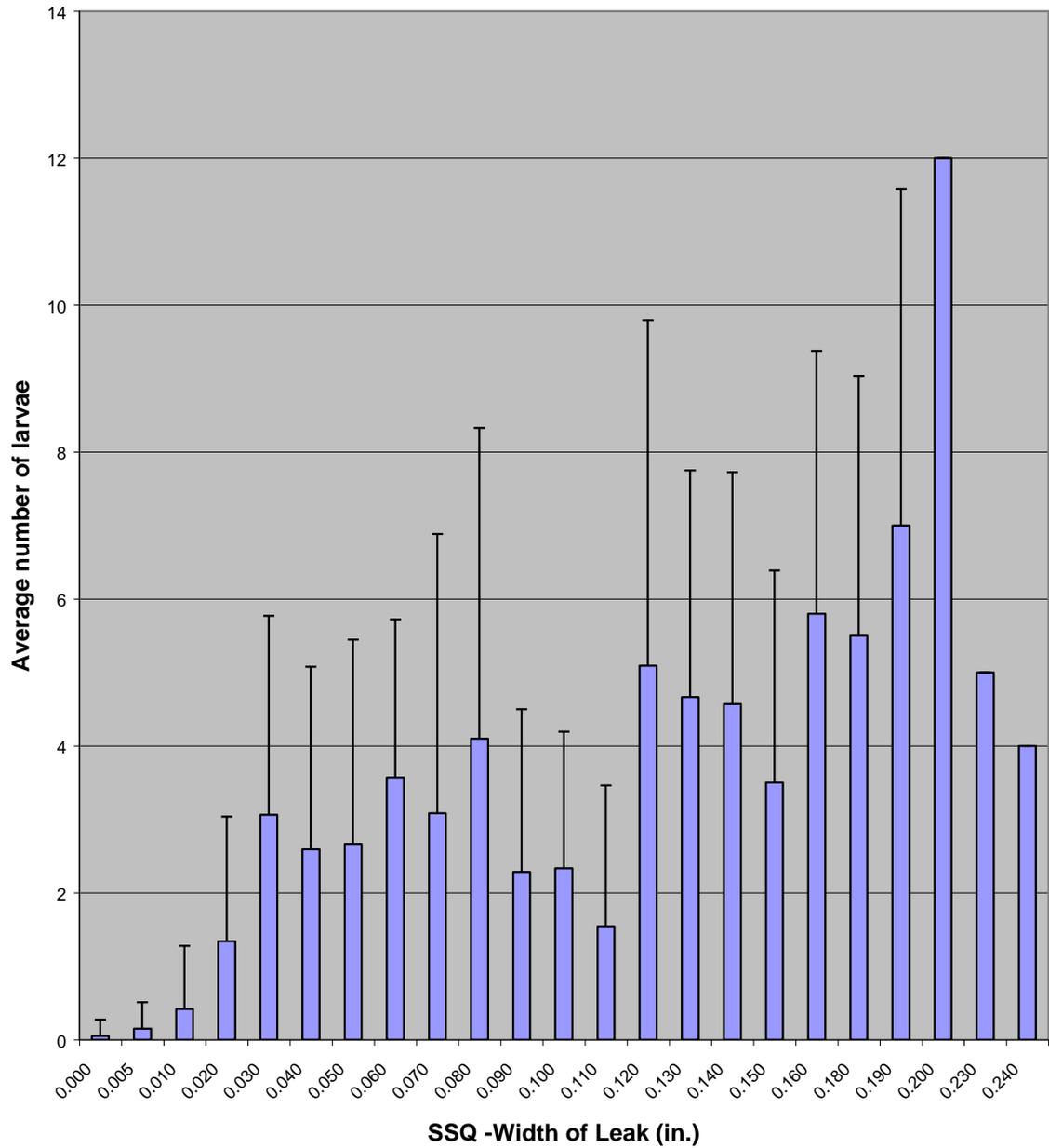


Figure 2. The Effect of SSQ on Ant Infestation of Almond Kernels

