

Strawberry Fruit Deformity and the Role of Lygus Bug

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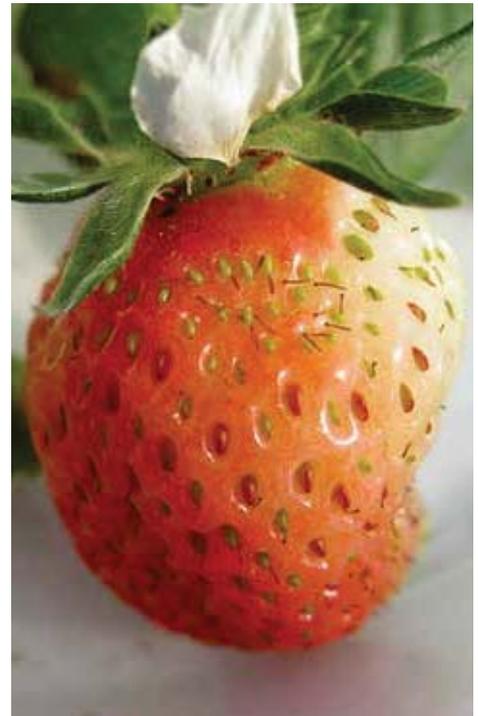
Strawberries are a popular fruit because of their sweet and tangy flavor, juicy texture, nutritional value, and also because of their shape and bright red color. Vitamins, minerals, fiber, protein, sugar, and antioxidant properties have made strawberries a popular fruit around the world. While processed strawberries are used in a variety of food items, fresh market berries take up the major share of the production, and deformed berries are not acceptable for the fresh market. Strawberry deformity can be caused by a variety of factors related to nutrition, genetics, environment, and insects. Deficiency of nutrients

such as calcium and boron can cause deformed berries. Genetic factors such as mutations can result in misshapen fruit. Temperature extremities are also responsible for fruit deformity where cold temperatures damage the flowers and hot temperatures affect the pollen viability resulting in improper fruit development. Poor pollination as a result of various factors is also another reason for deformed strawberries. The western tarnished plant bug or lygus bug (*Lygus hesperus*) feeding on developing berries causes uneven development and causes fruit deformity that is also referred to as “cat-facing.”

The lygus bug is considered a major pest of strawberries in California because it causes fruit deformity and is an integral part of pest management decisions. Treatment threshold is one lygus nymph/20 plants, but very high numbers above the threshold are frequently seen in strawberry fields. Most of the time growers and PCAs rely on lygus counts from routine monitoring before treatment decisions are made, however, it is not uncommon for the amount of deformed berries to influence those decisions. In light of these circumstances, a study was conducted

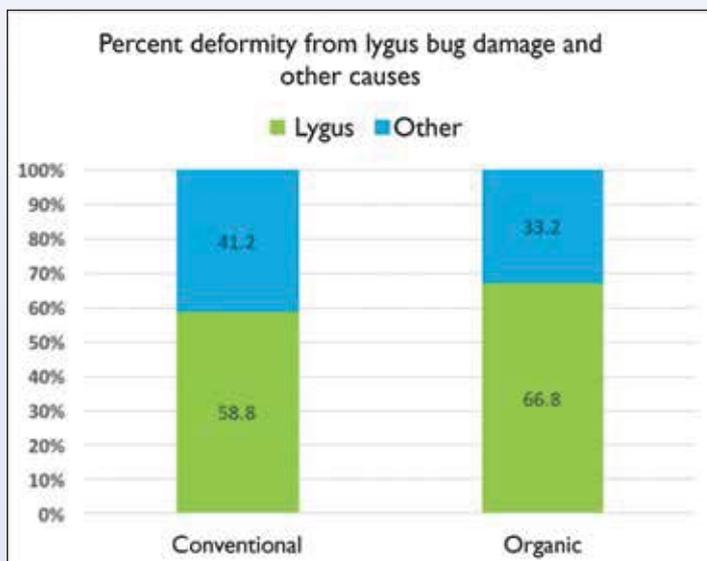


Deformity due to lygus bug feeding



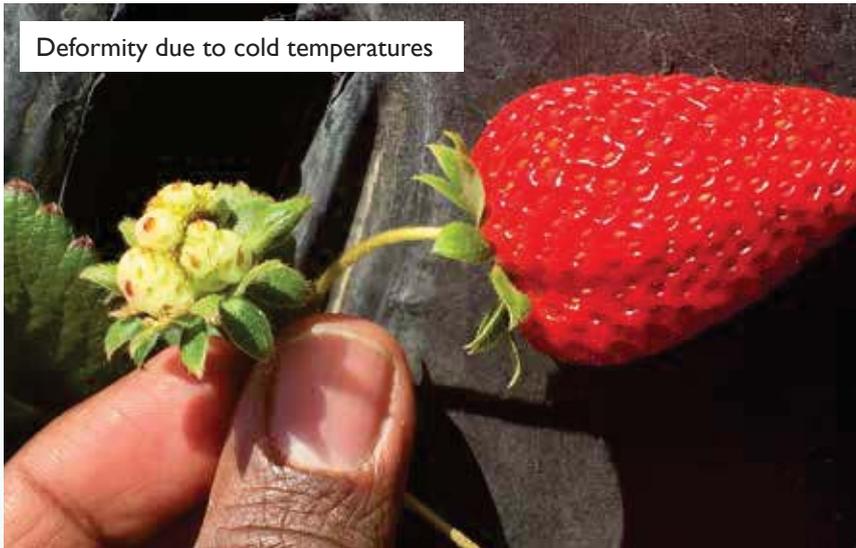
in 2015 to determine the role of lygus bug in fruit deformity in conventional and organic strawberry fields in the Santa Maria area.

A study was conducted between 2 and 30 September, 2015 to evaluate the role of lygus bugs and other factors in strawberry fruit deformity. Deformed berries were collected from 28 strawberry fields: 18 conventional and 10 organic. Conventional fields were sampled nine times and organic fields were sampled 5 times. Harvest crews typically discard misshapen berries in furrows and those berries, within a day after the harvest, were sampled for the study. On each sampling date, a field block was divided into four quadrants and at least 100 deformed berries (often 125-175) were collected from the furrows within each quadrant. Each berry was visually examined and categorized as a lygus- or non-lygus-related deformity based on the size of the achenes and shape of the berry. Certain patterns of fruiting in the field, environmental conditions, nutritional deficiency, varietal traits, or lygus bug populations can help narrow down the causes of deformity, but it is difficult to identify the exact cause of the deformity. According Zalom et al. (2014) fruit deformity



due to lygus or other causes can be determined by the size of achenes. Achenes in deformed and normal areas of the fruit are more or less uniform in size if the deformity is due to lygus bug. Achenes of different sizes indicate deformity due to factors other than lygus damage. Berries were categorized according to these characteristics and data were subjected to arcsine transformation and statistical analysis. Significant means were separated using Tukey's HSD test.

In general, lygus bug damage was significantly higher ($P = 0.01$) in organic fields than in conventional fields. On average, conventional fields had 77 deformed berries due to lygus damage and 54 deformed berries due



to other causes. Organic fields had 89 deformed due to lygus bug feeding and 45 deformed due to other causes. When weight of deformed berries was compared among lygus and non-lygus damage, across conventional and organic fields, the average weight of the berry damaged by lygus bug was 8.4 g, while the berry deformed due to other causes was 7.5 g. When the causes for the deformities were compared within conventional and organic fields, the proportion of deformed berries due to lygus bug damage was significantly higher ($P < 0.00001$) than those due to other causes. The proportion of deformed berries due to lygus damage was 58.8 in conventional fields and 66.8 in organic fields. While the lygus bug is a major factor in causing fruit deformity, it is important to note that about 41% of deformities in conventional fields and 33% in organic fields were due to factors other than lygus feeding. These results are important to understand the role of

various factors in causing fruit deformity and making appropriate treatment decisions. Sampling fields for lygus bugs is always the better and more efficient way to make treatment decisions, not counting on deformed berries.

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Reference
Zalom, F. G., M. P. Bolda, S. K. Dara, and S. Joseph (Insects and Mites). 2014. UC IPM Pest Management Guidelines: Strawberry. University of California Statewide Integrated Pest Management Program. Oakland: UC ANR Publication 3468. June, 2014.





Deformity due to genetic or environmental factors



Deformity due to unknown factors