

## **Black Mushy Walnut Hulls – Possible Causes**

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There are various reasons why walnut hulls turn black and become mushy. Some are pest related while other reasons include environmental stresses or tree physiology. This article briefly discusses each of these potential causes.

**Walnut husk fly (WHF).** In the Sacramento Valley, WHF egg laying can occur as early as late June or the first week of July; therefore it is recommended that traps go up by early June. WHF maggots are whitish after they hatch and turn yellow as they mature (Photos 1 and 2). Mature WHF maggots are distinctly yellow with black mouthparts and measure approximately 3/16 of an inch long. Observing such maggots inside the husks of black, mushy walnuts on the tree indicates WHF infestation. The outer skin of the husk usually remains intact, hiding the maggots inside. After feeding in the husk for 3 to 5 weeks, mature maggots drop to the ground and burrow several inches into the soil to pupate and emerge in following years. There is one generation per year. More information on WHF is available at: <http://www.ipm.ucdavis.edu/PMG/r881301211.html>

**Vinegar flies.** Nuts on the ground or with husks blackened by other factors may be secondarily infested with the larvae of vinegar flies (*Drosophila* spp.), which should not be mistaken for WHF damage. Vinegar fly maggots are smaller and remain white in color compared to WHF maggots. For this reason, the mature yellow maggot stage is the best indicator to distinguish WHF and vinegar fly infestation.

**Lack of adequate carbohydrate.** Hulls may also become black and mushy due to lack of adequate carbohydrate when photosynthates are insufficient for nuts to mature properly. The carbohydrate deficit occurs later in the season, which is why the kernels are well formed and often look normal. These nuts can occur in many different situations when carbohydrate demand outweighs supply, usually in the lower inside shaded areas of the tree canopy. This condition appears to be more prevalent in heavy bearing varieties like Chandler, Howard, and Tulare and in heavy crop years, possibly because heavier crop loads place more nutritional demand on the tree to mature the crop. Reduced light penetration into the lower inside spurs for these and other varieties contributes to hull breakdown as well.

**Environmental stresses.** Environmental conditions and/or orchard management will also affect tree physiology. Any stresses experienced by the tree would be expected to impact kernel and husk condition. Moisture stress can be problematic and irrigation management that allows trees to experience large changes in stem water potential – becoming either too wet or too dry – may influence husk and kernel integrity

**Diseases.** It is possible that some of the black husks are related to Botryosphaeria (Bot) and/or Phomopsis infections. Initially, these diseases cause the hull to turn black and soft, but by late summer/early fall, the hull dries to a black/brown color (Photos 3 and 4). Research to understand the nut blight phase of Bot and Phomopsis is ongoing by Dr. Themis Michailides and cooperating farm advisors and growers.



Photo 1. Newly hatched WHF maggot.  
Photo by Bill Olson.



Photo 2. Mature WHF maggot.  
Photo by Bill Olson.



Photo 3. Blighted fruit caused by Bot taken on  
September 3, 2014. Photo by Themis Michailides.



Photo 4. Blighted fruit caused by Bot showing  
pycnidia taken on September 3, 2014.  
Photo by Themis Michailides.