



What is the impact of hull rot in almonds?

'Hull rot' is a name given to the symptoms caused by fungal infections of either *Rhizopus* spp. or *Monilinia* spp. which become obvious prior to harvest; but rotten hulls are just the start of the problem. Grey-black mouldy growth between the shell and the hull of almonds is the commencement of an issue which can also impact the long term health of the tree. Hull rot often results in the following outcomes:

- Quality downgrade of nuts
- Initial harvest yield loss
- Storage losses
- A reduction in leaf function during the current year
- Leaf and shoot death, and its effect on the following year's crop
- Tree architecture changes
- Creation of entry sites for wood diseases
- Stick tights harbouring insect pests

Always consult the product label for detailed information.

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Direct Impact

The direct impact of the infection is visual with the possibility of staining on the shell of the almond, important for the critical Indian 'in shell' market.

The disease can then bring with it a complex of problems which can impact on the following season's production.

The hull rot infection produces fumaric acid which is toxic to the plant and moves down spurs and shoots from the infected nut, leading to clumps of leaves wilting and sections of shoots or whole limbs dying. This dieback restricts the viability of fruiting wood for the subsequent year's crop.

Some of the fruit which are infected with the fungus, (usually rhizopus in Australia), remain on the tree as 'mummies' or 'stick tights', and require repeated ashaking or manual poling to remove them from the tree, otherwise these can harbour carob moth or carpophilus beetles.

Rhizopus is a very common fungus in the environment; its spores come from the soil and during humid conditions float up into the tree and lodge into the freshly split hull. All varieties are susceptible but Nonpareil is particularly vulnerable as its soft shell remains succulent until it is nearly mature.

Humidity in the orchard canopy during periods of frequent irrigation is high enough to facilitate the infection process and rainfall periods during hull split will exacerbate the level and speed of disease development. Hull rot infection and the visual symptoms can escalate rapidly; in trials we have seen incidence levels climb from 7% to 56% in 14 days in unprotected trees.

Orchards which are vigorous and highly productive may be more prone to hull rot as the shading and humidity tends to be greater. Experience from California suggests that limiting water and nitrogen during the early hull split stage can reduce the level of disease however the Californian summer months are even dryer than in Australia and our soils are generally lighter meaning that inducing water stress can be a risky practice.

The period of hull split (dehiscence) takes several weeks, leaving the entire crop vulnerable, and making the timing of fungicide applications quite critical. Typically growers would like to avoid unnecessary tractor passes too close to harvest as crop damage is more likely then.

Is it worth spraying Luna Sensation at hull split?

Luna Sensation fungicide is registered for the suppression of hull rot which means our field research shows that it can significantly reduce the impact of the disease however there may be some level of symptoms which persist after application. The correct application timing is at early hull split, followed by another spray if infection is observed.

If hull rot has been an obvious problem in the past it is likely to present in future so a cost/benefit analysis could look like this; Cost of hull rot = Quality downgrade + Initial yield loss + Leaf function loss year 1 + Fruiting wood loss year 2 + Re-shaking/poling costs + incidental costs of insects overwintering

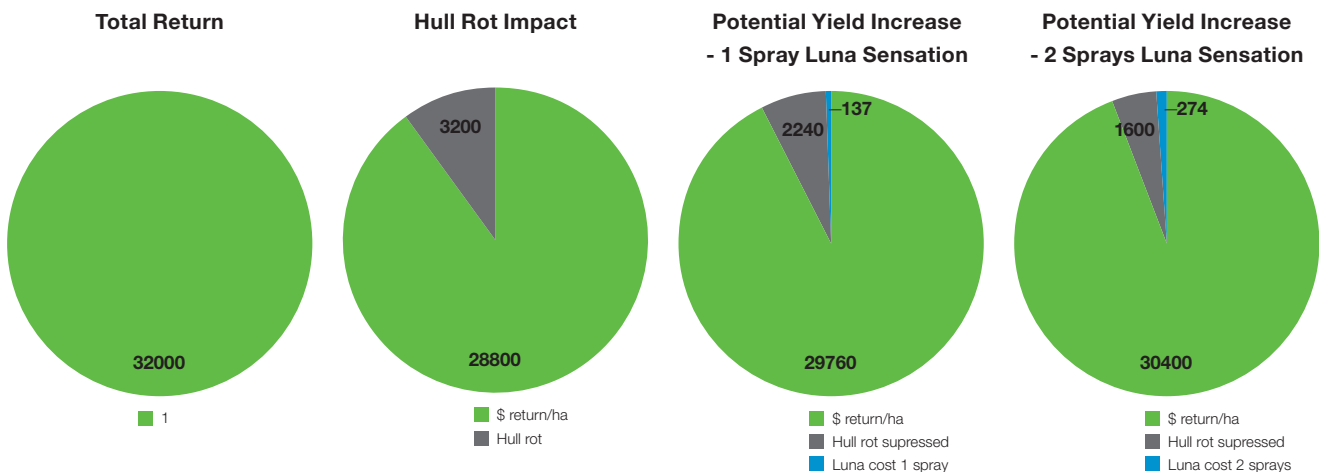
Eg. for a crop yielding 4000 kg/ha @ \$8/kg a possible outcome could be;

Cost of hull rot/ha = Quality downgrade (2%;\$640) + Initial yield loss* (3%;\$960) + Leaf function loss year 1(1%; \$320) + Fruiting wood loss year 2 (4%;\$1280) + Re-shaking/poling expenses(?) + incidental costs of insects overwintering(?) = \$3200+/ha

Average efficacy from one spray, minimum 30% reduction in impact; \$960/ha benefit.

Average efficacy from two sprays, minimum 50% reduction in impact; \$1600/ha benefit.

Cost of application = \$137/ha (40mL/100L @ 2000 L/ha) – (other disease benefits)



Graph: \$960/ha yield loss (base line), \$1,600/ha yield loss \$3,200/ha potential loss vs \$137/ha Luna Sensation application cost
*Initial Yield Loss 3% is equivalent to 500 nuts per tree remaining after the first harvest.

Based on individual cost impact of hull rot versus the cost of application, even if one single impact factor occurs it is still worth investing in the Luna Sensation spray.

To explore the details of this benefit for your own orchards please contact our field staff to arrange a discussion.
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