Scale insects in the vineyard

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Scale insect numbers have increased in vineyards throughout Southern Australia over the last 10 years. Scale are a soft body insect that feed predominately on phloem cells (Simbiken et al. 2015). Phloem sap is rich in carbohydrates but poor in soluble nitrogen compounds, therefore the scale insects must ingest large quantities of sap to meet their nutritional requirements. The excess carbohydrate rich solution is commonly referred to as honeydew (Malumphy et al. 2011). Ants are attracted to the honeydew and they farm the scale to feed off the honeydew. The honeydew is also a substrate for sooty mould. Sooty mould can reduce the photosynthetic rate of the leaf, trap heat from the sunlight and has a significant impact on fruit quality. The feeding by soft scale removes nutrients and carbohydrates from the plant, which slows plant growth and causes some necrosis which may lead to dieback of canes and spurs (Rakimov et al. 2015). Scale insects can spread viruses and may increase the level of botrytis and secondary rots in bunches. Overall, scale have a negative impact on both vine vigour and fruit quality.

Lifecycle of scale

The dominant scale species observed in South Australia are grapevine scale (*Parthenolecanium persicae*) and frosted scale (*Parthenolecanium near pruinosum*). Both grapevine and frosted scale were reported to have only one generation per year (Rakimov et al. 2015). However, in South Australia the scale insects have either more than one lifecycle per season or the scale are not all maturing at the same time, hence there are many different instars present at any one time. Juvenile scale, maturing scale and mature females can all be present on vine canes at leaf fall (Figure 13).

The lifecycle (Figure 14) of soft scale insects is greatly impacted by the environment (temperature and humidity). In brief, the female life cycle consists of an egg phase, two or three nymphal instars and an adult phase. In South Australia, the female scale matures rapidly in spring and lays eggs in late September to early October. The first instar or crawlers emerge in late October and are very mobile. They are dispersed by crawling away from their mothers or passively through wind movement. According to Yardeni (1987), wind can carry crawlers anywhere from 55 m to 4 km. Once the first instar has migrated or blown to a feeding site (generally the underside of a basal leaf), they remain there until the end of the growing season. The nymphs can be found on the underside of leaves from November through to leaf fall.

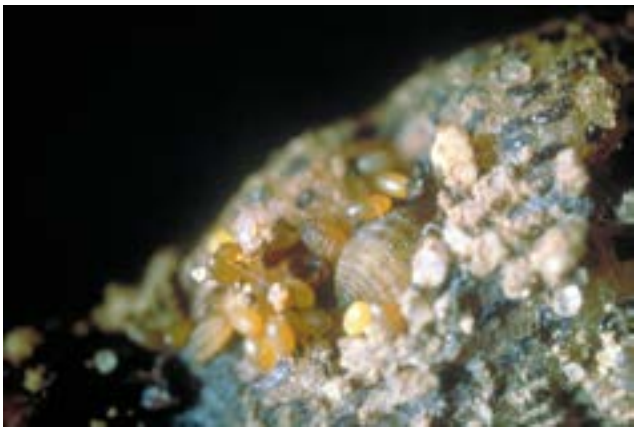

Figure 13. Grapevine scale. Photo: Central Science Laboratory, Harpenden , British Crown, Bugwood.org.

The second instar look very similar to the first instar but are slightly larger and, depending on species, can be darker in colour. Some species, including the grapevine scale, develop through to a third instar. Frosted scale have only two instars before they develop into a mature female. Most scale overwinter as either the second or third instar. When the vine leaves begin senescence, the scale migrate back to the spurs and main cordon where they seek protection under bark for winter. The scale grows rapidly in spring to mature into a female confined under a protective outer shell. The female then lays between 100–2000 eggs depending on the species (Camacho and Chong 2015).

Figure 14. Lifecycle of scale insects. 1. Eggs under mature female. 2. Crawlers emerging. 3. Crawlers migrating to leaves. 4. 2nd instar/nymphs on basal leaf. 5. 2nd or 3rd Instar overwintering on spurs. 6. Female growing rapidly in spring. 7. Mature females. 8. Eggs visible under mature female.

Impact of scale on the vineyard

The small size and inconspicuous habits of soft scales can make them difficult to find. The presence of ants and sooty mould on leaves and fruit is often what is noticed first. On closer inspection, ants farming the scale for the honeydew will be seen. Alternatively, the dead mature scale shells (from the previous season) and the overwintering juvenile scales are found during pruning as they are easy to see after leaf fall in winter. Scale numbers are often underestimated because juveniles overwinter on the underside of canes or spurs and underneath bark on the trunk or cordon of the vines. The identification of different species is difficult during winter as the immature stages of the different types of scale are very similar (Buchanan 2008).

Scale not only produce honeydew that is colonised by black sooty moulds causing fruit to be downgraded or rejected, they also cause delayed budburst (Figure 15), weaken canes and reduce the photosynthetic capacity of leaves.

Scale also have the potential to spread viruses through the vineyard. The presence of some viruses, such as grapevine virus type A (GVA) which causes Shiraz disease (SD), can limit the ability to top work a block. These viruses can also impact fruit quality.

Vines infested with scale have greater susceptibility to bunch rots. Scale can move on to bunches and cause a wound point where they feed. The feeding site then becomes an entry point for botrytis and other secondary moulds. In addition to botrytis, bunches can become covered in honeydew and then encased in black sooty mould (Figure 16). Most wineries have a 3-5% tolerance for moulds on fruit; hence rejection levels can eb reached easily if scale insects are present in the vineyard.

Control of scale

Control of scale needs to be a multi-pronged approach. There are few chemical options available for scale control, so overall vineyard management needs to be implemented. Mechanical control is an option for some growers, for example cane pruning blocks can significantly reduce the load of scale in a vineyard. Controlling ant populations in and around the vineyard can also have an impact on scale populations. Removing ants allows the naturally occurring beneficial insects such as lacewings, parasitic wasps and ladybirds to feed on scale eggs and nymphs, thus reducing the overall number of scale in the vineyard.

The only pesticides currently registered for scale control are Movento (Spirotetramat) which is registered for suppression only and can be used during the season up to EL18. Alternatively, mineral and paraffinic oils or Chlorpyrifos (and other group 1B insecticides) can be sprayed through winter as a dormant spray only. Many wine companies require you to contact them prior to an application of group 1B insecticides. Other products may have an effect on scale but are either not registered for scale control or are not recommended for use on wine grapes destined for the export market.

Figure 15. Vineyard rows showing scale controlled with insecticide (left) and without insecticide causing delayed budburst (right).

Figure 16. Honeydew and sooty mould on shiraz fruit.

Conclusion

If you are noticing scale in your vineyard it is important to record or tag the vines so you can monitor the spread. You may not see the scale itself initially but if you can see ant activity and sooty mould, check the back of basal leaves for small scale nymphs. Scale will reduce the overall vigour of vines over time and will have an impact on fruit quality. If you see them act immediately, do not ignore the signs.

References

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