viti-notes
[understanding grapevine growth]

Research to Practice

Flowering and pollination

Viti-note Summary:

- Air temperature
- Soil temperature
- Variety
- Pollination
- Self- or cross-pollination?

Figure 1. Grapevine inflorescence at early (left) and later stage of flowering (right). (Photos courtesy of AWRI image collection)

Development of individual flower parts starts just before budburst and continues until flowering.

Flowering (also known as bloom or anthesis) occurs once the flower parts are mature. The mean daily temperature at the start of flowering can vary from 16°C to 20°C in Australian regions.

In Australia, flowering extends from early November (e.g. Hunter Valley, NSW) to late December (Tasmania); however, for 90% or more of Australian winegrape production, flowering typically commences in November.

The time of flowering is determined by air temperature, soil temperature, scion variety and other factors.

Air temperature

The period from budburst to flowering (BB-F) is very temperature-dependent. In fact, this period is much more temperature-sensitive than the periods from flowering to veraison or veraison to harvest. For hot regions, the period may be as short as 30 to 40 days but for cool regions as long as 100 days. The mean duration of the BB-F period ranges from 52 days for the Hunter Valley to 96 days for Tasmania. Similarly, the time of flowering can vary considerably from season to season as a consequence of temperature: cool seasons delay flowering relative to warm seasons. For example, for Cabernet Sauvignon in a cool region, there can be a 5-week difference between the earliest and latest start of flowering.

As a result, harvest date is largely determined by length of the BB-F period.

Soil temperature

Warm soils promote earlier flowering but the response is variety-dependent.

Other topics in this Viti-Notes series include:

- Bud dormancy and budburst
- Spring shoot growth
- *Flowering and pollination*
- Berry development - up to veraison
- Berry development - Ripening
- Defining berry ripeness
- Site factors influencing berry ripening processes and rates of ripening
- Restricted Spring Growth syndrome

Variety

In general, early bursting varieties tend to have early flowering.

Early flowering varieties include: Chardonnay, Pinot Noir, Pinot Gris, Malbec, Touriga.

Mid-season varieties include: Merlot, Riesling, Cabernet Sauvignon, Semillon, Shiraz, Grenache.

Late season varieties include: Carignan, Crouchen, Muscadelle.

Exposure to low temperatures in the week prior to flowering will delay the onset of flowering. Furthermore, once flowering has started, low temperatures will cause delay in opening. This is often associated with retention of caps and poor fruitset. Increase in temperature results in increased rate of cap fall—at less than 15°C, few flowers open, at 17°C they open normally; and at 20-25°C opening is rapid. Light intensity and rain appear to have no direct effect. Flower opening commences in the early morning once the temperature reaches 15°C, and is largely completed for that day by 10-11 am.

At flowering time, the cap is shed to expose the anthers and pistil. Normally, the petals detach themselves at their base and lift off as a cap. However, petals may separate in some flowers at the top and spread open, instead of being shed in the form of a cap Flowers that open in this way are known as 'star-flowers'.

Pollination

Once the cap falls, pollen is released and dispersed. Better release of pollen occurs in dry weather—both rain and strong winds reduce pollen density. If a pollen grain lands on the receptive tissue of the stigma, it may germinate and produce a pollen tube. Pollen germination is optimal at 26 – 32°C.

Self- or cross-pollination?

For many, if not most fruit crops, cross-pollination is essential for successful set. This is the case for both dioecious crops—such as kiwi fruit and pistachio where male and female flowers are produced on different plants, and monoecious crops—such as apples, almonds and olives where some varieties are self-incompatible. This necessitates careful choice and placement of suitable pollinators in orchard design. However, the commercial varieties of Vitis vinifera are normally self-pollinated, but cross-pollination is possible.

Wind appears to have little effect on grapevine pollination. Insects visit flowers but they don't appear to play an active role in pollination.

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Further information

Useful references:

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