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Development of inflorescence primordia in *Vitis vinifera* L cv. Chardonnay from hot and cool climates

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• Flower formation in grapevines follows 3 steps: 1) formation of **uncommitted primordia**, also called *anlagen*, within the latent buds; 2) differentiation of uncommitted primordia into **inflorescence primordia**; and 3) differentiation of inflorescence primordia into **individual flowers**. Steps 1 and 2 happen during the previous season, whereas Step 3 does not happen until budbreak of the current season. Thus, conditions during the previous season have an important influence on the number of inflorescences in the current season, and therefore, on *yield*.

• Even though the timing of the different stages of inflorescence development has been previously studied for varieties such as Sultana, Chenin blanc and Syrah, it has not been studied for the most widely planted white cultivar in Australia (Chardonnay), and no study had previously compared the influence of different climates on bud development. The goal of this study was to fill that gap.

• Starting at 4 weeks post-budbreak, and repeating regularly throughout the 2004/05 season, the authors collected 50 compound buds, from node #4 of 50 random shoots on vines growing either in a *hot* (22°C mean January temperature, 834 accumulated degree-days) or a *cool* climate (18°C mean January temperature, 530 accumulated degree-days). Once in the lab, and under a light microscope, they first dissected the primary bud from the compound bud. Then they isolated the minute primary bud apex encompassing the intact inflorescence primordium (anywhere from 100 to 200 µm) and examined it under a scanning electron microscope (SEM). The phenological stage of the shoots on the date of the different bud collections was also recorded. This allowed the authors to establish a connection between bud development stages and vine phenology.

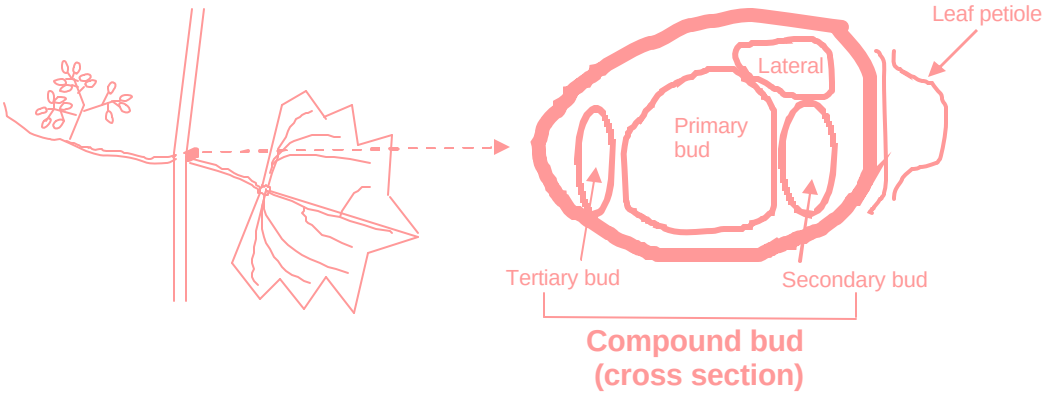

Diagram by authors, modified

• **Results**. 1) The first visible sign of inflorescence initiation inside the latent bud is the cleaving of the anlagen (the uncommitted primordium) from the apex. This was first observed 4 weeks after budbreak for the hot climate vines, and 6 weeks after budbreak for the cool climate vines. This was significantly earlier than that previously observed for other cultivars. 2) Once the uncommitted primordium is "committed" to form a cluster, it starts dividing into "branches". It is not until 3 or more branch primordia appear that the structure is referred to as an *inflorescence primodium.* The initiation of primary inflorescence branch primordia can be first discerned as the formation of round protuberances, each with a corresponding bract primordium underneath. This was first observed 6 weeks after budbreak for the hot climate vines, and 9 weeks after budbreak for the cool climate vines. That is, **inflorescence differentiation in the vines growing in a cool climate lagged 3 weeks behind those in a hot climate**.

Anlage (pl. anlagen)	**=**	***undifferentiated primordium (pl. primordia)***
Branch primordium	**=**	***inflorescence branch-to-be***
Bract primordium	**=**	***branch bract-to-be***
Inflorescence primordium	**=**	***group of 3 or more branch primordia + their respective bract primordia***
	=	***cluster-to-be***

• 3) Not only did climate affect the extent of bud differentiation, but **the size of the inflorescence primordia in the Chardonnay from a hot climate was significantly larger than those of vines from a cool climate**. 4) After these inflorescence primordia had formed, the authors did not observe any individual flower formation during winter dormancy. Individual floral parts did not start forming until 2 weeks prior to budbreak of the following season.

In summary, the authors found that reproductive development in Chardonnay is earlier than in other varieties previously examined, and that climate can affect both the timing and the extent of flower initiation –earlier and larger in hot climates. These observations may have implications for optimal timing of yield forecasting. You may want to check out the authors' fascinating SEM photos of developing inflorescences (I bet you never thought a beautiful grape cluster could have such humble beginnings). Also, for a chart of the vine growth stages the authors refer to throughout the text, you can go to http://www.blackwell-synergy.com/toc/ajgw/1/2 and click on the last article.

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