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Effects of chilling and garlic extract on bud dormancy release in Cabernet Sauvignon grapevine cuttings

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• **Chilling** is essential to terminate dormancy and allow for normal budburst. As a reference, this cold requirement can range anywhere from 50-400 hrs, at 7°C –less hours at colder temperatures- depending on variety. However, in many hot-climate regions, like Brazil, this cold requirement can be hard to meet.

• Currently, hydrogen cyanamide (H_2CN_2) is the only compound used to induce budbreak in grapevines. However, hydrogen cyanamide is highly toxic (category I= highest toxicity category) and faces imminent banning.

• In searching for alternatives, previous separate studies in Japan, Brazil, and Santa Rosa (California), have shown a positive effect of **garlic paste** (applied to the canes) in inducing budbreak in several fruit trees, and in grapevines. So these authors decided to examine the effect of chilling and garlic extract on budbreak of Cabernet Sauvignon, and compare it to the standard treatment with hydrogen cyanamide.

• Grapevine cuttings (3 replicates of 20 cuttings per treatment) were kept at chilling temperature (3.5°C) for various amounts of time (0, 168, 336, and 508 hours). The cuttings were then sprayed to "drip point" with 1.5% aqueous garlic extract (Bioalho), 3% aqueous garlic extract, 1.5% hydrogen cyanamide, or water (Control). After being in a growth chamber (25°C, 12 hr light/12 hr dark) for 35 days, budbreak was assessed by checking for any sign of 'green".

•**Results**. All treatments advanced budbreak compared to the Control. The most effective treatment was 1.5% H_2CN_2, which advanced budbreak by 2 weeks, achieving 80% at 35 days post-treatment. The next best treatment was 3% garlic extract, which attained 70% budbreak after 35 days in cuttings that had received only 168 chilling hours or more (while budbreak in the control remained at 20%). The authors also found that the chilling requirement for Cabernet Sauvignon was between 168 and 336 chilling hours (<6°C).

• Other authors showed that the way hydrogen cyanamide works is by inhibiting the enzyme *catalase*, responsible for breaking down hydrogen peroxide, H_2O_2, which is known to accumulate in bud tissue. Apparently, the presence of an excess of H_2O_2 triggers genes that are able to release bud dormancy. According to other others, the active substances in garlic extract are volatile compounds containing sulfur and an allyl group (- CH_2CHCH_2). However, the physiological role of these compounds in breaking bud dormancy has not been established.

Here in the US, we certainly won't need to resort to garlic to break bud dormancy, but this work is useful for New World hot-climate countries who are embracing Viticulture. *[Whereas I wrote this sentence with Central America countries in mind, it is clearly incorrect. As Dr. Matthew Fidelibus brought to my*

attention: "Hydrogen cyanamide is used by table grape growers in the Coachella valley, California, where it is not uncommon to have insufficient chilling hours. There are also areas along the central coast which do not accumulate enough chilling hours each year to ensure uniform bud break (…). One could have a relatively mild climate and still not accumulate many chilling hours over the winter."]

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