

Pyrazines:

A Double-Edged Sword

THESE **VOLATILE ORGANIC COMPOUNDS**
CAN BE DREADFUL OR DESIRABLE

by Deborah Parker Wong

Pyrazines—too much of a good thing and they're a fault; absent in varieties like Sauvignon Blanc and they leave something to be desired. In relation to bitterness, pyrazines can be the source of a flaw or fault, but that's just one of many ways they can impact wine flavor. Ask any maker of Bordeaux varieties, someone who grows grapes in a marginal climate or experiences a colder vintage, about their concerns, and they'll surely count elevated pyrazines among them.

Admittedly, pyrazines are a double-edged sword. Without them we wouldn't have the expansive range of wine styles that are possible from Sauvignon Blanc or the markers that help us identify the family of Bordeaux varieties and the likes of Carmenère. But in the extreme, pyrazines dominate wine at the expense of other varietal flavors. We've all tasted them—from pungently herbaceous boxwood (the polite reference to cat pee) and jalapeño pepper in Sauvignon Blanc to rank green bell pepper or even weeds in red wines that haven't achieved physiological ripeness.

Pyrazines are the family of volatile organic compounds most widely represented in food aromas. They are categorized into three groups, and we're concerned with those present in the natural state in plants and, more specifically, grapes. The methoxypyrazines found in grapes include 3-isobutyl-2-methoxypyrazine (IBMP) which is most com-



only found in the *Capsicum* or pepper family and characterized by flavors of green peas, bell pepper, tomato leaf and asparagus. IBMP is associated with rankness in wine and differs from capsaicin, a compound only found in the placenta and seeds of peppers.

Aromas and flavors of coffee, earth, potatoes, hazelnuts and chocolate can indicate the presence of the methoxypyrazine isopropyl methoxy pyrazine (IPMP). This pyrazine can cause coffee to smell like potatoes but typically isn't attributed to flaws or faults in wine.

Once established in finished wine, it's hard to hide unpleasant pyrazines because they have a very low detection threshold—one to two parts per trillion (ppt) for IPMP and 10–15 ppt for IBMP. In Sauvignon Blanc, pyrazines drop dramatically in the 20 days after veraison, and specific wine styles can be achieved by picking along a spectrum of ripeness during this time. A common winemaking technique is to precisely time picks for different aromas and flavors and blend the finished wines to create a more complex style.

The least amount of ripeness results in wines with distinct herbaceous and vegetal notes, i.e., black currant leaf, lemongrass and boxwood, which characterize New Zealand Sauvignon Blancs. Further along the spectrum is a window of floral notes—elderflower, honeysuckle and tropical flowers—that progresses to the citrus family of lemon, lime, grapefruit and tangerine, and green fruits like gooseberry and kiwi. Riper flavors of stone fruit from white peach to apricot and tropical fruits (passion fruit, lychee, mango, papaya) evolve into the ripest expression of the variety as straw, melon (cantaloupe, honeydew) and figs.

Certain aromas in Sauvignon Blanc, including passion fruit, black currant leaf and grapefruit, can also be attributed to the volatile thiol mercaptohexanol which is produced by yeast from precursors in the juice. If a wine is overtly grapefruit, both pyrazines and mercaptohexanol could be contributors.

Of the Bordeaux cultivars that exhibit the highest levels of methoxypyrazine are those that count Cabernet Franc as a parent—namely Cabernet Sauvignon, Merlot and Carmenère, Malbec being the exception as it is a cross of Magdeleine Noire des Charentes and Prunelard. As such, pyrazines are an inherent varietal characteristic that contributes complexity when expressed in balanced amounts in finished wine.

But overt greenness in these varieties can be attributed to a number of factors in addition to methoxypyrazines. Unripe phenolics, including and most commonly tannins;

hexanol, which is a higher alcohol; and the influence of resinous plants—eucalyptus, mint, boldo, esteva, *garrigue*—which contribute terpenes like eucalyptol and linalyl acetate are commonly mistaken as pyrazines. When these factors are compounded wines can seem startlingly green, with pyrazines usually taking all the blame.

In addition to the fault of lady bug taint, from IBMP (covered in detail in the June/July 2016 column), the pyrazine fault of geranium taint is one that usually afflicts sweet white wines. Gardeners have no trouble recognizing the distinct, pungent aromas of *Pelargonium*, commonly known as geranium. The fault originates when lactic acid bacteria metabolize potassium sorbate (a common stabilizing agent) in wine and can be prevented by the addition of sulfur.

Prevention is the cure for insuring that pyrazines are held in check in the vineyard. Key viticultural practices designed to minimize methoxypyrazines in grapes focus on adapted vineyard architecture, deficit irrigation and dry-farming, pruning to reduce vigor and rapid shoot growth, canopy management to optimize vine balance and light to clusters pre-veraison, and cluster-thinning to manage yield. For varieties like Sauvignon Blanc, vine balance is key; undercropping results in the same levels of pyrazines as vines that are cropped too heavily.

Once vinified, removing overt pyrazines from a wine is a time consuming, costly and not particularly effective practice. Options include thermovinification, or heating the must or wine to approximately 60°C to 80°C for a short period, micro-oxygenation, the technique invented to soften harsh tannins in red wines like Tannat, filtration with activated charcoal and, lastly, extended oak aging.

Bottle-aging can reveal the pyrazines that are masked by more dominant flavors in young red wines. In early drinking, fruit-forward vintages of Bordeaux and California Cabernet Sauvignon and blends, pyrazines can start poking through as the fruit begins to recede after about eight to ten years in bottle. Often described as celery salt and herbes de Provence in older red wines, this is when pyrazines reveal their most complex contribution to varietal character. §)

