Piperonal in Flavors

Beyond French vanilla, this ingredient surprisingly fits a wide and diverse range of flavors.

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Piperonal (FEMA# 2911, CAS# 120-57-0), probably better known as heliotropine, is really only a bit player in nature but, in contrast, it is often cast in a leading role by the flavor industry. The character of this popular ingredient closely resembles heliotrope flowers. It is also somewhat reminiscent of hay and vanilla, with a distinct floral, powdery edge. Even though the odor of piperonal does not really resemble the odor of the members of the coumarin family particularly closely, the powdery aspect is a very important note that they both have in common. This single aspect of similarity has ensured that piperonal has played a significant role historically in the highly problematic replacement of coumarin.

Piperonal is especially helpful in the ubiquitous French-style vanilla flavors. It is normally only present at less than 1 ppm in genuine Bourbon vanilla beans and plays an equally insignificant role in genuine French Tahitian vanilla beans (where the distinct character is actually driven mainly by anisyl derivatives). Despite this relative analytical insignificance, most commercial French-style vanilla flavors on the market today are dominated by piperonal. Beyond its importance in French-style vanilla flavors, and the very closely related caramel flavors, this unique raw material can be used in a much wider and more diverse range of flavors.

The dose rates given below are the levels of piperonal to be used in flavors that are intended to be dosed at 0.05% in a ready-to-drink taster, beverage or bouillon.

Brown Flavors

French vanilla: This powdery, floral note is extremely attractive (if not exactly authentic) at around 3,000 ppm in French-style vanilla bean flavors. In my opinion, lower levels are more subtle, but the attraction of this ingredient is obvious.

Bourbon vanilla: This ingredient is not so obviously associated with Bourbon vanilla, but the effect in Bourbon-style vanilla bean flavors is still attractive at much more subtle at levels, in the region of 20 ppm.

Butterscotch: High levels of piperonal, around 3,000 ppm, are ideal in most of the butterscotch family of flavors.

Caramel: The relative combination of vanillin and piperonal in caramel flavors is very similar to that in French-style vanilla flavors, and the ideal level is similar, around 2,000 ppm.

Toffee: A level of 2,000 ppm is also a good starting point in toffee flavors, which often have a similar structure to caramel flavors.

Malt and malted milk: The best level of addition of piperonal depends on the style of favor. Strong malt flavors can accommodate up to 2,000 ppm, but more subtle malted milk flavors are better served by levels of addition nearer 200 ppm.

Chocolate: The floral, powdery aspect of this raw material is a very effective bonus when used as part of the vanilla character in all types of chocolate flavors at around 400 ppm.

Brown sugar: Moderate levels, in the region of 200 ppm, work well to lift the profile of brown sugar and molasses flavors.

Maple: Like brown sugar flavors, maple flavors can easily tend to be heavy and dull. A similar level of 200 ppm of this ingredient works equally well to brighten the profile.

Coffee: Piperonal does not contribute significantly to coffee character in nature, but it can be very effective at around 100 ppm in coffee flavors, brightening and adding a pleasant floral note.

Fruit Flavors

Cherry: There are many different styles of cherry flavors, and the ideal level of piperonal is equally varied, ranging from a high of 3,000 ppm in wild cherry flavors down to a low of 300 ppm in more realistic styles.

Banana: The powdery, floral note of this ingredient is very helpful in banana flavors. Levels vary, but 300 ppm is a good starting point.

Raspberry: In a similar way, 200 ppm is very effective in raspberry flavors, adding an attractive powdery aspect to the dominant floral, violet note.

Blackberry: Two hundred ppm also works very well in blackberry and bramble flavors, combining especially effectively with the powdery musk note.

Mango: Piperonal can be helpful in mango flavors by counteracting the tendency to be too cloying, in addition to adding complexity to the mango skin top note, at levels around 100 ppm.

Rhubarb: Many rhubarb flavors seem to be very simplistic and the addition of 100 ppm of piperonal adds a little complexity and lift.

Strawberry: This ingredient is often used in strawberry flavors in conjunction with vanillin and, in my opinion, modest levels have the best effect, in the region of 50 ppm.

Blackcurrant: A level of 50 ppm also works well in most styles of blackcurrant flavors, adding welcome lift and brightness.

Apple: Piperonal is not ideal for all styles of apple flavor, but it can be helpful brightening juice-style apple flavors at around 50 ppm.

Cranberry: Modest additions, as low as 30 ppm, can help to lift the floral note of authentic-style cranberry flavors.

Dairy Flavors

Cream: One hundred ppm of piperonal is a reasonable level for realistic flavors, but much higher levels, up to 1,000 ppm, can be used to generate an attractive, if somewhat fantasy, effect.

Butter: A level of 100 ppm also works well in general for most types of butter flavors, offsetting the dominant creamy and buttery notes quite effectively.

Other Flavors

Honey: This raw material is excellent in most styles of honey flavors. Higher levels, in the region of 1,000 ppm, work well for clover honey flavors. Much lower levels, down to 50 ppm, work better in floral honey flavors.

Coconut: The dominant lactone notes in coconut flavors are often modified by a haylike character, and piperonal complements this very successfully at around 200 ppm.

Hazelnut: Only quite modest levels, in the region of 50 ppm, are required to add helpful complexity to hazelnut and praline flavors.

Rum: Rum flavors also only really require a modest addition of piperonal, around 50 ppm, to add depth and complexity to a flavor category than can often seem very simplistic and heady.

Whiskey: Whiskey flavors can rarely be described as heady, but the effect of this chemical in whiskey flavors is very similar to that in rum flavors. The ideal level varies with the style of flavor, but is noticeably lower, around 20 ppm.