Eugenol in Flavors

There are applications for this highly distinctive ingredient in a range of profiles.

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Eugenol (FEMA# 2467, CAS# 17-53-0), or 2-methoxy 4-prop-2-enyl phenol, is so strongly associated with clove that it is easy to miss the multitude of other uses for this surprisingly versatile raw material. The character of eugenol is strongly reminiscent of clove buds but is also recognizable as an integral part of the broad family of sweet smelling substituted phenols.

The problem for flavorists, I suspect, is the clove character is very familiar and gives rise to the understandable suspicion that the use of any level of eugenol in any flavor will result in a recognizable clove note rather than integrate smoothly into the flavor. The dose rates given throughout this article are the levels suggested for use in flavors intended to be dosed at 0.05% in ready-to-drink beverages or simple bouillons.

Herb and Spice Flavors

Clove buds: Levels of eugenol in clove-based flavors vary considerably, especially in blended spice flavors, but 10,000 ppm is a good starting point.

Allspice: Ten thousand ppm is also a good level of addition for eugenol in allspice (pimiento) flavors and Jamaican jerk-style spice blends.

Ceylon cinnamon: The presence of eugenol is one of the key differences between true cinnamon and cassia; 500 ppm is a good level in Ceylon cinnamon flavors.

Bay laurel: In bay leaf (laurel) flavors, especially bouquet garni-type blends, 500 ppm works well.

Sweet basil: Again, levels vary quite notably in sweet basil flavors. A typical level is in the region of 300 ppm.

Nutmeg: More modest levels work best in spice flavors based on nutmeg or mace; ideally around 100 ppm.

Savory Flavors

Smoke: Eugenol is an important part of the phenolic complex at the heart of all smoke flavors. The ideal use level depends on the profile required but 100 ppm is a good place to start.

Ham: The smoke component of eugenol carries over well into ham flavors, with varying levels depending on the level and type of smoked note; 50 ppm is a good starting point.

Bacon: The same comments apply equally to bacon flavors, again with 50 ppm as a good initial use level.

Tropical Fruits

Banana: One of the most effective demonstrations of a simple blend of key recognition characters is the mixture of isoamyl acetate and eugenol. Within a reasonably wide range of mixtures, the character spectacularly snaps into banana from being separate clove and tutti-frutti notes. The ideal level of eugenol in authentic-tasting banana flavors is 1,000 ppm.

Mango: Compared with banana, the role of eugenol in mango flavors is a distinct step down but the addition of 30 ppm enhances realism.

Guava: Guava flavors can easily be too simplistic; the addition of 10 ppm of eugenol can add complexity.

Lychee: Even lower levels are appropriate in the intrinsically subtle category of lychee flavors. Starting at 10 ppm, eugenol can add complexity to the floral rose note.

Berry Flavors

Cherry: Cherry flavors vary considerably in style, ranging from fruity to almond, through more authentic. Eugenol fits well into all these different styles with an ideal level of addition in the region of 100 ppm.

Blackberry: At 100 ppm, eugenol also is highly effective in fresh blackberry flavors, adding authenticity and complexity.

Raspberry: Slightly less, around 60 ppm, is the ideal level of eugenol addition in fresh raspberry flavors, offsetting the raspberry ketone effectively and adding realism.

Blueberry: At levels around 60 ppm, eugenol contributes significantly to the skin character of blueberry. It is even more effective in closely related bilberry flavors.

Cranberry: The skin note is also a vital component of cranberry flavors. Here, the ideal eugenol level is around 40 ppm.

Blackcurrant: A very similar berry skin effect is also achieved in realistic blackcurrant flavors at around 30 ppm eugenol.

Strawberry: Only low levels of addition are needed in fresh strawberry flavors; around 20 ppm.

Other Fruit Flavors

Plum: This flavor category is popular in Asia, and eugenol is an important part of the profile of authentic flavors, ideally used at around 200 ppm.

Grape: White grape flavors can benefit from a modest addition of eugenol; 10 ppm is probably the best level. However, red grape flavors derive much greater benefits from the skin-enhancing effects at 50 ppm.

Watermelon: Watermelon is an intrinsically difficult flavor category, because the connection between the vast majority of flavors on the market, with dated and simplistic tutti-frutti profiles, is tenuous at best. Eugenol is interesting in more authentic flavors at 30 ppm.

Peach and apricot: In all different styles of peach and apricot flavors, 20 ppm eugenol is highly effective, enhancing the realism and depth of the flavors.

Orange: Eugenol might seem an unlikely addition to citrus flavors but is quite effective at 10 ppm in sweet orange flavors.

Lemon: The same 10 ppm level is similarly helpful in lemon flavors, offsetting some of the harsh notes in lemon juice flavors.

Grapefruit: 10 ppm also works well in grapefruit flavors, especially those that have dominant catty sulfur notes.

Brown Flavors

Coffee: Levels in coffee flavors range from 10 ppm to 200 ppm, depending on the degree of burnt and smoky character of the flavor.

Cocoa and chocolate: Eugenol contributes to the mildly smoky character of good quality cocoa beans at around 60 ppm in cocoa and chocolate flavors.

Vanilla: Authentic Bourbon vanilla bean flavors are complex, and eugenol plays a small but important role at levels in the region of 30 ppm.

Black tea: Levels in black tea flavors are even more subtle and 10 ppm makes a good starting point.

Mint Flavors

Peppermint: Despite the fact that eugenol is quantitatively a minor component of peppermint in nature, it plays an important role within the overall profile, adding realism at around 20 ppm in peppermint flavors.

Spearmint: At 20 ppm, eugenol has a similarly beneficial effect in spearmint flavors, integrating what can sometimes be an over-simplistic profile.

Other Flavors

Walnut: Walnut flavors, and to a lesser extent, other nut flavors, benefit greatly from the added depth and richness of eugenol when used at around 200 ppm.

Rose: Far too many rose flavors claiming to be natural are derived from geranium oil, with its unpleasantly incompatible minty component. Eugenol is a key minor component of genuine rose and adds realism at 100 ppm.

Honey: Honey flavors cover a broad range of profiles but eugenol is useful in most of them, adding depth and authenticity at around 100 ppm.

Whisky: Lastly, spirit flavors in general can benefit from modest additions of eugenol but this is especially true of whisky flavors; 50 ppm is a good starting point.
