



Ethyl Acetoacetate

Although mostly used in apple and strawberry flavors, this ingredient can add punch to numerous other fruit flavors.

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Ethyl acetoacetate, also known as ethyl 3-oxobutanoate (FEMA# 2415, CAS# 141-97-9), is only very sparingly found in nature. It has been reported in coffee, passion fruit and strawberries, but I suspect it is only an occasional, extremely minor, partner of its much more abundant relative ethyl 3-hydroxybutanoate. Nevertheless, the character of this ingredient is extremely natural and subtle, representing a very attractive mixture of green notes with an apple-oriented fruit background. It is so natural tasting that it can be used successfully at relatively high levels.

The most obvious uses, by far, are apple and strawberry flavors, but this useful ingredient is capable of adding the illusion of authenticity and realism to a very wide range of different flavors.

One small word of caution needs to be added regarding the practical use of ethyl acetoacetate. The common practice of adding a little water to propylene glycol solvent should be avoided if ethyl acetoacetate is used. Even relatively slow, small-scale reactions between ethyl acetoacetate and water can generate significant amounts of carbon dioxide, possibly enough to break a glass bottle.

The dose rates given throughout this article are the levels suggested for use in flavors that are intended to be dosed at 0.05% in a ready-to-drink beverage or in a simple bouillon.

Berry Flavors

Strawberry: Despite the fact that the character of ethyl acetoacetate most obviously resembles apples, the most effective use of this ingredient is in strawberry flavors. Very high levels, up to 25,000 ppm can be used to good effect, simultaneously enhancing freshness and fruit characters. In my opinion, the ideal level of addition is a little more conservative, nearer 8,000 ppm.



Blackcurrant: A level of 8,000 ppm of this ingredient can also benefit realistic blackcurrant flavors that aim for a more fresh and fruity style rather than the common candy style.

Raspberry: The effect of enhancing fresh and fruit characters is very similar in raspberry flavors, but the best level of addition is lower, around 5,000 ppm.

Blackberry: The addition of 5,000 ppm of ethyl acetoacetate is also highly effective in blackberry flavors, adding welcome natural freshness.

Blueberry: Blueberry flavors can easily suffer from an excess of floral notes, and the fresh, fruity character of this ingredient blends in very well at 5,000 ppm.

Cherry: Ethyl acetoacetate has an effect in cherry flavors that is very comparable to that in blackcurrant flavors. It can enhance realistic flavors at around 5,000 ppm, but has very little role to play in the more traditional benzaldehyde flavors.

Grape: The ideal level of use in grape flavors can vary considerably. Levels around 500 ppm are best in anthranilate-dominated flavors, but much higher

levels, around 5,000 ppm, work very well in more floral styles such as Muscat.

Tropical Flavors

Pineapple: Ethyl acetoacetate is highly effective in pineapple flavors, especially at very high levels, around 25,000 ppm, in fresh fruit-style flavors.

Guava: It is equally effective in guava flavors at 25,000 ppm, offsetting the cloying nature of the other ingredients and introducing a welcome fresh fruit character.

Passion fruit: Some passion fruit flavors can be too heavily dependent on ethyl esters, and quite high levels of this ingredient, around 10,000 ppm, can work well. However, a level of 4,000 ppm is a better level in more balanced, natural-tasting flavors.

Kiwi: Kiwi flavors are delicate, and 5,000 ppm of this ingredient adds freshness and lift without intruding upon the basic character of the fruit.

Watermelon: Many watermelon flavors are strongly tutti frutti in character, but more authentic styles of flavor can be improved by the addition of 4,000 ppm of ethyl acetoacetate. Other types of

melon flavor, especially cantaloupe, can benefit from a similar level of addition.

Banana: Four thousand ppm is also the ideal level of addition in realistic banana flavors which, like guava flavors, can easily lack freshness.

Fig: The same comments apply to fresh fig flavors, and the best level of addition is also in the region of 4,000 ppm.

Lychee: Lychee flavors are subtle, but often dominated by a floral rose element. A level of 2,000 ppm of this ingredient adds naturalness, welcome complexity and lift.

Citrus Flavors

Lemon juice: Flavor styles that aim to recreate old fashioned lemonade (coupled with exaggerated jasmine notes) can benefit from quite high levels of this ingredient, up to 10,000 ppm, but lower levels, around 5,000 ppm, are more realistic in lemon juice flavors.

Lime: This component plays little part in the typical distilled lime style of flavor, but it can be very effective at levels up to 5,000 ppm in more fresh, juicy styles of flavor.

Mandarin: Moderate levels, in the region of 2,000 ppm, work well in mandarin flavors that aim more in the direction of juice than peel.

Orange juice: The character of orange essence oil seems to bear a striking resemblance to ethyl acetoacetate, so much so that there is a temptation to use high levels of this ingredient in orange juice flavors. In reality, caution is called for, and the best level of addition is around 500 ppm.

Grapefruit: Five hundred ppm is also a great level of addition for fresh grapefruit juice flavors, counterbalancing the sulfur notes quite effectively.

Other Fruit Flavors

Apple: Despite the fact that ethyl acetoacetate smells distinctly of apples, I think it is best to avoid excessive levels of addition in apple flavors (even though many styles of apple flavors will tolerate them). One thousand ppm is a very effective and realistic level.

Peach: In a similar way, even though high levels of this ingredient can be used in fresh peach flavors, the best level is around 1,000 ppm.

Apricot: Slightly lower levels, around

600 ppm, are ideal for apricot flavors, adding fresh and fruity notes.

Pear: Similar levels, around 500 ppm, are all that is required in realistic pear flavors to add a welcome hint of freshness.

Other Flavors

Hazelnut: Modest levels of addition, around 500 ppm, are interesting in hazelnut flavors and add realism.

Rum: Low levels, around 200 ppm, are helpful in alcoholic drink flavors, especially rum flavors.

Coffee: As one of the only three natural abodes of this ingredient, one might expect comments under this flavor category highlighting, perhaps, the freshly brewed notes imparted by ethyl acetoacetate. In reality, I have to confess to never having made this ingredient generate any positive effect in coffee flavors.

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