2,4,6-Trimethyldihydro-4H-1,3,5-dithiazine

Application in meat, fish and seafood, and other savory flavors

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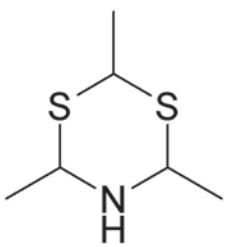
In the wide cornucopia of different profiles a flavorist will work on in a lifetime, there is no question that heated flavors in general, and meat flavors specifically, are the most complex and challenging. Good, realistic, meaty notes are not exactly abundant and, unfortunately, most of the best meaty notes have quite a high degree of profile specificity—an ingredient that will work well in chicken may prove to be of limited use in roast beef and vice versa.

2,4,6-Trimethyldihydro-4H-1,3,5-dithiazine (FEMA# 4018, CAS# 638-17-5; **F-1**), sometimes called thialdine, is one of the few exceptions to this rule. It is generated naturally by the combination of acetaldehyde, hydrogen sulfide and ammonia formed in the degradation of sulfur-containing amino acids. Hence it is found in nature in a very wide variety of cooked foods, ranging from beef and pork to shrimp and squid, although in some analyses it may actually be an artifact formed during the extraction process. Perhaps the most obvious profile affinity for this chemical is roast beef, but it also fits very well into the meaty aspect of a wide spectrum of flavor profiles. It can variously be described as meaty, roasted, cooked and eggy, and forms a central component of many "heated" flavor profiles.

F-1. 2,4,6-Trimethyldihydro-4H-1,3,5-dithiazine



Several other interesting dithiazines are used in flavors. 2,4,6-Triisobutyl-5,6-dihydro-4H-1,3,5-dithiazine (FEMA# 4017, CAS# 74595-94-1) is the most important. It is extremely characteristic of fried bacon, and so while it is capable of being used in a wide range of different profiles it can only play a minor role because of its specificity. Thus, it is nowhere near as generally useful as 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine.

2-Ethyl-4,6-dimethyl-5,6-dihydro-4H-1,3,5-dithiazine (FEMA# 4667; a mixture of the 2-ethyl-4,6-dimethyl and the 4-ethyl-2,6-dimethyl derivatives) is similar in character and range of use to 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine, but possibly slightly more orientated to seafood uses. 2-Isopropyl-4,6-dimethyl-5,6-dihydro-4H-1,3,5-dithiazine (FEMA# 3782; also covers a mixture of the 2-isopropyl-4,6-dimethyl and 4-isopropyl 2,6-dimethyl derivatives) is in the same general odor group but is slightly more useful in cocoa flavors. 2-Isobutyl-4,6-dimethyl-5,6-dihydro-4H-1,3,5-dithiazine (FEMA# 3781, another mixture of the 2-isobutyl-4,6-dimethyl and 4-isobutyl-2,6-dimethyl derivatives) is distinctly more nutty in character and is more directly applicable to hazelnut, peanut and, to a lesser extent, cocoa flavors.

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 simple bouillon or ready-to-drink beverage.

Meat Flavors

Roast beef: 2,4,6-Trimethyldihydro-4H-1,3,5-dithiazine can form the foundation of a good roast beef flavor. Levels of use can vary dramatically, depending on the effect desired, from around 100 ppm, for a subtle effect, up to as high as 2,000 ppm, for a heavily roasted meaty character, fabulously reminiscent of the pan scrapings from roasting beef.

Boiled beef: Although this ingredient fits well into roasted meat flavors, it is almost equally at home when the profile is boiled rather than roasted. The range of levels of use is a little lower but also quite varied, ranging from 100–1,000 ppm.

Burgers: Flavors in burgers are a distinctly special case and can vary in composition depending on the specific processing conditions. Levels of 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine in the region of 200 ppm in flavors can cover, to a degree, the unpleasant "warmed-over" character in pre-cooked burgers.

Ham: After roast beef, ham flavors are the most obviously important area of use for this chemical. It adds depth and realism to a profile that can be overly reliant on smoke notes. Levels of use vary, but can also be as high as 2,000 ppm.

Pork: In a similar way 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine is highly effective in all styles of pork flavors, including cured pork and pork sausages, but the levels are typically lower, in the region of 500 ppm.

Roast chicken: The aroma of roast chicken has an almost coffeelike aspect and this ingredient has no similarity whatever to that profile. Nevertheless it is highly useful and adds meaty character and realistic depth to roast chicken flavors at levels of use in the region of 100 ppm in white meat flavors and up to 500 ppm in dark meat chicken flavors.

Boiled chicken: Long-boiled chicken is an important profile in Asia and 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine can play an important part in recreating that effect. Levels of use can be higher than typically used in roast chicken flavors and can easily range above 500 ppm.

Lamb: In lamb flavors, 500 ppm of this chemical is also an effective level, giving meaty and roasted characters and de-emphasizing the fatty notes.

Bacon: This ingredient is not as central to the character of bacon flavors as it is in other types of meat but it can, nevertheless, add authenticity and welcome complexity at around 50 ppm, especially when used in conjunction with 2,4,6-triisobutyl-5,6-dihydro-4H-1,3,5-dithiazine.

Fish and Seafood Flavors

Prawn, scampi, lobster and shrimp: 2,4,6-Trimethyldihydro-4H-1,3,5-dithiazine is superb in all these flavors, realistically adding the strong meaty note that underlies the seafood character. Levels of use can range up to 500 ppm or 1,000 ppm in flavors.

Squid and calamari: These profiles contain a significant meaty note and so 500 ppm of this chemical in a flavor is a good starting point.

White fish: Low levels of this ingredient are appropriate in this delicate and challenging profile type, especially if the character is fried; 100 ppm can be quite effective.

Other Savory Flavors

Egg: Although 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine is notably meaty, it also has a distinct eggy profile and fits well into all cooked egg flavors. Levels of use vary but can easily top 2,000 ppm in a flavor.

French fries: The best french fries have a hint of meaty character. Levels of use of this chemical can vary widely, especially since this application can require a great deal of heat stability; 500 ppm is a good starting point.

Black and white truffles: These flavors can often appear extremely simple and lack realism. 2,4,6-Trimethyldihydro-4H-1,3,5-dithiazine supplies an attractive level of added complexity at around 500 ppm in truffle flavors.

Fried onions: The use of this ingredient in fried and boiled onion flavors is relatively obvious, given the meaty nature of their profiles; 500 ppm is a typical use level.

Green onions: Much less obviously, it also works well in raw onion style flavors, including chive and spring onion, at around 200 ppm.

Non-savory Flavors

Hazelnut: Such an obviously meaty ingredient would seem to have little place outside the realm of savory flavors, but 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine works surprisingly well in nut flavors, especially hazelnut; 400 ppm is a reasonable starting level.

Chocolate and cocoa: There is something distinctly eggy about the profile of good quality cocoa and this chemical can be used at widely varying levels in chocolate flavors depending on the effect that is desired. Very dark chocolate or cocoa flavors can easily accommodate 400 ppm, but milder, milk chocolate styles can be improved by the addition of just 20 ppm.

Peanut and peanut butter: After hazelnut, peanut is the next best application in the nut area, but the levels are rather lower, in the region of 100 ppm in flavors.

Condensed milk: Only subtle additions are needed in condensed and other heated milk flavors, but even 50 ppm of 2,4,6-trimethyldihydro-4H-1,3,5-dithiazine can round out the other dominant sulfur notes and contribute to a more authentic cooked character.