Formal Recommendation
From: National Organic Standards Board (NOSB)
To: the National Organic Program (NOP)

Date: April 26, 2019

Subject: Calcium acetate

NOSB Chair: Harriet Behar

The NOSB hereby recommends to the NOP the following:
Rulemaking Action: None

Statement of the Recommendation:
Calcium acetate should not be added to the National List.

Rationale Supporting Recommendation (including consistency with OFPA and Organic Regulations):
Based upon evidence reviewed in the Technical Report and public comments, this material is not essential to organic agriculture. Other materials are already available for delivering calcium more readily to plants. For sunscald protection, other alternatives also exist including cultural practices and other materials that are already approved. Without compelling evidence that this material is better than other, already available materials, calcium acetate is not essential to organic agriculture.

NOSB Vote:

Classification Motion:
Motion to classify calcium acetate as synthetic
Motion by: Steve Ela
Seconded by: Harriet Behar
Yes: 14 No: 0 Abstain: 0 Absent: 0 Recuse: 0

Listing Motion:
Motion to add calcium acetate at §205.601
Motion by: Steve Ela
Seconded by: Emily Oakley
Yes: 0 No: 14 Abstain: 0 Absent: 0 Recuse: 0

Motion Failed

National Organic Standards Board
Crops Subcommittee
Petitioned Material Proposal
Calcium Acetate
January 29, 2019

Summary of Petition [Calcium Acetate]:

Calcium acetate can occur naturally but is more often formulated by chelating finely ground limestone (calcium carbonate) with acetic acid. During this process calcium acetate is formed and comprises about 5% of the calcium in the final product. The remainder of the final product is primarily calcium carbonate. Other materials such as xantham gum and/or humic acids may be added to make a proprietary product.

Calcium acetate has a variety of potential uses. This petition asks for approval for organic use as a soil amendment, plant micronutrient, soil pH adjuster and as a sunscald protectant. Calcium acetate is also currently registered for yellowjacket control in conventional crops. In each of these uses, the calcium acetate product is mixed with water and applied by spray to the crop, soil, or structure/covering.

In the crops/soils use, the calcium acetate has an advantage in that it is much more water soluble than calcium carbonate and is more readily available to the plant. Other traditional sources of calcium, such as calcium carbonate, do not become water soluble until they have been acted on by soil microbes or acidic conditions. Products that include calcium acetate as well as other slower acting calcium sources can have both an immediate impact on the plant as well as an extended release effect as those less soluble materials are made plant available.

For sunscald protection, the material acts to block direct transmission of sunlight due to its opacity. Sunscald occurs when exposure to sunlight overheats crops and causes scarring. This scarring can affect keeping quality, cosmetic appearance, taste, and texture. An aqueous mixture containing calcium acetate may be sprayed on black plastic to lower soil temperatures or as a coating on greenhouses to lower inside temperatures. The opacity of the material is primarily due to the calcium carbonate remaining in the product after the calcium acetate is formed (2018 TR).

Summary of Review:

Several public comments were received during the Fall 2018 NOSB meeting in which a discussion document on this petition was part of the agenda. One commenter indicated that they would support the addition of calcium acetate to the National List if the petitioner was able to document better calcium uptake than other available products. The commenter recommended an annotation be added, “For use as a foliar spray to treat a physiological disorder associated with calcium uptake.” However, another commenter noted that this product should not be approved since good organic practices should resolve calcium deficiencies and that this product is not essential.

With regard to sunscald, one commenter noted that they might support listing with the annotation, “For use on plants, greenhouses, and plastic films for protection against excess sun exposure.” Another commenter stated that the need to approve one synthetic product to remediate issues with another synthetic product, such as black plastic, is non-sensical for organic production.

The 2018 TR reviewed international certification agencies and found no listing for calcium acetate by other certifiers. Calcium acetate is not listed for organic production by the Canadian General Standards Board Permitted Substances, CODEX Alimentarius Commission, European Economic Community, Japanese Agricultural Standard or the International Federation of Organic Agriculture Movements.

The petition and the 2018 TR concur that the environmental and human health impacts of calcium acetate are minimal. Since calcium is already common in the environment and calcium acetate can and does occur naturally, the use of this material for plant nutrition or pH adjustment is unlikely to cause unwanted environmental impacts. It is rapidly utilized and integrated into plant and soil systems.

While there are numerous calcium disorders documented in crops and supplemental calcium may need to be applied to ameliorate these disorders, the 2018 TR notes that other, already approved, chelating agents can improve bioavailability of existing calcium sources in the soil and cites references for various alternatives. These alternatives include calcium chloride and several other chelated calcium products. While this product might be slightly different than other products already approved for organic production, it is difficult to make the argument that this product is essential for organic production. Without compelling evidence that the currently available alternatives are not effective, this material is not essential to organic production.

For sunscald protection, this material is easy to apply and environmentally benign as well as being readily adapted to changing conditions. However, alternatives already exist, and this material is not essential for organic production.

Category 1: Classification

1. For CROP use: Is the substance **Non-synthetic** x **Synthetic?**
   Is the substance formulated or manufactured by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources? [OFPA §6502(21)] If so, describe, using NOP 5033-1 as a guide.

   Calcium acetate is made from finely ground limestone which is chelated with acetic acid. It is a naturally occurring substance, which is produced and broken down in the metabolic cycles of humans and animals (2018 TR), however, it is most commonly synthesized by the neutralization of acetic acid and calcium carbonate. The petitioner and the 2018 TR both state that the material is synthetic.

2. Reference to appropriate OFPA category:
   Is the substance used in production, and does it contain an active synthetic ingredient in the following categories: [§6517(c)(1)(B)(i)]; copper and sulfur compounds; toxins derived from bacteria; pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals; livestock parasiticides and medicines and production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers; or (ii) is used in production and contains synthetic inert ingredients that are not classified by the Administrator of the Environmental Protection Agency as inerts of toxicological concern?

   The petitioner is asking for calcium acetate to be classified as a synthetic compound under vitamins and minerals. In its use as a plant micronutrient or, possibly, as a pH adjuster, the use would fall under minerals. For its use as a sunscald protectant or shading material it could be interpreted as a production aid.

Category 2: Adverse Impacts

1. What is the potential for the substance to have detrimental chemical interactions with other materials used in organic farming systems? [§6518(m)(1)]

   Calcium is widely used and available in agricultural ecosystems and calcium acetate is simply a more soluble form of calcium that is rapidly bioavailable. In general, calcium products are positive additions since calcium forms the building blocks of cell structures and functions. However, the 2018 TR notes two potential negative impacts. First, calcium acetate could bind phosphates, thus making them unavailable to plants as a nutrient source. This would primarily happen with the improper use of phosphoric acid. Phosphoric acid is only approved as an equipment cleaner and should have no direct contact with organically managed land or livestock. Secondly, if overapplied it could cause an over adjustment of pH and could result in increased soil alkalinity.

2. What is the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment? [§6518(m)(2)]

   The 2018 TR states that there are no published studies on the environmental persistence of calcium acetate. Various EPA documents are cited noting that calcium acetate may be present in the metabolic cycles of animals; therefore, no risk is posed to the environment. The EPA has placed calcium acetate on the Safer Chemical Ingredients List (SCIL) for processing aids and additives as a safer replacement for traditional ingredients. Moreover, the EPA has designated calcium acetate as "verified to be of low concern based on experimental and modeled data," and has "not identified any toxic endpoints for birds, plants, aquatic, or soil organisms" (2018 TR).

3. Describe the probability of environmental contamination during manufacture, use, misuse or disposal of such substance? [§6518(m)(3)]

   In general, the environmental impacts of this material should be minimal, but the 2018 TR notes that the greatest potential for environmental degradation is the mining necessary to source the calcium carbonate. This mining could degrade or disrupt ground water, surface water, and ecosystems in the vicinity of the mine and could cause contamination from spills. There could also be additional carbon dioxide released to the atmosphere due to fossil fuel burned by mining equipment.

4. Discuss the effect of the substance on human health. [§6517(c)(1)(A)(i); §6517(c)(2)(A)(i); §6518(m)(4)].

   Calcium acetate is widely used for human health as treatment for calcium deficiency and to treat patients with hyperphosphatemia in end stage renal disease. It can be used as a stabilizer and preservative in many food substances. The 2018 TR quotes various sources in that it has been authorized for human consumption without limitation by the Joint FAO/WHO Expert Committee on Food Additives, FDA has granted it GRAS status as a sequestrant and direct food substance, and EPA has placed it on the Safer Chemical Ingredients List for processing aids and additives.

5. Discuss any effects the substance may have on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock. [§6518(m)(5)]

   When used as petitioned, calcium acetate is applied as an aqueous mixture with calcium carbonate. While the calcium carbonate could provide calcium, it is not readily absorbed by plants. Calcium acetate has been reported to increase plant absorption of calcium ions (Ca^{2+}) compared to salts with other organic and inorganic anions (e.g., lactate, citrate, oxalate, chloride, nitrate) (2018 TR). Calcium is necessary for cell wall formation and stabilizes lipids within cell membranes. It helps to regulate cell processes such as transport across cellular membranes and enzymatic functions (2018 TR). It may also aid in the uptake of other micronutrients and may increase the storage life of fruits and vegetables. Common symptoms of insufficient calcium in fruits and vegetables include blossom end rot in tomatoes and bitter pit in apples.

   Calcium is common in the environment and the application of calcium acetate simply makes calcium more readily available for absorption. EPA has "not identified any toxic endpoints for birds, plants, aquatic, or soil organisms" (2018 TR) so the application of calcium acetate should not have negative ecosystem effects except in the case of where it might be overapplied and create excess soil alkalinity.

6. Are there any adverse impacts on biodiversity? (§205.200)

   There are no published studies on the environmental impacts of calcium acetate; however, the EPA has "not identified any toxic endpoints for birds, plants, aquatic, or soil organisms" (2018 TR) The 2018 TR goes on to note that calcium acetate acts as a water-soluble and bioavailable source of calcium, especially important in soils with high pH. The petitioned substance also increases the pH of the soil. Additionally, when used as petitioned, the substance can provide protection from sunscald as well as act as a mechanism for regulating plant temperature due to the opaque nature of the applied liquid. Once introduced into agricultural soils, the salt may result in several different outcomes, including absorption by plants, reacting with acidic chemicals in the soil, or dissolving and entering water systems, depending on the environmental conditions of the soil.

Category 3: Alternatives/Compatibility

1. Are there alternatives to using the substance? Evaluate alternative practices as well as non-synthetic and synthetic available materials. [§6518(m)(6)]

   Calcium carbonate can also act as a soil amendment, pH adjuster, and micronutrient source, but is less rapidly available. The 2018 TR notes that other, already approved, chelating agents can improve bioavailability of existing calcium sources in the soil and cites references for various alternatives. Lignin sulfonate, or lignosulfonate, is a synthetic chelating agent that is approved by the NOP for use in organic agricultural production, at 7 CFR 205.601. Lignosulfonates can form chelates with cationic micronutrients, increasing their water solubility and bioavailability. Humic acids have also been shown to increase plant absorption of micronutrients, while also promoting the growth of soil microorganisms. Additionally, sodium carbonate (Na_2CO_3) and potassium bicarbonate ($KHCO_3$) are capable of pH adjustments and, due to their water solubility, provide a more suitable alternative to calcium acetate than calcium carbonate mineral sources,

calcium hydroxide, and lime sulfur. Calcium chloride is readily available to plants but may not be compatible with other organic materials such as oils and can cause phytotoxicity under some environmental conditions.

A compost program can also be an alternative to calcium acetate. The 2018 TR cites literature that organic compost includes micronutrients, natural chelates, and microbes that produce natural chelating agents and when used as part of a program could alleviate the need for additional calcium applications.

For sunscald, alternative practices include pruning, and the installation of shade cloth or overhead sprinklers. Applications of clay-based sprays to plastic, structures, or the crop itself may reduce temperatures of soils and crops. Conversely, pruning and the installation of shade cloth can be labor intensive and expensive, and the use of clays may cause problems with packing equipment and cleaning the produce for market.

2. In balancing the responses to the criteria above, is the substance compatible with a system of sustainable agriculture? [§6518(m)(7)]

   Since calcium is already common in the environment and calcium acetate can and does occur naturally, the use of this material for plant nutrition or pH adjustment is unlikely to cause unwanted environmental impacts. It is rapidly utilized and integrated into plant and soil systems. Based on the evidence reviewed in the TR and public comments, it was determined that this material is not essential for organic production. It does potentially provide a faster means to deliver calcium to plants, but there are other materials already available to growers that make the same claim, for example, calcium chloride or several chelated calcium products. Without compelling evidence that the currently available alternatives are not effective, this material is not essential to organic production.

   For sunscald protection, this material is easy to apply and environmentally benign as well as being readily adapted to changing conditions. However, alternatives already exist. Without compelling evidence that other natural alternatives are ineffective, adding a new synthetic material to the National List is not essential for organic production.

Classification Motion:

Motion to classify calcium acetate as synthetic
Motion by: Steve Ela
Seconded by: Harriet Behar
Yes: 7 No: 0 Abstain: 0 Absent: 1 Recuse: 0

National List Motion:

Motion to add calcium acetate at §205.601
Motion by: Steve Ela
Seconded by: Emily Oakley
Yes: 0 No: 6 Abstain: 1 Absent: 1 Recuse: 0

Approved by Steve Ela, Subcommittee Chair to transmit to NOSB, January 29, 2019