Sunset 2020 Review Summary
Meeting 1 - Request for Public Comment
Crops Substances
April 2018

Introduction
As part of the Sunset Process, the National Organic Program (NOP) announces substances on the National List of Allowed and Prohibited Substances (National List) that are coming up for sunset review by the National Organic Standard Board (NOSB). The following list announces substances that are on the National List for use in organic crop production that must be reviewed by the NOSB and renewed by the USDA before their sunset dates in 2020. This list provides the substance's current status on the National List, use description, references to past technical reports, past NOSB actions, and regulatory history, as applicable. If a new technical report has been requested for a substance, this is noted in this list. To see if any new technical report is available, please check for updates under the substance name in the Petitioned Substances Database.

Request for Comments
While the NOSB will not complete its review and any recommendations on these substances until the Fall 2018 public meeting, the NOP is requesting that the public provide comments about these substances to the NOSB as part of the Spring 2018 public meeting. These comments should be provided through www.regulations.gov by April 4, 2018 as explained in the meeting notice published in the Federal Register.

These comments are necessary to guide the NOSB's review of each substance against the criteria in the Organic Foods Production Act (7 U.S.C. 6518(m)) and the USDA organic regulations (7 CFR 205.600). The current substances on the National List were originally recommended by the NOSB based on evidence available to the NOSB at the time of their last review which demonstrated that the substances were found to be: (1) not harmful to human health or the environment, (2) necessary because of the unavailability of wholly nonsynthetic alternatives, and (3) consistent and compatible with organic practices.

Public comments should focus on providing new information about a substance since its last NOSB review. Such information could include research or data that may support a change in the NOSB's determination for a substance. Public comment should also address the continuing need for a substance or whether the substance is no longer needed or in demand.

Guidance on Submitting Your Comments
Comments should clearly indicate your position on the allowance or prohibition of substances on the list and explain the reasons for your position. You should include relevant information and data to support your position (e.g., scientific, environmental, manufacturing, industry impact information, etc.).

For Comments That Support Substances Under Review:
If you provide comments in support of an allowance of a substance on the National List, you should provide information demonstrating that the substance is:

(1) not harmful to human health or the environment;
(2) necessary to the production of the agricultural products because of the unavailability of wholly nonsynthetic substitute products; and
(3) consistent with organic crop production.

For Comments That Do Not Support Substances Under Review:
If you provide comments that do not support a substance on the National List, you should provide reasons why the use of the substance should no longer be allowed in organic production or handling. Specifically, comments that support the removal of a substance from the National List should provide new information since its last NOSB review to demonstrate that the substance is:

(1) harmful to human health or the environment;
(2) unnecessary because of the availability of alternatives; and
(3) inconsistent with crop production.

For Comments Addressing the Availability of Alternatives:
Comments may present information about the viability of alternatives for a substance under sunset review. Viable alternatives include, but are not limited to:

- Alternative management practices that would eliminate the need for the specific substance;
- Other currently exempted substances that are on the National List, which could eliminate the need for this specific substance; and
- Other organic or nonorganic agricultural substances.

Your comments should address whether any alternatives have a function and effect equivalent to or better than the allowed substance, and whether you want the substance to be allowed or removed from the National List. Assertions about alternative substances, except for those alternatives that already appear on the National List, should, if possible, include the name and address of the manufacturer of the alternative. Further, your comments should include a copy or the specific source of any supportive literature, which could include product or practice descriptions; performance and test data; reference standards; names and addresses of producers or handlers who have used the alternative under similar conditions and the date of use; and an itemized comparison of the function and effect of the proposed alternative(s) with substance under review.

Written public comments will be accepted through April 4, 2018 via www.regulations.gov. Comments received after that date may not be reviewed by the NOSB before the meeting.

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Note: With the exception of sodium carbonate peroxyhydrate, aqueous potassium silicate, and sulfurous acid, the materials included in this list are undergoing early sunset review as part of November 18, 2016 NOSB recommendation on efficient workload re-organization.

Reference: 7 CFR §205.601 Synthetic substances allowed for use in organic crop production.

Alcohols: Ethanol
Alcohols: Isopropanol
Sodium carbonate peroxyhydrate
Newspaper or other recycled paper
Plastic mulch and covers
Aqueous potassium silicate
Elemental sulfur
Lime sulfur
Sucrose octanoate esters
Hydrated lime
Liquid fish products
Ethylene
Sulfurous Acid
Microcrystalline cheesewax

Reference 7 CFR §205.602 Prohibited nonsynthetic substances

Potassium chloride

Alcohols (ethanol)

Reference: 205.601(a)(1)

(i) Ethanol. As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems.

Technical Report(s): 1995 TAP; 2014 TR - Ethanol; 2014 TR - Isopropanol

Petition(s): N/A

Past NOSB Actions: 10/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation

Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)

Sunset Date: 3/15/2022

Background from Subcommittee:

Use:

The United States Environmental Protection Agency (US EPA) regulates all non-food applications of ethanol, including its use as a pesticide and plant growth regulator. According to the Reregistration Eligibility Decision for Aliphatic Alcohols, ethanol and isopropanol were registered in the US as early as 1948 as active ingredients in indoor disinfectants (US EPA, 1995). Approximately 48 ethanol products were registered for use as hard surface treatment disinfectants, sanitizers and mildewcides as of 2012 (US EPA, 2012a). Ethanol is also the active ingredient in certain plant growth regulator products.

Manufacture:

Both fermentation and chemical synthesis procedures are used in the commercial production of ethanol for the preparation of disinfectant solutions, spirits, and industrial fuel sources. A variety of methods are available for the fermentative production of ethanol from carbon sources such as starch, sugar and cellulose using natural and genetically engineered strains of yeast or bacteria. Ethanol can also be produced synthetically through the direct or indirect hydration of ethylene and as a by-product of certain industrial operations.

International Equivalency:

Several international organizations provide guidance on the application of synthetic ethanol in organic crop and livestock production as well as the processing of organic foods. Among these are international regulatory agencies (EU, Canada and Japan) and independent organic guidelines and standards organizations (Codex and IFOAM).

Environmental/Health Issues:

Although ethanol is a volatile organic compound and potentially contributes to the formation of ozone and photochemical smog, large-scale releases of ethanol under the prescribed use pattern in organic crop production are unlikely. Ethanol is readily biodegradable in air, soil and water. According to US EPA, ethanol is practically non-toxic based on acute oral and inhalation toxicity tests as well as primary eye and dermal irritation studies.

Additional information requested by Subcommittee: None

Alcohols (isopropanol)

Reference: 205.601(a)(1)

(ii) Isopropanol. As algicide, disinfectants, and sanitizer, including irrigation system cleaning systems.

Technical Report(s): 1995 TAP; 2014 TR - Ethanol; 2014 TR - Isopropanol

Petition(s): N/A

Past NOSB Actions: 10/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation

Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)

Sunset Date: 3/15/2022

Background from Subcommittee:

Use:
Isopropanol is used for a variety of industrial and consumer purposes, ranging from chemical and solvent applications to medical and consumer usage. Regarding crop production, isopropanol may be effectively used to decontaminate the lines of irrigation systems as well as a variety of agricultural implements. Alcohols, including isopropanol and ethanol, can provide rapid broad-spectrum antimicrobial activity against vegetative bacteria, viruses and fungi, but lack activity against bacterial spores (McDonnell, 1999).

Manufacture:
Chemical synthetic procedures are used in the commercial production of isopropanol used in the preparation of consumer-use disinfectants, industrial solvents, and specialty chemicals. Specifically, indirect and direct methods for the hydration of petroleum-derived propylene are the two primary commercial processes to produce isopropanol. In addition, smaller amounts of industrial isopropanol are generated through the hydration of acetone over transition-metal catalysts (Papa, 2011; Merck, 2006). A variety of methods are also available for the fermentative production of isopropanol from carbon sources, such as starch, sugar, and cellulose, using genetically engineered yeast and bacteria (Papa, 2011).

International Equivalency:
A small number of international organizations provide guidance on the application of synthetic isopropanol in organic crop and livestock production as well as the processing of organic foods. Among these are the Canadian General Standards Board and the International Federation of Organic Agriculture Movements (IFOAM).

Environmental/Health Issues:
Although isopropanol is a volatile organic compound and potentially contributes to the formation of ozone and photochemical smog, large-scale releases of isopropanol under the prescribed use pattern in organic crop production are unlikely. Isopropanol may enter the environment because of its manufacture in addition to its solvent and chemical intermediate uses. According to US EPA, isopropanol is slightly toxic to practically non-toxic based on acute oral and inhalation toxicity tests as well as primary eye and dermal irritation studies (EPA, 410 1995).

Additional information requested by Subcommittee: None

Sodium carbonate peroxyhydrate

Reference: 205.601(a) – As an algaecide **-** Federal law restricts the use of this substance in food crop production to approved food uses identified on the product label.
Technical Report: 2006 TAP; 2014 TR

Original Petition: 2005 Sodium Carbonate Peroxyhydrate

Past NOSB Actions: 11/2007 NOSB recommendation; 11/2007 NOSB Crops Subcommittee Recommendation; 10/2014 NOSB sunset recommendation

Recent Regulatory Background: Proposed rule (including justification) published 6/3/2009 (74 FR 26591). Added to National List 12/13/2010 (75 FR 77521). Sunset renewal notice published 06/19/15 (80 FR 35177).

Sunset Date: 6/22/20

Background from Subcommittee:

Use:

Sodium carbonate peroxyhydrate is used as an algaecide in rice fields, ponds, ditches, and irrigation lines (TR lines 11-124). It was added to the National List in 2007 with the hope that growers would use it as an alternative to more problematic materials such as copper and chlorine; it has only been registered for use in rice since 2010. The 2014 technical report (TR) states that the material is a precursor to hydrogen peroxide and is used widely in household cleaners and detergents, as well as water bodies (lines 89-100).

Manufacture:

Sodium carbonate peroxyhydrate is produced by drying hydrogen peroxide in the presence of sodium carbonate and is a white granular crystalline powder. It rapidly dissolves in water and dissociates into hydrogen peroxide and sodium carbonate. It decomposes to leave only water, oxygen, and soda ash (TR lines 51-52 and 79-82).

International Acceptance by Other Certification Agencies:

While most international standards do not mention sodium carbonate peroxyhydrate by name, they do allow both hydrogen peroxide and sodium carbonate, which are the components and the precursors of this substance (TR lines 164-202).

Canada - Canadian General Standards Board Permitted Substances List does not include sodium carbonate peroxyhydrate.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999) does not permit the use of sodium carbonate peroxyhydrate for organic use.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008 does not allow sodium carbonate peroxyhydrate for organic production.

Japan Agricultural Standard (JAS) for Organic Production does not list sodium carbonate peroxyhydrate.

International Federation of Organic Agriculture Movements (IFOAM) does not list sodium carbonate peroxyhydrate.

Environmental/Health Issues:

An emission of sodium carbonate peroxyhydrate to the environment could potentially occur during production, formulation, and use of the substance (TR lines 323-24). Sodium, carbonate and hydrogen peroxide do not adsorb to sediment (TR line 333). No new concerns were raised about human health or environmental effects since the earlier review in 2006; however, it is highly toxic to bees and it should not be allowed to drift to flowering plants or used when contact with bees might occur (TR lines 395-434).

Discussion:

In 2014, a new TR was commissioned to address alternatives and use patterns. Of the alternatives presented, copper sulfate is the most problematic and also the most widely used (on 97,757 acres vs. 1,177 acres in California in 2010, representing 17.4 and 0.3% of California rice acreage, respectively) (TR lines 448 - 457). Some of the proposed alternative controls, including Chinese herbs, garlic extracts, or panchagavya and amruthajalam, have not been tested in the U.S. and may not be available (TR lines 487 - 497).

During the Sunset 2015 Review, the NOSB sought input comparing this material with copper sulfate for control of algal scum in rice production and asked if it could replace copper sulfate for that use. Limited and conflicting comments were received. Points raised in favor of renewing the substance stated that it provides better control of algae, and its breakdown components of water and oxygen are more favorable than the accumulation of elemental copper associated with copper sulfate. Additionally, when utilized in irrigation ponds sodium carbonate peroxyhydrate has fewer corrosion issues with irrigation equipment than copper sulfate. The points raised against renewing the substance stated that it does not fit any OFPA categories, is not permitted in organic production internationally (TR lines 164-202), and was found by the NOSB in its 2007 recommendation to not meet the OFPA criteria of essentiality, compatibility with organic production, and no impacts on human health and the environment.

The CS conducted further investigation into points raised in public comment. In particular, a 2007 report of the California Rice Research Board studied the efficacy of this material and found it did not work well enough to recommend it for rice paddies. Further investigations into controlling algae by the same group in 2013 indicated that management of phosphorus fertilization can influence the severity of algal growth. Reducing phosphate concentrations in rice field water was not mentioned in the 2014 TR but may be a promising alternative practice.

Additional information requested by Subcommittee:

1. The 2014 TR states: “In 2010, in California, 450 million three hundred and eighteen thousand pounds of copper sulfate were applied in 1442 applications to 97,757 acres and sixteen thousand, six hundred and fifty pounds of sodium carbonate peroxyhydrate were applied in 31 applications to 1,177 acres” (lines 449 to 452). Given the significantly lower use of sodium carbonate peroxyhydrate as compared to copper sulfate, despite its lower toxicity, please describe when and why it is used in rice cropping systems.
2. In addition to use in rice fields, please elaborate on other applications for which producers are using sodium carbonate peroxyhydrate.

Newspaper or other recycled paper

Reference: 205.601(b) As herbicides, weed barriers, as applicable. (2) Mulches. (i) newspaper or other recycled paper, without glossy or colored inks.
Reference: 205.601(c) - As compost feedstocks - Newspapers or other recycled paper, without glossy or colored inks.
Technical Report: 1995 TAP; 2006 TAP; 2017 TR
Petition(s): N/A
Past NOSB Actions: 10/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290 Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Several questions were raised during the 2015 NOSB review from Board members and the public that indicated that a Technical Report (TR) would be worthwhile for review of this material. While no substantiated issues of concern were raised regarding the OFPA criteria, there was little information about the ingredients and colored inks in newspaper, or their fate in the environment. The full board voted to renew this listing in 2015 and subsequently requested a TR to determine the need for a potential annotation change.

In summer 2017, a new TR was received and reviewed. The TR indicated that there has been some movement towards use of less toxic color inks, however, it is difficult or impossible to determine which inks are present in the newspaper. There is no methodology for separation between color inks that might be more acceptable for direct application to organic land, and those that are not. When reviewing the most recent TR, the NOSB decided the current annotation prohibiting glossy or colored inks should remain.

Additional information requested by Subcommittee:

1. Does this material perform an essential function on organic farms?
2. Is this material used regularly on organic farms?

Plastic mulch and covers

Reference: 205.601(b) As herbicides, weed barriers, as applicable. (2) Mulches. (ii) Plastic mulch and covers (petroleum-based other than polyvinyl chloride (PVC)).
Technical Report: 1995 TAP
Petition(s): N/A
Past NOSB Actions: 10/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Plastic mulches can be of various thicknesses and can be a film or woven type landscape cloth. Various colors are used for crop production enhancements in systems, such as red to increase tomato fruiting, silver to reflect and deter pests, black to warm the ground, white to cool the soil and more. Clear and translucent plastics are typically used as coverings for heated greenhouses or unheated high or low tunnels. There was a sunset review of a related material, biodegradable biobased mulch films, in fall of 2017, with the current annotation and National Organic Program guidance on this material retained as currently written. In addition to the allowance of plastic mulches and covers on the National List, there is this statement within the regulations:

§205.206 (c) Weed problems may be controlled through:

(6) Plastic or other synthetic mulches: Provided that, they are removed from the field at the end of the growing or harvest season.

When these plastic mulches are used for perennial crops, many, but not all, organic certification agencies have interpreted the regulations to allow this plastic mulch to remain in place for perennial crop production, since the harvest season is continuous from year to year. Long-term breakdown of the plastic films or plastic woven cloth can occur, especially if not protected from ultraviolet light from the sun.

Manufacturing Process:

Plastic mulches and covers are thermoplastic resins of high melt viscosity, usually polyethylene. Resin pellets are melted into an extruder and pumped or blown through a die or tube to form the plastic in the desired shape.

Specific Use:

Plastic mulches and covers are used extensively in both organic and nonorganic agriculture and are allowed for use under the EU, Canada and other organic standards. They offer numerous crop production benefits as a weed suppresser/barrier and can conserve water by lessening evaporation. Various colors of plastic mulch films provide benefits as well, as detailed above. There has been strong support for continued listing of plastic mulch and covers by the organic community at each of the previous sunset dates, this product is used extensively in both organic and nonorganic production systems. When this product is used as a mulch on the soil, it tends to get coated with soil which makes it very difficult to recycle, much of the plastic mulches removed at the end of the harvest season are landfilled. Greenhouse coverings and other uses of plastic where there is minimal soil attached, can usually be recycled, especially in agricultural regions where companies have specialized in the recycling of these plastic materials.

Additional information requested by Subcommittee:

1. Are there alternative methods or natural materials that could replace the functionality of this petroleum based material in crop production?
2. Are you aware of plastic mulches (either films or woven cloth) being left in place on the ground for more than 1-2 years and are you seeing degradation? How do you lessen that degradation, or address degradation if it occurs? Are plastic shards or debris found in the soil that cannot be removed?
3. Should woven poly landscape cloth be addressed differently than plastic mulch films? Are there heavier weights and thicknesses of plastic film mulches that are similar to woven poly landscape cloth in its resistance to degradation?
4. When the plastic mulch or cloth is removed, is it piled on the farm, landfilled, recycled or processed in an appropriate manner?
5. Are you aware that burning plastic is illegal in many states due to the release of dioxin and other problematic chemicals into the atmosphere? If burning plastic is an issue in your state or country, would you like to see an annotation banning burning of plastic mulch or covers under the organic regulation?

Aqueous potassium silicate

Reference:
205.601(e) – As an insecticide (including acaricides or mite control) - The silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.
205.601 (i) – As plant disease control—The silica, used in the manufacture of potassium silicate, must be sourced from naturally occurring sand.
Technical Report: 2003 TAP; 2014 TR
Petition(s): 2002 Potassium Silicate; 2006 Potassium Silicate Supplemental
Past NOSB Actions: 11/2007 NOSB recommendation; 10/2014 NOSB sunset recommendation
Recent Regulatory Background: Proposed rule (including justification) published 6/3/2009 (74 FR 26591). Added to National List 12/13/2010 (75 FR 77521). Sunset renewal notice published 06/19/15 (80 FR 35177).
Sunset Date: 6/22/20

Background from Subcommittee:
Use:
Aqueous potassium silicate is used as a crop protectant for insect, mite and disease control, and suppression. Formulations of aqueous potassium silicate are either sprayed on the foliage of plants or incorporated in the soil with the goal of plant uptake across root and leaf boundaries. The silica tetrahedra are purported to be incorporated in boundary cells (in roots and leaves) inhibiting insect feeding and the onset of plant disease infection.

Manufacture:
Aqueous potassium silicate is manufactured by combining high purity silica sand and potassium carbonate (both mined materials) and heating to a high temperature (2000 degrees F). The potassium carbonate and silicon dioxide fuse to form a molten potassium silicate glass with the evolution of carbon dioxide gas. This glass can either be 1) cooled and ground into a powder or 2) dissolved in water to form a potassium silicate solution. The solution may subsequently be spray dried to form hydrous powder granules of potassium silicate.

International acceptance by other international certifying bodies:
Internationally (Japan, Canada, EEC, CODEX, or IFOAM), natural sources of silica, not APS, are allowed (258-296).

Environmental/Health Issues:
Based on information in the January 6, 2014 technical review, the following concerns were raised by the Crops Subcommittee during the 2014 Sunset review:
Dermal exposure can lead to low-to-medium systemic toxicity and skin irritation (577-579);
Silicon reduces the availability of elements such as manganese, iron, and aluminum to roots (471-473)
Treatment with potassium silicate may not be appropriate when crops are used for feeding or as forage for livestock because it makes some forages less digestible (477-481);
The addition of potassium silicate as a foliar nutrient may result in the production of less tender fruits and vegetables or forage for grazing animals (479-481);
Silica supplementation can result in elongation and thickening of stems, delayed antithesis and flower deformation in some species (487-490);
In addition to morphological changes, changes in micronutrient in plants may occur as a result of silica supplementation (490-491);
New alternative materials suggested include other forms of silica that are available as approved supplements for the soil that can provide the same protection over a longer term against plant disease and compost made with silica-rich plants (592-594);

Discussion:
In 2007, the Crops Subcommittee recommended against listing aqueous potassium silicate (APS) because "multiple substitutes are available" and it is a "synthetic soil applied fertilizer not compatible with organic farming regulations." The substance was listed based on the following rationale: Public comment at the November 2007 NOSB meeting supported listing the substance as plant disease control. Commenters provided the historical 2003 NOSB consideration of the material, as well as more information from the petitioner and other interested stakeholders. New information was provided in a January 6, 2014 technical review. In 2014 the Crops Subcommittee voted 4 to 3 in favor of removing aqueous potassium silicate from the National List. At the Fall 2014 NOSB meeting in Kentucky, the motion to remove aqueous potassium silicate from the National List was not supported by the Board by a vote of 7 to remove and 9 against removal. Those voting for removal pointed to the bulleted items above while those voting not to remove saw the compound as an important pest control option for organic growers.

Additional information requested by Subcommittee:
There is little evidence that silicates are limiting in farmed soils. Please provide any additional data to aid in assessing the need for products that are intended to overcome soil deficiencies.

1. To what extent is aqueous potassium silicate used by growers?

2. To what extent does listing aqueous potassium silicate result in reductions in use of copper and sulfur based pest management?
3. If potassium silicate is taken up in the roots and moved throughout the plant via apoplast or symplast movement and then incorporated in sink tissue (the leaves) then the compound is behaving like a systemic, synthetic pesticide.
4. Is this compound systemic?
5. What evidence exists documenting the safety of animal and human ingestion of plants and forages with elevated silicate levels in leaf tissue?
6. Following on question 5, how does age and gender of animals and humans ingesting plant material with elevated silicate levels influence vulnerability?

Elemental sulfur

Reference: 205.601(e)(5) - As insecticides (including acaricides or mite control).
Reference: 205.601(i)(10) - As plant disease control.
Reference: 205.601(j)(2) - As plant or soil amendments.
Technical Report: 1995 TAP
Petition(s): N/A
Past NOSB Actions: Actions: 04/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 04/2010 sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Use:

Elemental sulfur is on the National List at §205.601(e)(5) – As insecticides (including acaricides or mite control), §205,601(i)(10) – As plant disease control, and at §205.601 (j)(2) – As plant or soil amendments. As an insecticide under (e)(5) it is used to help control arthropods, mites, leprosis, and scab mites. As plant disease control under (i)(10) it helps control powdery mildew, rusts, scab, pear scab, brown rot, rose black spot, and peach leaf curl. As a plant or soil amendment under (j)(2) it is used to help assist in balancing the soil pH and is useful to both plant and soil beneficial insects. It can also help aid in increased water penetration.

Manufacture:

Elemental sulfur can come either from a natural mined source, or may be produced as a by-product from natural gas or petroleum operations and refinery process. The latter appears to be the primary source of most elemental sulfur currently being used. Elemental sulfur has been used for centuries and approved for use in the U.S since 1920.

International (acceptance/nonacceptance) by other international certification agencies:

Internationally approved for use by: The E.U., IFOAM. Codex Alimentarius Commission (CAC GL 32-1999) permits the use of sulfur for pest and disease control when the certification body or authority recognizes the need for plant protection (Codex, 2013). Also allowed by Canadian Organic Standards.

The Canadian General Standards Board (CGSB) includes non-synthetic elemental sulfur as a permitted substance for organic production systems (CAN/CGSB-32.311-2015) for use as a soil amendment and as a foliar application. Chemically synthesized substances cannot be added, and chemical treatment is prohibited. The CGSB also permits the use of sulfur for the control of external parasites and sulfur smoke bombs in conjunction with other methods used for rodent control when a pest control program is temporarily overwhelmed.

The Codex Alimentarius Commission's "Guidelines for the Production, Processing, Labelling, and Marketing of Organically Produced Foods" (GL 32-1999) lists elemental sulfur as an allowed substance for pest and disease control.

The European Economic Community (EEC) Council Regulation (EEC No 2092/91) and carried over by Article 16(3)(c) of Regulation No 834/2007, permits the use of sulfur as a fungicide, acaricide, and repellent in organic food production.

The Japan Agricultural Standard (JAS) for Organic Production (Notification No. 1605 of 2005) permits the use of sulfur as a fertilizer or soil improvement substance, and as a substance for plant pest and disease control.

The International Federation of Organic Agriculture Movement's (IFOAM) lists sulfur as an approved substance for pest and disease control, for use as fertilizer/soil conditioner, and for use as a crop protectant and growth regulator.

Environmental/Health Issues:

Sulfur is heavily used worldwide. It is the most heavily used pesticide in California, where over 50,000,000 pounds are used annually, representing more than 25% of all agricultural pesticide use in the state (sulfur use as a pesticide is distinct from use as a soil amendment). Accurate information on use in the organic sector is not available.

Sulfur is an essential plant nutrient, naturally present in our food and soil, and is part of normal human biochemistry. In the original TAP the reviewers found elemental sulfur to be relatively innocuous in the environment when used according to the product use label. It was also found to be of low toxicity (http://extoxnet.orst.edu/pips/sulfur.htm). It should not be used within one month of any horticultural oil product, as currently stated on most sulfur labels. Two previous Sunset Material Reviews (2005 & 2010) of Elemental sulfur have resulted in all 3 use listings being re-listed.

Although low in acute toxicity, sulfur is a respiratory, ocular, and dermal irritant and adversely impacts farmworker health. Farmworker exposures can be mitigated if label recommendations and proper PPE recommendations are followed. However, agricultural sulfur use may also impact community health. A recent study reported significant associations between agricultural use of sulfur and poorer respiratory health in children living near fields (https://ehp.niehs.nih.gov/ehp528/). The use of wettable formulations, in contrast to dust applications, likely reduce exposures because fewer sulfur particles drift offsite from applications. Several agricultural commissioners in California have encouraged a shift to wettable formulations in vineyard applications and anecdotal information suggests fewer regulatory problems.

Discussion:

During previous reviews there has been strong support for the continued listing of sulfur, particularly for use against various bacterial and fungal diseases and other pests, and as a plant and soil amendment. Based on the original TAP, prior reviews, previous committee votes & discussions, and historical public comment, it would appear that elemental sulfur is still necessary in organic crop production.

Additional information requested by Subcommittee:

For this review, the Crops Subcommittee would like to consider additional information and input from the organic community in the following areas:

1. Have organic farmers, farmworkers, related family members, or residents living near treated fields, including young children, experienced adverse impacts of agricultural sulfur use?
2. If yes, what health problems have been encountered?
3. What mitigation steps were/are taken to address health impacts?
4. How many organic farmers use sulfur dust applications (in contrast to wettable spray applications) to control pest and disease problems?
5. Would an annotation requiring the use of wettable formulations for sulfur pesticide applications in organic crops be feasible?

Lime sulfur

Reference: 205.601(e)(6) - As insecticides (including acaricides or mite control).
Reference: 205.601(i)(6) - As plant disease control.
Technical Report: 1995 TAP (Livestock - hydrated lime); 2014 TR
Petition(s): N/A
Past NOSB Actions: Actions: 04/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:
Use:
Lime sulfur is on the National List at §205.601(e)(6) as an insecticide (including acaricide or mite control) and at §205.601 (j)(6) for plant disease control. As an insecticide lime sulfur is used to control mites (spider mites and rust mites), aphid, and san jose scale in tree fruit and other organic crops. As a fungicide it is used to control powdery mildew, anthracnose, scab, peach leaf curl, and several other plant diseases in tree fruit and berry crops. It is also part of a process that when used in conjunction (or

in rotation) with other allowed materials as a replacement for the two recently removed antibiotics for assisting to control fire blight in organic apple and pear production.

Manufacture:
Lime sulfur is often referred to by its chemical name, calcium polysulfide. It is considered to be synthetic and is produced by reacting boiling calcium hydroxide [$CaOH_2$] and ground sulfur (2014 TR). Residues of lime sulfur are exempt from the requirement of a tolerance under 40 CFR 180.1232 as determined by the U.S. EPA because the calcium polysulfides found in lime sulfur products rapidly degrade to calcium hydroxide and sulfur in the environment and human body.

I**nternational**:

- Canada – allowed as a fungicide, insecticide, or acaricide/mite control. (CAN,21)
- Codex Alimentarius – although not mentioned specifically, organic production guidelines from Codex Alimentarius Commission (CAC GL 32-1999) permit the use of sulfur for pest and disease control when the certification body or authority recognizes the need for plant protection (Codex, 2013).
- European Union – permits the use of lime sulfur (calcium polysulfide).
- Japanese Ministry of Agriculture Forestry and Fisheries – permits the use of lime sulfur powder for plant pest and disease control.
- IFOAM – lists lime sulfur in Section II of Appendix 3: Crop Protectants and Growth Regulators (IFOAM, 2014).
- UK Soil Association – only allows the use of lime sulfur on a case-by-case basis, when there is a demonstrated major threat to a grower's crop. (Soil Association, 2014).

Environmental/Health Issues:
Lime sulfur has a long history of use for crop production. The original technical advisory panel report (TAP) used the 1922 USDA Farm Bulletin as part of its fact finding. The 2014 technical evaluation report (TR) provided an extensive list of alternative materials and practices, however, a benefit of lime sulfur is that it can act both as an insecticide and fungicide. Alternative biological materials often need to be used preventatively whereas lime sulfur can sometimes be used to mitigate an existing crop issue. Lime sulfur can cause phytotoxicity in some crops, however, rates and timings can be used to avoid this problem. Similarly, the technical report notes that lime sulfur may impair some beneficial insects, but, once again, timing of use can minimize the negative effects. Lime sulfur is one leg of an integrated fire blight control program for pome fruits and has become especially important since antibiotics for fire blight control were removed from the National List.

The technical report noted potential human health concerns from lime sulfur primarily due to its high alkalinity or the release of hydrogen sulfide. This concern is largely mitigated during formulation or actual use if proper safety procedures are followed during manufacture and label directions are followed at application.

Additional information requested by Subcommittee:
Are there any alternatives to synthetic lime sulfur now in use since the 2014 technical report?

Sucrose octanoate esters

Reference: 205.601(e)(10) - As insecticides (including acaricides or mite control).
Technical Report: 2005 TR
Petition(s): 2004 Sucrose Octanoate Esters; Amendment #1; Amendment #2
Past NOSB Actions: 08/2005 NOSB recommendation for addition to NL; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Sucrose octanoate esters (SOEs) belong to the organic chemical family sucrose fatty acid esters (SFAEs). SFAEs are surfactants (or surface-active agents) that lower the surface tension of a liquid, allowing easier spreading and evaporation. SOEs are manufactured from sucrose (table sugar) and an octanoic acid ester commonly found in plants and animals. Sucrose esters, as a class of related compounds, vary, depending on the number and locations of esters attached to the sucrose molecules. Sucrose has eight potential places where individual esters may attach (Montello Inc., n. d.). The substance under review is a mixture of mono-, di-and tri-esters (TR lines 24-31).

Sucrose esters were first isolated when researchers investigated the insecticidal properties of the tobacco leaf hairs. This insecticidal property of sucrose esters acts by dissolving the waxy protective coating (cuticle) of target pests, causing them to dry out and die (U.S. EPA, 2002b). SOEs marketed as biopesticides are intended to mimic the pest control properties of *Nicotiana gossei* Domin. (wild tobacco) and other *Nicotiana* species. In addition to the tobacco plant, insecticidal sugar esters have been found in wild tomato and wild potato species and in the petunia plant (Chortyk et al., 1996) (TR lines 33- 38).

Approved Use:

SOEs are approved for use as a contact-type biochemical insecticide/miticide (EPA Registration Number 70950-2, OPP No. 035300) to control soft-bodied insects (TR lines 69 - 70). SOEs are permitted by EPA for use as a biopesticide for foliar spray in field, greenhouse, and nursery use on any type of agricultural commodity (including certain non-food ornamentals), as well as on mushroom growing media and on adult honey bees. (U.S. EPA, 2002a).

Environmental Impact Discussion:

According to the 2006 technical review, when SOEs are applied according to EPA approved label directions, no direct exposure of birds or aquatic organisms is expected (U.S. EPA, 2002a). In addition, SOEs biodegrade within approximately five days at approximately 68-80.6°F/20-27°C, in both aerobic and anaerobic conditions, so minimal potential for exposure exists for insects, fish, and other non-target wildlife. (U.S. EPA, 2002a).

Additional information requested by Subcommittee:

1. The TR does not address the toxicity of SOEs to non-targeted organisms, including predators, parasitoids, soil fauna, and aquatic organisms when exposed by spray. Is there further information available about the toxicity of SOEs to non-target organisms?
2. Is this product still being used, or are there other synthetic products that are more effective?
3. If SOEs are not being used, do we need it to keep in the crops toolbox to be rotated with other products?

Hydrated lime

Reference: 205.601(i)(4) - As plant disease control.
Technical Report: 1995 TAP; 2001 TAP; 2002 TR for Calcium Hydroxide
Petition(s): N/A
Past NOSB Actions: 04/1995 NOSB minutes and vote; 04/2006 sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Use:
Hydrated lime is used as a foliar application in combination with copper sulfate ($CuSO_4$); this mixture is also referred to as the 'Bordeaux mix'. The role of the hydrated lime ($Ca(OH)_2$) is that of a precipitating agent making the copper available to prevent infestations of mildews and other pathogenic fungi in a range of fruit production systems.

Manufacture:
Hydrated lime is considered a synthetic substance. The production of hydrated/slaked lime involves two elementary reactions beginning with naturally occurring limestone deposits. In the first step, ground limestone -which contains predominantly calcium carbonate ($CaCO_3$) with smaller amounts of magnesium, silicon, aluminum and iron oxide compounds -is thermally transformed into quicklime. Specifically, heating raw or minimally processed limestone to temperatures in excess of 900 ˚C results in conversion of the calcium carbonate content of limestone to calcium oxide (CaO) in a material known as quicklime. This thermal transformation occurs with liberation of carbon dioxide (CO_2) gas. In the slaking process, quicklime reacts exothermically (releases heat) with two equivalents of water to produce hydrated/slaked lime consisting primarily of calcium hydroxide ($Ca(OH)_2$). After hydration, the slightly moist slaked lime is conveyed to a separator where coarse fractions are removed, and the powder is dried.

International acceptance by international certifying bodies:

The Canadian General Standards Board, the European Union and the International Federation of Organic Agriculture Movements allow hydrated lime for use as a foliar application to plants for disease suppression.

Environmental/Health Issues:

Careful procedures are needed for handling hydrated lime as it can severely irritate and burn the eyes, skin and mucous membranes. The hydroxide anions (OH-) generated from dissolution of calcium hydroxide in water or other fluids is the main driver of toxicity for the substance. The effects of the substance on biological and chemical interactions in the agroecosystem are limited given its use as a plant disease suppressant. It is important to note that much has been learned about the impact of hydrated lime as a soil liming agent to elevate soil pH. However, orders of magnitude smaller amounts of the substance are used in the requested application as the mixture is applied to the foliage of the plants to limit plant disease establishment and spread.

The primary environmental issues associated with production of hydrated lime include energy use and dust formation. Calcium oxide is obtained through thermal decomposition of calcium carbonate (limestone) in fuel-powered kilns, a process that requires large amounts of energy. Crushing and handling of limestone and the burning, processing and handling of quicklime and hydrated lime results in dust emissions. Significant advances in deploying filtration systems have mitigated these effects.

Discussion:

Two Technical Advisory Panel Reports were published in 1995 and 2001 and a third Technical Evaluation Report was compiled March 23, 2015. Hydrated lime, in the form and application that is petitioned, has been used for some time and is known to be an effective disease suppression practice. In the past sunset review conducted in Fall 2015 the NOSB voted unanimously not to remove hydrated lime from the National List.

Additional information requested by Subcommittee:

1. Describe any alternative practices for suppression of leaf-borne mildews and other foliar fungal pathogens that would make the use of hydrated lime unnecessary.
2. Are adequate safety procedures in place to prohibit fieldworker and applicator exposure to hydrated lime?

Liquid fish products

Reference: 205.601(j) As plant or soil amendments (7) Liquid fish products —can be pH adjusted with sulfuric, citric or phosphoric acid. The amount of acid used shall not exceed the minimum needed to lower the pH to 3.5.

Technical Report: 1995 TAP; 2006 TR

Petition(s): N/A

Past NOSB Actions: 04/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation

Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Use:

Liquid fish products are used as fertilizers for the production of organic crops. These products contain fundamental nutrients and many trace minerals critical for use in organic farming. Liquid fish fertilizers are used in soil and container productions systems. Liquid fish foliar applications improve crop yields and reduce both insects and diseases.

Manufacture:

Liquid fish products are made from fish byproducts that are chopped and then enzymatically digested and heated or enzymatically processed without heat (cold-processing) to produce fish hydrolysate. Liquid fish products are then stabilized with an acid such as phosphoric, sulfuric or citric acid to prevent microbial growth. Use of formic acid is prohibited due to phytotoxicity. A third method utilizes fermentation by bacteria that produce lactic acid, which preserves the fish. All methods cannot result in pH below 3.5.

International (acceptance/non-acceptance) by other international certification agencies

The Canadian Organic Standard allows for the use of liquid fish products. Acids are permitted to lower the pH to 3.5, but no prohibited preservatives can be used. CODEX Alimentarius allows processed animal products from slaughterhouses and fish industries contingent on recognition from a certification body or authority. The Japanese Organic Standard permits the use of food industry byproducts of fish origin if they are derived from natural sources. IFOAM permits the use of fish and shell products and food processing of animal origin. Liquid fish is not on the EU Annex I list of approved fertilizers, but does allow fish meals.

Environmental/Health Issues:

Nutrient runoff from excessively or improperly applied fertilizers can cause eutrophication of surface waters, potentially harming fish and other aquatic animals.

Discussion:

Historically, there has been strong support for keeping liquid fish products on the National List. Concerns about the sustainability of source fish, including fish harvested for the sole purpose of producing liquid fertilizers, have been raised. The previous sunset review noted that “we do want to emphasize the importance of the sustainable harvesting of fisheries.” During the April 2016 NOSB meeting, the Board voted 11-4 to recommend that the addition of squid byproducts is consistent with the National List listing for liquid fish products that are pH adjusted with synthetic acid (7 CFR 205.601(j)(7)). Only squid byproducts originating from the food processing waste stream were recommended as acceptable for use in organic agriculture. The proposal was not intended to allow the use of whole squid in the manufacture of fertilizers.

Additional information requested by Subcommittee:

We are aware that the National Organic Program has received questions about the amount of acid used and when to measure the pH to determine compliance. For example, if pH that drops below 3.5 during the manufacturing process, but drifts up to 3.5 before sale and use, would the product be compliant? Therefore, we would like to solicit public comment on the following questions as part of the Sunset 2020 review at the Spring 2018 meeting:

1. How do certifiers and material review organizations determine the minimum amount of acid needed to stabilize liquid fish products?
2. How do certifiers and material review organizations evaluate liquid fish products for compliance with the pH threshold in the listing? For example:
    a. Must the pH be maintained at 3.5 or above throughout the entire manufacturing process?
    b. If the pH drops below 3.5 during manufacturing, but drifts up to 3.5 or above before sale, how do certifiers and material review organizations evaluate the product?
3. Feedback is needed from liquid fish fertilizer manufacturers on the scientific and technical basis for the pH 3.5 threshold and pH changes that occur during the manufacturing process.

Based on historical discussions about the sustainability of fish stocks used for the manufacture of liquid fish products, the Crops Subcommittee also asks for comments on the following questions:

4. What percentage of fish and/or fish by-products used as fertilizer is derived from farmed versus wild-harvested stocks?
5. For wild-harvested fish and/or fish by-products used as fertilizers, what percentage is derived from
    a. Waste from processing of wild market fish?
    b. Whole fish solely harvested for fertilizer? Please identify the species.
    c. By-catch (fish inadvertently killed when harvesting market fish)?
6. Are any manufacturers using exclusively wild-caught fish to manufacture fertilizers?
7. Is any new information available about the impact of liquid fish product manufacturing on the sustainability of wild fish stocks harvested solely for fertilizer production?
8. Please provide feedback on a possible annotation to this listing that would exclude the use of wild-caught *native* fish harvested exclusively for fertilizer.

Sulfurous acid

Reference: 205.601(j) – As plant or soil amendment —for on-farm generation of substance utilizing 99% purity elemental sulfur per paragraph (j)(2) of this section.
Technical Report: 2010 TAP; 2014 TR
Original Petition: 2008 Sulfurous Acid
Past NOSB Actions: 05/2009 NOSB Recommendation; 10/2014 NOSB sunset recommendation
Regulatory Background: Added to National List 7/6/2010 (75 FR 38693); Sunset renewal notice published 06/19/15 (80 FR 35177).
Sunset Date: 6/22/20

Background from Subcommittee:

Use:

Sulfurous acid is used to quickly acidify water in areas of the country where soils are alkaline or saline. Application of the acidic irrigation water can help to alleviate nutrient deficiencies created when saline or alkaline conditions tie up essential micronutrients. This in turn can improve crop yields and help to reduce soil degradation from salinity buildup. While similar reactions can eventually be obtained by applying soil sulfur, the reaction time of sulfur in the soil is relatively slow and the effect may take months or years to be realized (2014 TR). The last technical report was completed in 2014 and comments below draw from that report.

Manufacture:

Sulfurous acid is created by spraying water through smoke and fumes created by burning elemental sulfur. Several substances are created in this process, including sulfur dioxide, hydrogen sulfide and hydrogen sulfite (bisulfite). The sulfur dioxide dissolved in water is often termed sulfurous acid, however, the sulfurous acid is unstable and almost immediately forms hydrogen sulfite. The hydrogen sulfite is acidic and lowers the pH of the water (2014 Technical Report). This process is often done on-farm with a device called a sulfur burner and the effluent from the sulfur burner is used to acidify irrigation water.

Sulfurous acid does not require a tolerance or an exemption from tolerance and appears on the EPA non-food inert list. While sulfur dioxide, a potential pollutant, is generated by the burner, that sulfur dioxide is captured in the irrigation water and the release of sulfur dioxide to the atmosphere is minimal. EPA does not regulate this emission. In fact, the sulfur used to burn in these sulfurous acid generators is often sourced from scrubbers cleaning the emissions from oil, gas and coal industries.

International:

Canada – allowed for use in wine production but no mention of use as a soil amendment

CODEX Alimentarius Commission, European Economic Community - does not mention use as a soil amendment

Japan Agricultural Standard – mentions use of sulfur powder substances for pest or disease control

International Federation of Organic Agriculture Movements (IFOAM) – not listed explicitly as a fertilizer or soil conditioner, however the IFOAM Norms state that “Operators shall prevent or remedy soil or water salinization where these pose a problem”. Sulfurous acid is one way to remedy these problems.

Environmental Issues:

Sulfurous acid is a weak acid and does not produce notably toxic effects on fish, aquatic invertebrates or plants, and many bacteria possess sulfite reductase enabling them to metabolize sulfurous acid. In cases where sulfurous acid is used to acidify irrigation water, soils are often low in sulfur and the application of the sulfurous acid can be beneficial.

Additional information requested by Subcommittee:

None

Ethylene gas

Reference: 205.601(k) - As plant growth regulators. Ethylene gas - for regulation of pineapple flowering.
Technical Report: 2000 Supplemental TAP; 2007 TAP; 2011 Supplemental TR
Petition(s): N/A
Past NOSB Actions: 10/1995 NOSB recommendation; 10/2001 recommendation; 11/2005 NOSB sunset recommendation; 04/2011 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:
Use:
Ethylene gas is listed as a growth regulator for organic pineapple production only. It is used to induce uniform flowering in pineapples and is applied 7-15 months after planting. Application can be repeated two to three times after the initial application (TR lines 53-56).

Manufacture:
Made from hydrocarbon feedstocks, such as natural gas liquids or crude oil. It is produced almost exclusively from the pyrolysis of hydrocarbons in tubular reactor coils installed in externally fired heaters. Ethylene may also be produced from ethanol in fixed or fluid-bed reaction systems (2007 TAP).

International Acceptance by Other Certification Agencies:
Canada - Canadian General Standards Board Permitted Substances List permits use of ethylene "for post-harvest ripening of tropical fruit and degreening of citrus".
CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999) permits use of ethylene "as a flowering agent for pineapples".
European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008 has no mention of ethylene.
Japan Agricultural Standard (JAS) for Organic Production limits to the use of ethylene for the "afterripening [of] banana, kiwifruits, and avocado".
International Federation of Organic Agriculture Movements (IFOAM) states: " Ethylene gas is permitted for ripening".

Environmental/Health Issues:
The main safety concern in relation to ethylene use has been the explosive nature of the gas in the air. Operators should be well trained and prepared, though the safety concern to workers is limited when correctly used and monitored (2007 TAP).

Discussion:
The most recent technical report (TR) for this material was a supplement developed in 2011 that addressed questions of continued need, use according to scale of operation, and new alternatives.

The TR found that small-scale operations likely cannot afford the expensive equipment needed for whole plant application of ethylene gas in large fields (TR lines 215-16). Various technologies for applying ethylene were reported, including some limited evidence that smaller-scale producers are successfully adapting ethylene using handheld booms and manual application techniques in East and West Africa. Experiments involving cold treatment were reported in Taiwan, though actual use patterns in the field are unknown (TR lines 191-210). Alternative natural methods to induce flowering have not changed since the initial material review in 1999 and include cold stress, smoke, exposure to ripe fruits, and selective tilling of the weeds and cutting back of trees in agroforestry systems (TR lines 73-75).

This material was reviewed in 2015 ahead of its 2017 sunset date. The NOSB was concerned about the lack of comments from pineapple producers for the spring meeting, and they included another request to hear from stakeholders in the proposal for the fall meeting. Subsequently, organic pineapple producers, primarily from Costa Rica, presented a large number of both written and oral comments. These comments, along with historic information, previous sunset reviews, and discussions at the fall meeting helped to provide the NOSB with information about this material, how it is used by operations of various sizes, and the significance it plays in crop production. There have been concerns in the past that this material is used only by larger operations; the Fall 2015 grower comments showed that organic pineapple producers of all sizes use this material. Public testimony indicated that the current level of organic pineapple production is dependent on the availability of this material. No new issues of human health or environmental concerns were raised that had not been addressed in previous review cycles.

Additional information requested by Subcommittee:

The 2011 supplemental TR states that "no direct evidence has been found in the available information that allowance of ethylene gas for use in organic farming is placing small-scale producers at a disadvantage" (lines 217-18). A similar conclusion was reached during the 2015 sunset review. Does this remain true today, and if so, please elaborate on ways in which smaller-scale producers are applying alternative technologies and ethylene application methods?

Microcrystalline cheesewax

Reference: 205.601(o) - As production aids. Microcrystalline cheesewax (CAS #'s 64742-42-3, 8009-03-08, and 8002-74-2)-for use in log grown mushroom production. Must be made without either ethylene-propylene co-polymer or synthetic colors.
Technical Report: none
Petition(s): 2007 Petition; 2008 Petitioner response to questions
Past NOSB Actions: 05/2008 NOSB recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Federal Register rule amendment published 02/14/12 (77 FR 8089); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Microcrystalline waxes are a type of wax derived from the refining of the heavy petroleum distillates during the petroleum refining process. It is recovered from crude oil through a series of filtration, solidifying, and solvent extraction steps. The by-product must then be de-oiled at a wax refinery, resulting in the three components of the cheesewax. Depending on the end use and desired specification, the product may then have its odor removed and color removed (which typically starts as a brown or dark yellow). This is usually done by means of a filtration method or by hydro-treating the wax material. All the solvents in the process are recovered, with none remaining in the final product.

Microcrystalline wax is used in mushroom production, and is used to seal plug holes in Shiitake logs in which mushroom spawn is inserted. The original petition stated that there is no contact with the growing mushrooms at any time.

Microcrystalline cheesewax has been approved by the United States Food and Drug Administration (FDA) 21 CFR § 172.888 as a "synthetic petroleum wax," for use as a "masticatory substance," in chewing gum, a "protective coating," on cheese and raw fruits and vegetables, and a "defoamer in food." Microcrystalline cheesewax as a petroleum wax is also listed by the FDA at 21 CFR 178.3710 as an allowed "component of nonfood articles in contact with food."

Approved Use:
Microcrystalline cheesewax is used as a sealant to hold in the moisture and to physically hold the mushroom spawn in place when placed over the hole in the log in which the spawn has been inserted.

International acceptance by OFPA and International Certifying Bodies:
Organic Foods Production Act and USDA Final Rule: Microcrystalline cheesewax is not listed in the Organic Foods Production Act of 1990. Microcrystalline cheesewax is currently listed under the National Organic Program (NOP) regulations at 7 CFR §205.601(o) as a synthetic substance allowed as a "production aid," for "use in log grown mushroom production," with the exception that the wax "must be made without either ethylene-propylene co-polymer or synthetic colors."

Canadian General Standards Board Permitted Substances List
CAN/CGSB-32.311 "Table 6.5 Processing aids" prohibits the use of microcrystalline wax "either alone or in formulations with paraffin wax."

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999)
Neither microcrystalline cheesewax, nor its components identified in this petition are listed in the CODEX (GL 32-1999).

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008
Neither microcrystalline cheesewax, nor its components identified in this petition are listed in EC No. 834-2007 nor EC No. 889/2008.

Japan Agricultural Standard (JAS) for Organic Production
Neither microcrystalline cheesewax, nor its components identified in this petition are listed in the JAS for Organic Production.

International Federation of Organic Agriculture Movements (IFOAM)
Neither microcrystalline cheesewax, nor its components identified in this petition are listed in IFOAM.

Human Health Impact:
Microcrystalline cheesewax is melted to a liquid state to be placed in the spawn hole. During the melting process, petrochemical fumes might be released, causing mild respiratory irritation, according to the Materials Safety Data Sheet. The cheesewax does meet the FDA requirements for use in non-food articles in contact with food and for use in food (21 CFR 178.3710 and 21 CFR 172.886). Formulations of the microcrystalline cheesewax do contain BHT as an antioxidant preservative.

Environmental Impact:
Microcrystalline cheesewax breaks down readily in the environment, is not toxic to soil flora and fauna, and does not dissolve readily in water.

Additional information requested by Subcommittee:

1. During the 2008 NOSB recommendation review it was determined that there were no effective approved natural or synthetic materials that could replace microcrystalline cheesewax for plugging Shiitake mushroom log-grown substrates. Is there now an effective natural or approved synthetic replacement for the microcrystalline cheesewax that is derived from petroleum by-products?

2. Should an annotation be added that requires removal of residues of the microcrystalline cheesewax that remain in the environment once the Shitake Logs are finished fruiting?

3. Canada and Japan, and perhaps other countries, also produce organic Shitake mushrooms, but do not allow the use of microcrystalline cheesewax in their organic production. Why do these countries not allow the microcrystalline cheesewax and/or what other types of substances are those producers using as a sealant?

Potassium chloride

Reference: 205.602(e) - unless derived from a mined source and applied in a manner that minimizes chloride accumulation in the soil.
Technical Report: 1995 TAP
Petition(s): N/A
Past NOSB Actions: 04/1995 NOSB minutes and vote; 11/2005 NOSB sunset recommendation; 10/2010 NOSB sunset recommendation; 10/2015 NOSB sunset recommendation
Recent Regulatory Background: Sunset renewal notice published 06/06/12 (77 FR 33290); Sunset renewal notice published 03/21/17 (82 FR 14420)
Sunset Date: 3/15/2022

Background from Subcommittee:

Material Use:

Potassium is required for health in humans, plants, and microorganisms (TAP pg. 4, 14). Potassium is an essential element for plants as they use it to regulate water movement, regulate photosynthesis, assist in enzyme activation, and in the movement of nutrients within the plant. While potassium is found in many soils, it may not naturally be in high enough concentration, and/or it may be present but in a bound format rendering it unavailable, and/or the available concentration of soil potassium over time may not be sufficient to allow for successful growing of crops through their life cycle. Potassium is commonly used by growers either alone, as a complex in potassium chloride, or as an ingredient in a fertilizer blend for soil supplementation. Chloride is also an essential element for plants (TAP pg. 12); however, monitoring of chloride use is required to assure soil salinity is managed appropriately. Current NOP regulation stipulates monitoring in the current annotation for potassium chloride to prevent chloride accumulation.

Manufacture:

Potassium chloride is produced through mining or through solar evaporation of natural brines (TAP pg. 13). Processing of the mined potassium chloride involves physical separation processes and may potentially use conditioning agents to aid in separation of potassium chloride from sodium chloride and other impurities in the mined ore (TAP pg. 13). Natural resources of potassium are abundant within the U.S. in North Dakota, New Mexico, Utah and California (TAP pg. 13, 14).

International Equivalency:

Canada - Canadian General Standards Board Permitted Substances List permits use of potassium chloride in crop production as long as the source of the material is from muriate of potash and rock potash, and its use cannot cause salt accumulation in the soil.

CODEX Alimentarius Commission, Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (GL 32-1999) permits use of potassium salts with origins from Rock potash, mined potassium salts (e.g. kainite, sylvinite) and requires that it must be less than 60% chloride in composition.

European Economic Community (EEC) Council Regulation, EC No. 834/2007 and 889/2008 allows for the use of “Crude potassium salt or kainit” in fertilizer and soil amendments.

Japan Agricultural Standard (JAS) for Organic Production allows for use of potassium “formed by pulverizing or washing and refining the natural ore or those produced from sea water or lake water without the use of chemical treatment”.

International Federation of Organic Agriculture Movements (IFOAM) allows mineral potassium (e.g. sulfate of potash, muriate of potash, kainite, sylvanite, patenkali) but stipulates that it “shall be obtained by physical procedures but not enriched by chemical processes”.

Environmental Issues:

No significant concern for environmental issues were noted in the TAP review given the high amount of potash reservoirs, and that the discharge (sodium chloride) is not being directly released into the environment due to regulations preventing such practices (TAP pg 15).

Background Information:

During the last sunset review in 2015, the NOSB unanimously voted to relist potassium chloride at §205.602(e) with the current annotation requiring origin from a mined source, and that it is applied in a manner to prevent chloride accumulation in the soil.

Additional information requested by Subcommittee:

Is potassium chloride still required for growers? Or, are non-chloride potassium products available to organic growers that would eliminate the concern for chloride accumulation in the soil?