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Re. CS: 2019 Sunset of §601 Materials

These comments to the National Organic Standards Board (NOSB) on its Spring 2024 agenda are submitted on behalf of Beyond Pesticides. Founded in 1981 as a national, grassroots, membership organization that represents community-based organizations and a range of people seeking to bridge the interests of consumers, farmers and farmworkers, Beyond Pesticides advances improved protections from pesticides and alternative pest management strategies that reduce or eliminate a reliance on pesticides. Our membership and network span the 50 states and the world.

Below are comments on materials due to sunset from §205.601 in 2024.

Soaps, herbicidal

Current listing:
§205.601 (b) As herbicides, weed barriers, as applicable.
(1) Herbicides, soap-based—for use in farmstead maintenance (roadways, ditches, right of ways, building perimeters) and ornamental crops.

The supportive materials on this substance leave questions unanswered. The original TAP review appears to have considered only potassium-based soaps, but the more recent TR considers both potassium- and ammonium-based soaps. Yet ammonium-based soaps seem to be limited to another use altogether by §205.601(d) "As animal repellents—Soaps, ammonium—for use as a large animal repellant only, no contact with soil or edible portion of crop." A few excerpts from the 2015 TR demonstrate the confusion:

> The allowable use patterns for specific soap salt formulations are more restricted in organic agriculture. According to 7 CFR 205.601(a)(7), soap salts may be used as algicides and demossers in organic crop production. Unspecified soap salts are also allowed for use as insecticides, acaricides and for mite control (7 CFR 205.601(e)(8)). In addition, soap salts are permitted as herbicides for farmstead maintenance around roadways, ditches, right of ways and building perimeters, and for application to ornamental crops (7 CFR 205.601(b)(1)). Only ammonium salts of fatty acids may be

used in organic crop production as large animal repellents. Although not strictly stated in the final rule, it is generally assumed that soap salts used as algicides, herbicides and insecticides consist of potassium or ammonium salts of fatty acids (US EPA, 2013).[1]

The NOSB recommended against the explicit use of ammonium salts of fatty acids as herbicides in organic crop production in 2007 and 2008 (USDA, 2007; USDA, 2008). During both reviews, the NOSB voted to reject the use of ammonium soap salts due to the availability of numerous alternative weed management practices and incompatibility of the substance with the provisions of the Organic Foods Production Act (OFPA) for general use on crops or cropland. These rulings stand in contrast to the allowed use of generic soap-based herbicides—including potassium and ammonium salts of fatty acids—for use in organic farmstead maintenance under 7 CFR 205.601(b)(1).[2]

The National Organic Program (NOP) final rule currently permits the use of soaps for a variety of purposes in organic crop production: Soap-based algicides/demossers (7 CFR §205.601(a)(7)), soap-based herbicides (7 CFR §205.601(b)(a)), ammonium soaps as animal repellents (7 CFR §205.601(d)) and insecticidal soaps (7 CFR 205.601(e)(8)). As an approved herbicide, soaps are only allowed for nonfood uses—in farmstead maintenance (roadways, ditches, right of ways, building perimeters) and ornamental crops. The NOP final rule indicates that ammonium soaps are permitted as large animal repellents but may not come into contact with soil or the edible portion of crops. Several OMRI-approved herbicides are formulated with ammonium soaps, such as ammonium nonanoate (OMRI, 2014).[3]

Regardless, herbicidal soaps do not meet any of the three OFPA criteria, including absence of harm to humans and the environment, essentiality, and compatibility with organic practices.

Herbicidal soaps are inconsistent with organic practices.

Herbicidal soaps are non-selective synthetic herbicides. The NOSB has generally found synthetic herbicides to be incompatible with organic practices. Indeed, their use is inconsistent with the first "principle of organic production and handling" adopted by the NOSB:

> Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. These goals are met, where possible, through the use of cultural, biological, and mechanical methods, as opposed to using synthetic materials to fulfill specific functions within the system.[4]

[1] Lines 94-100.
[2] Lines 160-166.
[3] Lines 176-183.
[4] NOSB Principles of Organic Production and Handling, adopted October 17, 2001.

Herbicidal soaps harm the ecosystem.

The Technical Review (TR) finds a possibility of damage to, and bioconcentration by, aquatic organisms if the soaps are applied to water. They may harm many soil-dwelling organisms including insects, earthworms, and nematodes that are supportive of organic production. The annotation restricts its use to non-crop areas, but these areas should be sources of biodiversity that support the farm. Furthermore, it has come to our attention that the soaps may be used around high tunnels, on soil that is shared with crops within the tunnels.

Herbicidal soaps are not essential.

The TR and earlier TAP review list several natural materials that can be used instead of herbicidal soaps, including vinegar, citric acid, essential oils, corn gluten meal, mulches, and hot water. Alternative practices include mulching, mowing, grazing, hand/mechanical cultivation, and use of flame or other sources of heat.

Conclusion

Herbicidal soaps should be allowed to sunset because they do not meet the criteria for listing on the National List. If the NOSB decides to relist herbicidal soaps, it should clarify the confusion over ammonium-based soaps.

Biodegradable biobased mulch film

601(b)(2) Mulches. (iii) Biodegradable biobased mulch film as defined in §205.2. Must be produced without organisms or feedstock derived from excluded methods.

At its Fall 2021 meeting, the NOSB voted to change the definition for biodegradable biobased bioplastic mulch film to allow the use of films that are at least 80% biobased. Although this poses some technical difficulties in deciding which listing is to be sunsetted, our comments apply to either one. In short, we believe that plastic should be eliminated from organic production and handling in all its forms and uses. The term “biodegradable biobased mulch film” should not be used to hide the fact that these films are, in fact, plastic. Recent research and public awareness of the hazards of microplastics, which result from the breakdown of these films, need to inform the decision of the NOSB.

Background

Many things have changed since the passage of the Organic Foods Production Act (OFPA). Organic production has grown, and the size of many organic growing operations has grown. The way materials on the National List are used has changed—and many growers joining the ranks of organic are more dependent on those added synthetics than has been true historically. In addition, the materials themselves have changed. All of these changes are manifest in two materials on the National List—newspaper and other recycled paper and plastic mulch and covers.

Natural organic mulches should be the norm in organic production. The use of natural organic materials in compost and mulch is foundational to organic. In 2001, the National Organic Standards Board (NOSB)[5] advanced this definition:

> Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. These goals are met, where possible, through the use of cultural, biological, and mechanical methods, as opposed to using synthetic materials to fulfill specific functions within the system.

The NOSB went on to say that, among other things, an organic production system is designed to: "optimize soil biological activity;" "utilize production methods and breeds or varieties that are well adapted to the region;" "recycle materials of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources;" and "minimize pollution of soil, water, and air." The use of natural mulches—including cover crops—contributes to all of these values.

Organic production systems are also intended to function in sync with natural ecosystems. In natural systems, plants are fed by the action of soil organisms breaking down plant residues and excreting substances that are plant nutrients. Natural mulches provide a steady diet of organic matter for those soil organisms. This function is one way that we can judge the compatibility of synthetic mulches with organic values.

Plastic Mulch

As stated above, the use of natural organic mulches is foundational to organic production. The 1973 edition of the *Encyclopedia of Organic Gardening* does not mention plastic in its entry on mulches. By the time OFPA was passed and the first National List was promulgated, plastic mulch was so routinely used that it was approved unanimously by the NOSB. Nevertheless, clear misgivings are reflected in the language of OFPA, prohibiting the use of plastic mulches "unless such mulches are removed at the end of each growing or harvest season." The regulations also prohibit PVC plastic as mulch. Testimony at NOSB meetings indicates that this language is understood by many, but not all, certifiers to allow the continuous use of plastic mulch in perennial crops, such as fruit trees because the "growing season" is continuous.[6] Those using plastic mulch in annual crops report taking truckloads of mulch to the landfill at the end of the growing season.

Does plastic mulch meet OFPA criteria?

OFPA requires that a synthetic material on the National List meet three criteria:

1. It is not harmful to human health or the environment;
2. It is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and

[5] NOSB Principles of Organic Production and Handling. NOSB Recommendation Adopted October 17, 2001.
[6] NOSB meeting materials, Fall 2018. Plastic mulch and covers.

3. It is consistent with organic farming and handling.

The NOSB's 2015 sunset review of plastic mulch looked at these criteria in greater depth than before. With regard to impacts on human health and the environment, the NOSB said:

- Polyethylene is usually derived from either modifying natural gas (a methane, ethane, propane mix) or from the catalytic cracking of crude oil into gasoline, though it may be made from biological sources.[7]
- Use of plastic mulch leads to environmental contamination because used plastic gets taken to landfills, and pieces are left behind on fields.

With regard to the need for plastic mulch "because of the unavailability of wholly natural substitute products," the NOSB and technical reviews have pointed out alternatives. Natural alternatives are organic mulches and living mulches. Alternative practices that could be used include: for weed control, tillage and other mulches; for soil warming, planting adapted plants.

The NOSB and technical reviews have also pointed out reasons that plastic mulch is not compatible with organic farming:

- Solarization kills microorganisms.
- Loss of water: In one season, the loss of water was 2-4 times higher and the loss of soil sediment was three times higher in plots where PE mulch was used compared to those where hairy vetch residues were used.
- The substitution of plastic for natural mulches reduces inputs of organic matter.

Microplastics

Scientists are increasingly concerned about the impacts of microplastics—plastic fragments less than 5 mm in size in size—on a wide range of organisms. Although concerns were first raised about microplastics in the marine environment,[8] impacts on terrestrial organisms are increasingly documented. They contaminate even the Arctic.[9]

A major source of microplastics in surface water is wastewater treatment plants. Although microplastics in soil have been less studied, presumably, microplastics in soil make their way in runoff to surface water. Agricultural soils may receive microplastics from sludge/compost fertilization, plastic mulches, and wastewater irrigation.[10]

Microplastics can cause harmful effects to humans and other organisms through physical entanglement and physical impacts of ingestion. They also act as carriers of toxic chemicals that are adsorbed to their surface. Studies on fish have shown that microplastics and their associated toxic chemicals bioaccumulate, resulting in intestinal damage and changes in

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[7] Priscilla Lepoutre, The Manufacture of Polyethylene. http://nzic.org.nz/ChemProcesses/polymers/10J.pdf.

[8] Pabortsava, K. and Lampitt, R.S., 2020. High concentrations of plastic hidden beneath the surface of the Atlantic Ocean. *Nature communications*, *11*(1), pp.1-11.

[9] Inuvik Drum, 2021. Pesticides, microplastics contaminating Arctic air. https://www.nnsl.com/inuvikdrum/pesticides-microplastics-contaminating-arctic-air/.

[10] Zhu, F., Zhu, C., Wang, C. and Gu, C., 2019. Occurrence and ecological impacts of microplastics in soil systems: a review. *Bulletin of environmental contamination and toxicology*, *102*(6), pp.741-749.

metabolism.[11] Soil organisms and edible plants have been shown to ingest microplastic particles.[12] Earthworms can move microplastics through the soil, and microplastics can move through the food chain to human food.[13] They have been found in human tissues.[14] Microplastics can have a wide range of negative impacts on the soil, which are only beginning to be studied, but include reduction in growth and reproduction of soil microfauna.[15] When looking at the impact of microplastics, it is important to include the impact of associated substances. As noted above, they can carry toxic chemicals. They also slow the decomposition of contaminants.[16] A review by Zhu et al. cites several studies showing, "[M]icroplastics can serve as hotspots of gene exchange between phylogenetically different microorganisms by introducing additional surface, thus having a potential to increase the spread of ARGs [antibiotic resistance genes] and antibiotic resistant pathogens in water and sediments." [17] Other research confirms the synergistic impact of microplastics and other contaminants.[18]

Biodegradable Biobased Bioplastic Mulch

Biodegradable biobased mulch film (BBMF) was approved by the NOSB in October 2012, with very specific requirements for degradation, for use in organic production and the listing was finalized September 30, 2014 as:

> (iii) Biodegradable biobased mulch film as defined in §205.2. Must be produced without organisms or feedstock derived from excluded methods.

The NOP also adopted a definition in §205.2 of the regulations:

> *Biodegradable biobased mulch film.* A synthetic mulch film that meets the following criteria:
> (1) Meets the compostability specifications of one of the following standards: ASTM D6400, ASTM D6868, EN 13432, EN 14995, or ISO 17088 (all incorporated by reference; see §205.3);

[11] Li, J., Liu, H. and Chen, J.P., 2018. Microplastics in freshwater systems: A review on occurrence, environmental effects, and methods for microplastics detection. *Water Research*, *137*, pp.362-374.
[12] Zhu, F., Zhu, C., Wang, C. and Gu, C., 2019. Occurrence and ecological impacts of microplastics in soil systems: a review. *Bulletin of environmental contamination and toxicology*, *102*(6), pp.741-749.
[13] He, D., Luo, Y., Lu, S., Liu, M., Song, Y. and Lei, L., 2018. Microplastics in soils: analytical methods, pollution characteristics and ecological risks. *TrAC Trends in Analytical Chemistry*, *109*, pp.163-172.
[14] American Chemical Society. (2020, August 17). Micro- and nanoplastics detectable in human tissues. *ScienceDaily*. Retrieved January 12, 2022 from www.sciencedaily.com/releases/2020/08/200817104325.htm.
[15] He, D., Luo, Y., Lu, S., Liu, M., Song, Y. and Lei, L., 2018. Microplastics in soils: analytical methods, pollution characteristics and ecological risks. *TrAC Trends in Analytical Chemistry*, *109*, pp.163-172.
[16] Beriot, N., Zomer, P., Zornoza, R. and Geissen, V., 2020. A laboratory comparison of the interactions between three plastic mulch types and 38 active substances found in pesticides. *PeerJ*, *8*, p.e9876.
[17] Zhu, F., Zhu, C., Wang, C. and Gu, C., 2019. Occurrence and ecological impacts of microplastics in soil systems: a review. *Bulletin of environmental contamination and toxicology*, *102*(6), pp.741-749.
[18] Yin, J., Huang, G., Li, M. and An, C., 2021. Will the chemical contaminants in agricultural soil affect the ecotoxicity of microplastics?. *ACS Agricultural Science & Technology*, *1*(1), pp.3-4.

(2) Demonstrates at least 90% biodegradation absolute or relative to microcrystalline cellulose in less than two years, in soil, according to one of the following test methods: ISO 17556 or ASTM D5988 (both incorporated by reference; see §205.3); and
(3) Must be biobased with content determined using ASTM D6866 (incorporated by reference; see §205.3).

While BBMF was supported enthusiastically by those who saw an opportunity to have the benefits of plastic mulch without the wasteful and labor-intensive practice of carting it off to the landfill at the end of every growing season, others (including Beyond Pesticides) warned that the available products were "not ready for prime time." As predicted, the Organic Materials Research Institute (OMRI) soon announced that no products met the criteria in the National List—that is, 100% biobased and biodegradable. Before long, we were seeing declarations by OMRI, NOP, and the newer members of the NOSB that "there was confusion among Material Review Organizations (MROs) and certification agencies about how much of the feedstocks must be biobased." This is repeated in the CS proposal, which states, "Biodegradable biobased mulch films were approved for placement on the National List of approved synthetics (Biodegradable Mulch Film Made from Bioplastics) without detailing if non-biobased content would be allowed." This so-called confusion existed in spite of clarity from the NOSB in deliberations and listing and despite clarity on the part of NOP in its clarifying memo[19] that the BBMF approved by the NOSB is 100% biobased**. It is a misrepresentation of the previous Board's deliberations and language of the BBMF annotation to suggest that the NOSB and the public was not clear about prohibiting the introduction and incorporation of microplastic particles into soil, the very soil system that is foundational to critical microbial soil life, OFPA, and organic production**. In view of this "confusion," the NOSB at its Fall 2021 meeting voted to change the definition of BBMF to allow bioplastics that are at least 80% biobased in origin.

BBMFs are not removed from the field by the grower. Instead, they are tilled into the soil. The tillage process purposefully creates microplastics, with the intention that the action of soil organisms will degrade these small particles. However, as reported in OMRI's 2016 Supplemental Technical Review (STR),[20] many growers report that fragments persist in the soil. OMRI reports that research on the eventual fate of biodegradable mulch films is ongoing. There is, nevertheless, research reported by OMRI indicating that the BBMFs do not completely degrade and may degrade more slowly when tilled under the surface, that they contain components that may be hazardous, and particles may adsorb persistent toxins.

Synthetic mulches should not replace organic mulches.

Organic mulches have always been central to organic production. The Rodale *Encyclopedia of Organic Gardening*, for example, begins its long entry on "mulch" with this: "A layer of material, preferably organic material, that is placed on the soil surface to conserve moisture, hold down weeds, and ultimately improve soil structure and fertility. As with

[19] NOP, January 22, 2015. Policy Memo 15-1. Subject: Biodegradable Biobased Mulch Film. From Miles McEvoy, Deputy Director of NOP.
[20] OMRI, 2016. TR Biodegradable Biobased Mulch Films.

composting, mulching is a basic practice in the organic method; it is a practice which nature employs constantly, that of always covering a bare soil."[21]

As stated above, the NOSB Principles of Organic Production and Handling state that the goals of organic agriculture "are met, where possible, through the use of cultural, biological, and mechanical methods, as opposed to using synthetic materials to fulfill specific functions within the system."[22] Thus, reliance on synthetic mulches for functions that can be performed by organic mulch is not compatible with organic production. If soil warming cannot be achieved by organic materials like straw, both the listings for plastic mulch and BBMF should be annotated "for soil warming only."

Synthetic materials must meet all of the OFPA criteria.

In order to be included on the National List, synthetic materials must not cause harm from manufacture through disposal, be necessary for organic production, and be consistent with organic production. Avoiding harm from cradle-to-grave impacts requires that BBMF be both biobased and **completely** biodegradable. It appears to us that there is one purpose—soil warming—for which plastic/bioplastic mulches may be judged to be necessary. References to plastic (and lack thereof) in OFPA, NOSB guidance, and traditional organic literature suggest that plastic/bioplastic mulches are not consistent with organic production.

Environmental and Health Effects

In addition to the newer information about microplastics cited above, the NOSB should consider information available in previous meetings. Two research projects funded by USDA's National Institute of Food and Agriculture Specialty Crop Research Initiative —the first carried out between 2010 and 2013 (SCRI 1) and the second funded for four years beginning 2014 (SCRI 2)— provide much of the data used in the Supplemental Technical Evaluation Report (STR) prepared by the Organic Materials Research Institute (OMRI).

- Current research reports a lack of reliable methods for measuring biomass carbon or carbon residues from the degradation of BMFs, but "one of the current SCRI 2 project goals is to determine how BMFs contribute to the carbon cycle, including the fractions that are bioassimilated, lost to the atmosphere as CO2 via respiration, or converted into stable soil organic carbon: humus."[23]
- Researchers observed conflicting results concerning soil organic matter mineralization under BMF.[24]
- Studies conducted under SCRI 1 concluded that factors other than the use of BMF were most important in determining soil quality, and many more factors are being evaluated in the SCRI 2.[25]

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[21] Rodale, J.I. and the staff of Organic Farming and Gardening magazine, 1959. *The Encyclopedia of Organic Gardening*, Rodale Books, Inc., Emmaus, PA. P. 722.
[22] NOSB Recommendation Adopted October 17, 2001.
[23] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 97-102.
[24] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 118-134.
[25] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 180-197.

- There is scant evidence on ecotoxicity of the degrading BMFs, and what exists is equivocal. More research is underway as part of SCRI 2.[26]
- Cumulative impacts of continued use of BMFs is also uncertain. The STR reports on research by Brodhagen et al., who looked at the potential for long-term accumulation of fragments with continued use of BMFs that pass the ISO 17088 (2012) and ASTM D6400-12 (2012) composting standards. They report that the biodegradability standards of these tests would permit the accumulation of small plastic fragments (< 2.0 mm), as well as up to 49% of the concentration of regulated metals allowed for sludges, fertilizers and composts. A new testing standard under consideration for aerobically biodegradable plastics in a soil environment, ASTM WK29802 (2014), would result in similar conditions: persistence of 10% of the plastic mass after 2 years for each constituent present in the material at a concentration of more than 1%. With their assumptions, the authors calculate that, if any portion of the remaining 10% represents recalcitrant polymers, metals or untested components, they will accumulate with repeated applications in the soil in a manner that can be estimated.[27]
- Similarly, the STR reports, "There is a lack of specific evidence in the current scientific literature to show that the breakdown of BMF polymers adversely affects soil and plant life or subsequently grazing livestock. . . Although these studies did not uncover significant impacts of BMF degradation products on soil or plant life, it is generally accepted that any such impacts are poorly understood and need further study. Regarding livestock that that would graze crop residues or forages grown subsequent to the use of BMFs, Brodhagen et al. (2015) report that it is unknown what effect the ingestion of plastics has on terrestrial organisms. It has been noted that plastics can absorb pesticides and other contaminants such as mycotoxins in the environment."[28]
- The STR reports variation in decomposition of BMFs is affected by soil temperature, moisture, pH, nitrogen content, native microbial populations, and type of BMF.[29]
- The STR states, "It is currently unknown whether complete degradation of BMF is possible." There are many intermediates produced in decomposition. "The effect of BMF additives, processing aids and their metabolites which are released into the environment during BMF degradation have not been extensively addressed in the scientific literature." "Breakdown of a BMF polymer could potentially result in the release of nutrient elements such as nitrogen, with potential implications as a fertilizer or cause of toxicity, as in the case of ammonium, though such a scenario is more likely to occur in composted mulches." "Research related to the risks and benefits of carbon emissions during microbial breakdown of biodegradable mulches has yet to be undertaken; however, increased mineralization of soil organic matter due to elevated temperature and moisture has been cited as a source of increased greenhouse gas emissions."[30]

[26] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 200-219.
[27] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 245-253.
[28] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 271-295.
[29] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 313-377.
[30] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 383-436.

In summarizing the research on the impacts on soil health, the STR states, "These findings suggest that the effects of BMF degradation on soil quality will vary substantially based on a combination of factors, including the type of BMF used, location, cropping system and time since mulch incorporation."[31] Thus, the NOSB should not depend solely upon the American Society for Testing and Materials (ASTM) standards for compostability and degradability when establishing organic standards. ASTM standards are based on lab tests rather than field tests, and thus are not helpful in setting standards relating to on-farm conditions. The optimal conditions used in the lab would not likely be found in agricultural fields between growing seasons, and certainly do not account for variations in environmental and climatic conditions.

The NOSB does not, therefore, have information to determine that BBBM, as currently formulated, meets the OFPA criterion of lack of negative effects on human health and the environment.

Essentiality of BBBM

Since the studies that are in progress to address the many unknowns associated with the effects of BBBM on soils and the ecosystem will still require time to complete, the NOSB should use the opportunity to further investigate other ways of meeting the needs served by plastic mulches. To the extent that plastic mulch is used for weed control, natural mulches and cover crops can accomplish the job in a way that appears to be more compatible with organic production.[32]

Compatibility with Organic Production

Routine use of synthetic materials

The NOSB Principles of Organic Production and Handling[33] state:

> Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. These goals are met, where possible, through the use of cultural, biological, and mechanical methods, as opposed to using synthetic materials to fulfill specific functions within the system.

The routine use of synthetic inputs do not appear to be consistent with this principle. This applies to non-biodegradable plastic as well as BBBM.

Removal

The biogradable biobased mulch film, which was originally petitioned as "biodegradable plastic mulch made from bioplastics" is, regardless of all the qualifiers, a synthetic plastic. As such, it is subject to the OFPA restriction that prohibits the use of "plastic mulches, unless such

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[31] OMRI, 2016. Supplemental Technical Evaluation Report: Biodegradable Biobased Mulch Films. Lines 58-60.
[32] See Jeff Moyer, 2011. *Organic No-Till Farming*. Acres USA, Austin, TX. 2012 TR on Biodegradable Mulch Film Made from Bioplastics. Lines 684-721.
[33] Adopted October 2001. See 2016 Policy and Procedures Manual, pp. 37-38.

mulches are removed at the end of each growing or harvest season." (OFPA §6508(c)(2)) We agree with those who propose that complete degradation (not necessarily complete mineralization) would qualify as "removal." Unfortunately, we do not believe that the biodegradability/compostability criteria in the regulation are adequate to ensure biodegradability within the timeframe of OFPA. Further research is needed to determine the appropriate criteria for biodegradability –and hence, removal. This is particularly important since NOP's regulation inappropriately removes the NOSB requirement for producers to take the appropriate steps to ensure biodegradation in the timeframe allowed by OFPA.

The standard for biodegradation must be removal at the end of each growing or harvest season. Neither the standard put into regulation by NOP nor the standards proposed by the NOSB appear to be adequate to ensure complete removal. They do not address the wide range of conditions found on organic farms. A short review of the current state of affairs with respect to biodegradable biobased bioplastic mulches states,[34]

> Many types of mulch claiming to be biodegradable are actually compostable, and fulfill the requirements of ASTM D6400, or related standards. Moreover, no standard currently exists for measuring the biodegradability of plastics buried in soil under field soil conditions. To meet this need for measuring biodegradability within the soil, ASTM is developing a standard through a specification (Work Item 29802) entitled "Aerobically Biodegradable Plastics in the Soil Environment" (Ramani Narayan, ASTM Fellow, personal communication). In this new standard, biodegradable mulches must break down into CO_2, water and environmentally benign substances within one or two years, leaving no harmful residues. The ability of existing and emerging biodegradable plastic mulch products to meet these criteria in the soil environment is still being researched.

Therefore, and as discussed in the STR, we believe that it is not yet possible to establish adequate criteria that can be implemented by materials review organizations, certifiers, and growers that will ensure biodegradability to the extent required by OFPA.

Conclusion

BBMFs do not meet OFPA criteria—with or without the definition change made at the Fall 2021 meeting. Therefore, they should be allowed to sunset from the National List.

Boric acid

205.601(e) As insecticides (including acaricides or mite control). (3) Boric acid - structural pest control, no direct contact with organic food or crops.

Although boric acid has long been considered a "least-toxic" pesticide when placed in traps as non-volatile bait or gel formulations that eliminate direct exposure, its use as a dust in

[34] Corbin, A., Miles, C., Cowan, J., Hayes, D., Inglis, D., and Dorgan, J. 2013. Using biodegradable plastics as agricultural mulches. Washington State University Extension Fact Sheet: FS103E. Available at: http://cru.cahe.wsu.edu/CEPublications/FS103E/FS103E.pdf.

structures results in exposure and hazards for exposed people. There are alternative materials and practices that may be less harmful.

Environmental and Health Hazards

Boric acid is harmful to humans and the environment. It is a reproductive toxicant, a suspected endocrine disruptor, and toxic to plants and animals. Borax mining results in environmental damage and threatens worker health.[35]

Inhalation exposure from mining exposure has been documented to cause respiratory irritation such as dryness of the mouth, nose, or throat, dry cough, nose bleeds, and sore throat.[36] Reduction in sperm production has been found in both humans and experimental animals.[37] Other reproductive effects that have been documented include reduced success of pregnancy, reduced birth weight, and birth defects.[38] Consistent with its effects on sperm, boric acid has been shown to reduce testosterone levels.[39]

Essentiality

Boric acid is not essential. Natural alternatives include diatomaceous earth[40] and boiling water.[41] Management practices include sanitation, exclusion, sticky barriers, sticky traps[42] and removal of host plants for aphids.[43]

Compatibility

As an unnecessary toxic synthetic input with nontoxic alternatives, boric acid is not compatible with organic production practices.

Conclusion

With the challenging issues of health and environmental/mining impacts and available alternative materials and practices that may be less harmful, if boric acid remains on the National List, it should be further annotated, "for use only as bait in traps or in gel

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[35] "How Green are Boron Cleansers?" Scientific American, 2009. http://www.scientificamerican.com/article/how-green-are-boron-cleansers/.

[36] Agency for Toxic Substances and Disease Registry (ATSDR), 2010. Toxicological Profile for Boron.

[37] Agency for Toxic Substances and Disease Registry (ATSDR), 2010. Toxicological Profile for Boron.

[38] Agency for Toxic Substances and Disease Registry (ATSDR), 2010. Toxicological Profile for Boron. Caroline Cox, 2004. Pesticide Factsheet: Boric Acid and Borates. https://d3n8a8pro7vhmx.cloudfront.net/ncap/pages/26/attachments/original/1428423318/boricacid.pdf?1428423318.

[39] Caroline Cox, 2004. Pesticide Factsheet: Boric Acid and Borates. https://d3n8a8pro7vhmx.cloudfront.net/ncap/pages/26/attachments/original/1428423318/boricacid.pdf?1428423318.

[40] TAP, p. 10.

[41] Beyond Pesticides, ManageSafe: Ants. http://www.beyondpesticides.org/resources/managesafe/choose-a-pest?pestid=7. Northwest Coalition for Alternatives to Pesticides (NCAP), Ants. https://d3n8a8pro7vhmx.cloudfront.net/ncap/pages/45/attachments/original/1428428614/ants.pdf?1428428614

[42] TAP, p. 10.

[43] Beyond Pesticides, ManageSafe: Ants. http://www.beyondpesticides.org/resources/managesafe/choose-a-pest?pestid=7. Northwest Coalition for Alternatives to Pesticides (NCAP), Ants. https://d3n8a8pro7vhmx.cloudfront.net/ncap/pages/45/attachments/original/1428428614/ants.pdf?1428428614.

formulations." We urge that consideration of an annotation to the listing be placed on the CS work agenda.

Elemental sulfur

205.601(e)(5) - As insecticides (including acaricides or mite control).
205.601(i)(10) - As plant disease control.
205.601(j)(2) - As plant or soil amendments.

The 2018 Technical Review is overly dependent on EPA as a resource. If EPA's judgments were to be trusted, we could just rely on pesticide registration.

The need for sulfur has not been demonstrated in NOSB decision documents.

Sulfur may be needed for one or more of the three listed uses, but the TAP reviews, Technical Review, minutes, and NOSB recommendations do not provide a justification for the need. Since essentiality is one of the criteria that must be met for synthetic materials to be used in organic production, the NOSB must document the need.

Sulfur has significant health and environmental impacts.

Sulfur poses a threat to farmworkers. It was the cause of the most agriculture-related acute illnesses in California between 1984 and 1990. Drift of the dust may harm humans, plants, and aquatic systems. In addition, its manufacture is associated with sulfur dioxide pollution.

In 2011, the NOSB demonstrated concern over worker protection by including language in the narrative portion of the recommendation on coppers:

> The Committee will work with the National Organic Program to advance guidance that ensures that organic operations are strictly meeting, and to the extent possible, exceeding the standards established by the product label in meeting principles of sustainability and a sustainable work environment for all those who work in organic production.

<u>This never happened</u>. Since the NOP has not taken action to advance such guidance and has taken action to limit NOSB workplans to consideration of petitions for and reviews of National List materials, we ask that the NOSB recommend the inclusion of language protecting workers in the listings for sulfur. According to EPA, "The WPS (Worker Protection Standard) requires that owners and employers on agricultural establishments provide protections to workers and handlers from potential pesticide exposure, train them about pesticide safety, and provide mitigations in case exposures may occur." Since sulfur may be one of the most hazardous materials for workers used in organic production, this is an appropriate place to stress the importance of appropriate Personal Protective Equipment and compliance with EPA's Worker Protection Standard. We suggest this worker protection annotation, "Steps to meet worker protection standards must be documented in the Organic System Plan."

The 2018 TR documents adverse health impacts on people living near farms using sulfur:

People that live in agricultural communities near applications of elemental sulfur can be adversely affected. Specifically, reports have included nonoccupational cases of contact allergies , dyspnea, hypoxemia from an individual being exposed to sulfur drifting from a treated field, sulfur inhalation leading to a sore throat, chest pain, and acute tracheobronchitis. A recent report from UC Berkeley studied the correlation between elemental sulfur us and pediatric lung function. The study included a data set of 357 children at 7 years of age and evaluated associations between residential proximity to elemental sulfur applications and respiratory symptoms. After adjusting for other mitigating factors, the findings suggest that sulfur use in close proximity to residential areas may adversely affect the respiratory health of children. Adverse respiratory associations were only found within 0.5 and 1 km radii of the agricultural application. A strong correlation between asthma medication usage and respiratory symptoms was observed per every 10-fold increase in the estimated amount of sulfur used within 1 km of the child's residence. While the study had several limitations, such as the collection of high quality data from young children or not evaluating the children's personal exposure to elemental sulfur, the findings were consistent with previous reports on adverse respiratory effects associated with elemental sulfur in animal models, in workers, and in case reports of poisoning. This study also lends credibility to reports of drift of elemental sulfur after agricultural application. [44]

Sulfur's contaminants must be limited.

Synthetic elemental sulfur comes from scrubbers from fossil fuel plants, and may be contaminated with other metals. Heavy metals do not degrade, and may therefore build up in the soil, particularly when sulfur is used as a soil amendment. The Washington Department of Agriculture's fertilizer database lists varying rates of contamination of OMRI-listed sulfur products with arsenic, lead, selenium, cadmium, cobalt, mercury, molybdenum, nickel, and zinc.[45] We ask that the NOSB explore avenues to limit contamination –either through an annotation or through the project to limit contamination of organic farm inputs.

Sulfur has a negative impact on agroecosystems.

Sulfur has adverse impacts on predators and parasites. Specifically, its impacts are rated "Low to High" to predatory mites, "High" to parasitoids, and "Low to Moderate" to general predators.[46] These impacts make its use incompatible with organic production systems.

Conclusion

The NOSB must make a case for the need for sulfur in organic production, protect workers who use it and the surrounding communities, and ensure that its use does not result in ecological imbalance. The Crops Subcommittee should investigate the particular uses of elemental sulfur in plant disease and insect control to determine when they are necessary, and the committee should propose an annotation for specific uses. These measures may require annotation of the listings in order to ensure that OFPA criteria are met. We suggest this worker protection annotation, "Steps to meet worker protection standards must be

[44] Elemental Sulfur TR, April 19, 2018. Lines 430-446. Internal citations removed.
[45] https://agr.wa.gov/pestfert/fertilizers/productdatabase.aspx.
[46] UC Davis, IPM Online, Sulfur http://www.ipm.ucdavis.edu/TOOLS/PNAI/pnaishow.php?id=67 1/12/2015.

documented in the Organic System Plan." The NOSB should investigate ways to limit heavy metal contamination of elemental sulfur.

Copper sulfate and Coppers, fixed

§205.601(i) As plant disease control.
(2) Coppers, fixed—copper hydroxide, copper oxide, copper oxychloride, includes products exempted from EPA tolerance, *Provided,* That, copper-based materials must be used in a manner that minimizes accumulation in the soil and shall not be used as herbicides.

§205.601(i) As plant disease control.
(3) Copper sulfate—Substance must be used in a manner that minimizes accumulation of copper in the soil.

Beyond Pesticides does not propose the delisting of coppers. These comments point out the need for careful review of specific use patterns, which requires information about how these products are actually used by organic growers.

The conditions requiring the use of coppers must be reviewed.

OFPA requires that materials on the National List be itemized "by specific use or application."

Copper is viewed as an essential tool in organic agriculture by many who practice organic farming. Although there are many documented environmental and health impacts of copper products, the environmental impacts vary not only with use, but with soil type. There are many soils that are low in copper, and an increase that results from the pesticidal use of copper may be beneficial in those cases. However, compatibility with sustainable agriculture is a criterion for organic materials review, and European vineyards attest to the impacts of copper after 100 years of application.[47] Critics of organic production point to the allowed use of copper

[47] 2011 Copper Sulfate and Other Copper Products Technical Review, lines 535-537. "Vineyard soils in Europe, which have seen intensive use of copper sulfate containing Bordeaux mixtures for 100 years, have concentrations ranging from 100-1,500 mg/kg in soil (Besnard et al., 2001)."

products as "proof" that organic methods are no less hazardous than nonorganic, chemical-intensive methods.[48]

Fungicides are among the most hazardous of all pesticides in terms of human toxicity. Many are carcinogenic. Copper-based fungicides are less hazardous than most, and organic farmers challenged by diseases often consider them essential. However, organic farmers who do rely on copper materials do so without a specific listing of the allowed uses, as is required by OFPA.[49] The NOSB is limited in its ability to evaluate the health and environmental impacts of copper, with its range of use patterns, or its essentiality, lacking identification of permitted uses, which would allow the NOSB to judge the materials based on specific needs and alternative practices or materials. Without a firm foundation for NOSB decisions, the National Organic Program (NOP) cannot ensure that uses of copper (i) meet the standards of OFPA in protecting the health of workers, consumers, and the ecosystem, and (ii) are based on data or information that supports claims of essentiality.

Copper products are toxic and persistent.

Copper compounds are toxic, and this particularly poses risks to workers. Toxicity is described in the 2001 TAP lines 144-191,

> Acute toxicity: The oral LD50 of copper is 472 mg/kg in rats. Copper sulfate is caustic and acute toxicity is largely due to this property. The lowest dose of copper sulfate that has been toxic when ingested by humans is 11 mg/kg. Ingestion of copper sulfate is often not toxic because vomiting is automatically triggered by its irritating effect on the gastrointestinal tract. Symptoms are severe, however, if copper sulfate is retained in the stomach, as in the unconscious victim. . . Copper sulfate can be corrosive to the skin and eyes. It is readily absorbed through the skin and can produce a burning pain, as well as

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[48] See, for example: Christie Wilcox, 2011. Mythbusting 101: Organic Farming > Conventional Agriculture. http://blogs.scientificamerican.com/science-sushi/2011/07/18/mythbusting-101-organic-farming-conventional-agriculture/.
Steve Savage. An Unlikely Pair: "Heavy Metal" and "Organic Produce" http://redgreenandblue.org/2010/09/27/an-unlikely-pair-heavy-metal-and-organic-produce/.
David Derbyshire, 2008. "Thousands of tons of organic food produced using toxic chemicals," http://www.dailymail.co.uk/news/article-505427/Thousands-tons-organic-food-produced-using-toxic-chemicals.html.
Rob Johnston, 2008. "The great organic myths: Why organic foods are an indulgence the world can't afford" http://www.independent.co.uk/environment/green-living/the-great-organic-myths-why-organic-foods-are-an-indulgence-the-world-cant-afford-818585.html.
Fox News, 2008. "Organic Food Offers Little More Than Peace of Mind, Critics Say," http://www.foxnews.com/story/2008/10/04/organic-food-offers-little-more-than-peace-mind-critics-sa-346245969/.
In its publication "Criticisms and Frequent Misconceptions about Organic Agriculture: The Counter-Arguments," IFOAM (International Federation of Organic Agriculture Movements), includes "Misconception Number 7: Organic farming uses pesticides that damage the environment: natural pesticides are more dangerous than conventional pesticides because they are less efficient and therefore require the application of huge quantities. This is also true for fungicide (e.g., organic grape producers contaminate the soils with large quantities of copper because they are not allowed to use modern fungicides). In addition, some organic pesticides are as poisonous as synthetic ones (e.g., nicotine and pyrethrum)." http://infohub.ifoam.org/sites/default/files/page/files/misconceptions_compiled.pdf.

[49] OFPA §6517(b) The list established under subsection (a) of this section shall contain an itemization, by specific use or application, of each synthetic substance permitted under subsection (c)(1) of this section or each natural substance prohibited under subsection (c)(2) of this section.

the other symptoms of poisoning resulting from ingestion. Examination of copper sulfate-poisoned animals showed signs of acute toxicity in the spleen, liver, and kidneys. Injury may also occur to the brain, liver, kidneys, and gastrointestinal tract in response to overexposure to this material. Some of the signs of poisoning that occurred after 1-12 g of copper sulfate was swallowed include: a metallic taste in the mouth, burning pain in the chest and abdomen, intense nausea, repeated vomiting, diarrhea, headache, sweating, shock, and discontinued urination leading to yellowing of the skin. Injury to the brain, liver, kidneys, stomach, and intestinal linings may also occur in copper sulfate poisoning. It is readily absorbed through the skin and will give the above symptoms. Contact with skin causes burns and also acts as a sensitizer. Later exposure can cause allergic reactions (Kamrin 1997; Extoxnet).

Chronic toxicity: Vineyard sprayers experienced liver disease after 3 to 15 years of exposure to copper sulfate solution in Bordeaux mixture. Long-term effects are more likely in individuals with Wilson's disease, a condition that causes excessive absorption and storage of copper. Chronic exposure to low levels of copper can lead to anemia. The growth of rats was retarded when given dietary doses of 25 mg/kg/day of copper sulfate. Dietary doses of 200 mg/kg/day caused starvation and death. Sheep given oral doses of 20 mg/kg/day showed blood cell and kidney damage. They also showed an absence of appetite, anemia, and degenerative changes.

Reproductive effects: Copper sulfate has been shown to cause reproductive effects in test animals. Reproduction and fertility was affected in pregnant rats given this material on day 3 of pregnancy.

Teratogenic effects: There is very limited evidence about the teratogenic effects of copper sulfate; unlikely to be teratogenic in humans at expected exposure levels.

Mutagenic effects: Copper sulfate may cause mutagenic effects at high doses. At 400 and 1000 ppm, copper sulfate caused mutations in two types of microorganisms. Such effects are not expected in humans under normal conditions.

Considered an experimental equivocal tumorigenic agent (NTP, 2001). It has systemic and gastrointestinal effects in humans. HIGH via intraperitoneal route. MODERATE via oral and inhalation routes.

Carcinogenic effects: Copper sulfate at 10 mg/kg/day caused endocrine tumors in chickens given the material parenterally, that is, outside of the gastrointestinal tract through an intravenous or intramuscular injection. However, the relevance of these results to mammals, including humans, is not known (Extoxnet 1996).

Organ toxicity: Long-term animal studies indicate that the testes and endocrine glands have been affected.

Fate in humans and animals: Absorption of copper sulfate into the blood occurs primarily under the acidic conditions of the stomach. The mucous membrane lining of the intestines acts as a barrier to absorption of ingested copper. After ingestion, more than 99% of copper is excreted in the feces. However, residual copper is an essential trace element that is strongly bioaccumulated. It is stored primarily in the liver, brain, heart, kidney, and muscles.

Persistence is described in the 2001 TAP lines 210-220:

Environmental Fate: Breakdown in soil and groundwater: Since copper is an element it will persist indefinitely. Copper is bound, or adsorbed, to organic materials, and to clay and mineral surfaces. The degree of adsorption to soils depends on the acidity or alkalinity of the soil. Because copper sulfate is highly water soluble, it is considered one of the more mobile metals in soils. However, because of its binding capacity, its leaching potential is low in all but sandy soils. When applied with irrigation water, copper sulfate does not accumulate in the surrounding soils. Some (60%) is deposited in the sediments at the bottom of the irrigation ditch, where it becomes adsorbed to clay, mineral, and organic particles. Copper compounds also settle out of solution. (Kamrin, 1997)

Breakdown in water: As an element, copper can persist indefinitely. However, it will bind to water particulates and sediment (Extoxnet, 1996).

The 2011 TR lines 512-537 says,

Copper is a metal that has a potential to build up and decrease the productivity, filtering capacity, and buffering capacity of soil (Andreu and Gimeno-Garcia, 1999). This may be more of a concern in fragile ecosystems such as marsh or wetlands than rice crops. When metals such as copper are applied to the soil they may: (a) remain in soil solution and run off in drainage water, (b) be taken up by plants, or (c) be retained by soil in soluble or insoluble forms. In a system that is seasonally wet and dry, there is continuous change in the availability of metals due to cycles of aerobic and anaerobic conditions affecting the soil redox potential. This may make such soils more vulnerable to enhanced solubility and toxicity of metals (Andreu and Gimeno-Garcia, 1999). Of the metals, copper is relatively more mobile (extractable) than cadmium, lead, zinc, nickel, or cobalt, but even so is retained in the soil for very long time periods. In a study that sampled the same site over a five-year period in a rice growing region of Spain, it was found that copper does, however, gradually decrease over time, unlike cadmium that has shown a tendency to increase (Andreu and Gimeno-Garcia, 1999). Copper is found in the upper levels of the soil profile, and decreases with depth.

Factors Affecting Copper in Soil

Copper in a specific location greatly depends on the bedrock composition, weathering extent, and agricultural operations (crop rotation, fertilizer application, pesticide

application, irrigation, crop harvest, etc). Copper levels in soils studied in Italy were found to be closely correlated to agricultural use (Facchinelli et al., 2000). An application of 10 lb A-1 of copper sulfate pentahydrate, which is 25% copper as the active ingredient, would add 2.5 lb A-1 of copper (Besnard et al., 2001; Gimeno-Garcia et al., 1996). Grape producers may apply 3-10 application per year of Bordeaux mix. Vineyard soils in Europe, which have seen intensive use of copper sulfate containing Bordeaux mixtures for 100 years, have concentrations ranging from 100-1,500 mg/kg in soil (Besnard et al., 2001).

Copper products create environmental hazards in both use and manufacture.

The 2001 TAP lines 238-240 says,

Copper mining and refining cause pollution through runoff from spoils and emissions associated from acid rain. Production of copper sulfate recycles water used in the crystallization vats and wastewater is limited to some sludge form the softening process plus boiler blowdown (Sittig, 1980).

Reviewer #1 in the 2001 TAP lines 376-379 said, "From 1987 to 1993, about 450 million pounds of copper were released to the environment in the U.S., mainly through copper smelting operations. About 1.5 million pounds were released into water from various industrial operations (EPA, 2001). So it looks like the probability of environmental contamination from copper mining and smelting is high."

And at lines 222-230 the 2001 TAP says,
One of the limiting factors in the use of copper compounds is their serious potential for phytotoxicity. Copper sulfate can kill plants by disrupting photosynthesis. Blue-green algae in some copper sulfate treated Minnesota lakes became increasingly resistant to the algacide after 26 years of use (Extoxnet, Kamrin, 1997). Copper is more available for plant uptake from soil when soil is acidic. Toxic plant levels could be reached at soil levels of 25-140 ppm in acidic mineral soils. It is less available in soils rich in organic matter. Levels in soil with high organic matter could reach 1000 ppm before phytotoxicity would occur (Erich 1994). In Europe, general cropland has 5- 30 mg Cu/kg soil, and vineyards in Europe 100 to 1500 mg Cu/kg soil (Besnard 1). Each addition of 10 lbs/acre of copper sulfate could increase the concentration in the top 2 inches of soil by 6 mg/kg or 6 ppm.

The 2011 TR lines 606-612 says,

The event of fish kills in New York was reported by Preddice (2009) in the New York State Department of Environmental Conservation. The event occurred in the Hoosic River of Rensselaer County, New York, in 2001. Over one million of fish were killed by acidic copper sulfate solution. Details were not given in the report. According to a local newspaper, about 2,000 gallons of acidic copper sulfate, used to electroplate circuit boards, was accidentally spilled from a storage building at the Oak-Mitsui plant into the

> Hoosic River before 3:30 am, June 28, 2001. A seven-mile stretch of the river was contaminated. Most of the aquatic life, including brown and rainbow trout, was killed (Albany Times Union, 2001).

And lines 620-621, "A 23-page review on the effect of copper on freshwater food chains and salmon was given by Woody (2007)."[50]

In 2011, the NOSB recommendation emphasized the requirement to minimize soil accumulation, coming close to requiring frequent testing, "Good management practices require close monitoring to ensure that there is no accumulation in the soil."

Copper products are hazardous to humans, particularly workers.

As documented by the quotations from the TAP and TR above, copper causes a wide range of toxicological effects. The 2001 TAP line 243 says, "Direct hazards to applicators are the major concern." We have long advocated for a special requirement of certifiers and inspectors to ensure farm operator compliance with worker protections required on the pesticide label. We believe that since the organic certification system is much equipped to evaluate compliance than EPA we should seek to enforce worker protections than EPA state enforcement agencies. Typical enforcement of pesticide labels by state and federal agencies is well documents to be /inadequate. Therefore, the system that certifies organic cannot rely on EPA and state enforcement agencies under organic law. We say this in the context of the OFPA requirement to evaluate the cradle-to-grave impacts of a material on the National List. To the extent that organic certifiers cannot establish that proper systems are in place to protect workers who handle or are exposed to copper, then the standards are OFPA are not met

In 2011, the NOSB demonstrated concern over worker protection by including language in the narrative portion of the recommendation:

> The Committee will work with the National Organic Program to advance guidance that ensures that organic operations are strictly meeting, and to the extent possible, exceeding the standards established by the product label in meeting principles of sustainability and a sustainable work environment for all those who work in organic production.

This never happened. Since the NOP has not taken action to advance such guidance, we ask that the NOSB recommend the inclusion of language to protect workers in the listings for copper products. According to EPA, "The WPS (Worker Protection Standard) requires that owners and employers on agricultural establishments provide protections to workers and handlers from potential pesticide exposure, train them about pesticide safety, and provide mitigations in case exposures may occur." Since copper products may be the most hazardous materials for workers used in organic production, this is an appropriate place to stress the

[50] Woody CA. 2007. Copper – Effects on freshwater food chains and salmon: A review. Fisheries Research and Consulting. http://www.fish4thefuture.com/pdfs/Woody_Copper_Effects_to_Fish%20-%20FINAL2007.pdf.

importance of appropriate Personal Protective Equipment and compliance with EPA's Worker Protection Standard. We suggest this worker protection annotation, "Steps to meet worker protection standards must be documented in the Organic System Plan."

Copper products cannot be properly evaluated without enumerating their uses.

OFPA §6517(b) says, "The list established under subsection (a) of this section shall contain an itemization, by specific use or application, of each synthetic substance permitted under subsection (c)(1) of this section or each natural substance prohibited under subsection (c)(2) of this section." Copper products provide a perfect example of why OFPA requires this itemized list. It is not so much that any one use fails OFPA environmental and health criteria, but that the sum of all uses may. In order to be able to ensure that the use of copper materials in organic production is limited to that which is necessary and does not harm humans or the environment –and to reassure the public of those facts– the NOSB must solicit input on uses of copper products in organic production and annotate the listings.

In 2015, the Center for Food Safety specifically asked that these salient issues be investigated and researched:

- A comprehensive systems management-based approach to organic disease and lessening the need for copper use on a crop-by-crop basis;
- Breeding plants that are resistant to the types of diseases for which copper is used---induced resistance;
- Developing alternative formulations of pesticides and fungicides, such as smaller particles (not engineered nano products) of copper that facilitate coverage and thereby reduce the amount of copper that needs to be applied;
- Assessing existing cultural practices such as crop rotations, sanitation practices, and the timing of irrigation relative to the climatic conditions in which the copper is being used to make crops less prone to disease;
- Evaluating nutrition and soil fertility management approaches to mitigate the impacts of plant diseases on organic crops such as the use of plant extracts, beneficial microbes, and a host of other emerging tools and materials;
- Determining more efficient methods for spreading copper on leaf or flower; and
- Identifying the copper products that contain the least amount of elemental copper and investigating ways to reduce the amount of elemental copper in all products.

Conclusion

Having let another sunset review of copper materials pass without taking steps to comply with §6517(b), the CS must put such a review on its work agenda. It must start by requesting a Technical Review to enumerate and evaluate needs for copper materials in organic production. Since past actions by the NOSB have not been effective in initiating NOP action, we ask the board to attach an expiration date to the listings for fixed coppers and copper sulfate. The NOSB and those reliant on copper should note that the process we are recommending is just that –a process. It is critical for organic integrity and public trust in organic production methods to follow the law, past Board reviews and requests for action

and follow-through, and create a full public record that ensures the public that all materials are subject to full and thorough review. This is what distinguishes organic from chemical-intensive practices.

Since copper products are among the most hazardous materials for workers used in organic production and generate significant criticism of organic production, this is an appropriate place to stress the importance of appropriate Personal Protective Equipment and compliance with EPA's Worker Protection Standard. We suggest this worker protection annotation, "Steps to meet worker protection standards must be documented in the Organic System Plan."

We urge that consideration of an annotation to the listing be placed on the CS work agenda.

Humic acids

205.601(j) As plant or soil amendments (3). Humic acids - naturally occurring deposits, water and alkali extracts only.

Synthetic humic acids (those on the National List) do not meet the criteria under OFPA. They present environmental hazards in extraction, are not essential, and are not compatible with organic production.

The extraction/manufacture of humic acids has negative impacts on human health and the environment.

Synthetic humic acids are derived from low grade coal, usually obtained by surface mining, which causes widespread damage to the air, land, and water. In addition, exposure to people living in areas where lignite is mined, through dust or water pollution is relevant given the connection, noted in the Technical Review for oxidized lignite and humic acid derivatives (TR), between lignite exposure and kidney failure and renal cancer.[51]

Humic acids are not essential for organic production.

Natural humic acids are produced by the decomposition of organic material. As noted in the TR, "Compost, cover crops, manure, mulch, and other natural sources of organic matter can all increase humic acid content of the soil."[52]

Humic acids are not compatible with organic production.

As mentioned in the TR, "Humic acid derivatives, including oxidized lignite, do not explicitly fall into any of the categories for production found in 7 USC 6517(c)(1)(B)(ii)."[53] Therefore, they (including the alkali-derived humic acids) are not eligible for listing on the National List. In addition, it is profoundly contrary to organic principles to use a fossil-fuel-derived substance as a substitute for such fundamental organic practices as the use of compost, cover crops, manure, and organic mulch. The Spring 2018 statement by the CS, "Humic acids

[51] TR lines 319-323.
[52] TR lines 491-498.
[53] TR lines 236-237.

from decaying organic matter have been empirically shown to have the same benefits as those from fossil sources, such as lignite," is irrelevant to the consideration of National List materials. Many materials used in organic production are available in both natural and synthetic forms, but OFPA allows nonsynthetic forms unless prohibited on the National List and prohibits synthetic forms unless listed on the National List after a consideration of human health and environmental effects, essentiality, and compatibility with organic production.

Conclusion

In the fall of 2012, the NOSB denied the petition for oxidized lignite, saying that humic acids derived from coal by oxidation with hydrogen peroxide should not be listed because of environmental and health impacts, lack of essentiality, and incompatibility with organic production. The same reasoning should be applied to humic acids derived from coal by treatment with alkali, and humic acids should be delisted.

In addition, it was disturbing to read some of the comments reported by Organic Trade Association in response to its 2015 survey that indicate to us that this synthetic material is routinely used. Reliance on a synthetic soil amendment for soil fertility is not compatible with organic production processes. Synthetic humic acid may play a role in the transition to organic, but is incompatible with organic practices and should not be used on certified organic farms –certainly not on a routine basis. An annotation to the effect that "humic acid may be used in the transition to organic if accompanied by a plan for building soil that provides adequate nutrition through soil-building practices and organic inputs" would be acceptable.

Micronutrients: Soluble boron products, sulfates, carbonates, oxides, or silicates of zinc, copper, iron, manganese, molybdenum, selenium, and cobalt

205.601(j) As plant or soil amendments. (6) Micronutrients - not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Micronutrient deficiency must be documented by soil or tissue testing or other documented and verifiable method as approved by the certifying agent.
(i) Soluble boron products
(ii) Sulfates, carbonates, oxides, or silicates of zinc, copper, iron, manganese, molybdenum, selenium, and cobalt

In 2015, the NOSB voted to replace the wording "Soil deficiency must be documented by testing" with "Deficiency must be documented."

This listing covers a number of materials, and the coverage by the existing technical review is uneven, with much attention to nickel, not covered by this listing. It does not address the manufacturing (mining) impacts of these materials at all. We offer some comments below, but suggest that the Crops Subcommittee address each micronutrient, looking at manufacturing impacts, essentiality, and compatibility of each.

Synthetic micronutrients may not be needed.

Other sources of micronutrients include naturally occurring minerals, which may require weathering or biological action to release nutrients.[54] "Metal-accumulator plants may be grown on some metal-rich soil and the harvest may be used as nutrient source for different locations. This might provide a slow-releasing source of nutrients in a long term, but may not be a quick remediation for nutrient deficiency problems."[55] Other practices that can eliminate the need for micronutrients include pH adjustment, balancing nutrients, use of manure, crop rotations, and use of accumulators.[56]

The use of synthetic micronutrients is incompatible with organic production.

In an organic system, nutrients are provided by the soil, and the farmer feeds the soil natural organic and mineral materials. If synthetic micronutrients are to be used at all, it must be as an exception and in concert with soil building practices that restore the mineral balance naturally.

Synthetic micronutrients pose hazards for humans and the environment.

Agricultural use is a source of contamination by some metals, like copper[57] and selenium.[58] Micronutrients are generally applied as complexes with a chelating agent. Some synthetic chelating agents such as ETDA may cause the loss of other components in soil by complexing those components and making those components soluble in water.[59] The uptake of some micronutrients may be suppressed by the excess of others.[60] The toxic effect of one may be enhanced by another.[61] Some forms may bind to soil, and others may be more soluble and leach into water. "Once metals are introduced and contaminate the environment, they will remain. Metals do not degrade like carbon-based (organic) molecules. The only exceptions are mercury and selenium, which can be transformed and volatilized by microorganisms. However, in general it is very difficult to eliminate metals from the environment."[62]

The source of most micronutrients is mining. The environmental impact of mining includes erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater, surface water by chemicals from mining processes.[63] "[C]ommercial micronutrients are generally manufactured as by-products or intermediate products of metal mining and processing industries."[64] "The production for sulfidic zinc ores produces large amounts of sulfur dioxide and cadmium vapor. Smelter slag and other residues of process also

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.[54] TR lines 376-420.
[55] TR lines 876-878.
[56] TR lines 876-878; 941-974.
[57] ATSDR, Toxicological Profile for Copper. P. 123. http://www.atsdr.cdc.gov/ToxProfiles/tp132.pdf
[58] http://en.wikipedia.org/wiki/Selenium_pollution.
[59] TR lines 484-487.
[60] TR lines 513-514.
[61] TR line 521.
[62] USDA-NRCS, Heavy Metal Soil Contamination, p. 3. ftp://ftp-fc.sc.egov.usda.gov/IL/urbanmnl/appendix/u03.pdf
[63] http://en.wikipedia.org/wiki/Environmental_impact_of_mining.
[64] TR lines 323-324.

contain significant amounts of heavy metals."[65] "The major sources of release [of copper] are mining operations, agriculture, sludge from publicly-owned treatment works (POTWs) and municipal and industrial solid waste."[66] Iron mining has been identified as a source of water and air pollution.[67] Manganese has been identified in at least 869 of the 1,699 hazardous waste sites that have been proposed for inclusion on the EPA National Priorities List.[68] Molybdenum occurs in natural waters and may be present in concentrations of several hundred micrograms per liter or higher in ground and surface water near mining operations or ore deposits.[69] "Sources of [selenium] pollution include waste materials from certain mining, agricultural, petrochemical, and industrial manufacturing operations."[70] Areas around cobalt mining operations contain hundreds to thousands times the concentration of cobalt that are found in most soils.[71] Borax mining degrades the landscape, pollutes air and water, and requires large inputs of energy and water.[72]

These are heavy metals and are toxic in large amounts.[73] Heavy metals disrupt metabolic functions in two ways: (1) They accumulate and thereby disrupt function in vital organs and glands such as the heart, brain, kidneys, bone, liver, etc. (2) They displace the vital nutritional minerals from their original place, thereby hindering their biological function. It is, however, impossible to live in an environment free of heavy metals. There are many ways by which these toxins can be introduced into the body such as consumption of foods, beverages, skin exposure, and the inhaled air.[74] Boric acid is a reproductive toxicant and suspected endocrine disruptor.[75] Use of these materials as micronutrients may result in inhalation exposure, and risk levels may not be known for such exposures.[76]

Conclusion

The Crops Subcommittee must bring to the NOSB a proposal that is based on examining all of the allowed synthetic micronutrients and their chelating agents in light of OFPA criteria. Beyond Pesticides suggests that an annotation be added: "Soil deficiency must be demonstrated by verifiable site-specific documentation that is accompanied by a plan for

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[65] http://en.wikipedia.org/wiki/Zinc.
[66] ATSDR, Toxicological Profile for Copper. P. 123. http://www.atsdr.cdc.gov/ToxProfiles/tp132.pdf.
[67] Cory McDonald1, Brandy Baker-Muhich, Tom Fitz, Paul Garrison, Jordan Petchenik, Paul Rasmussen, Robert Thiboldeaux, William Walker, and Carl Watras, 2013. Taconite Mining in Wisconsin: A Review. http://media.jrn.com/documents/Iron-Mining-Review-011014.pdf.
[68] ATSDR, Toxicological Profile for Manganese, p. 403. http://www.atsdr.cdc.gov/ToxProfiles/tp151.pdf.
[69] EPA Region 6, ATSDR and CDC Health Effects and Toxicological Profiles. http://www.epa.gov/region6/6sf/newmexico/homestake_mining/appendix-d.pdf.
[70] http://en.wikipedia.org/wiki/Selenium_pollution.
[71] ATSDR, Public Health Statement for Cobalt. http://www.atsdr.cdc.gov/phs/phs.asp?id=371&tid=64.
[72] "How Green are Boron Cleansers?" Scientific American, 2009. http://www.scientificamerican.com/article/how-green-are-boron-cleansers/.
[73] TR lines 489-491.
[74] Singh, R., Gautam, N., Mishra, A., & Gupta, R. (2011). Heavy metals and living systems: An overview. *Indian Journal of Pharmacology*, *43*(3), 246–253. doi:10.4103/0253-7613.81505. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3113373/.
[75] NCAP factsheet, Boric Acid. http://www.pesticide.org/get-the-facts/pesticide-factsheets/factsheets/boricacid.
[76] See for example, ATSDR, Toxicological Profile for Copper. P. 16. http://www.atsdr.cdc.gov/ToxProfiles/tp132.pdf

building soil that provides adequate nutrition through soil-building practices and organic inputs."

Sticky traps/barriers

205.601(e)(9) - As insecticides (including acaricides or mite control).

This listing covers a wide range of traps and coatings made with a number of different materials. Some are coated paper, some are coated plastic, and some are a sticky chemical that is brushed on plants. Coated plastic, at least, produces plastic waste that goes to the landfill. The sticky coating may contain petroleum distillates, and the traps may contain volatile attractants. Most are non-specific and kill non-target insects, spiders, mites, reptiles, and amphibians. One TAP reviewer suggested the traps are compatible with organic only in processing plants.[77] Another suggested they should be used only for monitoring or mass trapping.[78] Some sticky traps can result in much suffering by animals caught in them.

Conclusion

Like a number of other materials used for insect control, sticky traps suffer from the shortcoming of having the potential to kill non-target organisms. Many can be used in such a way that the likelihood of trapping non-target animals is low. The CS should explore the possibility of an annotation that ensures the targeted use of these traps, such as "Must be used in a way that prevents the capture of non-target animals." Plastic should be prohibited.

Vitamins B1, C, E

205.601(j)(8) - As plant or soil amendments.

Vitamin B1

In 2017, the NOSB voted to remove Vitamin B1 from the National List. NOP failed to act on this recommendation until August 24, 2021, when it was included in a proposed rule.[79] Since a final rule still has not been issued, it is still on the National List. Vitamin B1 is used to stimulate rooting in cutting. The available documentation does not provide support for this listing in reference to OFPA criteria, except to state that they break down quickly and are non-toxic to plants and humans in the amounts used.

Synthetic vitamin B1 is incompatible with organic production.

The TAP review stated that vitamin B1 is used to stimulate rooting in cuttings. Synthetic growth promoters and growth hormones are not compatible with organic production. The technical review for indole-3-butyric acid (IBA) lists a large number of natural materials and other methods for rooting plants. As mentioned in the technical review for aqueous potassium silicate, silicates can play a plant-protective role and can be increased in plants through the use of silica-rich plants in compost and careful recycling of compost and manure. Organic practices

[77] TAP, pp. 5-6; 9.
[78] TAP, p. 3.
[79] Proposed Rule (86 FR 47242) 08/24/2021.

such as variety selection, soilscape, sanitation, crop rotation, and mulches all contribute to disease resistance.

The 2015 TR states that fermentation using genetically engineered organisms may be used to produce all three vitamins.[80] The TR states that vitamin B1 appears to be ineffective for its use as a root growth stimulator[81] and lists a number of alternative materials and practices, including "encouraging the health of existing soil fungi and supplementing soils with exogenous sources of beneficial fungi that release plant nutrients and growth factors to the soil may naturally stimulate root growth in transplanted crops."[82]

Vitamins C and E

The 2015 TR states that fermentation using genetically engineered organisms may be used to produce all three vitamins.[83] According to the 1995 TAP review, the antioxidant vitamins C and E are used as foliar sprays and dips for pest control.

Synthetic vitamins C and E are incompatible with organic production.

The available documentation does not state the purpose of applying vitamins C and E to plants. However, the literature shows that the use is as a plant growth promoter.[84]

The TR states, "No natural substances were identified as alternatives for the antioxidants vitamins C and E in organic crop production. However, the utility of external sources of these substances is uncertain due to the paucity of literature describing practical applications of these substances in agricultural settings."[85] The TR also says "horticultural crops grown under lower nitrogen supply and less frequent irrigation may be preferred due to the high concentrations of vitamin C and low concentrations of nitrate."[86]

Conclusion

Beyond Pesticides supports the sunsetting of vitamins B1 (again), C, and E in crop production. The vitamins may be produced by genetically engineered organisms, and the TR finds them ineffective for the purposes for which they are used, listing alternative substances for vitamin B1 and alternative practices for all three.

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[80] Lines 348-390.
[81] Lines 108-111; 208.
[82] Lines 649-692.
[83] Lines 348-390.
[84] Ibrahim, Z. R. (2013). Effect of Foliar Spray of Ascorbic Acid, Zn, Seaweed Extracts (Sea) Force and Biofertilizers (EM-1) on Vegetative Growth and Root Growth of Olive (Olea Europaea L.) Transplants cv. HojBlanca. *Int. J. Pure Appl. Sci. Technol*, *17*(2), 79-89. "[There is a widespread use of antioxidants especially ascorbic acid for enhancing the growth and productivity of fruit trees." Nour, K. A. M; Mansour, N. T. S. and Eisa G. S.A., 2012. Effect of Some Antioxidants on Some Physiological and Anatomical Characters of Snap Bean Plants under Sandy Soil Conditions. New York Science Journal 5(5):1- 9. Vitamin E had a significant effect on number of leaves/plant, total dry weight/plant, plant height, number of leaves and dry weight/plant.
[85] Lines 693-695.
[86] Lines 759-760.

Squid byproducts

205.601(j) As plant or soil amendments. (10) Squid byproducts—from food waste processing only. 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.

Squid byproducts were added to the National List at the Spring 2016 NOSB meeting. Beyond Pesticides urges the NOSB to remove synthetic extracts of squid and squid byproducts because they environmental harm, are not essential, and are not compatible with organic production.

Liquid squid products remove valuable nutrients from marine ecosystems and may harm agroecosystems.

While some liquid squid products are made from squid waste, others are made from whole squid.[87] Squid that do not have commercial value may have ecological value.[88] Use of discarded squid parts as fertilizer may also remove food from marine ecosystems.[89] According to the technical review,[90]

> Illegal, unreported and unregulated (IUU) fishing is a significant problem that affects the marine ecosystem and those who depend on it for survival. Illegal and unreported catches represented 20–32% by weight of wild-caught seafood imported to the USA in 2011. The value is between $1.3 and $2.1 billion of $16.5 billion total for 2.3 million tons of edible seafood imports, including farmed products. An estimated ten to fifteen percent of squid caught by fisherman from China, ten to twenty percent from Chile, fifteen to thirty percent from Thailand and twenty to thirty five percent from India are illegal and unreported.

Acids used to manufacture liquid squid products may cause harm to the environment if misused or improperly disposed. Some liquid squid products are acidic, and too strong a solution can burn plants.[91] Squid products may contain persistent, bioaccumulative toxic chemicals that can affect crops and livestock over the long term.[92]

Synthetic liquid squid products are not essential.

Squid may be preserved naturally. The technical review says,[93]

> Squid and squid byproduct hydrolysate need only contain squid byproducts and water. This is a natural process. The addition of a non-agricultural non-synthetic allowed substance such as a proteolytic enzyme derived from non-pathogenic fermented bacteria, e.g. Alcalase (subtilisin Carlsberg) from *Bacillus megaterium* may still be considered a natural process. Of the acids permitted for acidification, citric acid sourced

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[87] Petition, #B.5.
[88] http://discovermagazine.com/2001/sep/featfish/?searchterm=menhaden.
[89] http://www.scotsman.com/news/environment/ban-on-fishing-discards-may-damage-ecosystem-1-3408818.
[90] TR lines 727-733.
[91] TR lines 660-663.
[92] TR lines500-506; 531-536.
[93] TR lines 474-479.

> from an agricultural product is considered a nonagricultural product and its addition to the hydrolysate would still be natural.

In addition, squid and squid byproducts have been traditionally preserved by drying for both food and fertilizer use.[94]

Other natural materials that could substitute for synthetic squid products are manure, compost, aquatic plant products, blood meal, bone meal, compost, feather meal, kelp meal, guano, and other nonsynthetic animal or plant products.[95] Other practices include cover crops, crop rotations, and the application of plant and animal materials.[96]

Synthetic liquid squid products are incompatible with organic production.

In an organic system, nutrients are provided by the soil, and the farmer feeds the soil natural organic and mineral materials. If synthetic nutrients are to be used at all, it must be as an exception and in concert with soil building practices that restore the soil balance naturally. The TR says,[97]

> Fertilizers produced with squid and squid byproducts and acidified with phosphoric acid are effective in providing essential nutrients to soils when compared to synthetic commercial fertilizers. However, it has been observed that they are no more environmentally friendly than other organic fertilizers or synthetic fertilizers, rather they have been found to have a similar risk of NO_3–N and PO_4–P leaching to that of liquid or granular synthetic fertilizers applied at rates up to 292 kilograms per hectare per year. Leaching of PO_4–P can promote eutrophication, toxic algal blooms, loss of dissolved oxygen and fish kills in aquatic ecosystems. NO_3–N leaching into groundwater subsequently used as drinking water has been linked with thyroid disease, blue baby syndrome, and nitrosamine production (which can cause cancer).

Polyoxin D Zinc Salt

205.601(i) As plant disease control. (11) Polyoxin D zinc salt.

Beyond Pesticides urges the NOSB to delist polyoxin D zinc salt (PDZ) as a fungicide. PDZ does not meet any of the OFPA criteria—for environmental and health impacts, compatibility with organic systems, or essentiality.

Polyoxin D zinc salt has impacts on beneficial organisms and may cause chromosomal mutations in mammals.

The mode of action of PDZ is inhibition of the enzyme chitin synthetase, which stops the growth of the target fungi. However, plant pathogenic fungi are not the only fungi in an organic system. The soil ecosystem depends on fungi for breaking down organic matter and supplying nutrients to plants. A broad spectrum fungicide thus attacks the very basis of the organic agroecosystem. It also endangers some biocontrol organisms.

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[94] TR lines 62-65.
[95] TR lines 738-750.
[96] TR lines 779-781.
[97] TR lines 685-693.

Kaken, the petitioner, depends on two claims to support its statement that PDZ is nontoxic to soil fungi. First, it claims that PDZ is not toxic, but is fungistatic. Second, it claims that the fast rate of degradation means that PDZ is not present in the soil for long. Relative to the first claim, a fungistatic agent can be effectively toxic to a fungus in a competitive environment, especially one that might contain organisms that consume fungi. This is particularly true when the fungistatic agent inhibits the production of chitin, which protects fungi.

Second, the argument that PDZ degrades quickly focuses on the degradation in water (half-lives, depending on pH, of 0.4-1.6 days). However, the relevant degradation is in soil, where the half-life is 15.9 to 59.2 days. Since PDZ may be applied 6 times during the growing season–say, once every 30 days—it may accumulate in the soil, thus providing a constant exposure to soil fungi.

In addition, research reported in the Technical Report (TR) showed that PDZ inhibits the same target enzyme in cockroaches. Thus, we should assume until shown otherwise that it would inhibit chitin production in other insects, thus preventing the transformation from larvae to adults in lady beetles, for example. The petition reported on honeybee studies that were conducted on adults –oral and dermal, but not on larvae and pupae. Only acute (LD50) studies are reported, but EPA found PDZ "toxic to honeybees." We know from much experience that even non-lethal doses of pesticides can have impacts on bee colonies leading to colony collapse.

In addition, EPA noted moderate toxicity to aquatic species (freshwater invertebrates and rainbow trout) was observed in test results submitted by the registrant.[98]

Furthermore, EPA found a study (MRID 48653314) to be acceptable that demonstrated highly significant increases in chromosomal aberrations in hamster cells treated with PDZ.[99]

Polyoxin D zinc salt is incompatible with a system of organic and sustainable agriculture.

PDZ is an unnecessary (see below) synthetic input. It causes nontarget effects on beneficial organisms in the organic system. PDZ epitomizes the kind of input that is welcomed in integrated pest management (IPM) systems, but is incompatible with organic production. PDZ is welcomed in IPM because it is less toxic than many conventional fungicides and provides another "tool" in the IPM toolbox. It allows growers to cycle through more different chemicals, thus reducing the development and spread of resistance in pathogenic fungi. These are seen as very positive characteristics in systems that rely on chemical inputs for fertility and plant health.

[98] Ecological Risk Assessment –p. 4 at https://www3.epa.gov/pesticides/chem_search/reg_actions/registration/related_PC-230000_1-Jul-03.pdf.

[99] EPA memo dated May 11, 2012, from Manying Xue to Colin Walsh. Science review of product chemistry, residue chemistry, non-target organism and toxicity data in support of label amendment.

However, organic systems rely on the interactions of organisms in the agroecosystem to provide those things, and inputs must not endanger the web of relationships in that system.

Polyoxin D zinc salt is not essential.

As is pointed out in the TR, there are many alternatives to using PDZ, including "crop rotation, crop nutrient management practices, sanitation to remove disease vectors, selection of resistant species and varieties (where applicable) beneficial antagonistic bacteria, monitoring"—all important, but basic, organic practices.

Thus we urge the NOSB to sunset polyoxin D zinc.

Thank you for your consideration of these comments.

Sincerely,

Terry Shistar, Ph.D.
Board of Directors