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April 22 , 2026

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National Organic Standards Board
USDA-AMS-NOP
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Room 2648-S, Mail Stop 0268
Washington, DC 20250-0268

Docket ID # AMS-NOP-25-0914

Re. HS: Chitosan

These comments to the National Organic Standards Board (NOSB) on its Spring 2026 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 eliminate a reliance on pesticides. Our membership and network span the 50 states and the world.

These comments address the petition from Enartis to allow chitosan from *Aspergillus niger* to be added to §205.605(b) in making wine "made with organic grapes." Separately, we have submitted comments on the petition by Cascade Columbia to reclassify chitosan as nonsynthetic and petition by Tidal Vision to add to §205.601.

Chitosan as an "inert" is not approved for food use.

Although not directly relevant to this petition, since the petitioner and the technical evaluation report (TR) mention the inclusion of chitosan in the obsolete List 4, it is worthwhile mentioning that chitosan is not approved as an "inert" for use in food-use pesticides. In 2004, the NOSB received a petition to allow chitosan as an adhesive ("sticker") in fungicides used in organic production. The NOSB approved the petition, but NOP did not add it separately to the National List because the use was considered an "inert," and chitosan was listed on EPA's List 4B. EPA no longer maintains its "inerts" lists, however, and has reassessed "inerts." The purposes for which they are allowed, as well as references to tolerances or exemptions from tolerance (if any), can be found in EPA's InertFinder[1] database (for those approved through January 31, 2024). Those approved beginning February 1, 2024 can be found in the Individual

[1] https://ordspub.epa.gov/ords/pesticides/f?p=INERTFINDER:2::::::.

Inert Database.[2] Chitosan is listed in the database as allowed for non-food use only.[3,4] In view of this fact, we are concerned about the TR's statement, "At this time, it is used as an inert ingredient within at least 13 OMRI-Listed crop products and one livestock product."[5] In other words, EPA has listed chitosan with a restriction (annotation) that must carry-over to its use in organic production and processing. Outside of this restriction, any food use would be in violation of existing allowances. We consistently mention that Organic Foods Production Act (OFPA) standards are more stringent than the standards governing pesticide use (including pesticide formulations) under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). We cite EPA pesticide standards and allowances in this context to make the point that even FIFRA's weaker health and environmental standards do not allow the use of chitosan in food production.

Chitosan does not meet OFPA criteria for the National List.

OFPA requires that for a synthetic material to be included in the National List, the following criteria must be met:
(i) It would not be harmful to human health or the environment;
(ii) It is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and
(iii) It is consistent with organic farming and handling.

Chitosan and its health and environmental effects are not well characterized.

The 2020 and 2026 TRs repeatedly make the point that because "chitosan" is a polymer of undefined size, it may have different and opposite effects depending on polymer size, crop, and pest (internal citations removed):

- "Chitosan is a polymer, which means that it can exist in a range of molecular sizes (usually measured by weight). The molecular weight of a chitosan sample can affect its properties. For example, low-molecular-weight chitosan is more effective as a plant growth stimulator than high-molecular-weight chitosan polymers. Not only does the molecular weight of chitosan affect its properties, but so too does the degree (and distribution) of deacetylation. For example, as the degree of acetylation increases, chitosan becomes more amorphous (less crystalline) and better able to chelate metal ions."[6]
- "There is no degree of deacetylation that officially defines when chitin becomes chitosan, but the lower limit described in literature is 40–60 percent."[7]
- "Commercial chitosan usually contains at least 65 percent glucosamine and less than 35 percent N-acetylglucosamine. The degree of deacetylation can vary, and so any given quantity of chitin or chitosan will typically contain both types of monomers."[8]

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[2] https://www.epa.gov/pesticide-registration/individual-inert-ingredient-database.
[3] https://iaspub.epa.gov/apex/pesticides/f?p=INERTFINDER:2::::::;
https://ordspub.epa.gov/ords/pesticides/f?p=INERTFINDER:3:::::P3_ID:9212.
[4] See also 2020 TR, lines 307-310.
[5] 2020 TR, lines 454-455.
[6] 2020 TR, lines 93-99.
[7] 2020 TR, lines 75-76.
[8] 2020 TR, lines 78-82.

- "Chitosan has multiple modes of action. When used as a pesticide, it acts directly on target pathogens with toxic as well as growth inhibitory effects. It also has effects on plants themselves, stimulating plant immunity. Chitosan's effect on both plants and pathogens is not universal."[9]
- "Low-molecular-weight chitosan can permeate cell membranes while high-molecular-weight chitosan cannot. It appears that molecular weight plays a role in chitosan's different modes of actions – in some cases acting as a growth inhibitor for bacteria, while in other cases having the opposite effect and acting as a bacterial growth promoter."[10]
- "Chitosan is known to act as a plant growth promoter."[11] "Chitosan's effects as a plant growth promoter are variable, however, and depend on chitosan's chemical characteristics and the plant species involved. Khan, Prithiviraj, and Smith found small chitosan oligomers caused an 8–10 percent increase in maize photosynthesis but had little to no effect on soybean. On the other hand, larger chitosan molecules caused a decrease in photosynthesis for both maize and soybean. Despite these changes in photosynthesis, no differences in plant growth or development were observed after 10 days in comparison with control plants."[12]
- "Researchers do not fully understand how chitosan inhibits bacterial growth, and Gram-negative and Gram-positive bacteria do not appear to respond the same way. Additionally confounding matters, chitosan can also have the opposite effect—it can cause accelerated growth in the same bacteria, depending on the molecular weight, and possibly the dosage, of the chitosan used. Generally, chitosan's antibacterial effects are weaker than its antifungal effects."[13]
- "Due to the variety of results found from different studies, it is likely that chitosan has multiple antibacterial modes of action. The most relevant mode of action depends on factors such as the type of bacteria involved and the properties of the chitosan used."[14]
- "As with its antimicrobial effect, the mode of action of chitosan on fungi and oomycetes is not fully understood. Researchers hypothesize that chitosan functions in two ways; chitosan can initiate systemic resistance in plants and may act directly between host and pathogen to block the growth of the pathogen itself."[15]
- "It is worth noting that despite chitosan's classification as such a material [biochemical pesticide with non-toxic mode of action], it also has toxic modes of action to the target pest as described above."[16]
- "Under laboratory conditions, chitosan increases sporulation and the mycelial growth of beneficial *P. chlamydosporia* and causes an increase in the production of a protease used by the fungus to parasitize plant-damaging root-knot nematodes. However, these effects are not observed in agricultural soils. Instead, chitosan appears to promote the

[9] 2020 TR, lines 334-336.
[10] 2020 TR, lines 177-180.
[11] 2020 TR, line 241.
[12] 2020 TR, lines 247-252.
[13] 2020 TR, lines 340-343.
[14] 2020 TR, lines 346-348.
[15] 2020 TR, lines 365-368.
[16] 2020 TR, lines 376-377.

colonization of *P. chlamydosporia* in plant roots, which in turn makes the fungus a more effective biocontrol."[17]

- "The FDA does not include a standard of identity for chitosan in regulations."[18]
- "Variability in antimicrobial effectiveness has also been reported within different fungal chitosans, mostly due to differences in molecular weight. Miot-Sertier et al. (2022) conducted a large study focusing on the antimicrobial effects of two fungal chitosans, varying in molecular weight and viscosity."[19]

Beyond Pesticides has repeatedly called for the NOSB to address products of fermentation. The board should identify issues relevant to materials decisions, including acceptable substrates and the origin of the fermenting organism. The petition does not address the origin of the *Aspergillus niger*, and we would oppose a product produced by a genetically engineered organism. The petition says that the fermentation uses "substrates approved for organic production," but the meaning of that phrase is unclear given the lack of guidance on fermentation.

The need (or essentiality) for chitosan has not been established.

The petitioner has not presented a case that chitosan is "is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products," as required by OFPA.[20] In fact, the petition states, "Chitosan is proposed for use as either a complimentary tool to other materials already on the National List . . . or an alternative to SO2 for use in the production of wine 'made with organic grapes'." The 2026 TR describes many allowed substances for the proposed use.[21]

Conclusion

The petitioner has not presented a case showing that chitosan meets OFPA criteria for inclusion in the National List. The available TRs offer support for the HS proposal to deny the petition.

Thank you for your consideration of these comments.

Sincerely,

Terry Shistar, Ph.D.
Board of Directors

[17] 2020 TR, lines 419-423.
[18] 2026 TR, line 293.
[19] 2026 TR, lines 489-491.
[20] §6517(c)(1)(A)(ii).
[21] 2026 TR, lines 1186-1642.