BEYOND PESTICIDES
701 E Street, SE ▪ Washington DC 20003
202-543-5450 phone ▪ 202-543-4791 fax
info@beyondpesticides.org ▪ www.beyondpesticides.org

October 12, 2016

Ms. Michelle Arsenault
National Organic Standards Board
USDA-AMS-NOP
1400 Independence Ave., SW
Room 2648-S, Mail Stop 0268
Washington, DC 20250-0268

Re. HS: Beta carotene color

These comments to the National Organic Standards Board (NOSB) on its Fall 2016 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.

In reviewing this substance, the NOSB must apply the criteria in the Organic Foods Production Act (OFPA), that its use—
(i) would not be harmful to human health or the environment;
(ii) is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and
(iii) is consistent with organic farming and handling.[1]
May be used only when the product is not commercially available in organic form.

Beta carotene is listed on §205.606 under:
Colors derived from agricultural products - Must not be produced using synthetic solvents and carrier systems or any artificial preservative. (2) Beta-carotene extract color.

Beta-carotene is non-agricultural.

The listing of beta-carotene is annotated, “derived from carrots or algae.” There is another color listed as “carrot juice color.” As we understand the technical reports, this beta-carotene extract is generally made from microalgae because its extraction from carrots requires prohibited synthetic solvents. Although the NOSB may have previously assumed that it is

[1] OFPA §6517(c)(1)(A). Further details at OFPA §6518(m).

agricultural because a carrot is agricultural, that assumption is not valid when applied to beta carotene derived from microalgae.

Specifically, beta-carotene is extracted from the halophilic green flagellates, *Dunaliella salina* and *D. bardawil*, which are cultivated either in extensive cultures in large unstirred outdoor ponds, or more intensively in paddlewheel stirred raceways.[2] According to the TR,[3]

> [T]he algae require bicarbonate as a source of carbon and other nutrients such as nitrate, sulfate, and phosphate. It can be operated in two stages. First, initial growth phase requires in nitrate rich medium; magnesium salt is essential as it is required for chlorophyll production. In the second stage, nitrate limitation is induced to stimulate carotenogenesis. For the carotenogenesis phase, nitrate depletion along with salinity maintenance and light stress are essential.

This process would be more properly termed "fermentation" than "agriculture." According to the draft classification of materials guidance, if the material is the product of microorganisms grown on a non-agricultural substrate, then it should be classified as nonagricultural. The culture of *Dunaliella salina* requires a solution high in added inorganic nutrients, which is then manipulated to reduce nitrate, causing stress that stimulates production of carotenes.

We repeat our comment made previously that the NOSB should develop guidelines for the classification and acceptability of materials produced by fermentation.

Health and Environmental Impacts

Extraction of beta carotene from algae involves the use of solvents that may include carbon dioxide, acetone, methanol, propan-2-ol, hexane, ethanol, and vegetable oil.[4] However, the listing for colors requires that they "Must not be produced using synthetic solvents and carrier systems or any artificial preservative." Although the petitioner claims to use carbon dioxide, ethanol, or vegetable oil,[5] ethanol may be synthetic or nonsynthetic, and if nonsynthetic, may be derived from non-organically produced corn. If extraction with ethanol is permitted, then the impacts of growing the corn from which it is manufactured should be considered.

Corn

Non-organic corn production is an intensive user of pesticides and synthetic fertilizers. Most of the non-organic corn is also genetically modified.

Pesticide Tolerances —Health and Environmental Effects: The Beyond Pesticides *Eating with a Conscience* (EWAC) database shows that while field corn products grown with toxic chemicals show low pesticide residues on the finished commodity, there are 109 pesticides with established tolerance for field corn products. Of these, at least 39 are acutely toxic, creating a

[2] 2012 TR lines 382-384.
[3] 2012 TR lines 385-389.
[4] STR line 296.
[5] STR lines 303-305.

hazardous environment for **farmworkers**, 96 are linked to chronic health problems (such as cancer), 31 contaminate streams or groundwater, and 87 are poisonous to wildlife.

Pollinator Impacts: In addition to habitat loss due to the expansion of agricultural and urban areas, the database shows that there are 33 pesticides used on field corn products that are considered toxic to honey bees and other insect pollinators. For more information on how to protect pollinators from pesticides, see Beyond Pesticides' BEE Protective webpage.

- **This crop is foraged by pollinators.**

Vegetable oil may be extracted from a number of oil-rich seeds, but about 80 percent of the vegetable oil comes from soybeans.[6] Below are the pesticides with established tolerances (residue limits for pesticides used in the U.S. or by countries exporting to the U.S.) for soybeans. While not all the pesticides on the list are applied to all soybeans, there is no way to tell which pesticides are applied to particular crop.

Soybeans

California Farmworker Poisonings, 1992–2010: 1 reported. This poisoning incident represents only the tip of the iceberg because it only reflects reported incidents in one state. It is widely recognized that pesticide incidents are underreported and often misdiagnosed.

Pesticide Tolerances —Health and Environmental Effects: The EWAC database shows that while soybeans grown with toxic chemicals show low pesticide residues on the finished commodity, there are 83 pesticides with established tolerance for soybeans, 38 are acutely toxic creating a hazardous environment for farmworkers, 75 are linked to chronic health problems (such as cancer), 28 contaminate streams or groundwater, and 75 are poisonous to wildlife.

Pollinator Impacts: In addition to habitat loss due to the expansion of agricultural and urban areas, the database shows that there are 32 pesticides used on soybeans that are considered toxic to honey bees and other insect pollinators. For more information on how to protect pollinators from pesticides, see Beyond Pesticides' BEE Protective webpage.

- **This crop is dependent on pollinators.**
- **This crop is foraged by pollinators.**

The evaluation of beta-carotene must take into consideration the use of pesticides in the non-organic production of soybeans and ensure that GMO soy is not used in production of organic products.

In addition to the impacts of chemical-intensive culture –including the use of genetically-engineered varieties—the process of turning soybeans (or other oilseeds) into vegetable oil involves extraction with a solvent like hexane and refining using alkali.[7]

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[6] https://www3.epa.gov/ttnchie1/ap42/ch09/final/c9s11-1.pdf.
[7] https://www3.epa.gov/ttnchie1/ap42/ch09/final/c9s11-1.pdf.

Beta carotene extract is not essential for organic processing.

Organic consumers do not expect their food to be artificially colored, whether or not the color is "synthetic" according to the NOP classification of materials, so a color additive is not necessary. In addition, the 2012 Supplemental Technical Review identifies organic annatto coloring as an alternative. **The HS should determine whether organic annatto does indeed perform the function of beta carotene extract.**

Beta carotene extract coloring is incompatible with organic production and handling.

As mentioned above, organic consumers do not expect their food to be artificially colored. Beta carotene may be extracted using volatile synthetic solvents, using vegetable oils extracted using volatile organic solvents, or using solvents derived from genetically engineered plants, all of which are incompatible with organic production and handling.

Conclusion

The NOSB must reconsider the agricultural classification of beta-carotene, take into account all of the impacts of beta-carotene extract, and consider the expectations of consumers that food will not be artificially colored. The NOSB should investigate the availability and suitability of organic substitutes, as well as why an artificial color is needed.

Thank you for your consideration of these comments.

Sincerely,

Terry Shistar, Ph.D.
Board of Directors