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

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

Docket ID # AMS-NOP-19-0038

Re. CS: Paper pots

These comments to the National Organic Standards Board (NOSB) on its Fall 2019 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.

The technical review (TR) of paper pots offers valuable additional information for the Board's consideration. Our previous comments –urging the NOSB and NOP to allow the use of paper pots until a more thorough review of the pots can be performed—was based partly on the conclusion that, in terms of materials going into the soil, paper pots are unlikely to be worse (in terms of environmental and health impacts) than paper that is currently allowed in mulch and compost. We believe that opinion is supported by the new TR. However, now that more information is available, the petition for paper pots needs to be judged according to the criteria in the Organic Foods Production Act (OFPA), rather than in comparison to recycled newspaper and other paper.

We encourage the NOSB, in crafting a proposal, to include an annotation that limits allowed components of the paper pots. There will be innovations, and they may involve changes to the paper's content. Those changes can be petitioned and receive as thorough a review as the current petition receives. These comments will mostly address the chain paper pot system by Nitten as petitioned.

Impacts on Human Health and the Environment

Paper manufacture

The manufacture of paper pots begins with the manufacture of kraft paper. The TR summarizes environmental impacts of paper production:

> The environmental impacts of manufacturing virgin paper are considered to be significantly greater than recycling paper (Roberts 2007; Martin and Haggith 2018). Harvesting trees to make virgin pulp and paper predictably results in soil erosion and water sedimentation through road-building activity, exposure of bare soil, and accelerated water runoff (Corbett, Lynch, and Sopper 1978; Croke and Hairsine 2011; Anderson and Lockaby 2011). While forestry best management practices (BMPs) may mitigate these effects, BMPs are not always implemented and there are still environmental quality concerns that have not been addressed by BMPs (Anderson and Lockaby 2011). Reduction of forest disturbance by recycling is seen as an environmental benefit (Villanueva and Wenzel 2007). One ton of virgin kraft paper requires 4.4 tons of trees to produce; the same amount of recycled kraft paper requires 1.4 tons of recovered paper to produce (Roberts 2007).
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> The ability of the forest to sequester carbon is curtailed by harvest (Martin and Haggith 2018). Additionally, recycling waste paper consistently uses less energy and results in fewer greenhouse gas emissions compared with landfilling or incinerating it (Björklund and Finnveden 2005; Villanueva and Wenzel 2007; US EPA 2011; Ghinea et al. 2014). Agricultural by-product sources of pulp fiber can mitigate the adverse impacts of the reliance on wood from forests (USDA 2017; Martin and Haggith 2018). However, the workers who are making the paper pots are more likely to be exposed to chemicals that have adverse health effects than the farmers and farmworkers using the paper pots or those who eat the food grown from the transplants.
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> Recycled paper products generally have greater contaminant content than virgin paper (Biedermann and Grob 2010; Blechschmidt et al. 2012; Rosenmai et al. 2017). Inks, dyes, and other chemicals not applied to virgin paper will still be present in recycled paper, with only the highest grades of recycled papers being free of impurities and contaminants (Blechschmidt et al. 2012). Recycled paper can include a wide variety of chemical contaminants that are either not present or found at much lower levels in virgin paper. These include heavy metals that may be used in inks and dyes; synthetic polymers used in gloss and as reinforcement; and various adhesives, including the ones being considered in this Technical Review (Borchardt 2006).[1]

The 2017 TR on newspaper and other recycled paper goes into greater depth concerning discharges from manufacture:

> Pulp and paper manufacturing has a history of being a heavy polluter of water and air. Effluents from paper manufacturing include the chemical treatments used in the pulping

[1] Paper Pots and Containers TR, 2019. Lines 601-631.

process, dyes, fillers and bleaches (Hamm 2012). Pulp and paper facilities are regulated in the United States as point sources of water pollution under the Clean Water Act. As such, they are required to obtain permits for the discharge of effluents into water, to limit those effluents according to the permit, and to be subject to monitoring and fines by the EPA [40 CFR 430]. The effluent limits are technology based. Some of the treatments and reaction products may be classified as toxic pollutants subject to the Toxics Release Inventory program of EPA, including dioxins and furans (U.S. EPA 2006). Heavy metals are also discharged into water. In most years, pulp and paperboard manufacturing has been one of the top industrial sources of lead, cadmium and mercury released into Canadian water (Environment and Climate Change Canada 2016).

Pulp and paper mills generally use wood and waste paper as fuel, releasing carbon dioxide into the atmosphere and contributing to greenhouse gas emissions. In the United States, pulp and paper mills are considered stationary sources of air pollution and are subject to EPA regulation under the Clean Air Act [40 CFR 63]. In addition to greenhouse gases, paper mills also emit hazardous air pollutants (HAPs) that are generated as part of the pulping and chemical treatment of paper. The highest emitted HAPs from pulp and paper mills in 1996 were acrolein, acetaldehyde, o-cresol, carbon tetrachloride, chloroform, cumene, formaldehyde, methanol, methylene chloride, methyl ethyl ketone, phenol, propionaldehyde, 1,2,4-trichlorobenzene, and o-xylene (U.S. EPA 2001). The HAPs are produced by both the sulfite and Kraft processes, as well as by various treatments such as bleaching.

The petitioner has suggested that hemp could replace tree pulp, which would reduce the impacts of harvesting trees, but would add impacts of agricultural hemp production. Those impacts have not been assessed in the technical reviews. However, other authors have assessed the environmental impacts of hemp production and found them to be smaller in terms of input requirements and discharges than other major crops, while yielding higher quantities of dry matter.[2] The petition states that non-bleached kraft paper is used in the Nitten pots, which is significant, due to the contribution of chlorine bleach and its reaction products to the effluent stream.

Additives

Wood or hemp pulp is cellulose and readily degrades in the soil. Paper pots may also contain strengtheners, reinforcement fibers, adhesives, and antimicrobials. We do not consider the fact that these additives are currently used in other paper, which may end up in recycled paper on organic farms, to be a reason *per se* to accept them in paper pots.

The strengtheners cited in the petition are magnesium chloride, which is considered to be nonsynthetic, and the urea resin dimethylol dihydroxy ethylene urea (DMDHEU). DMDHEU is a resin that is also used in permanent press fabrics, where it is known as a formaldehyde-

[2] Werf, H., 2004. Life Cycle Analysis of field production of fibre hemp, the effect of production practices on environmental impacts. *Euphytica*, *140*.

releasing substance that may cause formaldehyde-allergic reactions.[3] Aside from the dermal sensitivity, DMDHEU is considered to have low acute toxicity.[4] It is suspected by the European Union of causing cancer through inhalation exposure and mutations.[5] It does not bioconcentrate, and its biodegradation half-life is 4.67 days.[6] The petition says, "The new line of paper pot products (which are the focus of this petition) will replace one of the synthetic ingredients in the paper with a natural substitute: hemp fiber." This refers to vinylon, so apparently the DMDHEU will remain. Urea-formaldehyde resin is allowed in paper and paperboard used in food packaging. [7]

The petition says that the adhesives used in paper pots are ethylene vinyl acetate (EVA) resin, polyvinyl acetate resin (PVAc), and acrylic acid ester (AAE) copolymer. An adhesive related to these is polyvinyl alcohol (PVA), to which PVAc is readily degraded through All three are used for food contact surfaces and/or food packaging.[8] PVA, EVA, and magnesium chloride are all on EPA List 4B, Minimum Risk Inert Ingredients.[9]

Fiber reinforcement may also be added. The Nitten paper pots used vinylon, but will substitute hemp fiber in the new line of pots.

The final –and most objectionable—additives are antimicrobials. These would not be allowed in packaging for organic foods, according to OFPA §6510(a)(5). Nitten certifies that their pots do not contain any fungicides, preservatives, or fungicides.

We conclude from the petition and TR that the Nitten pots, at least, do not contain any additives that could not be found in organic food by virtue of presence on food contact surfaces or food packaging. The remaining issue is the extent to which these additives biodegrade in the soil.

Biodegradability

PVA/PVAc

PVAc is commonly known from its use in Elmer's Glue-All.[10] It is related to polyvinyl alcohol (PVA) in that PVA is manufactured from PVAc by hydrolysis. The TR says, "Natural degradation of PVA can be readily 100 percent biodegradable in 30 days under ideal conditions."[11] Other

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33 De Groot, A.C., Le Coz, C.J., Lensen, G.J., Flyvholm, M.A., Maibach, H.I. and Coenraads, P.J., 2010. Formaldehyde-releasers: relationship to formaldehyde contact allergy. Part 2. Formaldehyde-releasers in clothes: durable press chemical finishes. *Contact Dermatitis*, *63*(1), pp.1-9.

4 https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID1025140#toxicity-values.

5 https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/notification-details/25960/745920.

6 https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID1025140#env-fate-transport.

7 Paper Pots and Containers TR, 2019. Table 2. FDA Status of Selected Paper Additives.

8 Paper Pots and Containers TR, 2019. Table 2. FDA Status of Selected Paper Additives.

9 Paper Pots and Containers TR, 2019. Line 115.

10 Paper Pots and Containers TR, 2019. Lines 161-163.

11 Paper Pots and Containers TR, 2019. Line 481.

authors state, "PVA is an outstanding example showing that conditions are crucial for biodegradation. Quantitative degradation is described in wastewater treatment plants run with an activated sludge containing an adapted microbial population; however, the biodegradation rate decreases significantly in systems lacking such a prepared microbial population. This must be kept in mind because degrading organisms or communities are not evenly distributed in all biotopes."[12]

Unfortunately, details about the rate of degradation of PVAc are harder to find. PVAc is degraded by fungi –specifically, it is known to be degraded by *Aspergillus* spp. and *Penicillium* spp.[13] Both fungal genera are ubiquitous and found in soil environments.[14] Vinyl acetate, the monomer of PVAc, is subject to microbial degradation to acetate and acetaldehyde.[15]

EVA

The only information about the biodegradability of EVA we have found is this statement of purpose in a research paper: "The purpose of this work was to prepare biodegradable copolymers using a non-biodegradable (ethyl vinyl acetate) and biodegradable polymers (polylactic acid), in order to obtain biodegradable copolymers."[16]

AAE Polymer

The Hazardous Substances Data Bank says the following, "In the semi-continuous activated sludge test for inherent biodegradability, [acrylic acid polymer] (mean molecular weight of 4,500) removal was 40% (incubation time not specified); using a continuous-feed activated sludge test, removal was 27%." No information was available for the identifying CAS number given in the petition. This was for acrylic acid polymer, CAS # 9003-01-4.

Compatibility with Organic Practices

The use of the petitioned paper pots is compatible with the way paper has been used in organic production –as mulch and a compost feedstock. It is used as a (mostly?) biodegradable input that performs a needed function while adding carbon to the soil, without adding toxic inputs. It is compatible with small-scale farms and does not require gasoline-powered machinery.

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[12] Amann, M. and Minge, O., 2011. Biodegradability of Poly (vinyl acetate) and Related Polymers. In *Synthetic Biodegradable Polymers* (pp. 137-172). Springer, Berlin, Heidelberg.

[13] Trejo, A.G., 1988. Fungal degradation of polyvinyl acetate. *Ecotoxicology and environmental safety*, *16*(1), pp.25-35.

[1414] https://drfungus.org/knowledge-base/aspergillus-species/; https://drfungus.org/knowledge-base/penicillium-species/.

[15] Nieder, M., Sunarko, B. and Meyer, O., 1990. Degradation of vinyl acetate by soil, sewage, sludge, and the newly isolated aerobic bacterium V2. *Appl. Environ. Microbiol.*, *56*(10), pp.3023-3028.

[16] Moura, I., Machado, A.V., Nogueira, R. and Bounor-Legare, V., 2010. Synthesis of biodegradable copolymers based on ethylene vinyl acetate and polylactic acid. In *Materials Science Forum* (Vol. 636, pp. 819-824). Trans Tech Publications.

Conclusion

The use of paper pots as petitioned –hemp kraft paper, with hemp fibers for strength, and with the petitioned additives –magnesium chloride and DMDHEU as strengtheners and the adhesives PVAc, EVA, and AAE—poses no more hazard to the soil or to organic consumers than the allowed use of recycled paper, which contains many more additives. However, as we stated at the beginning of these comments, this decision should not based on comparison with the allowed use of recycled paper, but on compliance with OFPA criteria.

The use of the paper pots does not appear to pose any health threat. The TR says, "The only additives commonly found in virgin kraft paper that is [*sic*] likely to pose any toxicological health risks are formaldehyde resins."[17] Even the urea-formaldehyde resin (DMDHEU) is allowed in food packaging used for organic food.

We are not satisfied with the lack of information on the biodegradability of the adhesives. It seems likely to us that the adhesives, encompassed in a matrix of cellulose, will probably degrade quickly. But we would like to base that judgment on data –more data than is available from the TR or other information we have found.

The TR notes, "A comprehensive review of the manufacturing processes of all possible additives, adhesives and reinforcement fibers is beyond the scope of this review." It is also beyond the scope of our comments, and the NOSB should consider it beyond the scope of its review of the petition. Based on the information in the new TR, the CS should develop a proposal that contains an annotation clarifying the materials and manufacturing processes that will be allowed. The NOSB should facilitate support for the domestic production of paper pots that are compatible with organic principles. Finally, since there will be other products that incorporate other additives, the NOSB should hold the line on allowed materials in the pots, while remaining open to amendments in the future.

Thank you for your consideration of these comments.

Sincerely,

Terry Shistar, Ph.D.
Board of Directors

[17] Paper Pots and Containers TR, 2019. Lines 567-568.