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

April 5, 2011

National Organic Standards Board
Spring 2011 Meeting
Seattle WA

Re. Comments on Nickel

Dear Board Members:

These comments are submitted on behalf of Beyond Pesticides. 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, 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 groups around the world.

We support the recommendation of the Crops Committee to deny the petition to allow nickel as a micronutrient. As we will explain below, nickel is toxic and a known human carcinogen, and is not needed.

Need

Nickel is present in adequate quantities in practically all soils. It is actually considered a nanonutrient because such small quantities are needed.

> Although Ni is a recognized essential mineral nutrient element for higher plants, its agricultural and biological significance is poorly understood. This is largely because of the low levels thought to be needed by plants (about 1–100 ng g^{-1} dry weight) in relation to the relative abundance of Ni in essentially all soils (> 5 kg ha^{-1}),” (Bai et al., 2006 and additional references cited therein). (TR lines 584-587)

The problem with nickel is usually its availability, which may be blocked by the presence of excess quantities of other metals. Given that it is abundant in virtually all soils, we must question the need for adding additional nickel.

> The availability of nickel to pecan trees was reduced by the excess presence of zinc (University of Georgia). The excess presence of nickel suppressed the assimilation of Zn, Cu, Fe, Mn, Ca, Mg, and S nutrients (Yang et al., 1996). (TR lines 517-519)

Nickel adsorption depends strongly on metal concentration and pH (Giusti et al. 1993). (TR lines 748-749)

Several factors might limit the availability of micronutrients to plants. The soil pH greatly determines this availability. In general, the availability decreases with increasing soil pH, except molybdenum. (TR lines 941-943)

The uptake of nickel by pecan trees, for example, was suppressed by zinc which was applied for zinc deficiency problem (University of Georgia). Solving the zinc deficiency in an alternative method may alleviate the nickel deficiency problem. (TR lines 964-966)

Human Health Hazards

A major concern with nickel is the great potential for adverse health impacts on humans, particularly workers.

Nickel compounds are known to be human carcinogens (ATSDR-Ni, 2005; 11th Report on Carcinogens – Nickel Compounds and Metallic Nickel). (TR lines 782-783)

The effect of nickel on human health is extensively discussed in ATSDR-Ni (2005). Nickel compounds "can be grouped according to their solubility in water: soluble compounds include nickel chloride, nickel sulfate, and nickel nitrate, and less-soluble compounds include nickel oxide and nickel subsulfide. Both the soluble and less-soluble nickel compounds are important with regard to all relevant routes of exposure. Generally, the soluble compounds are considered more toxic than the less-soluble compounds, although the less-soluble compounds are more likely to be carcinogenic at the site of deposition." (TR lines 785-791)

The human health concerns are especially great because it is being suggested that the nickel be applied to the canopy of pecan trees. Pecan trees grow to 180 feet tall with a spread of 75 feet. Spraying a known human carcinogen up into such a canopy (or down from a plane) poses a real risk to anyone in the vicinity.

Ecological Impacts

Overuse can lead to contamination problems that are more serious than deficiency.

On the other hand, these components, such as Cu, Zn, Ni, Co, Mo, Fe, and Mn, are also termed as "heavy metals."

The contamination of these heavy metals to the environment is well documented. It is a situation of case by case analysis, but the contamination problem such as the contamination of nickel in old orchard where fertilizers have been used extensively might be more general than the deficiency problem (e.g. U.S. EPA's Background report

> on fertilizer use, contaminants and regulations; U.S. EPA's Nutrient Management and Fertilizer; and USDA's Heavy Metal Soil Contamination). (TR lines 489-495)
>
> Heavy metals such as Cu, Zn and Ni are strongly retained in soil. Excessively applied micronutrients remain in soil for a long time and may cause toxic effects to subsequent plants. (TR lines 948-957)

As noted in the addendum to the committee's recommendation, numerous studies show negative impacts of nickel on soil respiration and the growth of soil fungi, including mycorrhizal fungi.

Alternatives

Apparently, a major cause of nickel deficiency is overuse of zinc micronutrients. This is not cause to approve another micronutrient, especially one that has known and serious adverse effects.

> Soil can provide insufficient nickel if it is 'absolutely deficient' and also if the level of another metal (especially zinc) that competes with nickel for root transport is high enough to block nickel uptake. Soils used for pecans are frequently deficient in zinc. Long-term application of zinc to the soil to correct the zinc deficiency has made the soil zinc level high enough to create a conditioned nickel deficiency in the plants. (Petition, p.12.)
>
> Alternative approaches to deficiencies may be more effective and less hazardous.
>
> pH adjustment might be more important than applying "required" micronutrients for correcting "deficiency" problems. "If the deficiency is due to pH imbalance, the approach is to modify the pH of the mix. In this case, adding micronutrients can make matters worse because the level of individual micronutrients may affect the level in the plant of other micronutrients through a process called antagonism. For example, too much iron may produce manganese and zinc deficiencies, while high levels of manganese may result in iron and zinc deficiencies. Copper and zinc are also antagonistic: too much of one may produce deficiency of the other," (Ohio State University). Heavy metals such as Cu, Zn and Ni are strongly retained in soil. Excessively applied micronutrients remain in soil for a long time and may cause toxic effects to subsequent plants. (TR lines 948-957)
>
> Micronutrients may also be supplied through growth of accumulating plants.
>
> The existence of nickel (Ni) deficiency in certain horticultural crops merits development of fertilizer products suitable for specific niche uses and for correcting or preventing deficiency problems before marketability and yields are affected. The efficacy of

satisfying plant nutritional needs for Ni using biomass of Ni hyperaccumulator species was assessed. Aqueous extraction of Alyssum murale (Waldst. & Kit.) biomass yielded a Ni-enriched extract that, upon spray application, corrects and prevents Ni deficiency in pecan Carya illinoinensis (Wangenh.) K. Koch. The Ni-Alyssum biomass extract was as effective at correcting or preventing Ni deficiency as was a commercial Ni-sulfate salt. Foliar treatment of pecan with either source at greater than or equal to 10 mg.L(-1) Ni, regardless of source, prevented deficiency symptoms whereas treatment at less than 10 mg.L(-1) Ni was only partially effective. Autumn application of Ni to foliage at 100 mg.L(-1) Ni during leaf senescence resulted in enough remobilized Ni to prevent expression of morphologically based Ni deficiency symptoms the following spring. The study demonstrates that micronutrient deficiencies are potentially correctable using extracts of metal-accumulating plants. (Wood BW, Chaney R and Crawford M. **2006**. Correcting micronutrient deficiency using metal hyperaccumulators: *Alyssum* Biomass as a natural product for nickel deficiency correction. *Hort Sci*., 41: 1231-1234.)

The support rationale and documentation to the nickel petition that relies on data (such as the risk data submitted by Richard Theur) pertaining to soil amendments are inadequate to the Board's decision because they do not relate to the only use that could be helpful—foliar applications. In this regard, the petition blurs important distinctions. In short, the soil application is unlikely to be effective, and the foliar application is likely to be dangerous. There are natural alternatives that are effective and safe, so there is no need to use a dangerous synthetic with dubious effectiveness.

We conclude with the thought that not every crop can be grown everywhere. If the soils are truly deficient in nickel, then we must ask whether that is the right place to grow crops with a high need for nickel. At the same time, if high levels of other micronutrients, such as zinc, added to the soil blocks pecan trees' uptake of nickel, the focus must return to soil management not the addition of a hazardous material.

Sincerely,

Terry Shistar, Ph.D.
Board of Directors