Metal Accumulation of Edible Fungi Species Within Pack Forest Biosolid Treated Sites

Mary Clouse
Dr. Erica Cline, advisor
University of Washington Tacoma, Environmental Sciences Program,

INTRODUCTION

- Bioaccumulation of metals in edible mushrooms is a possible safety hazard, especially where biosolids have been applied to forests (Zabowski et al. 1990).
- Fungi are known to accumulate certain toxic metals, especially cadmium, lead, and copper, in a species dependent manner (Gadd, 1992; Kalac & Svoboda, 1999).
- Our objective was to determine metal concentrations in edible mushrooms and whether they accumulate metals above background levels in their soil substrate.

METHODS

- Edible mushrooms were gathered during autumn of 2010 and 2011 at the UW Charles L. Pack Experimental Forest near Eatonville WA.
- Mushrooms and soils were collected from three forest sites with biosolids applications and two control sites (Table 1).
- Mushrooms were dried and then homogenized using a mortar and pestle.
- Metal concentrations were assessed at the UW School of Forest Resources Analytical Laboratory via Inductively Coupled Plasma Mass Spectrometry (ICP-MS).
- T-tests were performed using SPSS.

RESULTS AND DISCUSSION

- Soil pH (Fig. 1a) and moisture content (Fig. 1b) were not significantly different in biosolids-treated sites vs. control, while TOC (Fig. 1c) and all metals (Fig. 1d) were significantly higher in biosolids sites.
- Mushroom concentrations of Cd and Ag were significantly higher in biosolids treated forests, while the other metals were not significantly different (Fig. 2).
- Metals concentrations in mushrooms varied strongly by species (Fig. 3). Effects of biosolids were inconsistent; mushrooms from biosolids sites had significantly higher Cd for B. zelleri, L. amethysto-occidentalis and L. luculentus, Cu for B. chrysenteron, and Zn for G. subroseus. There were no significant effects of biosolids for As, Pb, and Ag.
- Accumulation of metals (Cd) occurred for Pb in both Boletus species, in Ag and Pb for G. subroseus, in Cu and Pb for L. amethysto-occidentalis, and there was no accumulation above 2 in L. luculentus.
- Safe exposure levels (Table 2).
- Overall, metals uptake was more strongly influenced by species than by biosolids application, consistent with other studies (Kalac, ADD THESE).
- Gomphidius subroseus exceeded the upper limit with Cd and reached it with Cu. All other mushrooms in this study where below the safe limits of consumption.

ACKNOWLEDGEMENTS

I would like to thank Dr. Erica Cline for her guidance, patience, and constant sharing of knowledge through the process of research. Thank you to the University of Washington Chancellor Funds for the funding of projects that enhance our learning experience that directly relates to our environment around us.