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Sampling oak logs to determine the log-to-shiitake transfer factor of Cs-133

Graduate School of Agricultural and Life Sciences, The University of Tokyo[*1],
Forestry and Forest Products Research Institute[*2]
○ O`BRIEN, Martin[*1], HIRAIDE, Masakazu[*2], OHMAE, Yoshimi[*1], NIHEI, Naoto[*1],
MIURA, Satoru[*2], TANOI, Keitaro[*1]

1. Introduction

Stable cesium (Cs-133) can be used to predict the future transfer factor (TF) of radiocesium from Fukushima oak logs to shiitake mushrooms. However, the current approach to obtain a representative wood sample for Cs-133 determination involves breaking down and milling the entire log to a powder prior to analysis. In the current study, we investigated if sawdust obtained from cutting a log along its length was as robust but a faster alternative to providing a representative wood sample to determine the TF of Cs-133 between logs and shiitake.

2. Method

Five oak logs and the shiitake fruiting bodies growing on those logs were sampled and analyzed for Cs-133 concentration. To facilitate the separation of the sapwood from the heartwood, each log was cut at 10-cm intervals along its length (n = 9 discs/log). The sawdust produced from cutting each disc (n = 8 sawdust samples/log) and fruiting bodies present on each disc (n = 9 fruiting body samples/log) were collected. The 10-cm discs were separated into bark (n = 9 samples/log), sapwood (n = 9 samples/log) and heartwood (n = 9 samples/log). Fruiting bodies, log parts and sawdust samples (0.3 g) were digested with 60% HNO_3 and the Cs-133 content was measured by ICP-MS. A 1-way ANOVA was used to compare the TF based on heartwood, sapwood and sawdust, and the TF between sawdust samples collected along the length of the logs.

3. Results and discussion

The TF of Cs-133 (mean ± SE) based on heartwood (29 ± 3.1), sapwood (27 ± 1.5) and sawdust (24 ± 1.5) did not differ ($P > 0.05$). In addition, the TF of Cs-133 based on sawdust collected along the length of the logs did not differ ($P > 0.05$). In the current study, the mean concentration in eight sawdust samples was used to obtain an estimate of Cs-133 concentration in logs. An alternative approach would be to first collect a number of sawdust samples per log at pre-determined locations (eight was found to be satisfactory and convenient in the current study) and then mix these samples to produce one representative sample of the whole log.

4. Conclusion

Sawdust can be used as an alternative to sapwood and heartwood to determine the TF of Cs-133 between logs and shiitake. The use of sawdust will greatly reduce both the time and labor for sample collection and preparation and allow a larger number of logs to be sampled when required.