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Seedling Uptake and Fate of Soil-applied Capsaicin, a Potential Browse Deterrent

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ABSTRACT

Seedling damage due to browse constitutes a major challenge to afforestation and reforestation efforts in the Central Hardwood Forest region of the USA. Many efforts have been made to deter herbivores, but the costs, implementation methods, and relative ineffectiveness of existing mitigation options often preclude operational implementation. An alternate means of deterring wildlife browse is capsaicin, a hot pepper concentrate, which has been reported to decrease herbivory of tree seedlings and is available in a controlled-release form designed to act systemically following application to the soil and subsequent plant uptake. However, the degree to which seedlings are capable of absorbing capsaicin from the soil solution and the location of absorbed capsaicin within the plant remain largely unexamined. A greenhouse experiment was conducted to determine the potential absorption of soil-applied capsaicin in post-transplant northern red oak (*Quercus rubra* L.) seedlings in conjunction with a growth chamber study investigating the fate of capsaicin in the soil. In the first experiment, each seedling received the recommended dose of 0.03g of soil-applied capsaicin, was separated into roots, leaves, and stems at three and five weeks after capsaicin application, and was analyzed using QQQ-LC/MS. No capsaicin or capsaicinoids were found in any of the tissues. Capsaicin was quantified in the soil, leachates, and ambient air using QQQ-LC/MS in a related experiment with the same growing conditions and capsaicin application rate. These results reflect observed efficacy of capsaicin in the field, and the implications of this study should be considered when evaluating animal browse mitigation measures.

KEYWORDS

Browse, deer browse, capsaicin, seedling uptake, HPLC Plant Analysis

REFERENCES

- Collins, M.D., Wasmund, L.M., Bosland, P.W. 1995. Improved Method for Quantifying Capsaicinoids in *Capsicum* Using High Performance Liquid Chromatography. *Horticultural Science*, 30(1):137-139.
- Horsley, S.B., Stout, S.L., and David S. Decalesta. 2003. White-tailed deer impact on the vegetation dynamics of a Northern hardwood Forest. *Ecological Applications*, 13(1): 98–118.
- Kozukue, N., Han, J., Kozukue, E., Lee, S., Kim, J., Lee, K., Levin, C., Friedman, M. 2005. Analysis of Eight Capsaicinoids in Peppers and Pepper-Containing Foods by High-Performance Liquid Chromatography and Liquid Chromatography–Mass Spectrometry. *Journal of Agricultural and Food Chemistry*, 53: 9172-9181.

Sloan, J. 2011. Examination of Endogenous and Exogenously Influenced Physiologically Patterns of Post Transplant *Quercus Rubra* Seedlings (Unpublished doctoral dissertation). Purdue University, West Lafayette.