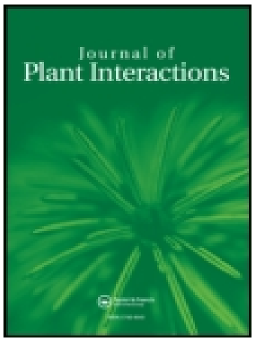

Journal of Plant Interactions

ISSN: 1742-9145 (Print) 1742-9153 (Online) Journal homepage: http://www.tandfonline.com/loi/tjpi20

Effect of genetic relatedness on volatile communication of sagebrush (*Artemisia tridentata*)

Satomi Ishizaki , Kaori Shiojiri , Richard Karban & Masashi Ohara

Journal of Plant Interactions
Vol. 6, Nos. 2–3, June–September 2011, 193

SHORT COMMUNICATION

Effect of genetic relatedness on volatile communication of sagebrush (*Artemisia tridentata*)

Satomi Ishizaki[a]*, Kaori Shiojiri[b], Richard Karban[c] and Masashi Ohara[a]

[a]*Graduate School of Environmental Science, Hokkaido University, Sapporo 060-0810, Japan;* [b]*The Hakubi Center, Kyoto University, Kyoto 606-8501, Japan;* [c]*Department of Entomology, University of California, Davis, CA 95616, USA*

(Received 29 November 2010; final version received 30 November 2010)

Sagebrush (*Artemisia tridentata*) uses volatile cues to induce systemic resistance to herbivory within and between plants (so-called volatile communication). Previous study revealed that the volatile components varied among individuals and that sagebrush suffered less damage when it received volatiles from clonally potted genetically identical branches than when it received volatiles from genetically different potted branches. In this study, we investigated whether there are genetic relationships among individuals growing within 60 cm where volatile communication occurs under natural condition, and whether volatile components are influenced by genetic relationships. By using genetic analysis involving microsatellite markers, we found that genetically identical ramets which were thought to be clonally propagated and genetically closely related ramets were growing near to each other. In addition, volatile components were similar among genetically identical or closely related ramets. Our results imply that genetic relatedness and volatile similarities may influence the strength of induced resistance of ramets that received volatiles.

Keywords: inter-plant signaling; herbivory; resistance; kin selection; self-recognition

Induced resistance via inter-plant signaling has been reported at least from 10 plant species (Heil and Karban 2010). In inter-plant signaling, cues that are emitted from damaged individual plant are received by neighboring individual plant and induce resistance in the receiver plant. Sagebrush (*Artemisia tridentata*) is known to use volatile cues to induce systemic resistance to herbivory within and between plants (so-called volatile communication) (Karban et al. 2006). In the system of volatile communication of sagebrush, the area where the volatile communication occurred was within 60 cm from damaged individuals (Karban et al. 2006) and the components of volatiles varied among individuals (Karban and Shiojiri 2009). Moreover, when sagebrush received volatiles from self branches or clonally potted genetically identical branches, it suffered less damage than when it received volatiles from genetically different potted branches (Karban and Shiojiri 2009). In this study, we answered whether there are genetic relationships among individuals which grow within 60 cm in natural habitat, and whether volatile components are influenced by genetic relationships among individuals. By using genetic analysis involving microsatellite markers, we investigated the genetic structure of two 10×10 m quadrats in a natural population of sagebrush in western North America. We found that genetically identical ramets which were thought to be clonally propagated were growing next to each other. Spatial autocorrelation analysis showed that genetic relatedness of samples up to about 2 m were significantly higher than expected from a random distribution of genotypes. In addition, we characterized the volatile profiles from the headspace of sagebrush ramets. For the genetically identical ramets, the volatile similarities were higher than those among genetically different ramets. Moreover, for genetically different ramets, positive correlation was observed between genetic relatedness and volatile similarities. Our results suggest that volatile communication occurs more frequently among genetically closely related ramets under natural condition. The results of previous (Karban and Shiojiri 2009) and our current study imply that genetic relatedness and volatile similarities may influence the strength of induced resistance of ramets that received volatiles.

References

Heil M, Karban R. 2010. Explaining evolution of plant communication by airborne signals. Trends Ecol Evol. 25:137–144.

Karban R, Shiojiri K. 2009. Self-recognition affects plant communication and defense. Ecol Lett. 12:502–506.

Karban R, Shiojiri K, Huntzinger M, McCall AC. 2006. Damage-induced resistance in sagebrush: volatiles are key to intra- and interplant communication. Ecology. 87:922–930.

*Corresponding author. Email: ishizaki@ees.hokudai.ac.jp

ISSN 1742-9145 print/ISSN 1742-9153 online

DOI: 10.1080/17429145.2010.544770
http://www.informaworld.com