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Invited Commentary

Comments on "green symphonies"

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Gagliano (2012) argues that we should expect plants to make use of meaningful acoustic cues in the environment, including the sounds and vibrations produced by other plants. We agree. Although it is not clear how plants perceive sounds, examples of plant responses include sound-responsive genes that could allow the use of sound to regulate gene expression in transgenic crops (Jeong et al. 2008) and directional growth of young corn roots toward the source of a soil-borne vibration (Gagliano et al. 2012). As plants also emit acoustic energy under some conditions, often grow in dense stands with many other individuals, acoustic cues have the potential to provide plants with important information about their surroundings. For group-living animals, "public" information about the activities of neighbors is important in predator detection, foraging, assessment of social competition, and coordination of collective actions (Danchin et al. 2004; Dall et al. 2005; Phelps et al. 2006; Krause et al. 2010). Such information can be available in the form of cues, such as movement decisions, or in the form of signals, such as alarm or recruitment signals (Wagner and Danchin 2010). Individual plants clearly use public information in the form of chemical cues produced by neighbors, which provide information about the level of threat from herbivory (Baldwin 2010; Hare 2011). If information about the state of nearby plants is also available in the form of acoustic emissions, it could be important in many interactions, such as competition or coordination of foraging. The possibility that sound could also provide a channel for plant-to-plant communication is intriguing. For chemical cues, it has been challenging to determine whether the interactions among neighboring plants represent communication or eavesdropping. For example, do the volatiles produced by wounded plants represent signals whose production has been favored because of their influence on conspecific or heterospecific receivers? Or are they an incidental consequence of wounding, or a form of within-plant communication, either of which would permit eavesdropping by neighbors (Dicke and Baldwin 2010)? The acoustic emissions of plants provide another route to examine the possibility of plant–plant communication, perhaps revealing sound-producing structures or temporal patterns of sound production that represent adaptations for influencing the behavior of nearby individuals.

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REFERENCES

Baldwin IT. 2010. Plant volatiles. Curr Biol. 20:R392–R397.
Dall SRX, Giraldeau L-A, Olsson O, McNamara JM, Stephens DW. 2005. Information and its use by animals in evolutionary ecology. Trends Ecol Evol. 20:187–193.
Danchin E, Giraldeau LA, Valone TJ, Wagner RH. 2004. Public information: from nosy neighbors to cultural evolution. Science. 305:487–491.
Dicke M, Baldwin IT. 2010. The evolutionary context for herbivore-induced plant volatiles: beyond the 'cry for help'. Trends Plant Sci. 15:167–175.
Gagliano M. 2012. Green symphonies: a call for studies on acoustic communication in plants. Behav Ecol. doi:10.1093/beheco/ars206.
Gagliano M, Mancuso S, Robert D. 2012. Towards understanding plant bioacoustics. Trends Plant Sci. 17:323–325.
Hare JD. 2011. Ecological role of volatiles produced by plants in response to damage by herbivorous insects. Annu Rev Entomol. 56:161–180.
Jeong M-J, Shim C-K, Lee J-O, Kwon H-B, Kim YH, Lee S-L, Byun MO, Park SC. 2008. Plant gene responses to frequency-specific sound signals. Mol Breed. 21:217–226.
Krause J, Ruxton GD, Krause S. 2010. Swarm intelligence in animals and humans. Trends Ecol Evol. 25:28–34.
Phelps SM, Rand AS, Ryan MJ. 2006. The mixed-species chorus as public information: tungara frogs eavesdrop on a heterospecific. Behav Ecol. 18:108–114.
Wagner RH, Danchin E. 2010. A taxonomy of biological information. Oikos. 119:203–209.