Aphid Acceptance of Barley Exposed to Volatile Phytochemicals Differs Between Plants Exposed in Daylight and Darkness

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INTRODUCTION

Volatile phytochemicals, such as those released by herbivore-infested plants, can induce a range of responses in plants, including activation of defences against pathogens and herbivores, modification of volatile profile and increased attractiveness to herbivores and natural enemies.1,2 In some cases, release of plant volatiles has been found to differ between day and night. For example, caterpillar feeding-induced emissions from tobacco contain certain compounds released only at night.3 In other cases, volatile emissions have been found to peak during daylight hours.4-6 However influence of light on plant responsiveness to phytochemicals has not been reported.

Barley plants exposed to volatiles released by undamaged plant neighbors become less acceptable to aphids,7,8 a process that has been named allelobiosis.9 Aphids are sucking herbivores that feed directly on plant phloem and use a variety of chemical cues to assess host quality. They are therefore excellent model herbivores to assess changes in host plant status. The changes in plant chemistry and physiology that are induced by allelobiosis are unknown, as are the nature of volatiles causing these effects.

Methyl salicylate and methyl jasmonate are components of the blend emitted by some herbivore or pathogen-damaged plants and, along with their nonvolatile acids, are known as plant defence inducers and regulators of a range of other processes.10,11 There are several examples of methyl salicylate or jasmonate-mediated affects on plant-aphid interactions. Exposure to methyl salicylate reduced acceptance and population development of Rhopalosiphum padi on barley.12 In Arabidopsis, constitutive activation of jasmonate signalling was correlated with enhanced resistance against Myzus persicae,13 and sorghum became less acceptable to Schizaphis graminum after treatment with methyl jasmonate.14

The aims of this study were (a) to investigate the influence of the presence or absence of light on the response of barley to phytochemicals and (b) to compare the effects of exposing barley to phytochemicals from undamaged plant neighbors and the stress-related