Plant traits mediating differences in gall density and gall size among willow genotypes

Methods

Results

We found that willows displayed genetic variation in susceptibility to galling insects in terms of both the frequency of gall attack and gall size. Specifically, attack rates from four of the five gall species varied between 22.8- and 70.2-fold among willowgenotypes, resulting in genotype explaining 23% of the variance in gall community composition (*H2* = 0.23, *F DF* = 2.62, *P* = 0.001). For example, willow genetic variation in susceptibility was highest for the most common gall former (44% of total galls), *Iteomyia* (*H2* = 0.36, *RLRT* = 27.78, *P* < 0.001) in this network. Willow genotype also influenced variation in the size of *Iteomyia* galls (*H2* = 0.13, *RLRT* = 3.68, *P* = 0.022), with a 2.3-fold variation, ranging in size from 4.8-11.0 mm, among the most disparate genotypes.

We found that the gall community was influenced both by leaf quality and plant architecture traits. In particular, both *Iteomyia* and *R. salicisbrassicoides* were found at higher densities on shorter willows with higher leaf C:N (*Iteomyia*, *R2* = 0.17, *F*2,119 = 12.14, *P* < 0.001; *R. salicisbrassicoides*, *R2* = 0.15, *F*2,120 = 10.97, P < 0.001). *Pontania* was found at higher densities on smaller willows with low leaf trichome density, but higher concentrations of flavones (*R*2 = 0.17, *F*3,106 = 7.38, *P* < 0.001). *Cecidomyiid* sp. A was positively associated with higher concentrations of flavanones and flavanonols (*R2* = 0.10, *F*1,131 = 15.21, *P* < 0.001). *Iteomyia* gall size was positively associated with higher concentrations of salicylates and flavones (*R2* = 0.14, *F*2,75 = 5.88, *P* = 0.004).