Figure S1

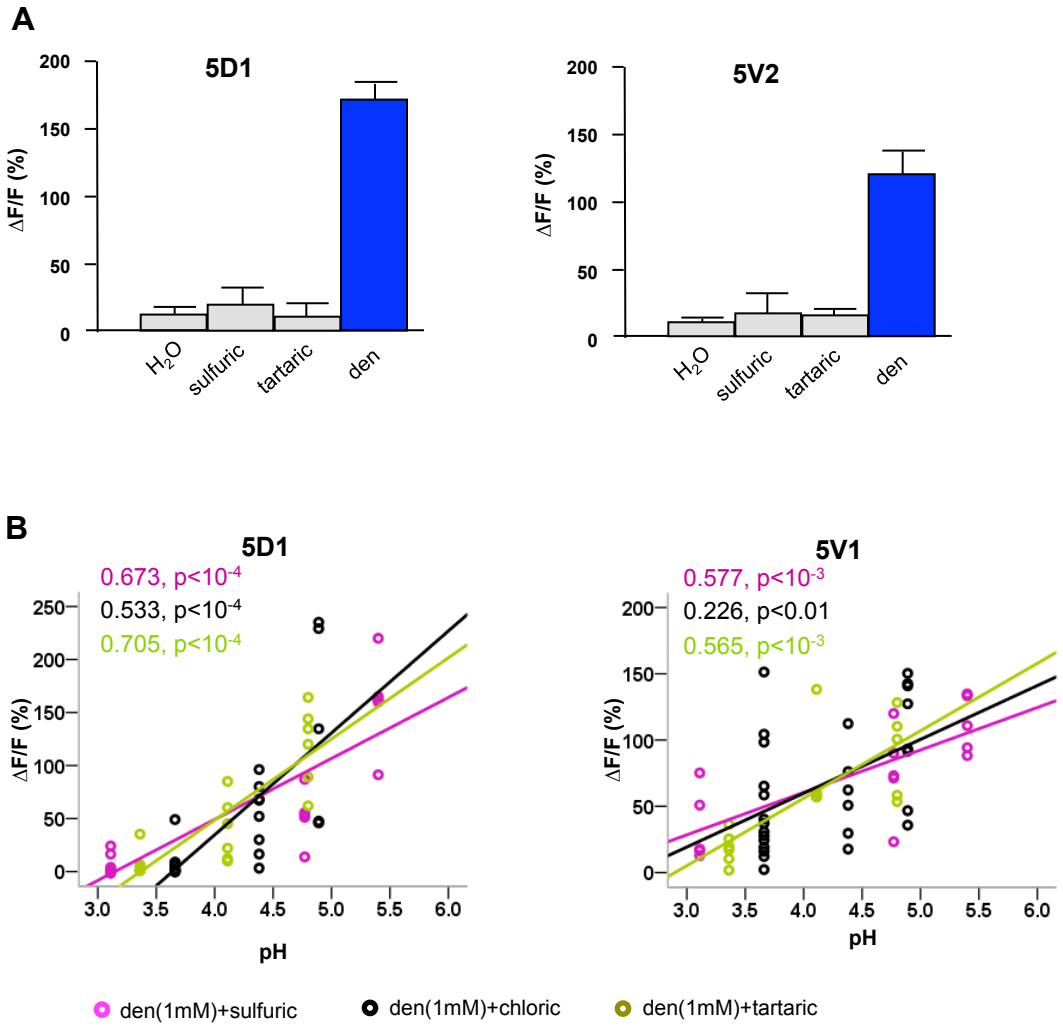

Figure S1 (related to Figure 1) Sulfuric and tartaric acid fail to activate bitter neurons, but repress bitter neuron responses to denatonium.
A) 2mM tartaric acid (pH3.03) and 1mM sulfuric acid (pH2.70) fail to activate tarsal bitter neurons of the 5D1 and 5V1 sensilla of *Gr33a^{GAL4} UAS-GCaMP3.0/+* flies.
B) Scatter diagrams with linear regression indicates that repression to denatonium is pH dependent using sulfuric (0.01mM, 0.1mM and 1mM) and tartaric acid (acid 0.1mM, 0.5mM and 2mM), along with HCl (0.1mM, 0.4mM and 1mM); 5<n<12. Regression coefficient (R^2) and p values are indicated for each acid. Note that denatonium slightly increases the pH of equimolar acid solutions.

Figure S2

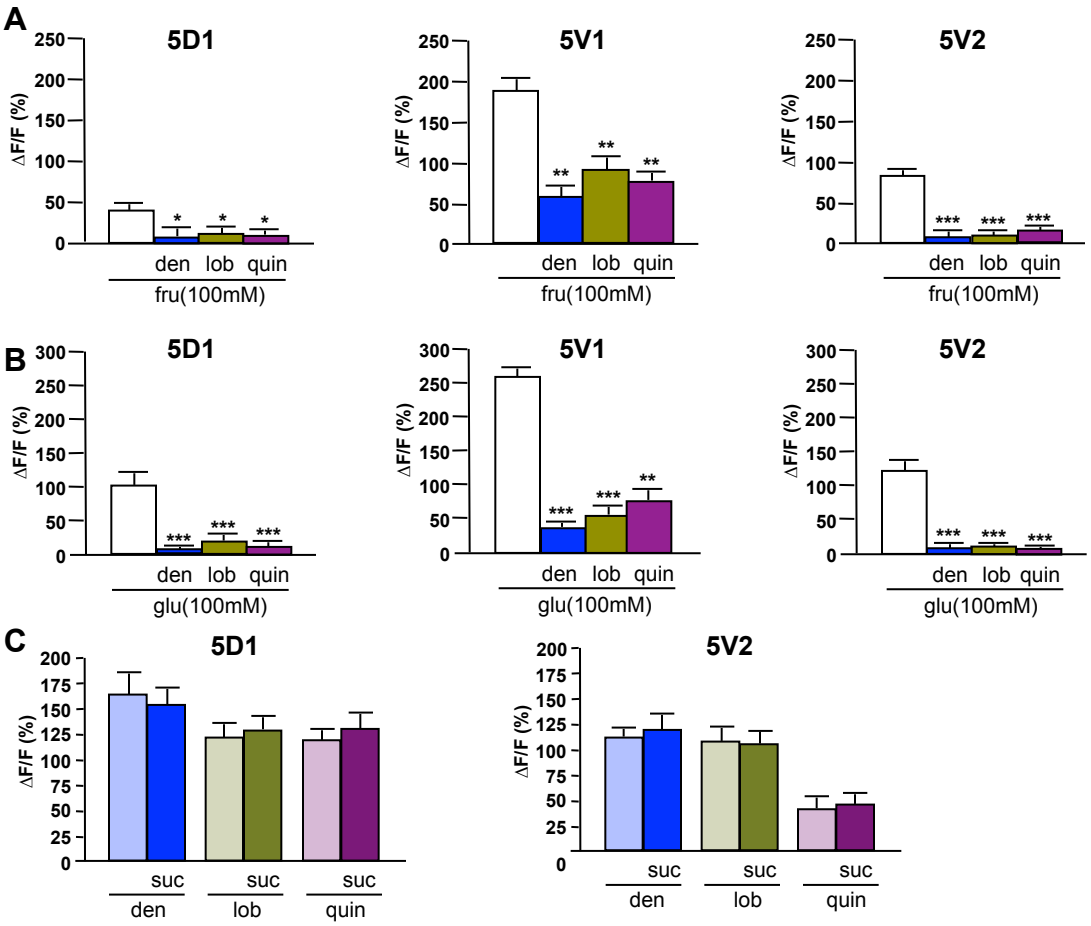

Figure S2 (related to Figure 2) Effects of bitter compounds and sugars on sweet and bitter sensing neurons.

A and B) Bitter compounds repress sweet neuron response to fructose (A) and glucose (B): All tested bitter compounds strongly suppress Ca^{2+} response in sweet neurons of tarsal taste sensilla using Ca2+ imaging of *Gr64f-GAL4 UAS-GCaMP3.0 /+* flies. Maximum relative fluorescence change (ΔF/F%) of sweet neurons to sugar-BC mixtures. Note that fructose and glucose responses are much higher in 5V1 associated sweet neuron, compared to the 5D1 and the 5V2 associated sweet neuron. Concentrations of denatonium (den), lobeline (lob) and quinine (quin) were 1 mM, 5 mM and 1 mM, respectively. * represent p<0.05, ** represent p<0.001, *** represent p<0.0001. One way ANOVA with post hoc Bonferroni correction; 5<n<9.

C) Sucrose does not affect the Ca^{2+} response in tarsal bitter neurons of *Gr33a^{GAL4} UAS-GCaMP3.0 /+* flies: Maximum relative fluorescence change (ΔF/F%) of bitter neurons of the 5D1 and 5V2 sensilla to bitter compounds and sugar/bitter compound mixtures. Concentrations of denatonium (den), lobeline (lob) and quinine (quin) were1 mM each and concentration of sucrose (suc) was 100 mM, respectively. 7<n<10.

Figure S3

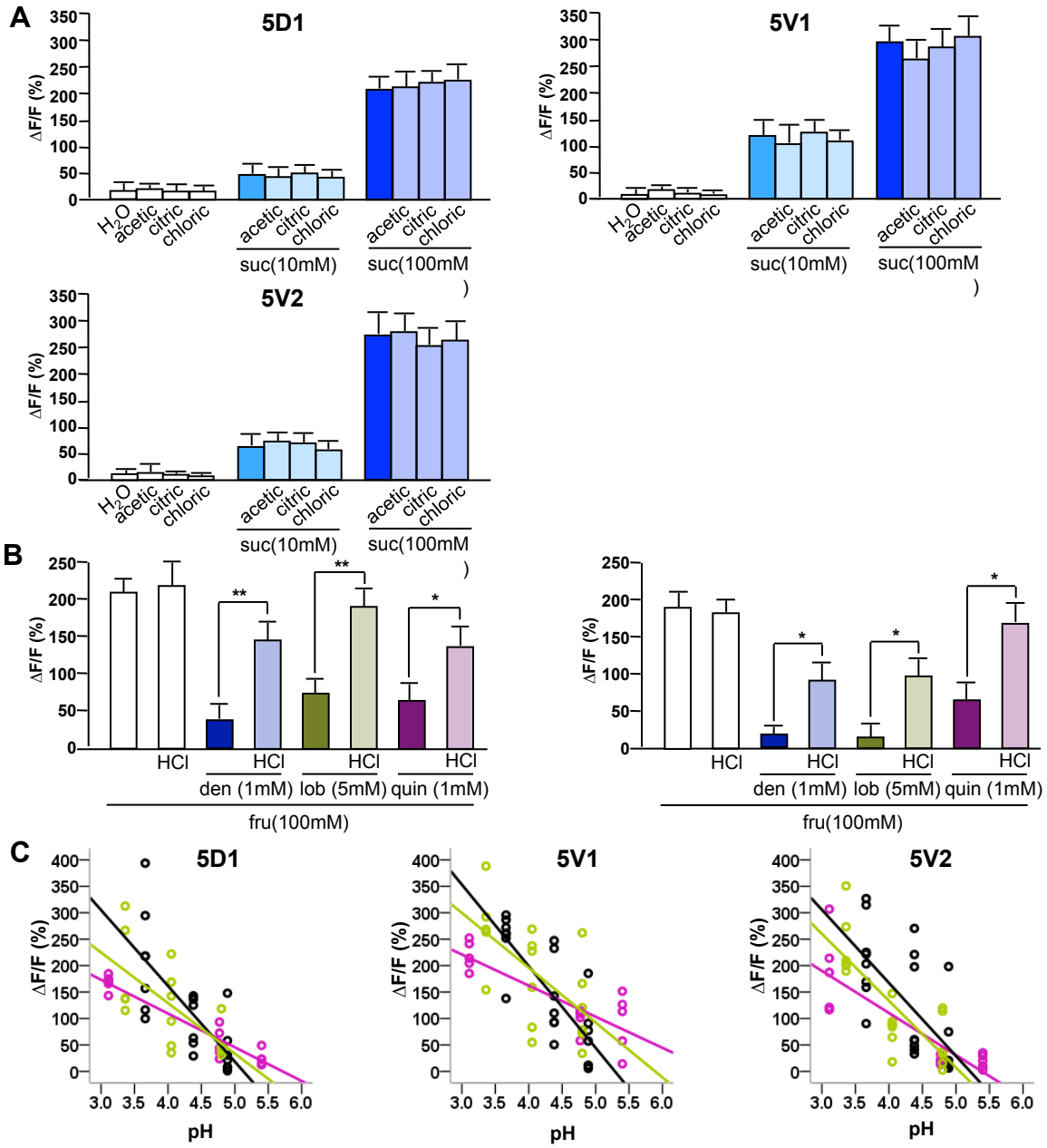

Figure S3 (related to Figure 3) Effects of acids on sweet neuron responses:
A) Acids neither activate nor modulate Ca^{2+} response to sugars in sweet neurons of *Gr64f-GAL4 UAS-GCaMP3.0* /+ flies. Maximum relative fluorescence change (ΔF/F%) of sweet neurons in the 5D1 (top), 5V1 (middle) and 5V2 (bottom) sensilla to acids and sugar-acid mixtures. Concentrations of acetic acid (AA), citric acid (CA) and HCl were 50 mM, 2 mM and 1 mM, respectively (corresponding to a pH of ~ 3.0). suc = sucrose. 5<n<9.
B and C) Acids de-repress response to sugar/bitter compound mixtures in in sweet neurons: (B) Maximum relative fluorescence change (ΔF/F%) of sweet neurons in the 5D1 sensillum to fructose/ bitter compound and glucose/bitter compound mixtures in the presence and absence of HCl. Concentration of HCl was 1 mM (pH of ~ 3.4), and concentration of denatonium (den), lobeline (lob) and quinine were 1 mM, 5 mM and 1 mM, respectively. fru = fructose, glu = glucose. * represent p<0.05, ** represent p<0.001, *** represent p<0.0001. One way ANOVA with post hoc Bonferroni test. 5<n<9. (C) Scatter diagrams with linear regression indicates that de-repression to sucrose/denatonium mixtures is pH dependent using sulfuric (0.01mM, 0.1mM and 1mM) and tartaric acid (acid 0.1mM, 0.5mM and 2mM) and HCl (0.1mM, 0.4mM and 1mM); 5<n<8. Regression co-efficient (R^2) and p values are indicated for each acid.

Figure S4

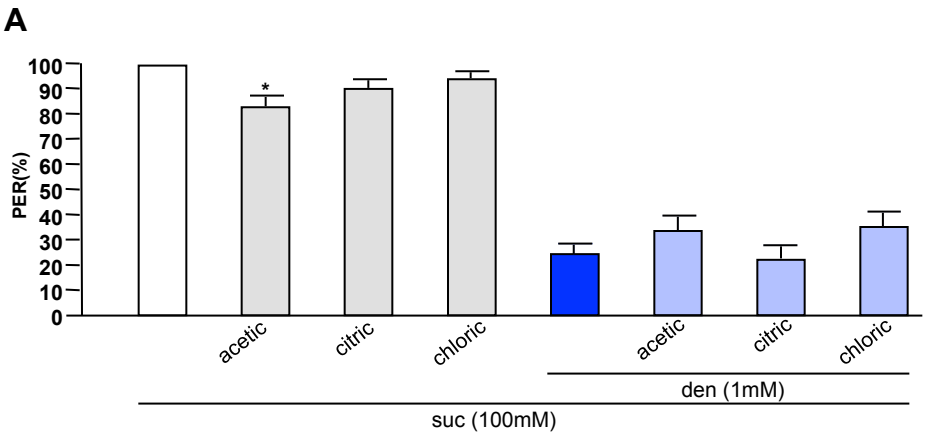

Figure S4 (related to Figure 5) Acids do not revert suppressed PER of sucrose/bitter compound mixtures when stimulus is applied to labial palps. While acids mixed with sugars elicit strong PER, they do not de-repress PER to sucrose/denatonium mixtures when the labellum alone is stimulated. Concentrations of acetic acid (AA), citric acid (CA) and HCl were 50 mM, 2 mM and 1 mM (corresponding to a pH of ~ 3.4),respectively, and concentrations of denatonium (den) was 1 mM. suc = sucrose. One way ANOVA with post hoc Bonferroni correction. 6<n<10. For Genotypes, see Figure 5.