Huanglongbing (HLB, also known as citrus greening) is the most serious disease threatening destruction of many of the world’s citrus industries. HLB affects all cultivated citrus varieties and causes a rapid decline of trees and produces unmarketable fruit, leading to substantial economic losses. This disease is caused presumably by a phloem-limited bacterial pathogen (Candidatus Liberibacter sp.) and is vectored by the Asian citrus psyllid (ACP, Diaphorina citri). Incorporation of gene(s) via genetic engineering can potentially confer resistance to susceptible cultivars, while maintaining varietal fidelity. Several constructs containing antimicrobial peptide genes and NPR1 have been tested in commercial sweet orange and grapefruit cultivars with varying degrees of success. Field trials in an HLB-endemic environment, as well as greenhouse-based insect vector transmission trials, have identified a few genes that can potentially confer tolerance to HLB. These genes include the CEMA and CEAD antimicrobial lytic peptide genes and NPR1, driven either by a constitutive d35S promoter or a phloem-specific Arabidopsis SUC2 promoter. We will also discuss our current citrus improvement strategies and progress to develop consumer acceptable, HLB resistant citrus by the utilization of plant-based genetic constructs.