Using computational methods we study the gas phase hydration of three different atmospherically relevant organic acids with up to 10 water molecules. We study the dicarboxylic acid (pinic acid) and a tricarboxylic acid (3-methyl-1,2,3-butanetricarboxylic acid (mbtca)) that are both identified as products from α-pinene oxidation reactions. We also study a 2-oxohexanediperoxy acid (ohdpa) that have been identified as a product from cyclohexene autoxidation. To sample the cluster structures, we employ our recently developed systematic hydrate sampling technique and identify a total of 551 hydrate clusters. The cluster structures and thermochemical parameters (at 298.15 K and 1 atm) are obtained at the ωB97X-D/6-31++G(d,p) level of theory and the single point energy of the clusters have been refined using a high level DLPNO-CCSD(T)/aug-cc-pVTZ calculation. We find that all three tested organic acids interact significantly weaker with water compared to the primary nucleation precursor sulfuric acid. Even at 100% relative humidity (298.15 K and 1 atm), we find that ohdpa remains unhydrated and only the monohydrate of pinic acid and mbtca are slightly populated (4% and 2%, respectively). From the obtained molecular structures potential implications for ice nucleating ability of aerosol particles is discussed.