We study cut-off effects at tree-level of perturbation theory for pure Wilson, Wilson twisted mass and overlap fermion lattice actions. For our analytical calculations, lattices with infinite extension in the time direction are considered. The cut-off effects are investigated by computing the mass spectrum and decay amplitudes for different 'hadrons' in the thermodynamic limit. We illustrate how automatic O(a)-improvement works in the case of twisted mass fermions and demonstrate that maximally twisted mass and overlap fermions scale with a rate of \(O(a^2)\). We also investigate the situation when twisted mass fermions are moved slightly away from maximal twist. Finally, we show the scaling behaviour of ratios of masses built from different fermion discretizations.