13C nuclear spin relaxation processes in 6- to 12-membered cyclodextrins (from α to η) were investigated in D2O solution at multiple magnetic fields. Detailed analysis of the 13C longitudinal relaxation, the 13C relaxation in rotating frame and the 1H-13C nuclear Overhauser enhancement (NOE) in these molecules yielded their rotational diffusion tensors and semiquantitative picture of the internal motions these oligosugars undergo. The dynamics in α- and β- molecules seems to be different than the motional behaviour of their higher analogues. The results suggest that on the time scale of molecular tumbling none of the investigated cyclodextrins takes rigid truncated-cone conformation.