The ability to accumulate uranium was tested on 20 different cultivars and GMOs of *Nicotiana* spp. grown in Hoagland's hydroponic medium indoors. Apart from the accumulation and translocation of uranium in plants, the effects of genetic modifications and adaptations of hydroponic medium on the ability of plants to accumulate uranium were tested. *N. glauca*, *N. tabacum* cv. M 51 and GMO M 51 Pro seemed to be the best plants for accumulation of uranium. Concentrations of uranium in these plants grown in medium with 0,5 mM of uranium were as high as 31.28 mg/g dry weight in roots and 0.21 mg/g in upper parts. *N. tabacum* cv. La Burley 21 and GMOs TRI2 – T1 and TRI2 – T2 were tested for accumulation and translocation of uranium. Highest concentration was 72.49 mg/g in roots, 4 mg/g in stems and 1.1 mg/g in highest leaves for plants cultivated in medium with 1 mM of uranium. Absence of phosphate in the hydroponic medium resulted in increased accumulation of uranium.