This thesis deals with tests of independence for time series of identically distributed Poisson random variables. In the introductory part, important terms and definitions are defined, in particular the autocorrelation function, its estimates and INAR(1) model. Three types of tests of independence are described in the thesis – tests based on estimates of the autocorrelation function, simple runs test and tests based on contingency tables. These tests are compared in a simulation study under the null hypothesis of independence and under the alternative of INAR(1) model.