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Isolation and study of biologically active compounds of plant origin with antiviral activity against influenza viruses and coronaviruses

Variety of successful antivirals to fight influenza and COVID-19 are very limited which significantly reduces the efficacy of treatment for these pandemic infections. Therefore, development of new antivirals efficient against influenza viruses and coronaviruses is an important problem of great scientific and practical significance. Natural biologically-active compounds of plant origin are a very promising source for elaboration of new antivirals with broad spectrum activity. In the research presented, 54 preliminary selected plant extracts obtained from plants of the flora of Kazakhstan were screened for antiviral activity against influenza viruses and coronaviruses. Plant extracts were studied for their capacity inhibit reproduction of A/H1N1 and A/H3N2 influenza viruses and 2 test-coronavirus (avian infectious bronchitis gamma-coronavirus, mouse hepatitis beta-coronavirus) and also screened for the ability inhibit SARS-CoV-2 main protease and activity of the ACE-2 receptor. The results of the study have shown that 8 plant extracts expressed good antiviral activity against tested influenza viruses and coronaviruses. It was also found that these plant extracts were able effectively inhibit experimental influenza and coronavirus infection in mice at therapeutic and prophylactic routes of application. Selected plant extracts were fractionated by HPLC and 27 compounds of different chemical structures were isolated and characterized by HPLC and mass-spectrometry. The results of analyses have shown that isolated substances possessed antiviral activity were mainly associated with three groups of biologically-active compounds: flavonoids, terpenes and organic acids. The results obtained indicated a good potential of isolated plant substances for the development of new antivirals efficient against influenza viruses and coronaviruses.