Four cationic ruthenium(II) complexes with the formula [Ru(\(\eta^5\)-C\(_5\)H\(_5\))(PPh\(_3\))(2)](\(+\)), with \(L = 5\)-phenyl-1H-tetrazole (TzH) 1, imidazole (ImH) 2, benzo[1,2-b; 4,3-b'] dithio-phen-2-carbonitrile (Bzt) 3, and [5-(2-thiophen-2-yl)-vinyl-thiophene-2-carbonitrile] (Tvt) 4 were prepared and characterized in view to evaluate their potentialities as antitumor agents. Studies by Circular Dichroism indicated changes in the secondary structure of ct-DNA. Changes in the tertiary structure of pBR322 plasmid DNA were also observed in gel electrophoresis experiment and the images obtained by atomic force microscopy (AFM) suggest strong interaction with pBR322 plasmid DNA; the observed decreasing of the viscosity with time indicates that the complexes do not intercalate between DNA base pairs. Compounds 1, 2, and 3 showed much higher cytotoxicity than the cisplatin against human leukaemia cancer cells (HL-60 cells).