Recently, six cyclometallated Iridium (III) complexes with imine-N-heterocyclic carbene ligands were synthesized and their in vitro anticancer activities were studied. Flow cytometric, confocal microscopy and immunofluorescence techniques with suitable fluorescent probes were used to quantify the apoptotic effect of complexes. The cytotoxicity of the complexes was tested against A549 cell lines. The IC\textsubscript{50} values of all complexes were higher than clinically approved cisplatin drugs. After 24 h of incubation with the complexes, there was a significant reduction in mitochondrial membrane potential, generation of reactive oxygen species (ROS) and lysosomal damages in the cancer cells.