

Storage and UV stability of small unilamellar liposomes with encapsulated silymarin and silibinin

Abstract

In the present research, the storage and UV stability of small unilamellar liposomes (SUVs) with encapsulated silymarin and silibinin were investigated in terms of changes in vesicle size, polydispersity index (PDI), zeta potential, mobility, and conductivity. Silymarin and silibinin were encapsulated within phospholipid liposomes produced using the proliposome method and subsequently sonicated. On the 1st day, vesicle size was 1681.0 ± 55.5 nm for silymarin liposomes and 1884.7 ± 2.5 nm for silibinin liposomes, whereas PDI was 0.321 ± 0.012 and 0.319 ± 0.011 . Additionally, the zeta potential of SUVs with silymarin and silibinin was -38.6 ± 0.8 and -37.6 ± 1.2 mV, respectively, whereas mobility and conductivity were -3.03 ± 0.06 $\mu\text{mcm/Vs}$ and 0.149 ± 0.002 mS/cm (for silymarin sample) and -2.94 ± 0.09 $\mu\text{mcm/Vs}$ and 0.154 ± 0.002 mS/cm (for silibinin sample). After 28 days of storage at 4°C , there was a statistically significant increase in the vesicle size of SUVs with silymarin and silibinin (2703.5 ± 44.5 and 2172.5 ± 26.2 nm) and a decrease in zeta potential (-16.7 ± 0.5 and -9.8 ± 0.1 mV), mobility (-1.31 ± 0.04 and -0.76 ± 0.01 $\mu\text{mcm/Vs}$), and conductivity (0.027 ± 0.001 and 0.023 ± 0.001 mS/cm). On the other hand, UV irradiation did not affect changes in vesicle size and PDI of all liposomes, but it caused a decrease in zeta potential, -32.9 ± 1.0 mV for silymarin and -33.9 ± 0.3 mV for silibinin, mobility, -2.64 ± 0.1 and -2.47 ± 0.2 $\mu\text{mcm/Vs}$, and conductivity, 0.131 ± 0.005 and 0.075 ± 0.006 mS/cm. Also, after 28 days of storage, UV-irradiated SUVs with silymarin and silibinin have significantly higher vesicle size and lower zeta potential, mobility, and conductivity in comparison to the measurements immediately after UV irradiation. In conclusion, both non-treated and UV-irradiated silymarin- and silibinin-loaded SUVs were unstable during storage at 4°C , resulting in changes in vesicle size, zeta potential, mobility, and conductivity, thus additional experiments for improving liposomal stability should be performed.