

Empowering the Antibacterial and Antifungal Effects of Juglone by Obtaining Juglone: Beta Cyclodextrin Binary System for Pharmaceutical Purposes

Hincu, Nadejda (School: Union City High School)

Tighineanu, Elena (School: Saint Pius X High School)

The overuse of substances with antibacterial and antifungal properties cause drugs to lose their efficiency because of the resistance that microorganisms started to develop. By using the Juglone-beta Cyclodextrin Binary System, we aimed to prove that certain properties of Juglone (that is widely used in medicine) can be improved, thus offering a greater solution to solving the global problem of microorganisms' resistance and replacing the synthetical drugs with natural ones. The System was applied on *Staphylococcus Aureus* (gram positive), *Escherichia Coli* (gram negative) bacteria and *Candida Albicans* fungus, in different Juglone/beta Cyclodextrin ratios in order to observe the different efficiencies. Compared to pure Juglone, the Juglone-Beta Cyclodextrin System in ratios of 2:1 and 1:1 occurred to have a better efficiency on all 3 cultures, having a lower Minimum Inhibitory Concentration (pure Juglone: 0,0625 mg/ml on *Staphylococcus Aureus* and *Escherichia Coli*, 0.25 mg/ml on *Candida Albicans*, and 2:1 ratio – 0,015625 mg/ml on both *Staphylococcus Aureus* and *Escherichia Coli*, 0,0625 mg/ml on *Candida Albicans*). The study showed that the Juglone-beta Cyclodextrin Binary System is more efficient than pure Juglone, thus giving it a great potential in future medicine use. The universality that our system showed on all 3 different cultures makes it a highly innovative discovery, that could replace the synthetical antibiotics with natural ones, lower the prices and cure the inflammations and infections faster.