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جامعة الملك سعود King Saud University

Formulation And Evaluation Of Chrysin Loaded Solid Dispersion Using Spray Dryer Technique.

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INTRODUCTION

- Chrysin (5,7-dihydroxyflavone) is a dietary flavonoid which is abundantly present in many natural resources such as honey, propolis, honeycomb, blue passion flowers. It is crystalline in nature having poor water solubility property.
- Cyclodextrin (CDs) are the cyclic oligosaccharides consisting of D glucopyranose linked by -1,4 glycosidic bonds.
- CDs have an internal hydrophobic cavity and an outer hydrophilic surface. It forms the inclusion complex with different hydrophobic guest molecules by hydrophobic interaction in aqueous solution.

OBJECTIVES

- The overall aim of the study was :
- To enhance the solubility of chrysin with the addition of (HP-β-CD) and poloxamer.
- To enhance dissolution , physicochemical characterization, antimicrobial activity and cell viability of Chrysin.

METHODS

- **Phase solubility study:**

The study was performed in distilled water by adding an excess of chrysin in the water. An aqueous solution is prepared with HP-B-CD (0 - 20 mM) for binary mixture and with the addition of poloxamer for a ternary sample.

- **Formulation of inclusion complex**

Spray dry method: HP-β-CD/Chrysin complex was prepared by spray drying in a Büchi B-191 mini spray dryer (Büchi Labortechnik AG, Flawil, Switzerland) under the operating conditions of outlet drying temperature 110°C; pump 10%; flow rate 600 L/h.

Chrysin and HP-B-CD (molar ratio = 1:1) were dissolved in pure ethanol and water to obtain a clear solution and kept at feed pipe. All spray-dried complex samples were stored in desiccators at room temperature before characterization.

- **Dissolution study:**

The dissolution study was performed for pure chrysin, prepared physical mixture (binary and ternary) and inclusion complex (binary and ternary) to evaluate the release in given time using dissolution media (phosphate buffer, 900 mL) (Ezawa et al., 2018).

- **Fourier transform infrared spectroscopy:**

The samples were evaluated to check the complex formation by evaluating the change in peak shape, peak position and intensity.

- **X-ray diffraction:**

The diffraction patterns of the solid samples were evaluated by the prepared X-ray diffractometer (Ultima IV diffractometer, Rigaku Inc. Tokyo, Japan)

- **Scanning electron microscope:**

The surface morphology of the pure chrysin, carrier (HP-β-CD), chrysin PM, chrysin inclusion complex was evaluated by using the scanning electron microscope (JSM 6360A, JOEL, Tokyo, Japan).

- **Antimicrobial study:**

The selected chrysin inclusion complex was evaluated for the antimicrobial evaluation using the nutrient broth media.

- **Cell viability study:**

The prepared chrysin inclusion complex was evaluated for their efficacy in-vitro on cell viability of breast cancer (MCF7) cell line. The result of pure chrysin was compared with the chrysin ternary inclusion complex.

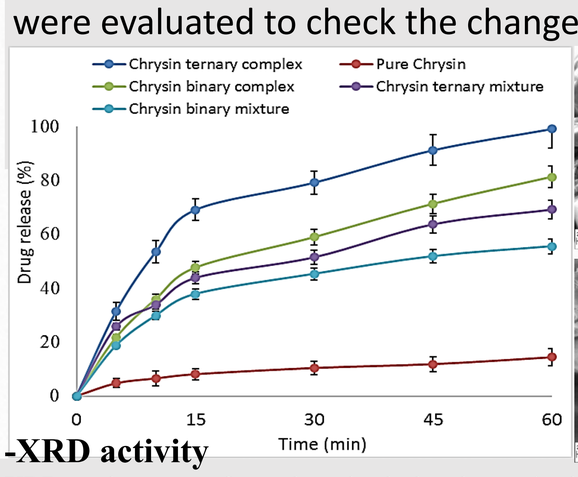
RESULTS

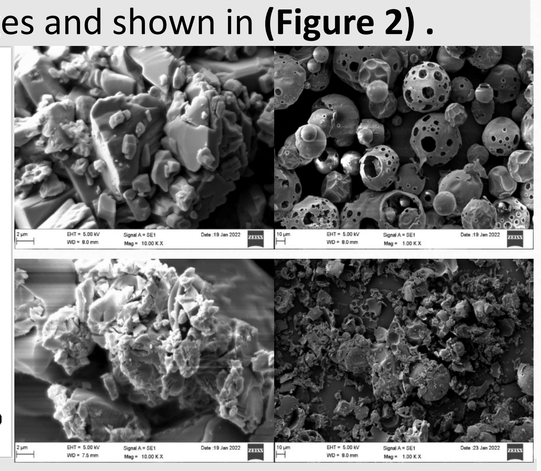
-Dissolution study

The ternary system showed significant higher stability constant value and the value confirmed that the complex was stable. **(Figure 1) .**

There was significant improvement in the release was observed for the tested Chrysin ternary inclusion complex.

-The surface morphology of pure chrysin and prepared samples were evaluated to check the changes and shown in **(Figure 2) .**

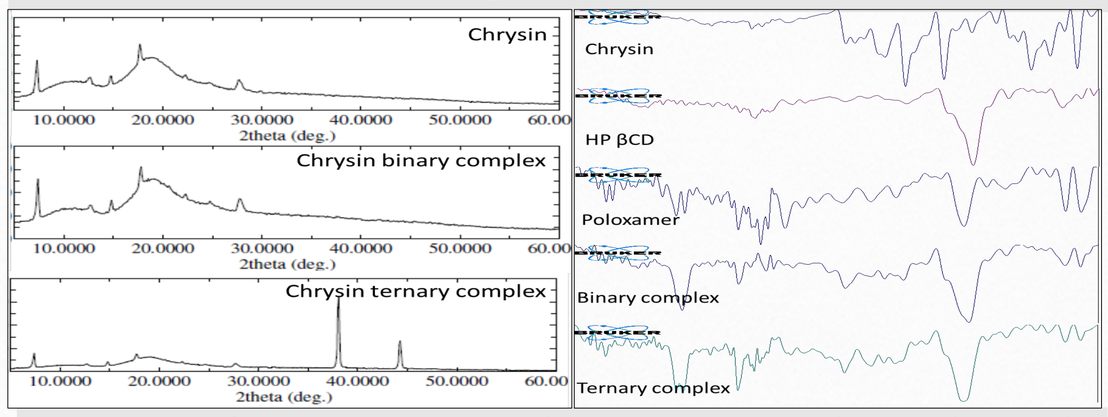




-XRD activity

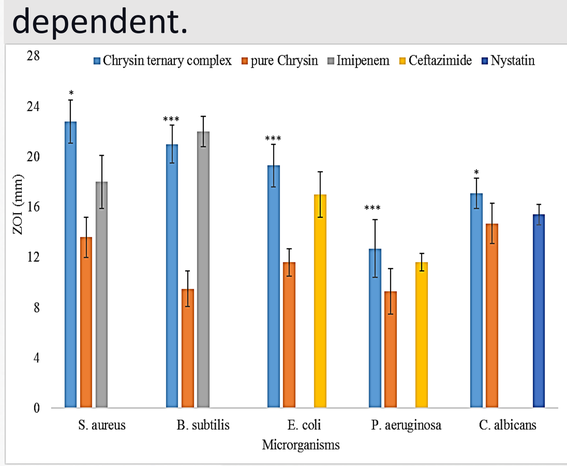
XRD study was performed to check the change in the crystallinity of the pure sample chrysin. The comparison was performed between the characteristic peaks of chrysin, HP β CD, chrysin physical mixture and chrysin inclusion complex are depicted in **Figure 3**

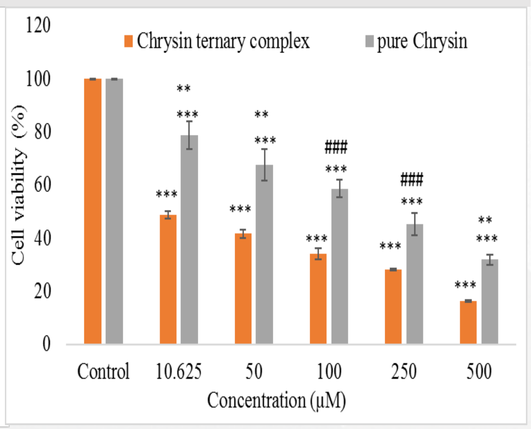
-Fourier-transformed infrared spectroscopy (Figure 4) .



ZOI against four strains were shown **(Figure 5)** The study results revealed significant enhancement in the activity. The prepare ternary chrysin complex showed greater activity against all tested organisms.

-The cell viability study showed a significant ($p<0.001$) effect against the cell lines **(Figure 6)** in the concentration range of 10 µM to 500 µM than control. The effect was found to be concentration-dependent.





DISCUSSION & CONCLOSION

- The binary and ternary inclusion complex showed 16.2 – 39.6 folds enhancement in solubility.
- The dissolution study results showed a marked enhancement in release profile.
- XRD and SEM study depicted presence of more amorphous chrysin structures.
- The antimicrobial activity results showed enhanced antibacterial activity against all the tested organism due to the marked enhancement in solubility.
- The cell viability results revealed lesser toxicity from the prepared inclusion complex than pure Chrysin.

REFERENCES

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