DETERMINATION OF *ALOE VERA* RELEASE FROM ALGINATE BASED HYDROGELS

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Introduction

New trends among hydrogel materials indicate their modification with active substances of both natural and synthetic origin, which allows for gradual and controlled release of the drug. The most important are hydrogels prepared based on biopolymers, such as: chitosan, alginate, gelatin or pectin. Therefore, the combination of alginate hydrogels with *Aloe vera* constitute a very interesting materials for application as wound dressings. *Aloe vera* extract/juice contains many active substances, due to it exhibits antibacterial, anti-viral, anti-inflammatory and anti-fungal activities. However, from the medical application point of view, the release profile of active substances, are very important and necessary. Properly designed hydrogels can provide controlled release of active substances, which increases the effectiveness of treatment, and the undesirable side effects of the used drugs reduces, significantly [1-4].

Materials and Methods

In this studies alginate based hydrogel matrix modified with *Aloe vera* (2% solution, in composition: 15%, v/v) were applied. This sample was obtained by radical polymerization and the initiator of the reaction was ammonium persulfate (APS), while poly(ethylene glycol) diacrylate (PEGDA) was used as the crosslinking agent. The gel fraction of this hydrogel matrix is around 60%. The chemical structure was confirmed using FT-IR spectroscopy. Moreover, the swelling abilities and other physicochemical properties of analyzed sample, were characterized. The release of active substance was conducted using USP4 method (DZF II Flow-Through System, Erweka GmbH, Langen, Germany) [5,6]. The equipment incorporated seven in-line flow-through diffusion cells (FIG. 1). The membrane was placed over a support with an orifice of 1,5 cm in diameter (diffusional area, 1.766 cm^2). The vertical cell was made in glass and was designed to have a volume into the donor compartment of 6.22 ml. All the cells were placed in a cell warmer connected with the Erweka heater DH 2000i and the Erweka piston pump HKP 720. The piston pump transports the receptor fluid via seven channels to the flow-through cells and automatically adopts the setting of the flow rate. All volumes were measured by gravimetric methods by filling the chambers with Milli-Q water and assuming a density of 1 g/ml. All the determinations were made in triplicate for each cell. The release study of *Aloe vera* was carried out using a regenerated cellulose membrane Spectra/Por®Dialysis Membrane MWCO 6-8,000 Carl Roth® Company. The assays were performed in aqueous medium as acceptor phases mimicking physiological conditions corresponding to buffer solutions at pH 7.4. A flow rate of receptor fluid of about 1 ml / 1 min. was selected. The experiment was carried out for 9 h, at 37°C. Samples were evaluated at different time points, and data analysis was made by comparing the releasing efficiency (PE) values. The released concentration of *Aloe vera* in the receptor solution was analyzed by means of UV-Vis spectroscopy (Perkin Elmer Company), at the wavelength of 350 nm.

Results and Discussion

The obtained results exhibit that after first 2 hours of experiment burst release of *Aloe Vera* was reached, followed by the tendency to pulsatile active substance delivery to the acceptor fluid, was observed (FIG. 2). This is possible due to the chemical structure and crosslinking degree of the alginate based hydrogel.

FIG. 1. The equipment used for USP4 method (DZF II Flow-Through System, Erweka GmbH, Langen, Germany).

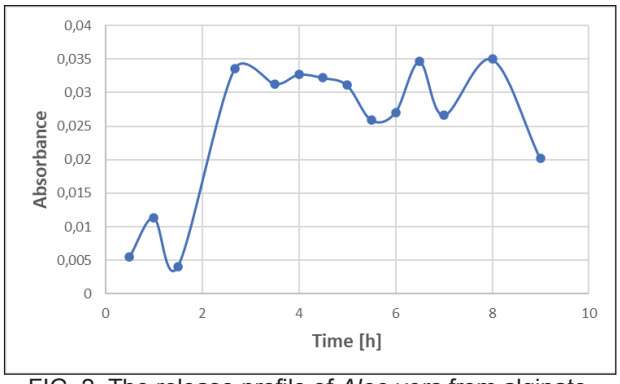

FIG. 2. The release profile of *Aloe vera* from alginate based hydrogel, at 37°C.

Conclusions

The USP4 method constitutes the interesting alternative solution in the case of the determination of active substance release from different forms of drug, especially: hydrogel matrix, tablets, capsules, granules, ointments, suspensions, implants, stents, microspheres and suppositories. This method confirmed pulsatile mechanism of drug release form the hydrogel matrix which is useful for treatment of patients, due to the high efficiency and lack of undesirable adverse effects to the whole body.

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