FTIR SPECTROSCOPY ANALYSIS OF ENCAPSULATED BIOACTIVE COMPOUNDS FROM *PELARGONIUM ALCHEMILLOIDES (L). L'HERIT* IN ELECTROSPUN POLYVINYLPYRROLIDONE/CELLULOSE ACETATE NANOFIBERS

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Abstract

Pelargonium alchemilloides (L).L'Herit is an ancient medicinal plant especially known for its beneficial properties for human health, due to its bioactive compounds. In this work, nanofibers were successfully obtained by electrospinning technique with the addition of a natural *pelargonium alchemilloides (L). L'Herit extract* (PA) (at 3, 4, and 5 wt% loadings) in polyvinylpyrrolidone (pvp)/cellulose acetate (CA) blend solutions. The successful incorporation of PA extract into PVP/CA was clearly evidenced by Fourier transform infrared spectroscopy (ATR-FTIR). PA is a complex mixture of bioactive compounds that are naturally present in PA and it might include different aromatic and phenolic groups. The liquid extract of PA displayed 2 major bioactive compounds at 3347 and 1444 cm-1, responsible for the antioxidant and antibacterial properties of PA, respectively. The characteristic peaks for the PA extract were found at 1010, 1003, and 1010 cm1 for BMS3, BMS4, and BMS5, respectively. However, the peak coincided with the peak for CA at 1036 cm1 for all the composite fibers (BMS3, BMS4, and BMS5), forming a shoulder beside the sharp peak. The results suggested that the obtained nanofibers could be promising materials for biological applications.

Keywords: *Pelargonium alchemilloides (L). L'Herit*, polyvinylpyrrolidone (pvp)/cellulose acetate (CA), electrospinning, and bioactive compounds.

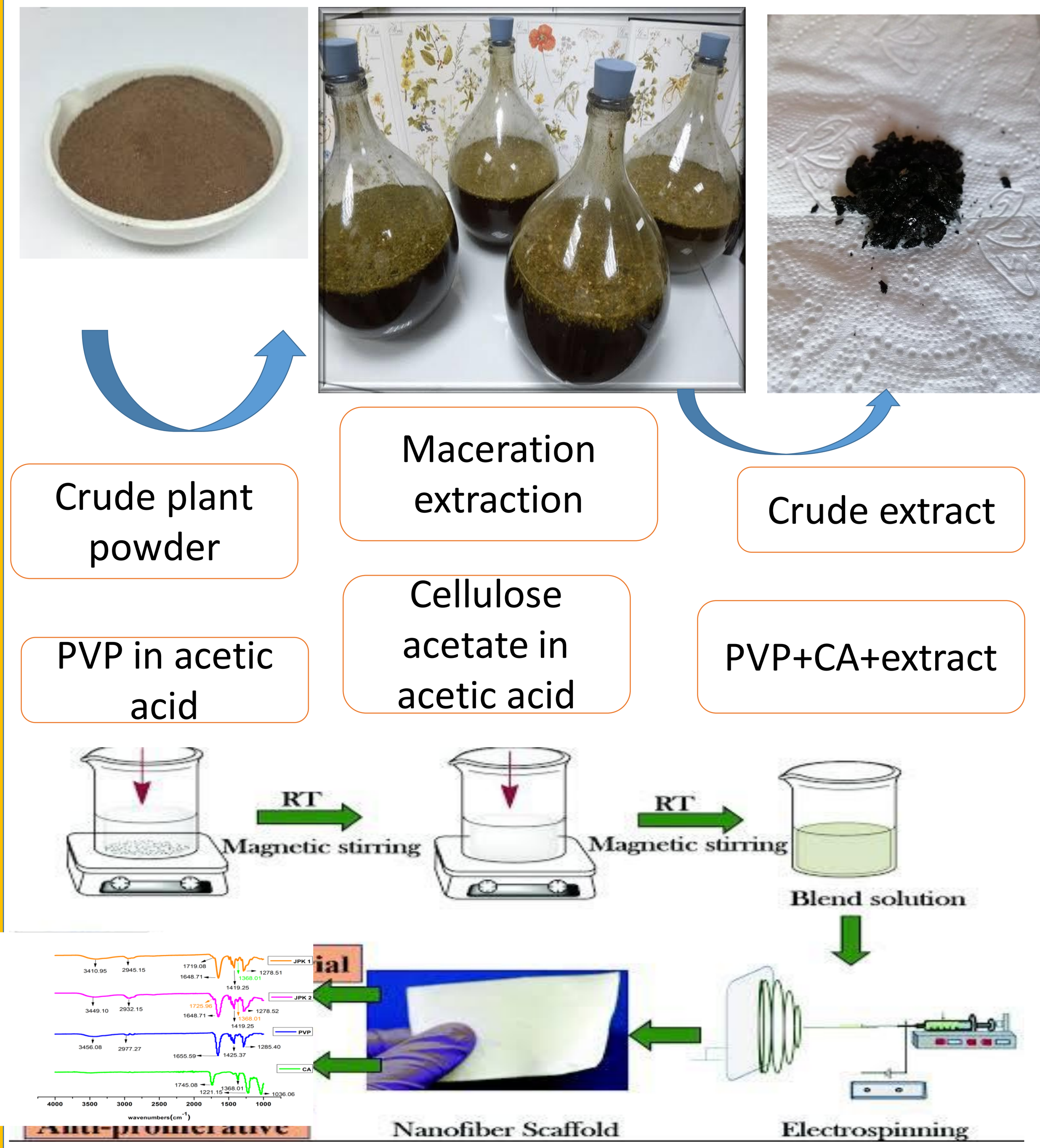
Background

The use of natural-based nanofibers has gained great importance in the past few years, due to its environmental, economic, and biological advantages. . *Pelargonium alchemilloides (L).L'Herit* is an ancient medicinal plant, mostly associated with healing properties, specially related to skin burns, wound or infections. Maceration is one of the best extraction techniques to use for the extraction of biomolecules from vegetable sources.

Natural extracts rich in polyphenols, such as PA often show instability under the storage conditions due to their sensitivity towards high temperature and humidity. In this context, encapsulation techniques can bring a solution to some of these concerns. Among these techniques, electrospinning is gained increasing attention over the last decades to obtain nanometric fibers from a variety polymers.

Among the several electrospinnable polymers, PVP and CA are safe to use for the encapsulation of bioactive compounds by electrospinning, due their non-toxicity, biocompatibility properties,etc.

Methodology



FTIR Results

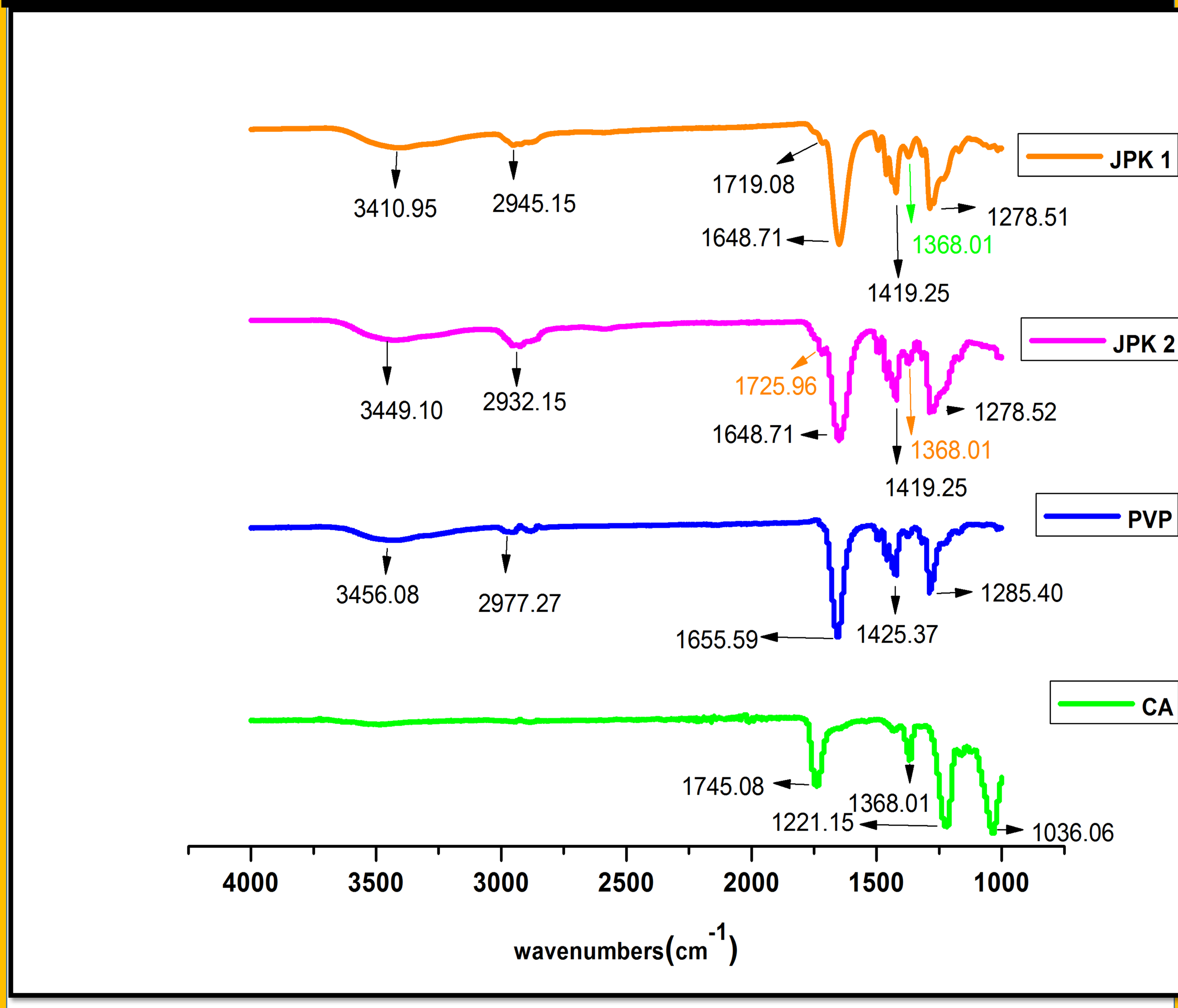


Figure 1: FTIR Spectra of CA (cellulose acetate), PVP (Polyvinylpyrrolidone), and PVP/CA blends.
JPK1: PVP/CA (70:30)
JPK2: PVP/CA (90:10)

FTIR Results (Cont.)

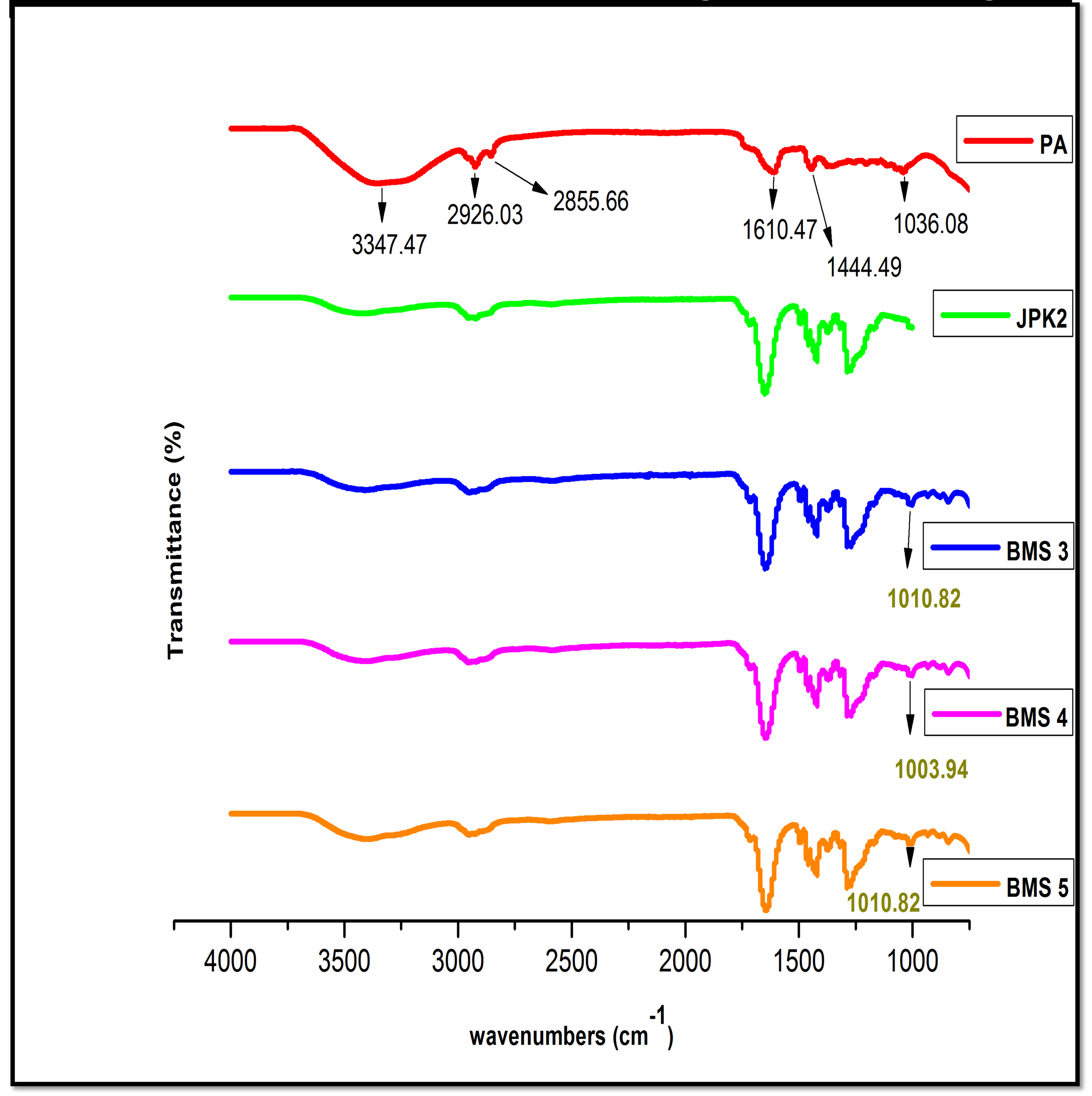


Figure 2: FTIR Spectra of extract, PVP/CA, and PVP/CA-En nanofibrous membranes
BMS3: PVP/CA-Extract (3% of extract)
BMS4: PVP/CA-Extract (4% extract)
BMS5: PVP/CA-Extract (5% extract)

Summary

- ❖ Blending of PVP and CA was confirmed by FTIR spectra and the FTIR spectra of PVP, CA, and PVP/CA nanofibers are shown in figure 1. One of the main evidences confirming the above-mentioned statement was "the peak shifts "and characteristic peaks of PVP and CA found when we mixed the two polymers.
- ❖ Incorporation of extract into the PVP/CA nanofibers was confirmed by FTIR spectroscopy and the FTIR spectra for PVP/CA, plant extract, and extract-loaded PVP/CA electrospun membranes are shown in figure 2. The spectra contains all the features of the peak at around 1003 and 1010 cm-1 which is the main evidence for the presence of the extract in the matrix.
- ❖ All the other peaks of the extract were masked by the vibrations of functional groups in PVP/CA. This confirmed that the extract present and well associated with the PVP/CA membrane.

Work in progress

1. Characterization of PVP/CA and plant extracts/PVP/CA nanofibers using scanning electron microscopy **(SEM),** thermogravimetric analyzer **(TGA)**, and X-ray diffraction **(XRD).**
2. To investigate the in vitro bioactivity of the prepared nanofibers against ***Escherichia coli (E. Coli)*** and ***Staphylococcus aureus (S. Aureus)*** using the **quantitative AATCC Test Method 100:2004 protocols** with slight modifications.

Results from SEM, XRD. And TGA will help one to confirm the hypothesis stated from the early results of FTIR spectroscopy.

References

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