CRUSHED TABLETS: CHARACTERIZATION AND EVALUATION OF THEIR POTENTIAL USE AS FEEDSTOCK FOR 3D-PRINTING REFORMULATION

Matteo Grandoni[a], Mattia Tiboni[a], Annalisa Aluigi[a], Costanza Fratini[a] and Luca Casettari[a]

[a] Department of Biomolecular Sciences, School of Pharmacy, University of Urbino Carlo Bo, Via Ca le Suore 2 - 61029 Urbino (PU), Italy

INTRODUCTION

- **Three-dimensional printing (3DP)** is a highly flexible and versatile technology that enables the fabrication of personalized dosage forms tailored to individual patients' needs[1].
- These features have driven growing interest in its potential application at the **point of care (PoC)** for on-demand, small-batch, and decentralized manufacturing[2].
- In PoC settings, one of the main challenges is ensuring the consistent **availability of pure APIs**[3].
- Using powders obtained by **crushing commercially available tablets** could represent a potential solution to this issue.

METHODS

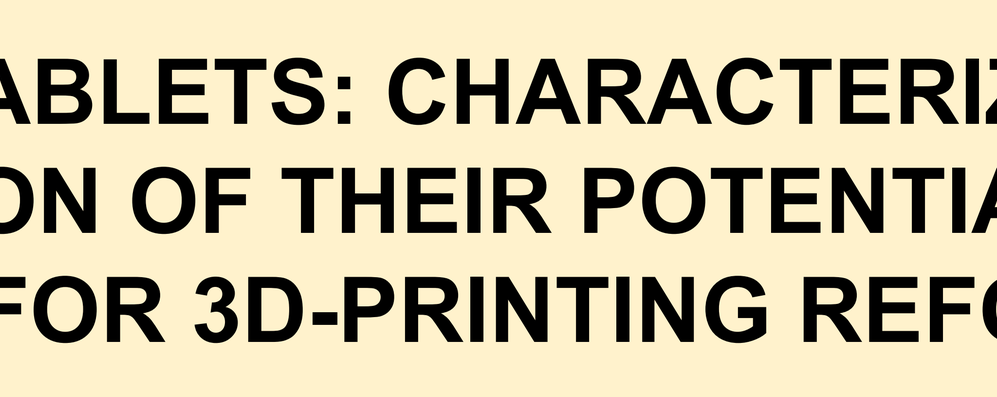
Crushing techniques

- Mortar and pestle
- Mechanical micronization using a powder mixer (Galena Top system, Ataena, Italy) equipped with steel spheres of different sizes: big spheres (*Bsp*, d = 22,23 mm); medium spheres (*Msp*, d = 19,05 mm) and small spheres (*Ssp*, d = 15,88 mm).

Comparative solid-state characterization

The thermal and structural properties of the crushed tablets were evaluated and compared with those of intact tablets and pure API.

RESEARCH AIM



RESULTS

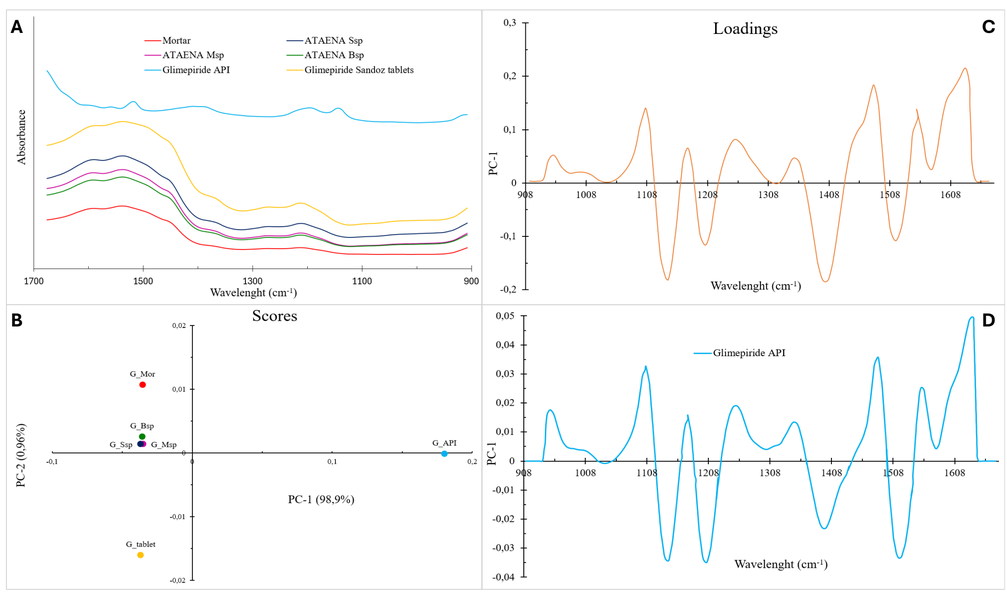


Figure 1. Near-infrared (NIR) spectral characterization and chemometric analysis: A) Raw NIR spectra of pure glimepiride, intact and crushed tablets; B) Principal component analysis (PCA) score plot of PC1 versus PC2; C) PC1 loading plot; D) Pre-processed NIR spectrum of pure glimepiride (SNV, detrending, and second derivative).

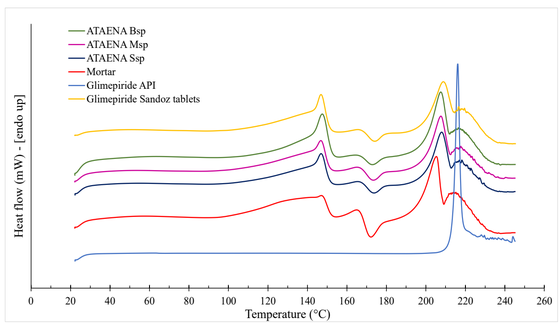


Figure 2. DSC thermograms of pure glimepiride, intact and crushed tablets.

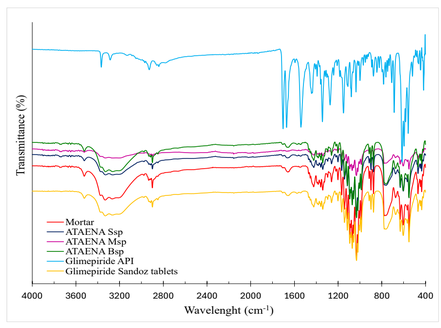


Figure 3. FTIR spectra of pure glimepiride, intact and crushed tablets.

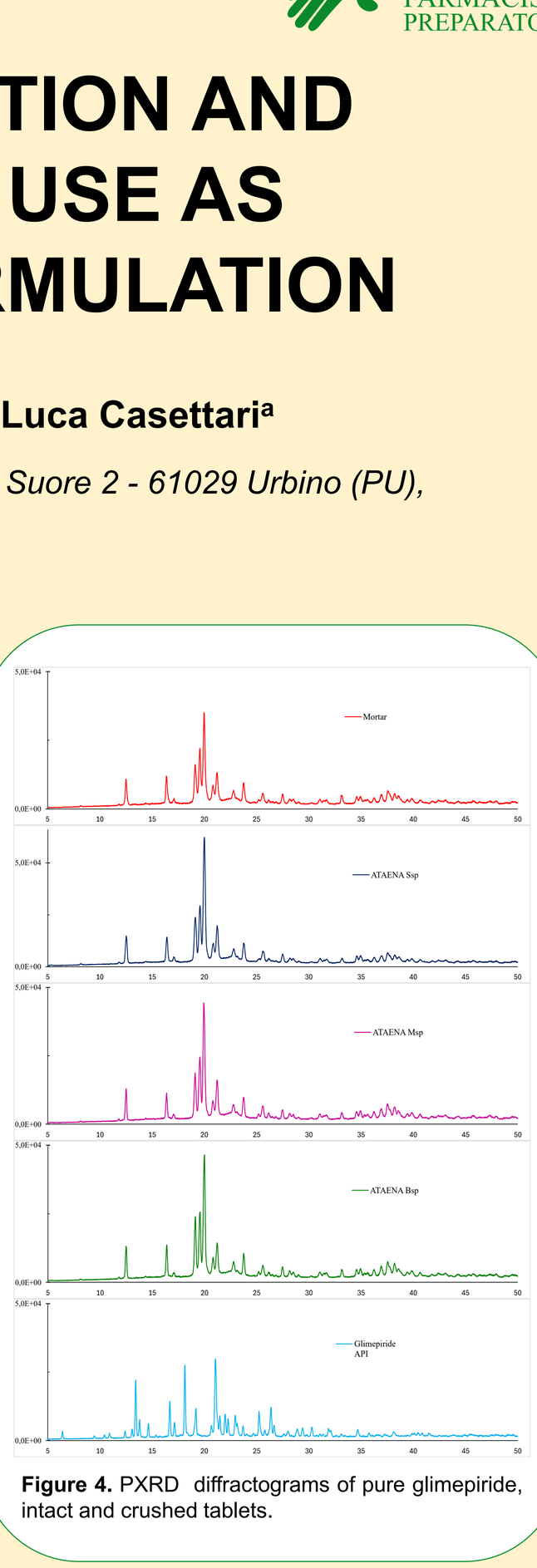


Figure 4. PXRD diffractograms of pure glimepiride, intact and crushed tablets.

CONCLUSIONS

- The chemical and structural integrity of glimepiride was preserved following crushing.
- The findings support the feasibility of using crushed glimepiride tablets as feedstock for 3D printing.

» **Next steps:** 3D printing-based reformulation to produce personalized dosage forms.

REFERENCES

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3. Rogers, L. et al. "Continuous Production of Five Active Pharmaceutical Ingredients in Flexible Plug-and-Play Modules: A Demonstration Campaign". Org. Process Res. Dev. 24(10):2183-2196 (2020).

Contact Info:

m.grandoni4@campus.uniurb.it