

Pharmaceutical residues in crop irrigation water: a potential threat to groundwater

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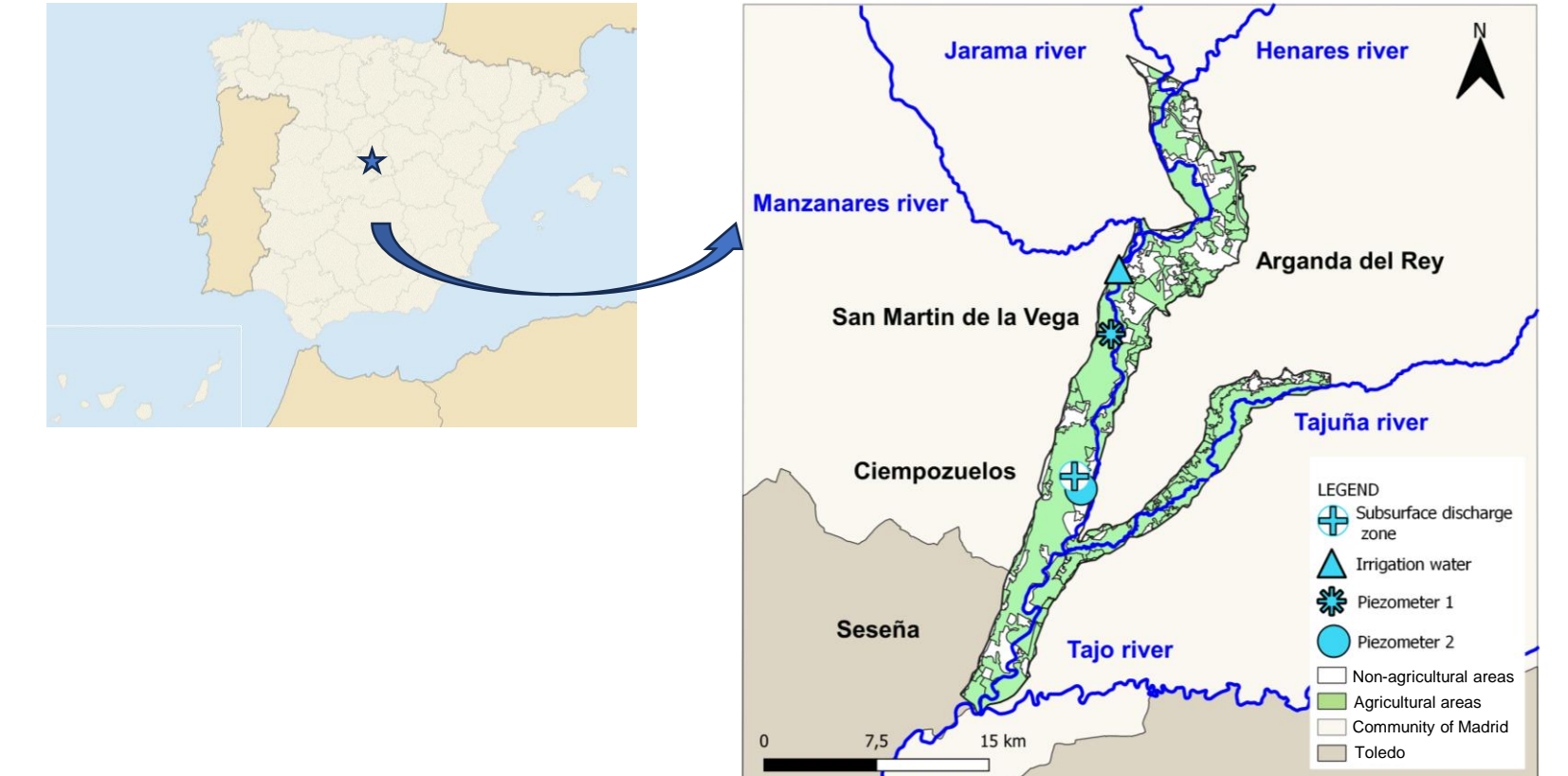
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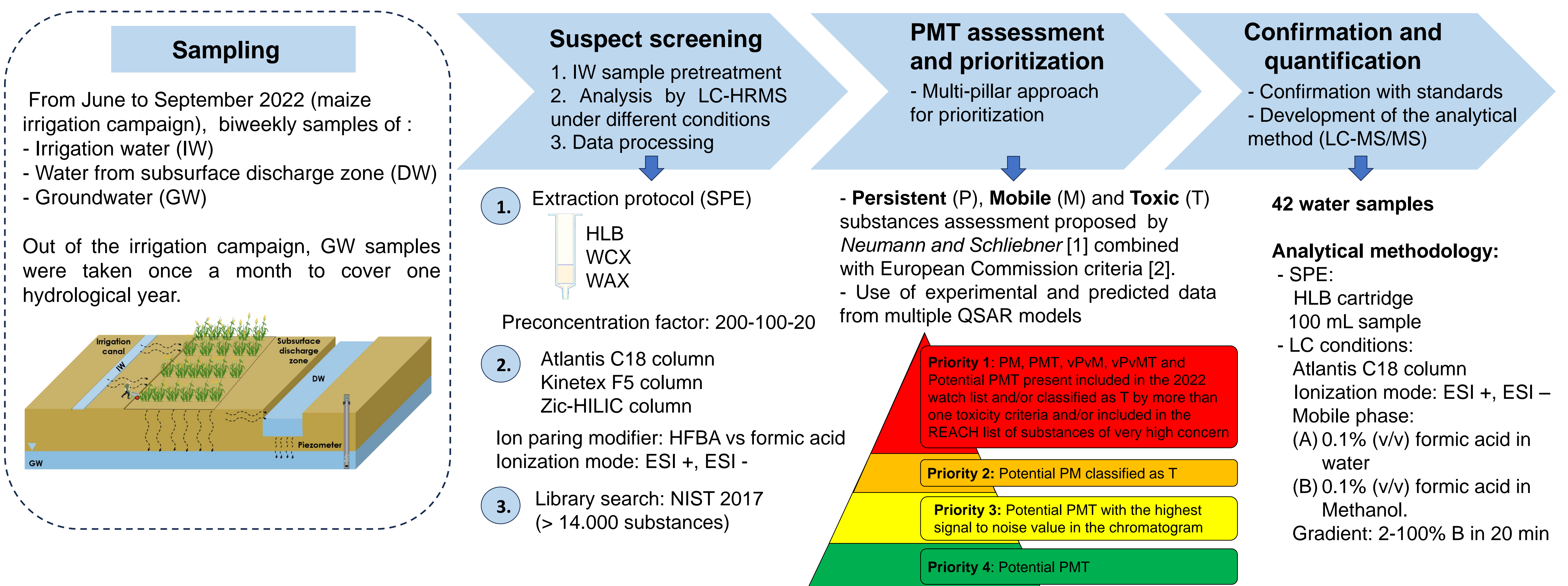
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CONTEXT

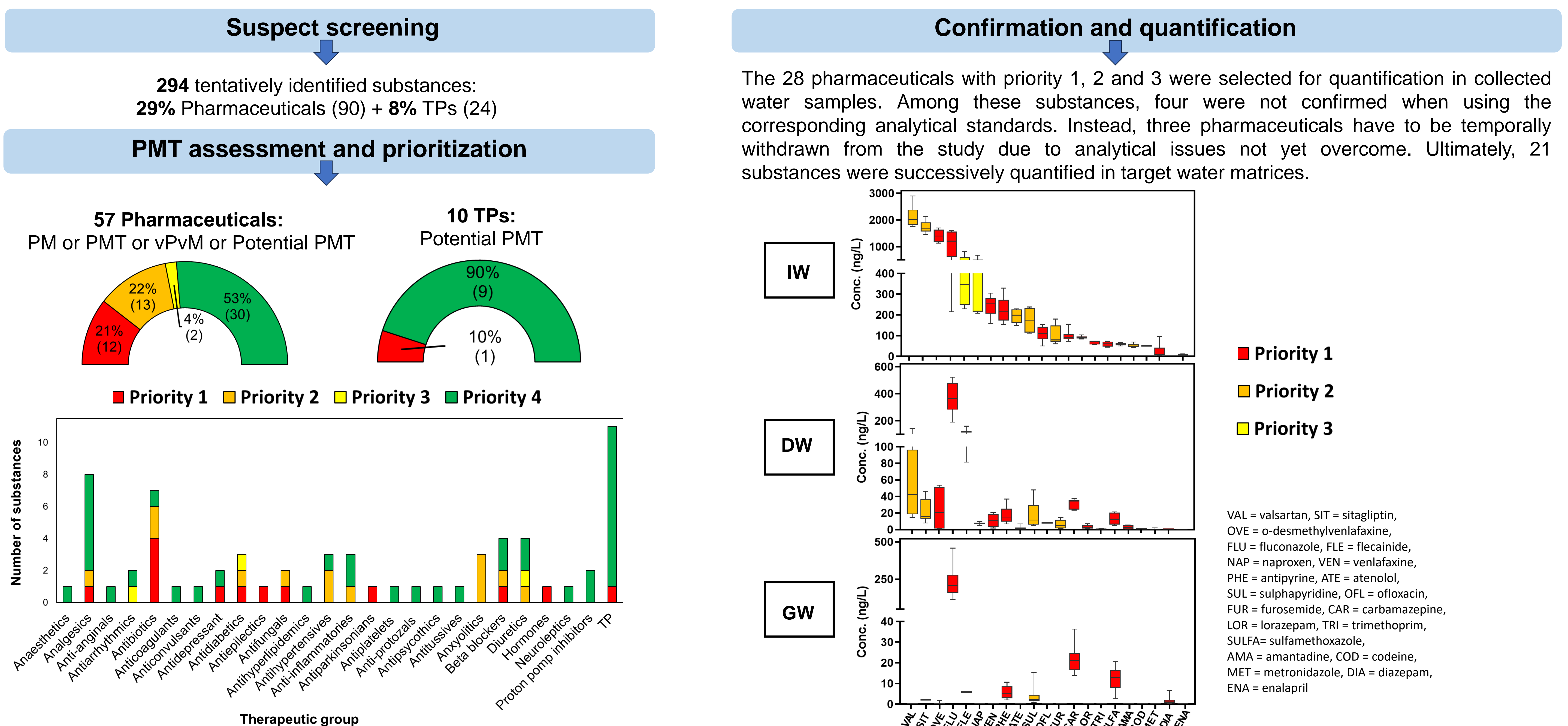
Unplanned reuse of surface water affected by wastewater treatment plant (WWTP) effluents for crop irrigation can easily spread pharmaceutical residues in the environment. These pharmaceuticals may show properties that are typical of substances defined as persistent, mobile, and toxic (PMT) category. PMT substances has gained considerable attention from both scientific and regulatory perspectives due to their potential adverse effects on ecosystem and, though them, to humans. This study focuses on assessing the presence of pharmaceutical residues and their associated transformation products (TPs), previously classified as PMT substances, in irrigation water and their spread to groundwater. The agricultural scenario selected for the study is the Vega Baja of the Jarama river, whose water is strongly impacted by the effluents of the main WWTPs of the Community of Madrid (Spain).



METHODS



RESULTS



CONCLUSIONS

- The screening employing a library with over 14,000 compounds has identified 294 substances in IW. Among these substances, 67 Pharmaceuticals and TPs fulfill the criteria for persistence, mobility and toxicity.
- Although concentrations of the studied PMT pharmaceuticals are generally in the ng/L range in IW, certain exceptions exist. Substances such as the TP of venlafaxine OVE, the antifungal FLU, the antidiabetic SIT, and the antihypertensive VAL deviate from this trend, exhibiting concentrations in the order of µg/L.
- Despite their intrinsic characteristics, identified PMT pharmaceuticals undergo natural attenuation processes capable of reducing their concentrations during infiltration through the soil. However, the unplanned water reuse for crop irrigation causes the spread of some of these contaminants to the GW.
- Among studied pharmaceuticals, the two most persistent are FLU and CAR, both classified as priority 1 substances. These contaminants arise particular concern due to their potential impact on the integrity of water resources and associated ecosystems.

REFERENCES

- [1] Neumann and Schliebner (2019), German Environment Agency (UBA)
[2] Chemicals Strategy for Sustainability Towards a Toxic-Free Environment European Commission (2020)

Acknowledgements

The authors thank to Grant PID2020-118521RB-I00 funded by MCIN/AEI/10.13039/501100011033.