NATURALLY-OCCURRING MODULATORS OF CORONAVIRUS INFECTIONS: VIRTUAL LIBRARY DEVELOPMENT

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INTRODUCTION & AIMS

- Plant biotechnologies can support production of promising molecular scaffolds for design of anti-coronavirus agents.
- The therapeutic strategies that could be addressed involve different approaches, including virus-targeted, immunotherapy, etc.
- The aims of this study were to: (i) perform screening of research literature for potential modulators of coronavirus infections naturally-occurring in plants and (ii) prepare a virtual library of selected modulators.

DATA & METHODS

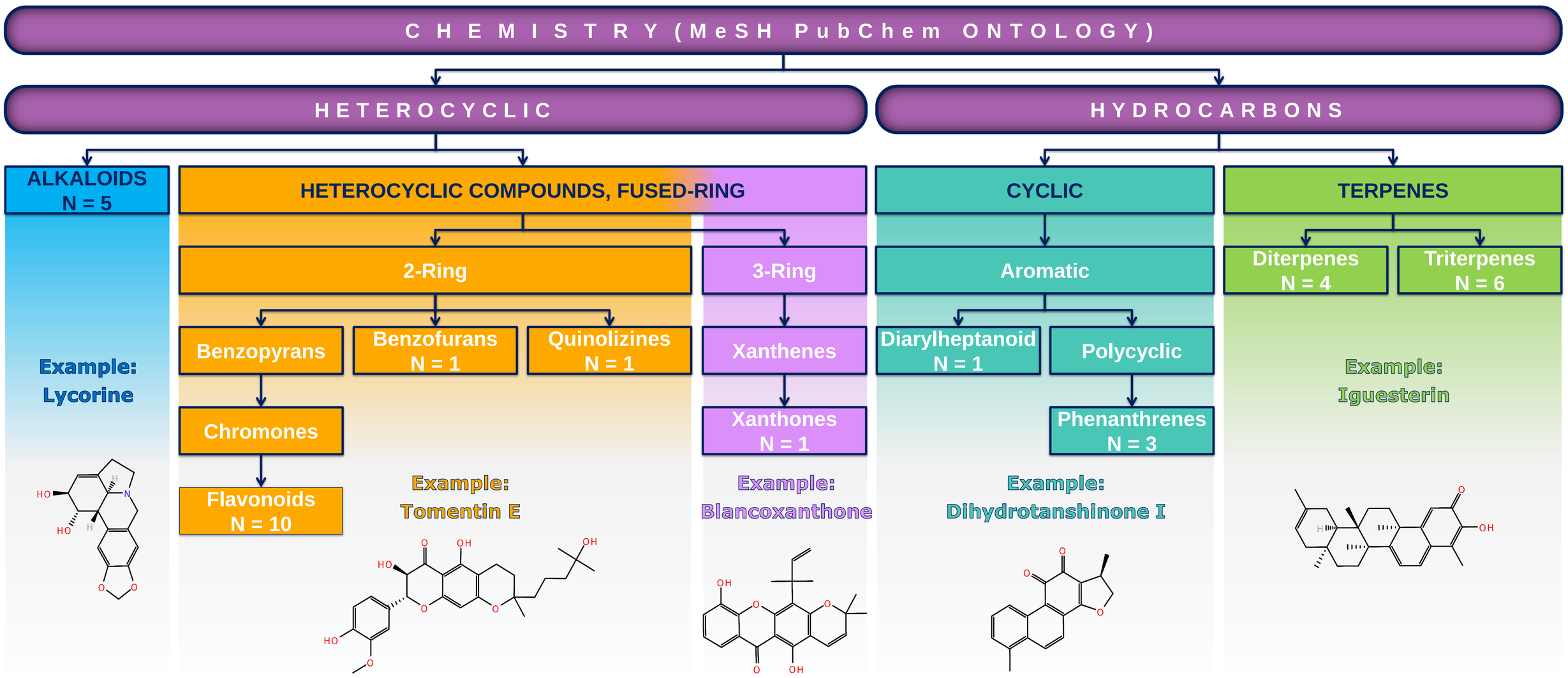
- Data on naturally-occurring compounds of plant origin were retrieved from the NIH PubMed and PubChem systems (https://www.ncbi.nlm.nih.gov/).
- Analysis of the collected data was done based on the chemical scaffolds and the proposed mechanisms of action of the compounds.

RESULTS: CORONAVIRUS-ORIENTED VIRTUAL LIBRARY OF PHYTOCHEMICALS (32 COMPOUNDS AND >130 RECORDS)

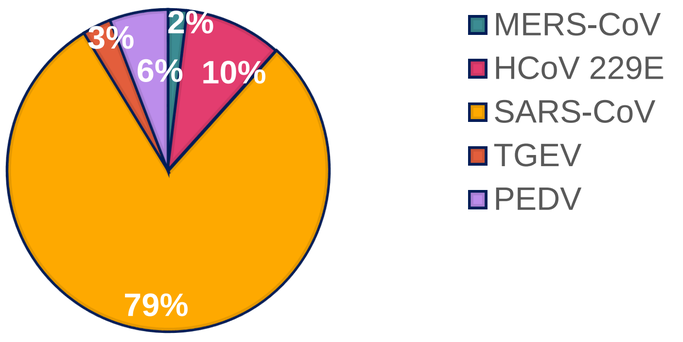
1. Source plants – compounds were found in species from 20 genera belonging to 18 families:

- *Amaryllidaceae*
- *Anacardiaceae*
- *Apiaceae*
- *Apocynaceae*
- *Betulaceae*
- *Brassicaceae*
- *Celastraceae*
- *Clusiaceae*
- *Crassulaceae*
- *Lamiaceae*
- *Leguminosae*
- *Moraceae*
- *Paulowniaceae*
- *Plantaginaceae*
- *Rhamnaceae*
- *Scrophulariaceae*
- *Taxaceae*
- *Theaceae*

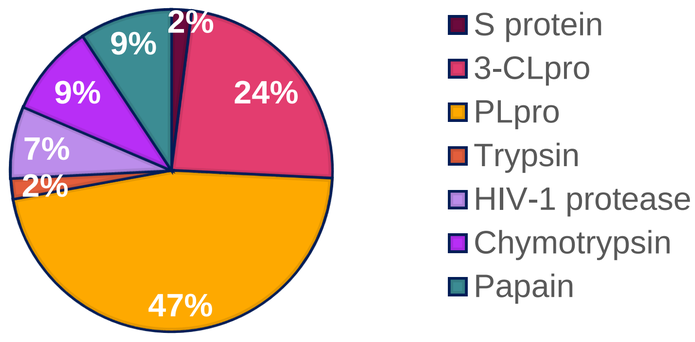
2. Distribution of the compounds by chemical classes:



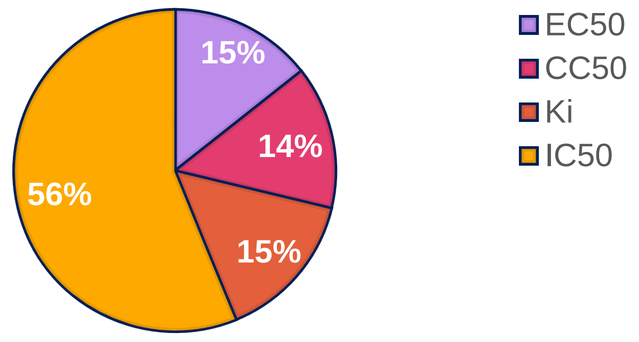
3. Experimental data – currently >130 records on 5 coronaviruses, 7 targets and 4 activity types:



3.1. Data distribution by studied coronavirus



3.2. Data distribution by molecular target



3.3. Data distribution by measured activity type

Abbreviations: HCoV 229E – Human Coronavirus 229E; MERS-CoV – Middle East Respiratory Syndrome Coronavirus; SARS-CoV – Severe Acute Respiratory Syndrome Coronavirus; PEDV – Porcine Epidemic Diarrhea Virus; TGEV – porcine Transmissible Gastroenteritis coronavirus; 3-CLpro – 3-Chymotrypsin-Like protease; PLpro – Papain-Like protease; S protein – Spike protein; CC_{50} – 50% Cytotoxic Concentration; EC_{50} – 50% Effective Concentration (antiviral concentration of 50% effectiveness, the concentration which achieved 50% inhibition of virus-induced cytopathic effects); IC_{50} – 50% Inhibitory Concentration (the concentration that caused 50% loss of enzyme activity); K_i – Inhibitory constant.

CONCLUSIONS

- **Chemical and biological data about 32 compounds naturally-occurring in plants** and investigated for their potential activity against various coronaviruses (**SARS-CoV, MERS-CoV, HCoV 229E, TGEV and PEDV**), have been harvested and organized in a virtual library.
- The library is characterised by chemically diverse scaffolds of phenols, terpenes, and alkaloids and could serve as a **mechanistically justified, highly curated resource of naturally-occurring compounds** which could be subjects of further pathology-oriented *in silico* studies, relevant to the modulation of coronavirus infections (e.g. see Poster B&BE-3).

ACKNOWLEDGEMENTS

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