

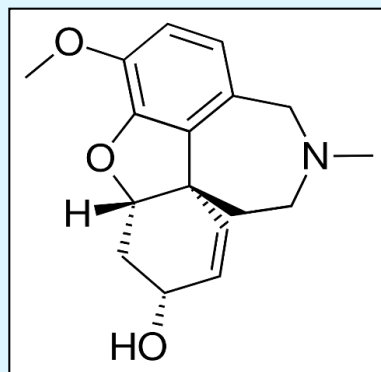
# BIOTECHNOLOGICAL PRODUCTIVITY OF THE UV-15 STRAIN OF *UNGERNIA VICTORIS* TISSUE CULTURE

Iryna Konvalyuk<sup>1</sup>, Liudmyla Mozhylevska<sup>1</sup>, Oleksandr Bieda<sup>1,2</sup>, Sergiy Yarmoluk<sup>1</sup>, Viktor Kunakh<sup>1</sup>

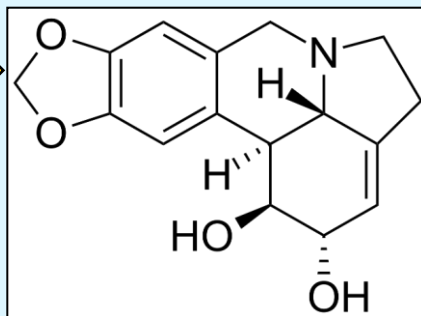
<sup>1</sup>Institute of Molecular Biology and Genetics, National Academy of Sciences of Ukraine, Kyiv, Ukraine

<sup>2</sup> Scientific service company "OTAVA" LLC, Kyiv, Ukraine

*Ungernia victoris* Vved. ex Artjushenko is a rare endemic medicinal plant from mountain valleys of Tajikistan and Uzbekistan. The pharmacological value of the species is due to the accumulation of isoquinoline alkaloids galantamine, lycorine and their derivatives; as well as coumarins, polysaccharide complexes and other biologically active compounds (BAC). Preparations based on *U. victoris* extracts have a normalizing effect on the central and peripheral nervous systems.



galantamine



lycorine

Since 1995, we have established and maintained a tissue culture of *U. victoris*, the extracts of which exhibit a wide range of pharmacological activities: antimutagenic, radioprotective, general stimulating, regenerating and antitumor. Through long-term cell selection, the strain UV-15 was derived from the initial UV-2 strain.

The **aim** of the work was to investigate the biotechnological characteristics of the UV-15 strain of *U. victoris* tissue culture, and to assess the content of BAC in cellular biomass.

*Ungernia victoris* in nature and its biologically active compounds

**Methods.** Callus was cultured on a specially developed solid hormone free medium 5C [Kunakh, Alpatova, Mozhylevska, 1996] in glass jars. The subculture duration was 45–50 days for tissue culture propagation and 55–65 days for harvesting biomass. To determine the yield of wet and dry biomass in a subculture cycle, wet and dry tissue were weighed, respectively, when transplanted onto fresh medium and every 10 days for 90 days.



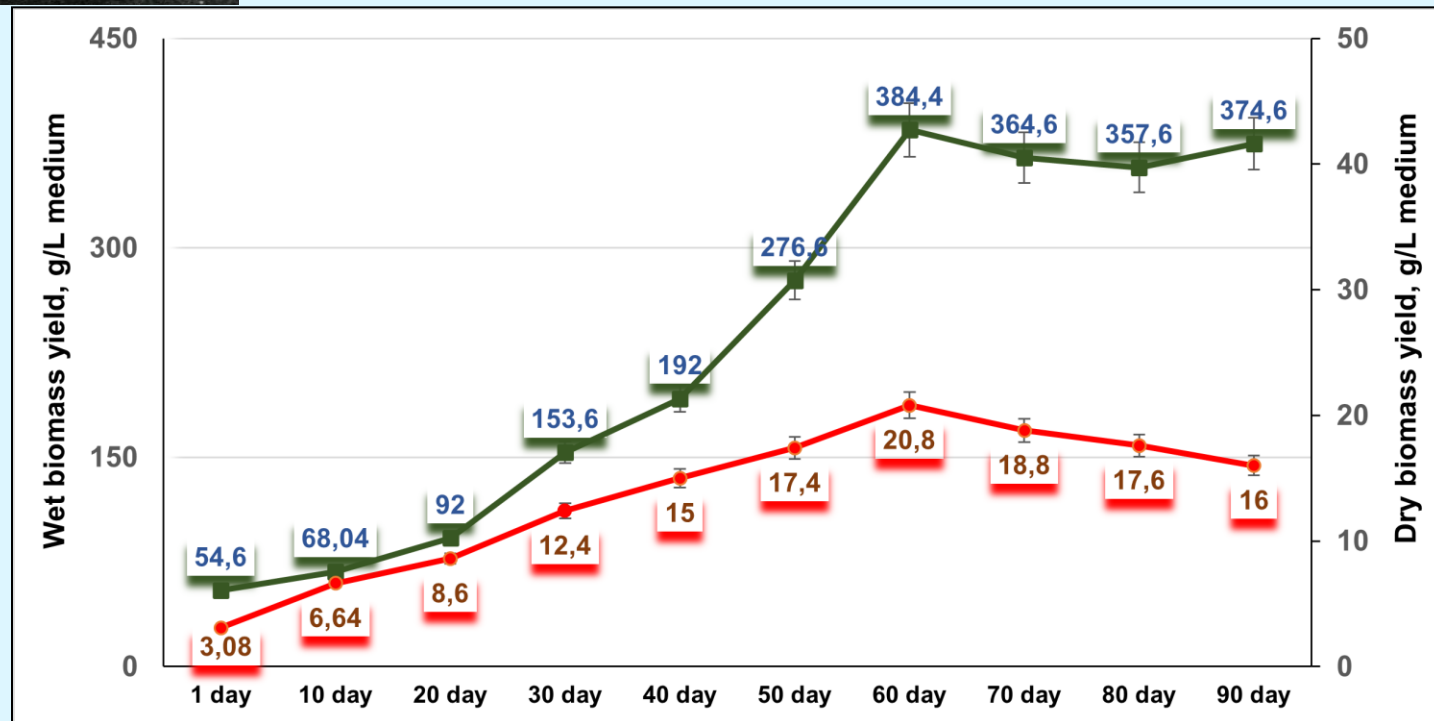
The content of water-soluble mono- and polysaccharides in extracts from dry cell biomass was examined using the method according to DSTU5059:2008. The content of polyphenols was determined using Folin-Ciocalteu method in mg rutin equivalent. Chromatographic screening of extracts was performed using HPLC.

**Results.** The UV-15 strain tissue culture was heterogeneous, consisted of slightly friable aggregates ranging in size from 0.1 to 0.8 cm and was yellow to light yellow in color. The growth type was unorganized, the growth index was 6-7.

### The UV-15 strain of *Ungernia victoris* tissue culture

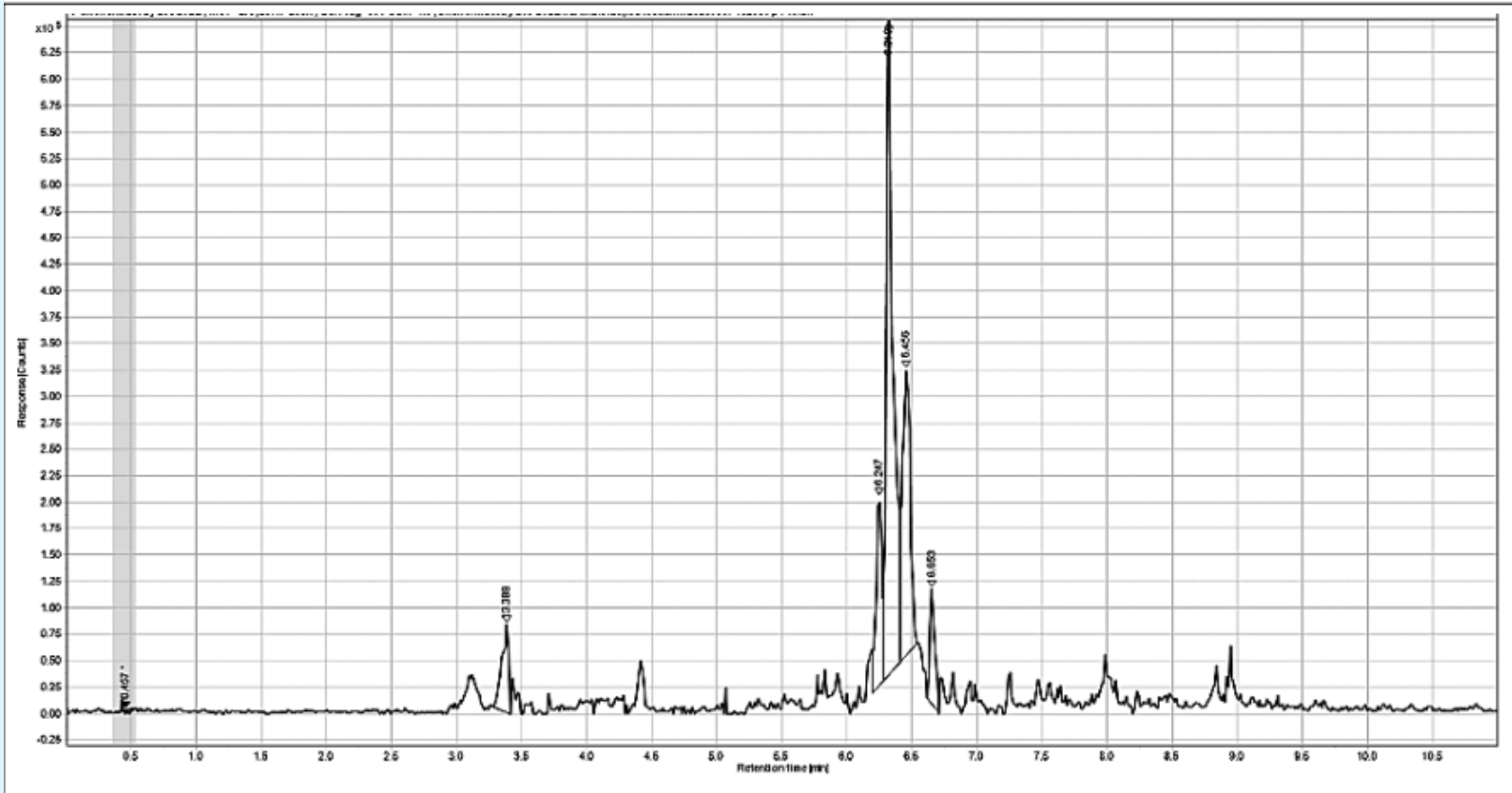
The maximum yield on the 60<sup>th</sup> day of subculture was 384.4 g/L of medium for wet biomass and 20.8 g/L for dry biomass.

The content of dry biomass in the wet in the stationary phase of growth was 5.4–7.8 %.



The polyphenol content in the dry biomass extract was 0.031 % w/w. The monosaccharide content in the wet biomass was 0.11% w/w, while the hydrolysable polysaccharide content was 0.47 % w/w.

The content of water-soluble polysaccharides in terms of dry mass was 4 %. Chromato-mass spectrometry revealed the most intense peaks at m/z 288 (ion  $[M+H]^+$ galantamine, lycorine or their isomers), m/z 183 (ion  $[M+H]^+$ harmane or isomers), and m/z 166 (ion  $[M+H]^+$ hordenine or isomers).



Chromatogram of the dry biomass extract by ion current m/z 288 (supposed to be galantamine, lycorine or their isomers)

**Conclusions.** Thus, the UV-15 strain of *U. victoris* tissue culture is highly productive. The cell biomass accumulates polyphenols, mono- and polysaccharides, as well as compounds that are likely to be derivatives and/or isomers of galantamine or other alkaloids, according to ESI mass spectra. These compounds require further detailed study.