

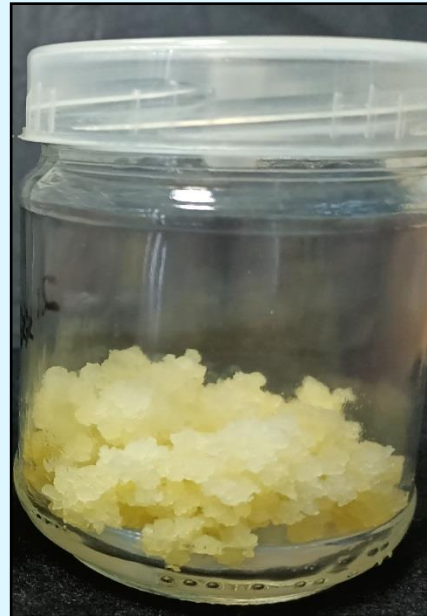
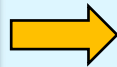
# ANTIVIRAL POTENTIAL OF *UNGERNIA VICTORIS* TISSUE CULTURE BIOMASS-BASED BIOLOGICALLY ACTIVE COMPOUNDS

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*Ungernia victoris* Vved. ex Artjushenko is a rare endemic medicinal plant from mountain valleys of Tajikistan and Uzbekistan. The plant contains the range of biologically active compounds (BAC), including, alkaloids, coumarins, essential oils, poly-saccharide complexes, etc. of pharmacological value. Modern technology of plant tissue culture of medicinal plants *in vitro* provides an opportunity to preserve this type of plant as a source of valuable BAC.



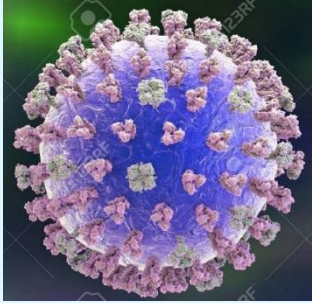
***Ungernia victoris* in nature and tissue culture *in vitro***

The influence of tissue culture condition on the content and composition of BACs is unknown at the moment and requires special research.

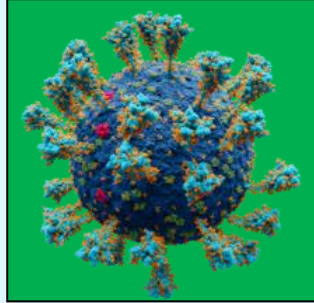
Secondary metabolites with antibacterial, antiviral and antitumor activity are of special attention. The search for substances possessing antiviral activities is a first step in designing new drugs because viral infections remain a major cause of morbidity and mortality worldwide.

In this regard, the **aim** of our study was identifying the components of *U. victoris* extracts with a pronounced antiviral activity.

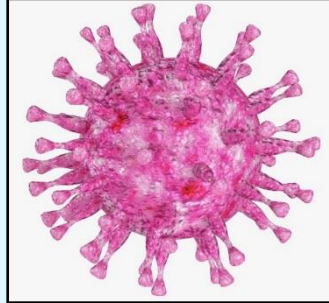
**Methods.** Extracts were obtained from highly productive UV-2 strain of *U. victoris* tissue culture, which was grown on a specially developed solid hormone-free medium. Secondary metabolites, were extracted with 40% ethanol saturation, then evaporated and dry residue was dissolved in water. extracts were tested for antiviral activity under *in vitro* conditions against strain of influenza virus A/FM/1/47(H1N1), swine transmissible gastroenteritis coronavirus and herpes simplex virus type 2 (HSV-2).



**virus A/FM/1/47 (H1N1)\***



**virus swine transmissible gastroenteritis coronavirus\***

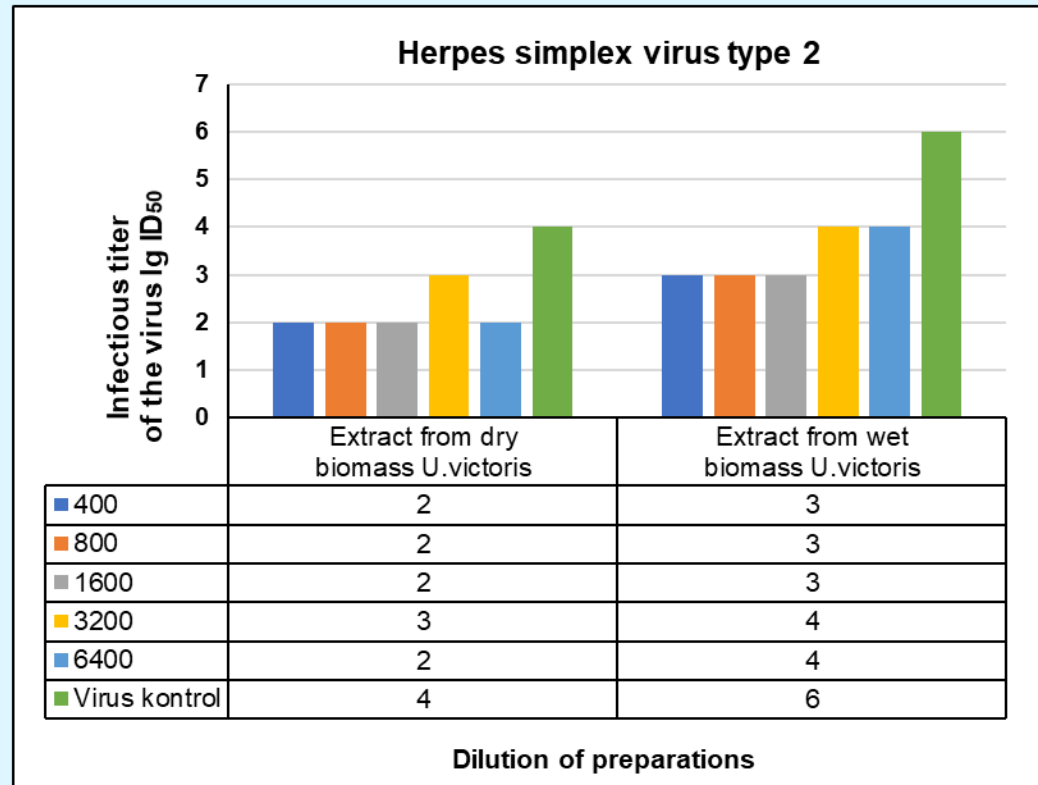


**herpes simplex virus type 2 (HSV-2)\***

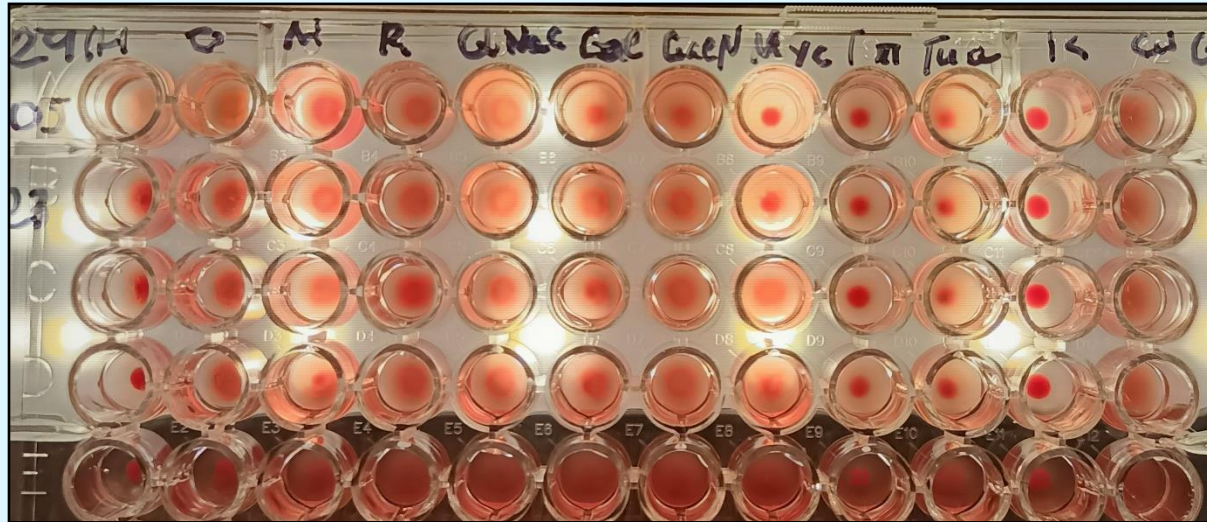
To detect lectin-like substances, water-salt extracts were prepared from dry cell biomass in a 0.15 M NaCl. Lectin activity and carbohydrate specificity were determined in the supernatant and sediment of the extracts by the generally accepted method in a series of double dilutions in a 96-well immunological plates in reaction of hemagglutination with 2% solution of erythrocytes.

\*Virus models from Internet resources

**Results.** Ethanol-extracted secondary metabolites was shown to exhibit antiviral activity against all three model viruses *in vitro* with low cytotoxicity for cells. It was shown that the *U. victoris* extracts inhibited the reproduction of the influenza virus A/FM/1/47(H1N1) and virus swine transmissible gastroenteritis coronavirus up to a dilution of 1:6400. For herpes simplex virus HSV-2 this parameter was lower (1:1600). This may indicate the existence of some receptor specificity.



In addition to 40% ethanol extracts, for the first time, we examined the *U. victoris* tissue culture for the content of water-soluble carbohydrate-binding proteins - lectins. Special interest in plant lectins is caused by their immunomodulatory, antiviral, antibacterial, antitumor activity .

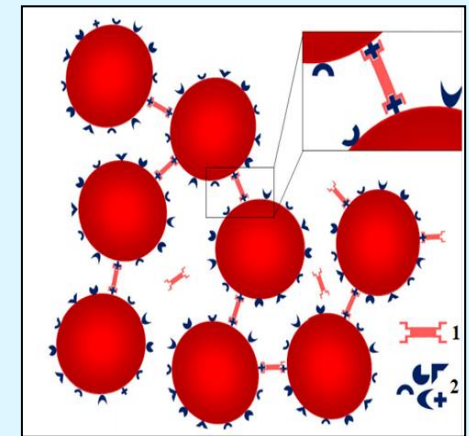


1 2 3 4 5 6 7 8 9 10 11 12

**Carbohydrate specificity of *U. victoris* lectins:** 1 – glucose, 2 – positive control (without carbohydrate), 3 – mannose, 4 – rhamnose, 5 – N-acetyl-glucosamine, 6 – galactose, 7 – N-acetyl-galactosamine, 8 – mucin, 9 – heparin, 10 – hyaluronic acid, 11 – control without lectin, 12 – WGA – commercial wheat germ lectin

In our research lectin activity in water-salt extracts of *U. victoris* tissue culture was discovered for the first time. The general characteristics of the lectin-like substances were given, and its carbohydrate specificity was revealed. The carbohydrate specificity for complex polymeric molecules (hyaluronic acid>heparin>mucin) was shown. It is known that mucin contains sialic acids, which are a component of the receptors of common animal viruses, primarily the influenza virus .

**Conclusions.** Thus, we can conclude, that studied UV-2 strain of *U. victoris* tissue culture is a promising producer of antiviral compounds, that require further research in field of natural pharmacotherapy of viral diseases.



**Reaction of hemagglutination\***

\*Figure from Internet resources