BIOLOGICAL ACTIVITY OF RIBOSOME-INACTIVATING PROTEINS ISOLATED FROM NIGELLA SATIVA (BLACK SEED)

Qoraboyeva B.B.
Oripova M.J.
Xashimova.Z.S.
Oshepkova Yu.I.
Institute of Bioorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan,
Tashkent city, Republic of Uzbekistan
e-mail: biochem@uzsci.net
https://doi.org/10.5281/zenodo.17343425

One of the most important directions in the development of new biotechnologies is the creation of pharmacological preparations that have a highly specific effect on cells or molecules in the organism. Currently, proteins or their conjugates are attracting particular interest from researchers in the creation of highly selective drugs. In this context, plant toxins that completely stop protein synthesis in the cell by switching ribosomes to an inactive state are being actively studied. These toxins are collectively called Ribosome-Inactivating Proteins (RIPs).

Among the proteins isolated from plants, Ribosome-Inactivating Proteins (RIPs) occupy a special place. These proteins target the ribosomes in eukaryotic cells, exhibiting N-glycosidase activity towards the conserved A4324 nucleotide within their 28S rRNA. This nucleotide is essential for the functional activity of the ribosome, and its depurination results in the cessation of protein biosynthesis. RIPs possess numerous biological activities, among which their antibacterial, antiviral, antitumor, and antifungal properties deserve special attention. Recent research provides a basis for a deeper understanding of the medicinal and biochemical properties of RIPs. Nevertheless, the biological functions of plant RIPs are still insufficiently studied, and research in this area is a current and pressing issue.

It is known that *Nigella sativa* is a source of physiologically active substances promising for medicine. In this regard, our previous studies involved the isolation of RIPs fractions from the seeds of this plant. Due to the numerous scientific publications in recent years confirming that RIPs can show high efficacy in conjugates for developing selective antiviral and anticancer agents, the cytotoxic activity of the extract and its main isolated fraction—Ns rip type-1—was studied against the HeLa cell line within the framework of this research.

Cells treated with no substance were used as the control group, where the MTT uptake into the cells was set at 100% (0% growth inhibition). For comparison, Cisplatin was selected as a standard pharmacological agent directed at slowing down or stopping the proliferation of tumor cells. The results are presented in the table below:

Effect of Extract and Fractions Isolated from Black Cumin Seeds on Cell Culture HeLa, μg/ml

Samples	MTT penetration into the cells %			MTT-induced reduction in cell growth) %		
	100	10	1	100	10	1
Extract	24,68±0,6	96,44±0,3	112,61±0,2	75,32±0,1	3,56±0,2	-
Ns rip 1-tip	14,98±0,1	95,83±0,7	104,07±0,4	85,02±0,2	4,17±0,6	-
Cisplatin	20,1±0,3	65,5±0,6	88,3±0,31	79,1±0,4	34,5±0,2	11,7±0,1

Statistically significant difference compared to the control group $P<0.05$.

In conclusion, the cytotoxic activity of the extract was 75.32% at a dose of 100 μg/ml. This activity increased up to 85.02% in the purified fraction containing type-1 RIPs. The fractions studied at doses of 1 μg/ml and 10 μg/ml showed no cytotoxic effect. It was observed that the cytotoxic activity of the extract increased during the purification process.