The influence of *Rhodiola quadrifida* 50% hydro-alcoholic extract and salidroside on tumor-induced angiogenesis in mice

E. Skopińska-Różewska¹, M. Malinowski², A. Wasiutyński¹, E. Sommer¹, M. Furmanowa³, M. Mazurkiewicz¹, A.K. Siwicki⁴

¹ Department of Pathology, Biostructure Center, Medical University, Chalubińskiego 5, 02-004 Warsaw, Poland
² Department of Pharmacognosy and Molecular Principles of Phytotherapy, Medical University, Banacha 1, 02-097 Warsaw, Poland
³ Department of Biology and Pharmaceutical Botany, Medical University, Banacha 1, 02-097 Warsaw, Poland
⁴ Department of Microbiology and Clinical Immunology, University of Warmia and Mazury, Oczapowskiego 13, 10-719 Olsztyn, Poland

**Abstract**

The genus *Rhodiola* (Crassulaceae) consists of more than 100 species. They grow mainly in Tibet, China and Mongolia and are traditionally used as tonic, adaptogen, antidepressant and anti-inflammatory drugs. The best known is *Rhodiola rosea* (*R. rosea*) now cultivated also in Europe and North America, and present on the market as dietary supplement. Some authors reported anti-tumor activity of *R. rosea* extracts. Recently, we have published some data on immunomodulatory and antiangiogenic properties of *R. rosea*.

*Rhodiola quadrifida* (*R. quadrifida*) belongs to the same family, but is almost not known in Europe, and there is no information about its possible anti-tumor as well as immunotropic and angiotropic activity.

The aim of this study was to determine the influence of 50% hydro-alcoholic extract from rhizomes of *R. quadrifida* (Mongolian origin) and its main biologically active compound salidroside on tumor-induced angiogenesis. Angiogenesis was induced in the skin of Balb/c mice by grafting of syngeneic L-1 sarcoma cells. Mice were fed *R. quadrifida* extract or salidroside in daily doses 40, 200 and 400 µg, or 0.5, 1, 2, and 4 µg, respectively. After 72 hours, mice were sacrificed with lethal dose of Morbital. All newly formed blood vessels were identified and counted in dissection microscope. Results: It was found that *R. quadrifida* extract and salidroside highly significantly decreased neovascular reaction in all doses applied.

**Key words**: angiogenesis, tumor cells, mice, *Rhodiola quadrifida*

Correspondence to: E. Skopińska-Różewska, e-mail: ewaskop@hotmail.com