(+)-USNIC ACID CONTENT AND ANTIOXIDANT ACTIVITY OF THREE LICHEN EXTRACTS

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Lichens produce a variety of secondary metabolites which belong to the depsides, depsidones, dibenzofurans and pulvinic acid derivative family. They proved to be a good source of natural antioxidants (1). Usnic acid uniquely found in many lichens has been reported to have analgesic, antimicrobial, anti-inflammatory, antiplatelet/antithrombotic, antiviral, cytotoxic/antiproliferative, gastroprotective, weight loss, and wound healing activity (2). We examined the (+)-usnic acid content and the anti-oxidative properties of the chloroform extract of lichen: *Cladonia sylvatica* (L.) Hoffm., *Evernia prunastri* (L.) Ach. and *Usnea barbata* (L.) Wigg. (s. l.) were collected in Mari El Republic of Russian Federation in June, 2011. Reverse phase HPLC analysis was carried out (Perkin Elmer Series 200 HPLC instrument; C18 column (C18; 25 cm×4.6 mm, 5μm); UV/VID detector; solvent: methanol-water-phosphoric acid (80:20:.9, v/v/v)). The sample injection volume was 20 μl and the flow rate 1.0 mL/min. A standard of (+)-usnic acid was used. The total antioxidant activity of the extracts was evaluated by the phosphomolybdenum method as described Manojlovic et al. (3). The chloroform extracts of *C. sylvatica*, *E. prunastri and U. barbata* showed contents of (+)-usnic acid of 8.91 ± 1.18, 5.68 ± 0.47 and 74.49 ± 8.64 % respectively. The antioxidant activities were: 277.1 ± 20.0, 171.1 ± 17.1 and 205.8 ± 7.2 mg of ascorbic acid (AA) per g of extract respectively; In comparison, the antioxidant activity of the (+)-usnic acid standard was determined as 154 ± 6.5 mg AA/g. We can report that *U. barbata* is a good source of (+)-usnic acid. Other secondary metabolites than (+)-usnic acid present in *C. sylvatica* and *E. prunastri* contribute to their high antioxidant activity and need to be further investigated.

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EXPERIMENTAL RESEARCH OF VEGETABLE DRUG «TABLETS FOR INTELLECT»

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We developed the vegetable drug “Tablets for intellect”, that contains roots of Scuttelaria baicalensis, Zinziber officinalis, Phodiola rosea, Rhaponticum carthamoides, herb of Schizonepeta multifida, Dracocephalum moldavica, Arnica montana, Melilotus officinalis, Astragalus membranaceus, Phlojodicarpus villosus, Bacopa monnieri and Inonotus obliquus. The aim of the research was detection of nootropic and psychoactivating qualities of “Tablets for intellect”. Researchers used in the experiment intact rats of Wistar line of both sexes with initial mass 180–200 g. The rats were divided into 3 groups (7 animals in every group): first one was a check group; in second and third groups animals got a decoction, that was made of the tablets in doses of 100 and 300 mg/kg respectively. The test drug was injected intragastric once a day during 7 days before the experiment. Animals of the check group were injected with pure water in the similar amount in the same scheme. A level of motive and exploratory activities and emotional state of animals was determined in test “Open field” by the 7th day of the experiment. The installation “Open field” consisted of square area 100 100 cm sized with walls measuring40 sm. The area was divided by black lines into 25 (5 5) equal squares and was illuminated by lamp with power of 50 W that was hung above centre of the field at a height of 150cm. A rat was placed at the corner of installation, after then it was been supervising for 3 minutes: horizontal (number of crossed squares) and vertical (number of rises on hind legs) kinds of activities, number of episodes of grooming and defecation (according to number of defecation boluses) were registered. On the 7th day of the experiment test of animals

was realized in "cruciform raised labyrinth" (CRL). The labyrinth installation was central square area (10 10 cm) with four "corridors" (boards with width of 10 cm and length of 50 cm) that moved off from every wall. Two of them oppositely placed "closed corridors" were limited on sides to walls that height of which was 40 cm, two ones were "opened corridors" that were without any walls. The installation was raised at a height of 50 cm above floor level and was illuminated from one side by a lamp with power of 50 W. A rat was placed on a central area so that their muzzles were against opened corridor. After that number of visits in closed and opened corridors and general time, that a rat was there, were registered. Every animal was been supervised for 5 minutes. On the 8th day of the experiment method of conditioned reaction of passive avoidance was used: animals were tough in the installation that had light and dark compartments with electrode floor. The compartments were divided by partition with hole of a wire 4 cm. in diameter stretch. Animal was placed in light compartment and after its movement in dark compartment; electric painful irritation was provoked by series of switching on current in electrode floor with power of 1,5 mA during 1 sec in 2 sec. Thereby reflex of "dark compartment" was formed. Nootropic activity of test drug was estimated according to duration of latent period (safety of memorial track) up to animal's movement from light to dark compartment of installation in 1,3 and 7 twenty-four hours after teaching. In test "Open field" rats, that were injected with test drugs in doses 100 and 300 mg/kg, indexes of horizontal activity were higher in 1,6 and 1,5 times than check ones ($p \leq 0,05$). On the contrary, indexes of vertical activities were lower and the number of defecation boluses was in 2,8 and 2,3 times lower than check ones ($p \leq 0,05$). Index of explorative activity (holes) of animals of the 3rd group was higher in 2,0 and 5,5 times than check indexes. Grooming indexes of animal of experimental groups was lower in 2,8 and 5,6 times ($p \leq 0,05$). In the test КПЛ number of visits of experimental group rats in open parts of labyrinth was higher than check indexes in 1,2 and 1,3 times. General time of stay of rats, that were injected with test drugs in doses 100 and 300 mg/kg, in open part was higher in 1,5 and 1,6 times ($p \leq 0,05$) respectively than check indexes. Duration of latent period in test "conditioned reflex of passive avoidance" of animals that were injected with the drug in doses of 100 and 300 mg/kg, for the 3rd day of experiment was longer by 26 and 22 % respectively than check index of check group rates, and for the 7th day also it was longer by 24 and 21 %. Thereby, course intragastric injection of test drug in doses of 100 and 300 mg/kg increases horizontal and explorative activities of animals in test "Open field", moderately lowers level of anxiety: enlarge number of visits in light corridors of labyrinth and time that was spent there "CRL", improve indexes of memories in test "conditioned reflex of passive avoidance".

LIGNANS FROM SHIZANDRA CHINENSIS SEMINA OLEUM EXTRACT

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Schizandra chinensis Turcz. (Baill.), fam. *Schizandraceae* is endemic plant known for stimulation of physical activity and adaptogenic properties. Biological activity of Shizandra fruits and semina is caused by special group of chemical compounds — lignans (shizandrins, fig.).

They are lypophylic components and can be extracted by non-polar extragents. Oil extract from Shisandra shinensis semina was obtained by original technology (1) with various fatty oils. The aim of the present work was to study lignans composition and content in Shisandra shinensis semina oil extracts. Qualitative and quantitative analysis was done by RP-HPLC method with standards of five shizandrins. Content of the dominant lignans was (in %wt): shizandrol A 0,088–0,102, shizandrol B 0,075–0,087, shi-

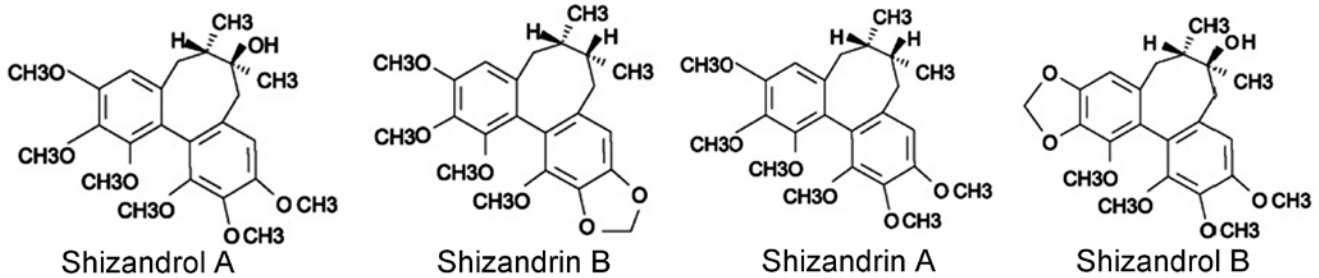

Figure. Structures of main Shizandra lignans