SHORT COMMUNICATION

Aésculus hippocástanum: Phytoscreening, Antiradical Activity, and Anti-Inflammatory Effect

Albina Filatova[1], Luiza Azimova[1], Ulugbek Gayibov[2], Abboskhon Turaev[1], Takhir Aripov[2], Sabina Gayibova[2]*

Address: Sabina Gayibova
[1]Laboratory of polysaccharides, Institute of Bioorganic chemistry, Academy of Sciences, 83, Mirzo Ulugbek Str., Tashkent, Uzbekistan
[2]Laboratory of Plant cytoprotectors, Institute of Bioorganic chemistry, Academy of Sciences, 83, Mirzo Ulugbek Str., Tashkent, Uzbekistan

*Corresponding author: gayibova.sabina@gmail.com

ABSTRACT

In the present paper, we introduce the phytoscreening and antiradical characteristics of conker extracts prepared from 2-, 1-year stored and just collected plants as well as the anti-inflammatory effect of oinment composition based on the extract.

Keywords: chestnut, stable radical, phytoconstituents, swelling

INTRODUCTION

Medicinal plants are used for a thousand years; they deservedly take their place since about half of all drugs are obtained by pharmacists from herbs. Aésculus hippocástanum (horse chestnut) is widely used in folk medicine for the treatment of hemorrhoids, varicose veins, rheumatism, arthritis, and other diseases. Based on the fruits, leaves, flowers, and bark of this tree, decoctions, alcohol tinctures, compresses and infusions are applied. Chestnuts were collected at the territory of the Botanical Garden of Tashkent in 2017 (sample 1), 2018 (sample 2), 2019 (sample 3) years at full maturity, and were stored at the same conditions. Extracts were prepared from horse chestnut fruits by extraction of crushed raw materials with hot water (1:10), after which the resulting aqueous extracts were evaporated in vacuum to 1/10 of the initial volume and the extract complex was precipitated with a 3-fold amount of 95% alcohol.
The antiradical activity was determined by standard protocol of measuring absorbance kinetics of free stable radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) as described elsewhere **(Gayibova *et al.*, 2019).** Qualitative chemical composition was determined according to generally accepted methods **(Bandiola *et al.*, 2018)**. The ointment composition was developed based on our previous works **(Mukhamedjanova *et al.*, 2012)**. Anti-inflammatory effect was assessed on 20 animal models by using carrageenan-induced rat paw edema.

Table 1 Phytochemical analysis of extracts

	Constituents	Samples		
		1	2	3
1	Proteins	-	-	-
2	Carbohydrates	+	+	+
3	Flavonoids	++	++	++
4	Saponins	++	++	+++
5	Terpenoids	-	-	-
6	Phenols	++	++	++
7	Resins	-	-	-
8	Alkaloids	-	-	-
9	Tanins	+	+	+

Table 2 Antiradical characteristics of extracts

$K\ 10^{-3}$, sec^{-1}			EC_{50}, µl			t_{50}, sec		
1	2	3	1	2	3	1	2	3
1,2	5,3	0,4	14,3	7,2	8,6	105	9,6	900

Table 1 represents the results of phytochemical analysis of horse chestnut extracts from different points of time. The work has revealed the presence of such phytochemicals as reducing sugars, tannins, phenols, saponins and flavonoids in all the samples. Saponins were observed to be dominating that reflects the bibliography data. It is known, that the saponin that is widely represented in chestnut is aescin **(Patlolla *et al.*, 2015)**. Flavonoids are also widely represented in conker namely quercetin and kaempferol **(Kapusta *et al.*, 2007)**. Alkaloids, terpenoids and proteins were not observed under the protocols used. On the other hand, the solvent used in the extraction procedure is very important and promotes extraction of certain constituents.
The reaction of DPPH radical with antioxidant is a kinetic driven process. The antiradical activity was evaluated by three parameters: constant rate (K), effective concentration which scavenges 50% radical (EC50) (IC50) and the half maximal inhibitory time (t50). Results are presented in Table 2. Effective interaction rate constants of the extracts were obtained by processing the data of the kinetic curves of the decrease in the optical density of DPPH. As it can be seen from the data in Table, all the extracts have pronounced anti-radical activity, with quite low EC_{50} and short t_{50}. A certain tendency was observed as extracts from the sample 2 showed more pronounced antiradical characteristics.
As it is known that one of the main components of horse chestnut is saponin aescin manifesting anti-inflammatory activity, and the fresh collected fruits possessed higher content of saponins the ointment was prepared based on the latter.
The composition of the ointment was as follow:

The component	Percentage content
Horse Chestnut Extract	1.0%
Carbopol	0.5%
Glycerin	10%
Ethanol	5%
Timoptin	0.0001%
Triethanolamine	0.5%

Anti-inflammatory activity was studied on carrageenan-induced acute inflammatory models (20 white outbreed rats, 160 ± 10 g) by the change in the volume of the paw *in vivo* (Table 3).

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Table 3 Paw volume and anti-exudative activity in rats treated with oinment

	The volume of the paw 3 hours after induction,%	Anti-exudative activity,%
Control	100	-
Gel	18±1,0	84
Timoptin,10^{-4}мкг/кг	38±1,8	49
Base	55±1,0	30
0,5% Prednisolone ointment	20±1,4	82
Levomekol ointment	29±2,0	78
Solcoseryl ointment	46±3,7	65

Conclusions about the anti-inflammatory activity of the test samples were made by the ability to reduce swelling of the paws of experimental animals in comparison with the control in percentage terms. The most pronounced antiexudative effect of the studied samples was observed after 3 hours. During this period, the studied ointment exceeded the activity in the comparison to such drugs as “Levomekol”, “Solcoseryl” and ointments. Thus the paw volume was decreased 1.61, 2.55 and 1.1 times correspondingly. The anti-exudative effect was also higher in the studied ointment while slightly exceeding “0,5% Prednisolone” in their anti-inflammatory activity.

CONCLUSION

Studies have shown that the studied samples exhibit a pronounced antiradical and anti-exudative activities and reveal high content of biologically active inflammation inhibiting saponins.

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