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EVALUATION OF THE ANTIRADICALIC POTENTIAL OF THE *PERSEA AMARICANA* MILLER FRUIT BY THE MEANS OF OXIDATIVE STRESS PARAMETERS

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INTRODUCTION

Oxidative stress is the consequence of the accumulation of high concentrations of reactive oxygen species (ROS) in cells and it represents a pathological condition due to the oxidative degradation of some molecules from the cell structure (proteins, lipids, nucleic acids) [4,3]. Identifying and using, mostly for chemopreventive purposes, the natural and non toxic antioxidants represents a priority for the research studies from the fields of environmental sciences. Among these antioxidants we can also mention Pycnogenol. The generic name of Pycnogenol reunites a series of standard bark extracts from the maritime pine tree that grows in the Mediterranean area of France (*Pini maritimae cortex)* extracts conditioned as different pharmaceutical formulations. These extracts are appreciated in modern therapy because of their intense antiradical action which annihilates the oxygen's reactive species. Its antioxidant/antitoxic effects are due to the presence of proanthocyanidins, soluble compounds whose chemical structure derives from flavan-3-ols which can polymerize through condensation. The condensation products of proanthocyanidins are also present in the grape's seeds (*Vitis vinifera)* and are known, just like the monomers, for their antiradical features [1, 6]. Thanks to their antiradical potential, the proanthocyanidins from the bark of maritime pine tree prevent the binding of free radicals to the cell constituents, including DNA, being effective in preventing or improving severe diseases (cancer, cardiovascular and cerebrovascular diseases, Alzheimer, inflammatory disorders, bony chemiodystrophies etc.) [2, 7, 5]. The present article suggests the possibility of introducing the avocado fruit *(Perseae fructus)* in the alimentation because of its antitoxic/antioxidant effects as a chemopreventive agent in the intoxications with mycotoxins, acrylamide, benzpyrene etc. The avocado fruit presents important antitoxic/antioxidant characteristics due to the phyto-complex it includes, it being represented by vitamin antioxidants (ascorbic acid, retinol, tocopherol) and non-vitamin antioxidants (glutathione, monounsaturated fatty acids). Paul P et al. suggest introducing this fruit in the alimentation of cancer patients subjected to long term chemotherapy (cyclophosphamide) as a chemopreventive agent [8].

MATERIAL AND METHODS

The experimental model (table 1) conceived and presented in the present paper indented to asses and compare at the same time the antioxidant power of the *Persea Americana* Miller fruit (*Lauraceae* family) and the medicamentous antioxidant product, the Pycnogenol solution. The trial was conducted according to the experimental model, on 3 experimental groups of white Wistar rats, with the mean body weight of 333.5 g. The first group represented the reference group; it included 3 animals fed and kept in the same conditions as the experimental groups. The second group (5 rats) represented the control group, the animals in this group being given Pycnogenol, product known for its valuable antitoxic/antioxidant effects. The third group of rats formed of 5 animals received, in addition to the other *ad libitum* groups, a hydroalcoholic solution of 5% avocado fruit in their food. After the 5 weeks of the experiment, the animals were taken blood samples and it was sent for biochemical analyses. The process consisted in determining some oxidative stress parameters, more precisely, quantifying the activity of some serum enzymes with role in annihilating the free radicals that cause oxidative stress. The activity of serum catalase (CAT), superoxide dismutase (SOD) and glutathione peroxidase (GPx) have been evaluated.

RESULTS AND DISCUSSIONS

The results obtained after quantifying and statistically processing the activity of serum catalase are presented in table 2. The study of its variation indicates a significant growth at the group treated with maritime pine phytopreparate (632.8 U/ml),

compared to the reference group (611.4 U/ml) which suggests the antiradical intervention of its active principles.

Table 1. Experimental model

Groups	Pycnogenol-solution [mg] *pro die*	*Perseae fructus* - Hydroalcoholic solution 5%	Parameters studied
Reference group (group I)	-	-	CAT, SOD, G-Px, free SH groups
Control group (group II)	0.4285	-	
Experimental group 1 (group III)	-	*ad libitum*	

The figure illustrating the catalase activity from the serum of the group protected with hydroalcoholic solution of *Perseae fructus* is equal to 629.999 U/ml, value higher than that of the reference group and very close to that of the group that was given Pycnogenol. The analysis of the second oxidative stress parameter, superoxide dismutase, indicates an increasing enzymatic activity from the reference group (788.93 U/mL) to the group treated with Pycnogenol solution (800.55 U/mL) and the maximum activity is reached by the enzyme from the serum of the animals protected with avocado fruit (812.52 U/mL). This extremely significant increase of SOD activity at group III compared to the reference group suggests an effective annihilation of the free radicals by the active principles, mainly by the glutathione from *Perseae fructus.* A similar path in its evolution has the third parameter as well, glutathione peroxidase, enzyme with an activity value of 101.112 μmol/min/mL that increases at 112.091 μmol/min/m L at the group protected with solution extracted from maritime pine and reaches its maximum value (120.581 μmol/min/mL) in the serum of the animals treated with macerated avocado.

Table 2. The evolution of catalase and serum superoxide dismutase activity

Groups	CAT [U/mL]	SOD [U/mL]
Reference group (group I)	611.412	788.932
Control group (group II)	632.82	800.554
Experimental group 1 (group III)	629.999	812.529

The analysis of the free thiol groups, as it results from table 3, confirms the role of glutathione from the avocado fruit: a valuable antioxidant and detoxifier. If the concentration levels of the thiol groups are around 300.661 μmol/ mL for the reference group affected by the presence of the free radicals from the organism of the animals included in this group, the value of the mercapto groups increases significantly in the serum of the animals from group III (315.559 μmol/ mL) and especially in the serum of the animals protected with Pycnogenol (319.352 μmol/ mL).

Table 3. Oscillation of serum glutathione peroxidase and thiol groups

Groups	G-Px [μmol/min/mL]	Free thiol groups [μmol/ mL]
Reference group (group I)	101.112	300.661
Control group (group II)	112.091	319.352
315.559	120.581	

CONCLUSIONS

The activity of serum CAT underlines the existence of the antiradicalic effect of the avocado fruits similar to the value of Pycnogenol;

The SOD oscillation which reaches the maximum value at group III confirms the antioxidant potential of Persea americana Mill fruits, potential comparable with that of the maritime pine extract;

The GPx variation, almost identical to that of SOD, supports the hypothesis of the existent antiradical potential of the phytocomplex from the avocado fruits.

ABSTRACT

The present study reveals a sequence from an extensive experiment that intends to establish the antioxidant potential of some plants used in food processing. The avocado fruit (*Persea americana* Miller) may represent a valuable source of active principles that counteract the reactive oxygen species responsible, in some conditions such as pathological diseases, atmosphere charged with free radicals resulted from the water radiolysis, some meteorological phenomena, for the setting-up of the oxidative stress. The antitoxic virtues of this edible fruit are owed to the high content of glutathione, a tripeptide that counteracts the aggressive free radicals due to the thiol group, and also due to the presence of ascorbic acid and vitamin E. The experiment presented herein also intends to evaluate the antioxidant activity of the *Persea americana* Miller fruit in comparison with an antioxidant drug known under the trade name as Pycnogenol. The experimental model consisted of three groups of Wistar rats, with an average body weight of 333.5 g. The first group represented the reference group, whose animals were fed with standard food and maintained in the same conditions as the others. The second group was the control group, the animals being supplementary given Pycnogenol, while the third group received, besides standard food and

Pycnogenol, the avocado fruit included in their daily diet in a dose equivalent to that of Pycnogenol. After five weeks of experiment, blood samples were collected and biochemically investigated for the determination of serum catalase, superoxide dismutase, and glutathione peroxidase. The results clearly emphasize the antioxidant effect of the active principles from *Persea americana* Miller.

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