RESEARCH STUDY ON THE ASSESSMENT OF THE ANTITOXIC ACTION OF VARIOUS PHYTOPREPARATES DERIVED FROM THE VEGETAL PRODUCTS OF *LEVISTICUM OFFICINALE*

CERCETĂRI REFERITOARE LA EVALUAREA ACŢIUNII ANTITOXICE ALE UNOR FITOPREPARATE DERIVATE DE LA PRODUSE VEGETALE DE *LEVISTICUM OFFICINALE*

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Abstract. *The thermal processing of food leads to the formation of certain toxins that are included on the list of the 1st group human carcinogens. Among them we can also mention acrylamide, a substance with two unsaturation centres and high toxicity level manifested by embryotoxicity, neurotoxicity and carcinogenicity. The experiment included in this study is part of a wider series of experiments that are conducted in parallel: finding the ways of shunting (avoiding or diminishing) the formation of acrylamide and the identification of new ways for phyto-chemoprevention in the case of acrylamide intoxication. The present experiment was intended to test the antitoxic effect of the phthalides form different lovage phytopreparates, being known that acrylamide manifests its toxicity as the free radical of the major metabolite, glycidamide. The experimental model relies on the use of four groups of white Wistar rats, which after a subacute intoxication with acrylamide are treated with Levistici aetheroleum, Levistici semen (infusion 5%) and Levistici herba (infusion 5%). The results of the biochemical test battery performed at the end of the experiment (hepatic cytolysis and proteosynthesis indicators) underline the high antitoxic potential of the lovage volatile oil.*
Key words*: acrylamide, glycidamide, Levistici aetheroleum, Levistici herba, Levistici semen, hepatic cytolysis indicators, proteosynthesis indicators*

Rezumat*. Prelucrarea termică a alimentelor induce formarea unor toxice aflate pe lista carcinogenilor umani de grad I. Printre acestea se află şi acrilamida, substanţă posesoare a două centre de nesaturare şi a unei toxicităţi ridicate, manifestate prin embriotoxicitate, neurotoxicitate şi carcinogenitate. Experimentul descris în această lucrare este segment dintr-un lung şir de experimente ce se desfăşoare pe două planuri paralele: găsirea unor căi de şuntare (evitare sau diminuare) a fenomenului de formare a acrilamidei şi descoperirea unor căi de fitochemoprevenţie a intoxicaţiei cu acrilamidă. Prezentul experiment a avut ca scop testarea efectului antitoxic al ftalidelor din diferite fitopreparate de leuştean, cunoscut fiind faptul că acriliamida îşi exercită toxicitatea sub forma radicalului liber al metabolitului major, glicidamida. Modelul experimental se bazează pe utilizarea a 5 loturi de şobolani albi, linia Wistar, care pe fundalul unei intoxicaţii subacute cu acrilamidă, sunt trataţi cu Levistici aetheroleum, Levistici semen (infuzie 5%)*

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şi Levistici herba (infuzie 5%). Rezultatele bateriei de teste biochimice efectuate la finalul experimentului (indicatori de citoliză hepatică şi de proteosinteză hepatică) evidenţiază un puternic potenţial antitoxic pentru uleiul volatil de Leuştean.
***Cuvinte cheie**: acrilamida, glicidamida, Levistici aetheroleum, Levistici herba, Levistici semen, indicatori de citoliza hepatica, indicatori de proteosinteza*

INTRODUCTION

Acrylamide, a double unsaturated chemical compound widely used in the industry, is characterized by a powerful toxicogenic potential that manifests itself by neurotoxicity, carcinogenicity, embryotoxicity and it influences the reproductive system. Acrylamides originate in the thermal processing process of food consisting of amino acids and glucides, when formed mainly from the precursors of Maillard reaction. The high incidence of acrylic amide in basic aliments correlated with its aggressive toxicity requires the identification of ways to diminish the toxicity level and to prevent/limit its apparition in food (Chudaet al., 2003). Due to the fact that acrylamide expresses its toxicity as the epoxidic radical (Fennel et al., 2003; Sumner et al., 2003) it is considered that its toxic effects might be diminished using various active principles of plants (Prisăcaru and Rotaru, 2008; Prisăcaru et al., 2008; Burlacu, 2009). In this context, the interest in identifying ways of diminishing the toxicity level of acrylamide, that first manifests itself at the level of the hepatocyte, where, at the level of the microsomes, takes place its metabolization, might be oriented toward vegetal products that include phtalides, substances with antitoxic role at this level (Prisăcaru, 2010). Based on this information, actions have been taken to test the role of phtalides from lovege as some phytopreparates: *Levistici aetheroleum, Levistici herba* and *Levistici semen*.

MATERIAL AND METHOD

The experimental model (table 1) presented in this study can be included in the category of those experiments focused on the study of the ways of reducing the toxicity level of acrylamide and it intends to assess the biochemical modifications resulted in case of intoxication caused by the administration of a dose of 50 mg acrylamide/kg body mass, as well as the assessment of the possible protective effect of some phytopreparates obtained from lovage in case of subacute acrylamide intoxication.

The experiment was conducted on 5 groups of male Wistar rats and it lasted four weeks. The first group represented the reference group and it included 5 animals that were kept in the same ecologic conditions as the rats of the other groups. The second group, consisted of the same number of animals, and provided information on the toxic effect of acrylamide, the toxic substance being administered to them in a dose of 50 mg/kg body mass. The animals from the third group (trial group 1) were given using the gavage technique, apart from the dose of acrylamide, 5 *guttes* of lovage volatile oil (*Levistici aetheroleum)*. The fourth group, considered to be trial group 2, was simultaneously treated with a subacute dose of acrylic amide and 5 ml of aqueous extraction solution 5% of *Levistici herba*. The animals of the fifth group (trial group 3) benefited from the protection of 5 ml of extraction solution 5% of *Levistici semen*, the solution being administered using the gavage technique along with their

daily dose of acrylamide. At the end of the experiment blood samples were collected from the retroorbital plexus of the rats for biochemical analyses. These analyses consisted in assessing the liver integrity and the proteosynthetic function.

Table 1

Trial model

Groups	Acrylamide (mg/Kg body)	*Levistici aetheroleum*	*Levistici semen* 5%	*Levistici semen* 5%
Reference group	-	-	-	-
Control group	50	-		
Trial group 1	50	5 *guttes*	-	-
Trial group 2	50	-	5 *guttes*	-
Trial group 3	50	-	-	5 *guttes*

RESULTS AND DISCUSSIONS

The results obtained from the biochemical investigations of transaminase, highly important enzymes for the integrity of hepatocytes, (table 2, fig. 1), indicate a pertinent increase of their activity for the control group compared to the reference group. Referring to the groups where the transaminase level was monitored for capturing the apparition of a probable protective action over the membrane of the hepatocytes, it can be noticed that AST and ALT activity have improved. It is noticed that the activity of transaminase is slightly improved, but not significantly, in the blood of the animals in the group treated with *Levistici semen* phytopreparate but more obvious it is in the blood of the ones in the group that benefited from the administration of lovage volatile oil. The activity of AST and ALT records values equal or lower than those of the reference group which suggests the effective protection provided by the hepatocyte membrane aggressed by the presence of glycidamide.

Table 2

Variation of the biochemical parameters studied

Groups	AST[UI]	ALT [UI]	GGT [UI]	ChE [UI]
Reference group	22.11±3.52	17.528±2.99	8.67±2.54	4.99±2.79
Control group	39.88±4.15	41.05±3.39	11.25±3.42	2.62±2.85
Trial group 1	21.98±3.58	21.22±3.68	8.68±3.45	4.33±1.98
Trial group 2	29.73±3.31	21.65±4.53	9.89±2.45	3.67±2.48
Trial group 3	31.62±4.15	25.62±4.95	9.17±1.22	3.54±3.02

Gamma-glutamyl transpeptidase (table 2, figure 2), an enzyme with multiple diagnostic values (marker role for the ethylic effect on the liver, enzymatic induction, the apparition of a centre of oncogenesis etc.) activates toward supporting the protective intervention of lovage phytopreparates, mainly of the volatile oil of *Levisticum officinale*.

The modification of the values of serum cholinesterase activity, an enzyme whose synthesis takes place exclusively at the level of the liver providing us information on the proteosynthetic function of the liver, confirms the antitoxic

role of lovage phtalides, the incontestable hepatoprotective potential of the volatile oil of lovage (*Levistici aetheroleum*).

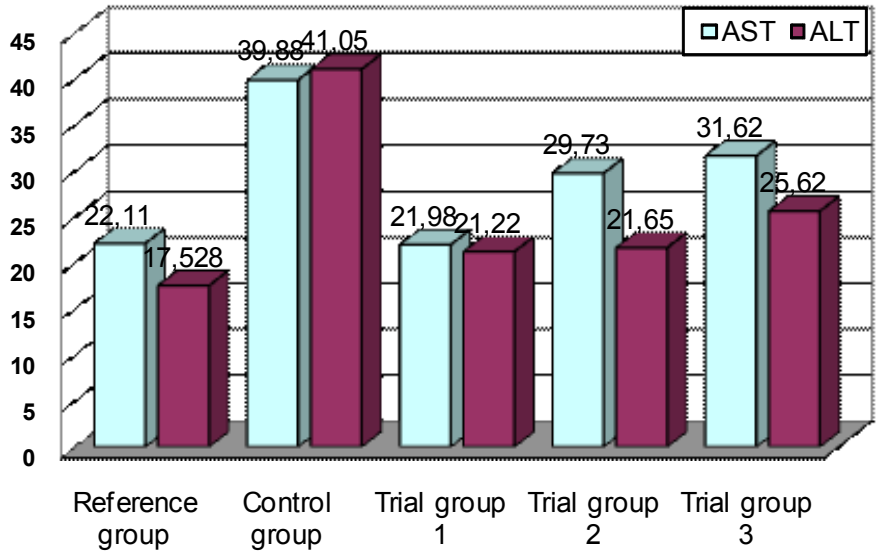

Fig. 1 - Variation of transaminase (AST and ALT)

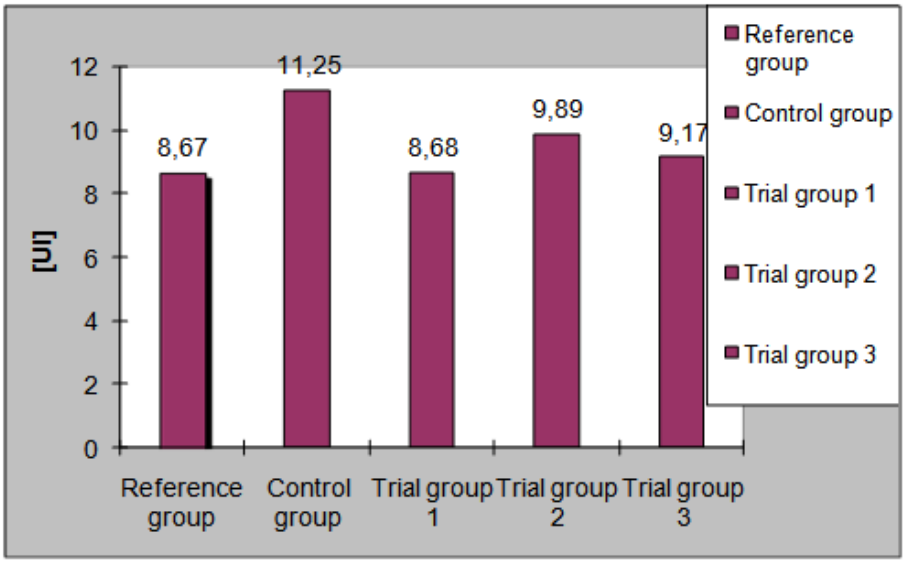

Fig 2 - Variation of gamma-glutamyl transpeptidase (GGT)

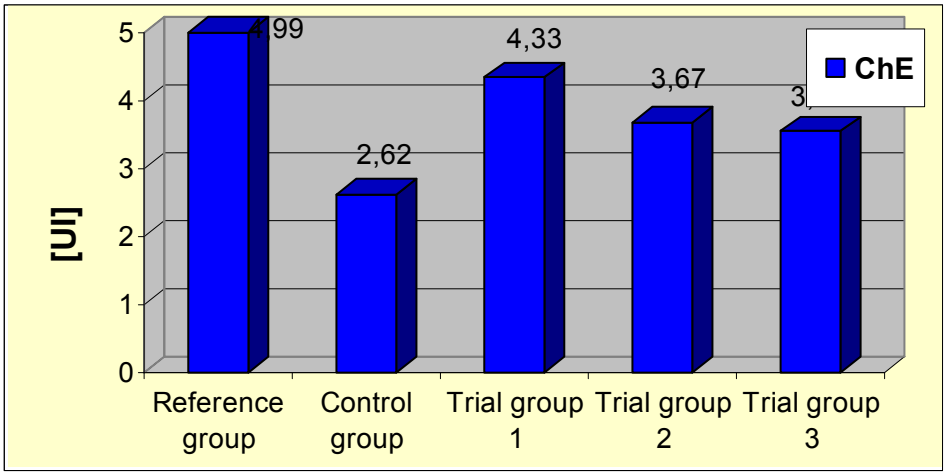

Fig 3 - Evolution of serum cholinesterase (ChE)

CONCLUSIONS

1. The evolution of transaminases activity, cytosolic enzymes considered to be hepatic cytolyse indicators, points out a significant increase at the group treated exclusively with acrylic amide and a normalization of their activity for the group that benefited from the administration of lovage volatile oil (*Levistici aetheroleum*);

2. The variation of gamma glutamyl transpeptidase underlines the hepatoprotective role of lovage extract solutions (*Levisticiherba* and *Levistici semen*), but the element with the highest hepatoprotective role is the volatile oil (*Levistici aetheroleum*);

3. The serum variation of serum cholinesterase, an enzyme synthetized in the liver, points out the reduction of proteosynthetic capacity of the liver in the animals treated only with acrylic amide and, at the same time, the obvious hepatoprotective role of lovage volatile oil (*Levistici aetheroleum*).

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