Effects of Heavy Metals on the Snails *Helix aspersa* Bioindicators of the Environment Pollution for Human Health

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Abstract

In this study we were interested in the evaluation of toxicity sub-chronicle of the metal dust collected on the level of the iron and steel complex of EL-Hadjar**(Eastern Algeria) on** accumulating organizations bio and bio indicator of pollution *Helix aspersa.* The first results on the metabolic level show that metal dust causes a significant increase in proteins with a significant reduction in the Carbohydrates and lipids on the level of the two studied bodies (digestive Gland and the kidney). With regard to the bio markers we highlighted a reduction in the acetyl cholinesterase (AChE) activity at the level of the head. In addition, the exposure of *Helix aspersa*to metal dust induced a lipidic peroxidation with release of malondialdehyde (MDA) to the level of the studied bodies.

Keywords: *Helix aspersa,* dust metal, biomarkers, pollution, MDA, AChE, bioaccumulation, digestive gland, kidney.

1. Introduction

The transfer of pollutants in the trophic networks is not limited to the organic compounds. The increase in the concentrations in elements traces metal (ETM) in the grounds – mainly due to the human activities[1].The central model of this study is the snail *Helix aspersa* for its capacities to accumulate the ETM with significant concentrations in its fabrics[2].The objective of this work is to study the effects of the stress oxidizing induced by metal dust of the iron and steel complex of EL-Hadjar (Annaba) on an accumulating metal bio, the gastropod terrestrial *Helix aspersa***.**

2. Materiel and Methods

2.1. Biological Material

The biological material used is a terrestrial gastéropode: the snail Helix*aspersa*collected area of Guelma**(Eastern Algeria)**. The snails (of average Weight of 8,5 ± 0,15g) are high under the following optimal environmental conditions[2].

2.2. Chemical material (The Metallic Releases)

The iron and steel complex of EL-Hadjar (Annaba) is at 15 km of the town of Annaba on the trunk road N44 (**(Eastern Algeria)** Metal dust in the study was collected manually .One analyzes chemical by atomic absorption was used to determine the composition of this dust. This analysis determined the presence of 07 heavy metals (Cu, Zn, Pb, Cr, Ni, Mn, Fe) [3].

2.3. Mode of treatment

Treatment of the animals at summer carried out by addition of the increasing concentrations of metal dust in the food. We retained 4 concentrations and a pilot medium (100, 500, 1000, 1500 food μg/g).[2].After (28days) of treatment, the snails are dissected and digestive Gland (DG),the kidney (K) and Headare taken.

2.4. Measured parameters

The proteins are quantified to the method of [4], the proportioning of the carbohydrates is carried by the method of [5] and lipid level's is given according to the method of [6] .The MDA is proportioned according to the method of [7] , the proportioning of the (AChE) is carried out according to the method of[8].

2.5. Statistical analysis of the results

The results are compared by the nonparametric test of Kruskal-Wallis, This test is carried out using software of analysis of the data: Minitab (Version 14.0) [9].

3. Results

3.1. Effect of the metal rejections on the total proteins

Figure (1) illustrates the variations of the total protein on the level of the digestive gland and the kidney in the presence of metal dust. We note that at the treaties, the rate of total proteins tends to increase in manner proportions dependent in the digestive gland and kidney.

3.2. Effect of the metal rejections on the total of Carbohydrates

Figure (2) illustrates the variations of the total of Carbohydrates on the level of the digestive gland and the kidney in the presence of metal dust. It is noticed that the rate of the carbohydrates at the level of digestive gland and kidney to decrease it in snails treated with the concentrations compared to the control.

3.3. Effect of the metal rejections on the Total lipids

Figure (3) illustrates the variations of the total lipid levels on the level of the digestive gland and the kidney in the presence of metal dust. We note that in the presence of xenobiotic the lipid level in the digestive gland and kidney decreases in a significant way for the treaties by concentrations compared to the control.

3.4. Effect of the metal rejections on the malondialdehyde (MDA)

Figure (4) illustrates the variations of the rate of MDA on the level of digestive gland and of the kidney in the presence of metal dust, we note that in the presence of xenobiotic, the rate of MDA tends to increase in a manner proportions – dependent and very highly significant between the rate on MDA for the treaties by the various concentrations on the level of the two bodies and this always compared to the control.

3.5. Effect of the metal rejections on the activity Acetylcholine Esterase (AChE)

Figure (5) illustrates the variations of the rate of AChE on the level of the head of snails; we note that in the presence of xenobiotic, the acetylcholine esterase rate tends to decrease in a manner proportions – dependent. The statistical analysis reveals a difference very highly significant compared to the control for the treaties by the various concentrations tested.

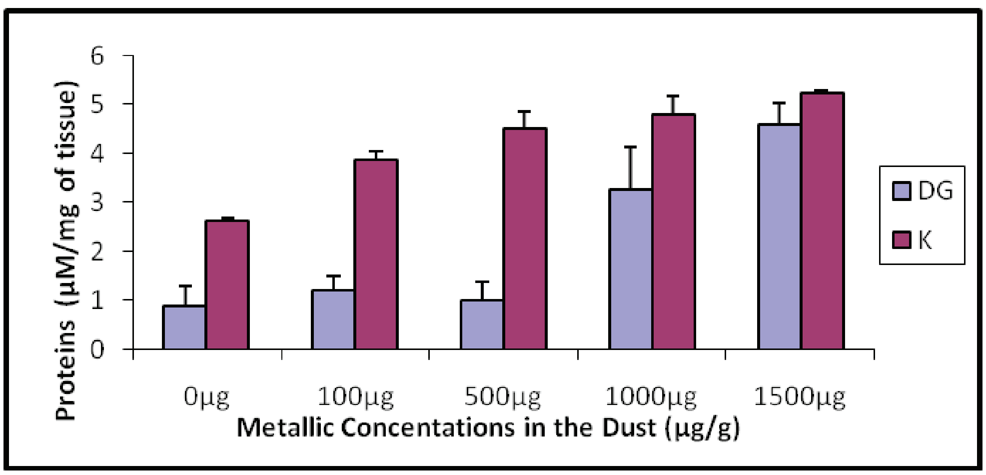

Fig 1. Evolution of the total proteins rate according to the increasing concentrations in metal dust.

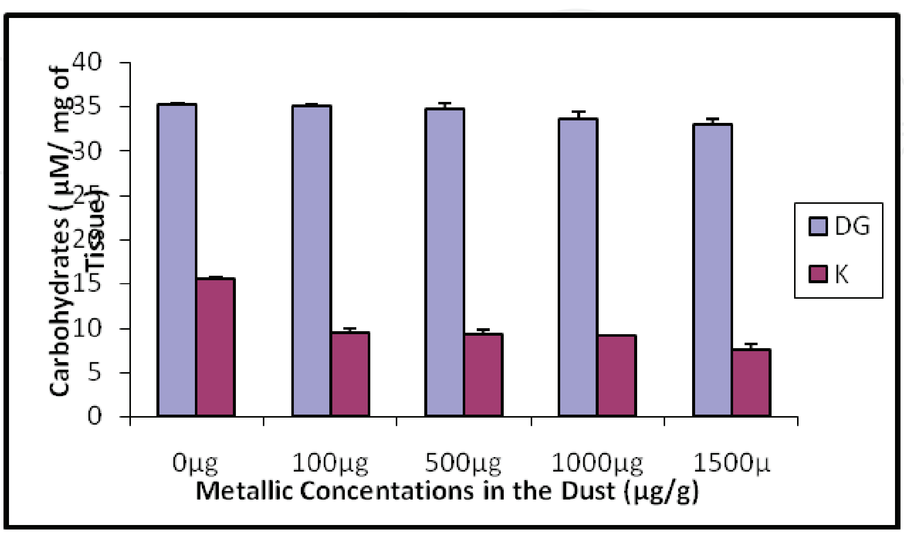

Fig 2. Evolution of the Carbohydrates rate according to the increasing concentrations in metal dust.

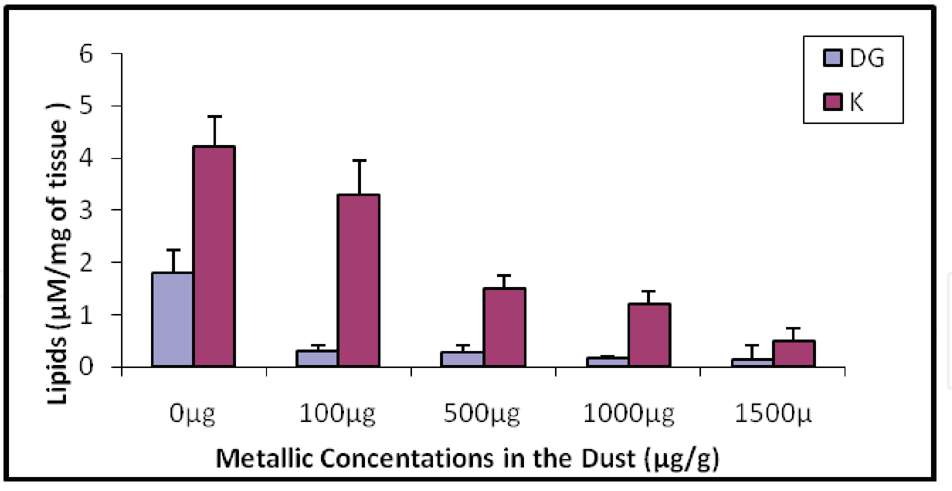

Fig 3. Evolution of the lipids rate according to the increasing concentrations in metal dust.

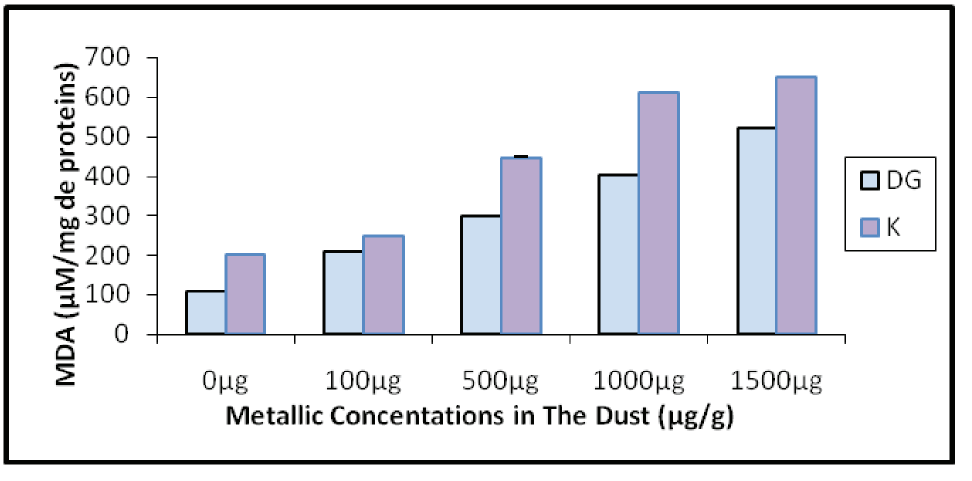

Fig 4. Evolution of the MDA according to the increasing concentrations in metal dust.

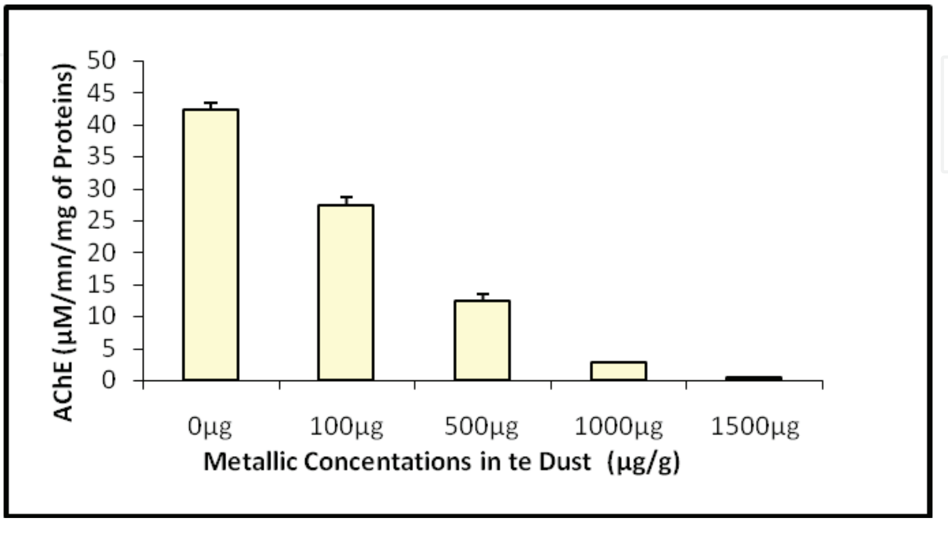

Fig 5. Evolution of AChE activity according to the increasing concentrations in metal dust.

4. Discussion

In our work, we highlighted that the rate of proteins in the two bodies increases in a manner proportions –dependent in the presence of metal dust and of cadmium, these results go in the same direction as those of Masaya and *al*.,(2002)which highlighted a significant increase in the total protein rate under the effect of a chemical stress at different biological models[10].

The results concerning the evolution of the lipid level in the two bodies highlight a significant reduction in the lipids in treated snails and this in manner proportions – dependent by the various concentrations , Aurousseau(2002) suggest the free oxygenated radicals are toxic via the degradation of the lipids of which the β-oxidation [11].concerning the evolution of the Carbohydrates , we noted that this rate decreases in a manner proportions –dependent in the presence of metal dust in the two bodies chosen, this reduction would be due to the oxidation of the carbohydrates in the presence of the metal ions leading to the release of aldehyds and hydrogen peroxide, under the condition of stress, the reserves of carbohydrates are exhausted to satisfy the energy demands, these results are in conformity with those of EL-Wakil and Radwan (1991), which suggested that exposed to Endosulfane, the methyl parathion, of the quinalphos and to Nuvan (pesticides) would be the consequence of the direct use of glycogen for the generation of energy[12].

In the present study, toxicity in metal dust is at the origin of an increase in the rate of MDA which is the principal active aldehyde of theperoxidation of acid membranes.

The MDA is also under product of the biosynthesis of the prostaglandin [13] . Our results are in agreement with those of Viarengoand *al*.,(1990) [14] which studied the toxic effects of heavy metals on the peroxidation of the lipids at *Mytillusgalloprovinciallis*. Our results concerning the evolution of the rate of AChE during the various experiments, highlighted a reduction proportions dependent on the activity of this enzyme dice the weakest metal concentrations. Our results are in agreement with the study of Antonio and *al*., (2003)[15] The studied snails are edible species for the man and can cause significant metal concentrations within the organization of the human[1].The metals transferred at the humandy the consummation of gastropoda can be at the origin of oxidative stress which represents one of the factors potentiating the genesis ofplurifactorielles diseases such as the cardiovascular diseases, the diabetes, rheumatisms, asthma, cancer,the neurodegenerative diseases and disease of Alzheimer[16].

5. Conclusion

Our experiments show that the snails answer the criteria of the bioindicator to take part in the bio monitoring of the environment.De, more, these are edible species for the man, therefore it is appropriate attentive on the origin of snails to be collected in nature because, being likely to contaminate the human.

6. References

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