# Decline in glutathione peroxidase and cytoplasmic catalases by lindane may cause an increase of reactive oxygen species in *Saccharomyces cerevisiae*

**T. Pita[1], I. Alves-Pereira[1,2]** and **R. Ferreira[1,2]**

[1]Departmento de Química, Escola de Ciências e Tecnologia, Universidade de Évora, R. Romão Ramalho, 59, 7001-554 Évora, Portugal
[2]Instituto de Ciências Agrárias e Ambientais Mediterrânicas (ICAAM), Universidade de Évora, Núcleo da Mitra, 7002-774 Évora, Portugal

Lindane or gamma 1α,2α,3β,4α,5α,6β-hexachlorocyclohexane is an organochlorine insecticide, persistent in soils and aquifers, lipophilic, chemically and biochemically inert that accumulates along the human food chain. It is commonly used on a wide variety of crops, in warehouses, in public health to control insect-borne diseases, and (with fungicides) as a seed treatment. Lindane is also presently used in lotions, creams, and shampoos for the control of lice and mites (scabies) in humans. Several chemicals as lindane, toxic for aquatic organisms, birds and mammals have been in the news recently, since the European Union intend to ban it. Therefore it is urgent to clarify the toxicological mechanisms of this compound in eukaryotic cells. Thus the main purpose of this work was to evaluate the effects of lindane in the wine wild-type *Saccharomyces cerevisiae* UE-ME$_3$ of Alentejo musts, Portugal, a unicellular eukaryotic organism, described as resistant to the presence of pesticides or metals.

Cells at mid-exponential phase were inoculated in YEPD medium with 2 % (w/v) glucose and incubated during 72 h in a water bath with orbital shaking, at 28 ºC, in the absence or in presence of 5 and 50 µM lindane. Samples from each treatment were used to obtain growth curves, wet weight and to prepare post-12000 g supernatant, used for determination of reactive oxygen species (ROS) [1] by fluorimetry and alkaline phosphatase (ALP) [2], glutathione peroxidase (GPx) [3], selenium-dependent glutathione peroxidase (Se-GPx) [3] and cytoplasmic catalase (CAT T) [4] activities as well as pellet for determination of peroxisomal catalase (CAT A) [4] activities by spectrophotometry.

The results show that lindane inhibited cell growth of *S. cerevisiae* UE-ME$_3$, causing a decrease in the biomass produced along 72 h, as well as cell viability from 24 h of assay. On the other hand, was detected an increase in the ROS content of post-12,000 *g* sediment of cells exposed to 5 µM lindane and post-12000 *g* supernatant of cells subjected to any exposure conditions, eventually conditioned by a decline in GPx and CAT T activities, which has become the detoxification of hydrogen peroxide less effective. The increase in the CAT A activity without significant changes in the ALP and Se-GPx activities justified, in part, the increase in ROS levels of S. cerevisiae exposed to lindane, as well as the loss of cell viability due to inadequate response of glutathione cycle or cells signaling pathways that assure lipid biosynthesis.

**Keywords:** organochlorine; gluthatione peroxidase; yeast

**References**

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