STUDY OF TRACE METALS (HG, CD, PB, CU, AND ZN) IN CYSTS AND BIOMASS OF ARTEMIA SALINA (LINNAEUS, 1758) (BRANCHIOPODA, ANOSTRACA) FROM THE SALT WORK OF SFAX (TUNISIA)

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ABSTRACT

The salt work of Sfax (southern Tunisia) is a potential site for the exploitation and production of local Artemia. Significant quantities of Artemia (cysts and biomass) are harvested each year and are used in larval feeding.

Since this salt work is surrounded by several sources of emissions and pollution, assessing the quality of the cysts and biomass of Artemia, is of great importance. To this end the determination of some toxic trace metals: mercury (Hg), cadmium (Cd), lead (Pb), copper (Cu), and zinc (Zn) was performed. The analyses of these metals were carried out by atomic absorption spectrometry.

The results obtained showed that the concentrations in both cysts and biomass are low compared to those recorded for other strains that have already been commercialized and are used in fish farming. Thus, Artemia from the salt work of Sfax could be used without chemical risks in the feeding of fish larvae.

RÉSUMÉ

La saline de Sfax constitue un site potentiel pour l’exploitation et la production de l’Artemia locale. Des quantités importantes d’Artemia (cystes et biomasse) sont exploitées chaque année et sont utilisées en alimentation larvaire.

Nous avons jugé utile d’analyser les cystes et la biomasse d’Artemia exploités dans cette saline qui est entourée par plusieurs sources de rejets, en vue de déterminer la concentration de quelques métaux traces toxiques : le mercure (Hg), le cadmium (Cd), le plomb (Pb), le cuivre (Cu) et le zinc (Zn). Les analyses sont réalisées par spectrométrie d’absorption atomique.

Les résultats obtenus ont montré que les concentrations aussi bien au niveau des cystes que de la biomasse sont faibles par rapport à celles enregistrées sur d’autres souches, déjà commercialisées et utilisées en pisciculture. De ce fait, l’Artemia de la saline de Sfax pourrait être utilisée sans aucun risque chimique en alimentation larvaire.

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INTRODUCTION

During the last three decades, aquaculture has developed throughout the world, diversified, intensified, and it has advanced significantly in a technological sense. The contribution of aquaculture to the world’s finfish production has increased from 5.3% in 1970 to 31.9% in 2006 (FAO; Statistics, 2007).

Furthermore, the increasing complexity of fishing techniques causes a reduction in and a depletion of fish stocks. The development of fish farming appears to compensate this depletion and meet the growing demands of seafood for human consumption.

In fish hatcheries, fish food has been at the crossroad of major concerns for the development of aquaculture. Indeed, previous research on the feeding of larval stages (Seale, 1933; Rollefsen, 1939) focused on the nutritional value of live food: *Artemia*, which is considered of high nutritive value as food for fish larvae, and for postlarvae of crustaceans. This discovery largely contributed to the development of aquaculture. Since then, the species *Artemia salina* (Linnaeus, 1758) has become an essential trophic source in hatcheries, as have some of its congeneric forms.

In Tunisia, aquaculture is under continuous development and it largely depends on *Artemia*, of which the cysts are imported at a high price. Several studies have been performed on *Artemia* in Tunisia (Ben Abdelkader, 1985; Turki, 1986, 1988; Khemakhem, 1988; Aloui, 1992, 1995, 1998, 2003a, b; Toumi, 1998, 2004; Aloui & El Abed, 2002; Ghlala, 2002; Ben Naceur, 2004; Guermazi, 2004), that considered several aspects of this anostracan: biology, ecology, physiology, biochemistry, genetics, etc. These studies have also revealed the presence of *Artemia* at several sites, including salines, and in particular the salt work of Sfax, which is a potential site for the exploitation and production of local *Artemia*.

Like other, similar organisms, *Artemia* is able to bioaccumulate large amounts of elements (e.g., heavy metals) from the aquatic environment, which it can transfer to the fish and thus to human consumers as potentially toxic elements.

In the light of these considerations, this study focuses on the chemical quality of *Artemia* and more precisely on the concentration of trace metals. It aims to assess the state of contamination of cysts and adults of *Artemia* in the salt work of Sfax by some trace metals (Hg, Cd, Pb, Cu, and Zn), in order to use this feed in larval rearing of fish without any risk for human health.

DESCRIPTION OF THE SALT WORK OF SFAX

The salt work of Sfax (34°38’N 10°43’E) is an artificial site, located to the south of the city of Sfax, along the sea side for a distance of 12 km and covering 1500 hectares. It is situated on a small peninsula called the Ras Sfax region. This salt