

# ABOUT NEMATODES AS A FACTOR TO CONSIDER IN THE PROCESSES OF NON CONVENTIONAL TECHNOLOGIES FOR WASTEWATER TREATMENT AND REUSE

<sup>1</sup>C. Santos Lobatón, <sup>1</sup>E. Trujillo Mena and <sup>2</sup>Martín, I

Department of Fisiology and Zoology, Nematology (Faculty of Biology), Seville, Spain. [csantosl@us.es](mailto:csantosl@us.es), [etrume@us.es](mailto:etrume@us.es) <sup>2</sup> Foundation Center of New Water Technologies (CENTA), Seville, Spain. [imartin@centa.es](mailto:imartin@centa.es)

## Abstract

For this study we consider total nematodes by using their elimination like a factor of efficiency degree in wastewater systems. On the other hand the presence of plant-parasitic nematodes is studied due to be considered as a risk factor in the use of treated wastewaters in the fields. Periodic studies and one end have been carried out on nematodes retained in the studied wastewater treatments. Samples have been carried out during two years in the Experimental Plant of treatment of Carrión de los Céspedes, (PECC, in Seville, Spain).

**Keywords:** Nematodes, Indicators, wastewater treatment, water reuse

## Introduction

Nematological analysis, considered in recommendations, guidelines and international legislations, approved by the Comitee on Standard Methods (1959), shows a group with great abundance and diversity. In wastewaters the removal of total nematodes can be used as a factor of efficiency degree in wastewater treatments. For this study three Biological types of total nematodes have been considered, according the Gadea classification (Gadea, 1952). Bacteriofagous nematodes, rabditoide type, that contribute to reduce both BOD and concentrations of faecal bacteria (Santos *et al*, 2005). Predaceous nematode, triloboide type, contributes to the balance in the populations of nematodes in these means besides feeding other microorganisms. Plant-parasitic nematodes, tilencoide type, are considered in mind that remains in the studied systems and would be passed on later, supposing a great risk for host crops in the event these are watered with reclaimed water carrier for these organisms (Santos *et al*, 2004,

2005). On the other hand, physic-chemical parameters related with wastewater treatment (BOD<sub>5</sub>, COD and TSS) have been evaluated in all samples.

## Methods

The studied effluents are from Waste Stabilisation Ponds, Constructed Wetlands and Peat Filters. Likewise were studied influent water and, punctually Imhoff Tank. For isolating nematodes have been used decantation and filtration techniques, carried out in samples of 10 liters, proceeding to the direct filtration to separate nematodes using different filters in order to separate by mesh. In the case of dense or very dense samples, a previous filtration is applied in inverted glass just is carried out in the technique of Decantation and filtration of Cobb, according to Flegg (1967).

The Stabilisation Pond system installed in PECC consists of two Anaerobic Ponds laid out in parallel, with an unit volume of 200 cubic meters and dept of 4 meters, one Facultative Pond with a capacity of 3,500 cubic meters which receives the effluent of the Anaerobic ponds and finally there are two Maturation Ponds which are feed by the effluent from the Facultative Pond with capacities of 400 and 600cubic meters, respectively. These ponds can be used in series or in parallel.

Regarding Constructed Wetlands, given the widespread development and implementation of this technology worldwide (Hench, K.R. *et al.*, 2003), in the PECC has been decided to include all of the different existing systems, to which end it has laid out a plot of 1,500 square meters, with six different types of Constructed Wetlands: one surface flow and four subsurface flow (two vertical flow and two horizontal flow), which in turn have different substrates and plants densities, and which can be combined in different permutations. Before this system there is an Imhoff Tank. During the work have been studied six constructed wetlands working in different combinations.

## Results and Discussion

Influent water takes a high load of nematodes and, keeping in mind both the frequency and the punctual character of the samples, we can consider it as an important vector of nematodes. Effluents of final Maturation Pond present high nematodes removal and do not contribute to the presence of nematodes except when this system was removed for its cleaning. In Constructed Wetlands the presence of nematodes is very low. In the Imhof Tank we can not conclude on the nematodes removal because have been taken few samples. In the Peat Filter total

removal of nematodes belongs to the coincidence of the sampling with the change of the filter.

There were nematodes belonging to the three biological types and in all stages of their cycles indicating that conditions are good for their development and removal the population, being the gravis females and second juvenile stage, J2, the best testimony.

With regard to plant-parasitic nematodes, during the period of study was detected the presence of two parasitic species those cause serious damages in host crops: *Pratylenchus pratensis* and *Ditylenchus dipsaci*, both present in the pretreated wastewater as well as in the outlet of some monitored technologies (Martín, I., 2010)

## Conclusions

We can conclude that all systems present performances of BOD<sub>5</sub>, COD and TSS according the established values in the European Urban Wastewater Directive (91/271/EC).

Systems allow the development of nematodes and their populations increase. In this sense, sludge and filters must be kept in mind in the moments of evacuation during cleaning of systems and maintenance to avoid contamination.

The presence of plant-parasitic nematodes in the outlet of some systems, leads to their consideration on the reuse of treated wastewater on agricultural crops (Martín, I., 2010).

Funds of systems and filters must be kept in mind in the moments of evacuation cleaning and maintenance to avoid contamination.

## References

Gadea (1952). Contribución al conocimiento de los Nematodos libres terrestres y dulceacuícolas de la fauna española. CSIC. Publicaciones. Pub. Inst. Biol. Apl. Ser. Zoological 1. Barcelona Spain.

Hench, K.R. *et al.* (2003). Fate of physical, chemical and microbial contaminants in domestic wastewater following treatment by small constructed wetland. *Water Research*, 37, 921-927.

Santos, M.C., Trujillo, E.M., Casaus, M. y Oliva, J. (2004). Los nematodos como indicadores en el proceso de depuración de las aguas residuales. Tecnología del agua. Special Smagua 2004. Año XXIV, 244. ISSN 211/8173

Santos, M.C., Trujillo, E.M. e Isaac, L. (2005). Bioindicadores de interés en el proceso de depuración de EDARS. VI Simposio del Agua en Andalucía. Tomo II. IGME. pp: 1109–1116, J.A. López-Geta, J.C. Rubio-Campos, M. Martín-Machuca (Eds.).

Martín, I, (2010). Effectiveness of different systems for wastewater treatment in pathogens removal in view of Planner Water Reuse. Doctoral Thesis. University of Seville.

Standard Methods for the Examination of Water and Wastewater (1995). 19th ed. American Public Health Association/American Water Works Association/ Water Environment Federation, Washington DC, USA.