Contents lists available at SciVerse ScienceDirect

Ecological Engineering

journal homepage: www.elsevier.com/locate/ecoleng

Short communication

The comparison of parasite eggs and protozoan cysts of urban raw wastewater and efficiency of various wastewater treatment systems to remove them

Kiomars Sharafi[a], Mehdi Fazlzadehdavil[b], Meghdad Pirsaheb[a,*], Jamshid Derayat[a], Sadegh Hazrati[b]

[a] Department of Environmental Health Engineering, School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran
[b] Department of Environmental Health Engineering, School of Public Health, Ardabil University of Medical Sciences, Ardabil, Iran

ARTICLE INFO

Article history:
Received 2 June 2011
Received in revised form 21 February 2012
Accepted 26 March 2012
Available online 2 May 2012

Keywords:
Activated sludge
Stabilization ponds
Constructed wetland
Protozoan cyst
Parasitic egg

ABSTRACT

One of the most important quality characteristics associated with wastewater reuse in agriculture is the microbial quality. This study aimed to determine the efficiencies of Ghasreshirin (constructed wetland), Islamabadgharb and Gilangharb wastewater treatment plants (stabilization ponds), Sarpolezahab and Paveh (extended aeration activated sludge) and Kermanshah (conventional activated sludge) in the removal of protozoan cysts and parasitic eggs.

This study was carried out during six months and samples were collected at weekly intervals from influent and effluent of the wastewater plants. In order to determine the concentration of ova, 288 samples were analyzed by Mc Master Slide according to Bailenger method.

No parasite eggs or protozoan cysts were detected in the effluents of the constructed wetland or stabilization ponds systems. The extended aeration activated sludge system of Sarpolezahab removed 99–100% of parasite eggs and ≥99% of protozoan cysts. The respective values for extended aeration activated sludge system of Paveh were 97.5–100% and ≥99%. However, the conventional activated sludge of Kermanshah removed 97–99% and 99–100% of parasite eggs and protozoan cysts, respectively.

According to the results, removal efficiency for cysts and parasite eggs in natural systems (constructed wetland and stabilization ponds) is better than mechanical systems (extended aeration activated sludge and conventional activated sludge). The effluent quality of all systems in terms of nematode eggs is consisted to Engelberg index (nematode eggs count: 1 ≥ counts per liter).

1. Introduction

In relation to the reclaimed wastewater application, suitability of effluent quality particularly in terms of microbial parameters and compliance with national and global standards is very important (Carr, 2005; Bitton, 2005; Kalavrouziotis and Apostolopoulos, 2007; Papaiacovou, 2001; Weizhen and Andrew, 2003).

In reusing, if do not pay attention to microbial quality and sanitary aspects of effluent, human health and environment may be encountered to serious risks. It would be more important when the effluent is applied to irrigation of public lawns and parks and raw crops such as vegetables (Palese, 2009; Lubello, 2004; Gupta et al., 2009). The wastewater must be treated in order to remove pollutants such as organic matters and pathogens. There are various biological treatment processes including activated sludge, trickling filter, aerated lagoon, stabilization pond, and constructed wetland (Ansola et al., 2003; García et al., 2008; Song et al., 2006; Tchobanoglus and Burton, 2003). Mechanisms of parasite eggs removal via wastewater treatment processes are varied from the removal mechanism of the other pollutants. The eggs are removed mainly through precipitation, sedimentation, filtration, adsorption by plant roots, trapping in suspended biosolids, and deactivation due to unfavorable environmental conditions (Donald and Rowe, 1995; Miranzadeh and Mahmoudi, 2002; Patricia et al., 2008).

Based on recent researches, efficiencies up to 99% for trickling filter, 99.9% for aerated lagoon, 99% for activated sludge, and nearly 100% for stabilization ponds and subsurface constructed wetlands (due to high retention times) are achieved in parasitic eggs removal. In any process, removal efficiency is a function of wastewater characteristics and treatment plant design criteria and experiences high variations (Patricia et al., 2008; Matteus, 2000). In Iran, a few studies have been conducted on efficiency of removal by wastewater treatment plants in protozoan cysts and parasite eggs removal and there is no similar research on natural and mechanical wastewater

* Corresponding author at: Iran- Kermanshah- Dolat Abad- Eisar Square- School of Health- Department of Enviromental Health Engineering, Iran.
Tel.: +98 8318262005; fax: +98 8318263048.
E-mail address: mpirsaheb@yahoo.com (M. Pirsaheb).

0925-8574/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.ecoleng.2012.03.008