INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
ISSN Print: 1560–8530; ISSN Online: 1814–9596
08–083/IAZ/2008/10–5–591–592
http://www.fspublishers.org

Short Communication

Effectiveness of Fish Culture Implementation to Improve Irrigation Water Quality

NAGWA HASSAN ELNWISHY[1]
Researcher in the Biotechnology Research Center, Suez Canal Univ., Ismailia, Egypt
[1]Corresponding author's e-mail: nwishy@yahoo.com

ABSTRACT

This paper reports the significance of recycling water in fish farming twice before being used for a third time in agriculture irrigation. The test examined the effect of the Di-recycling system on enriching the irrigation water with natural fertilizers. Tilapia (*Oreochromis niloticus*) and catfish (*Claris gariepinus*) were used in the experiment. Organic matter (OM), total Nitrogen (TN) and NH_3 were determined in fish drainage water (DW). Results revealed significant difference (*$P \leq 0.05$) between the supplying water (SW) and the drainage water of tilapia (DWT), the drainage water of catfish and the drainage water of catfish reared on DWT (DWTC). DWC and DWTC were recommended for field use on soil quality and crops productivity by a small scale implementation in the study area.

Key Words: Water quality; Irrigation; Water recycling; Fertilizers

INTRODUCTION

Frequent pollution of aquatic systems even at small levels of pollutants causes biochemical dysfunctions and damages to fish (Elnwishy *et al.*, 2007). This diverted attention to fish farming. However, recycling the drainage water (DW) of fish farming, rich with organic matter for agriculture use can improve soil quality and crops productivity (Elnwishy *et al.*, 2006), reduce the total costs since it decreases the fertilizers use, which demand became affected by the prices and the framer's education (Ebong & Ebong, 2006). Meanwhile, organic matter content supports the cation exchange process in soils, which is important to the nutrition of plants (Altaf *et al.,* 2000).

This research compared the output parameters of DW of tilapia (DWT) and DW of catfish (DWC) and DW of catfish reared on recycled DW of tilapia (DWTC). The research aimed to come out a better irrigation water quality that would enhance soil properties, secure water resources sustainability and provide additional food security.

MATERIALS AND METHODS

Ninety tilapia (*Oreochromis niloticus*) 1.7 ± 0.5 g and 90 catfish (*Claris gariepinus*) 150 g were brought from the Fisheries Research Center in Suez Canal University, Egypt. The fish were distributed by 30/aquatium and 15/aquatium for tilapia and Catfish, respectively. All tilapia aquaria and three of catfish aquaria were supplied with clear supplying water (SW), the other three catfish aquaria were supplied with the DWT. All the fish were fed on 40% protein pellets for tilapia and 30% for catfish; with 10% of fish wet weight twice a day (Eurell *et al.,* 1978). Water was maintained at 30^{o}C. At 21 days, SW and DWT, DWC and DWTC were analyzed; NH_3 (Page *et al*., 1982), TN and OM were determined (Richards, 1954) and statistically analyzed by multivariate ANOVA at ($P < 0.05$).

RESULTS AND DISCUSSION

Significant differences were found between SW and DWT, DWC and DWTC. OM, TN and NH_3 were significantly the highest in DWTC. Meanwhile, less significant differences were found between DWT and DWC (Table I).

The increase on N and NH_3 was mainly due to the presence of ammonia and urea. They are original substances of fish excrete, which usually across the branchial epithelium via passive NH_3 diffusion (Wilkie, 2002; Mohammed *et al*., 2004), the warm water in which fish were reared has possibly increased the NH_4 decomposition resulting in the increase of NH_3 content (Gamal, 1991). However, NH_3 level in the obtained results is not harmful to fish as they range within 0.5 – 1 ppm (Fig. 1). Organic matter was increased (Fig. 2) probably due to the accumulation of fish fasces and feeds (Torres, 2005). DWTC was most likely richer in N, NH_3 and COD than DWT and DWC due to their accumulation in the water by recycling. However, catfish is less sensitive to water quality than Tilapia.

To cite this paper: Elnwishy, N.H., 2008. Effectiveness of fish culture implementation to improve irrigation water quality. *Int. J. Agri. Biol.,* 10: 591–2

Table I. LSD multiple comparisons

Dependent Variable	(I) Sources	mean	Std. dev.	(J) sources	Sig.[1]
Organic Matter (%)	SW	18.61	0.46	DWT	0.001**
				DWC	0.001**
				DWTC	0.001**
	DWT	31.43	4.06	SW	0.001**
				DWC	0.13
				DWTC	0.001**
	DWC	35.09	4.60	SW	0.001**
				DWT	0.13
				DWTC	0.001**
	DWTC	56.53	1.70	SW	0.001**
				DWT	0.001**
				DWC	0.001**
Total Nitrogen (ppm)	SW	8.29	0.25	DWT	0.001**
				DWC	0.001**
				DWTC	0.001**
	DWT	24.07	0.60	SW	0.001**
				DWC	0.02*
				DWTC	0.001**
	DWC	28.06	1.18	SW	0.001**
				DWT	0.02*
				DWTC	0.001**
	DWTC	32.30	0.47	SW	0.001**
				DWT	0.001**
				DWC	0.001**
Ammonia (ppm)	SW	0.08	0.03	DWT	0.001**
				DWC	0.001**
				DWTC	0.001**
	DWT	0.45	0.05	SW	0.001**
				DWC	0.48
				DWTC	0.001**
	DWC	0.47	0.06	SW	0.001**
				DWT	0.48
				DWTC	0.001**
	DWTC	0.74	0.04	SW	0.001**
				DWT	0.001**
				DWC	0.001**

The mean diffrences is significant at the .05 level.
Significance within treatments (J) compaired to control (I)

Fig. 1. Differences of TN and NH_3 content between treatments

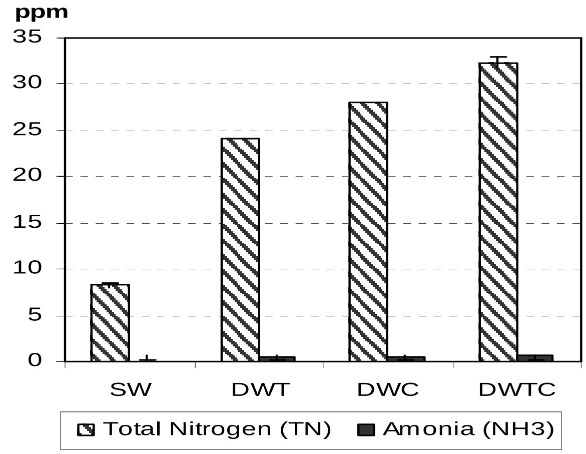
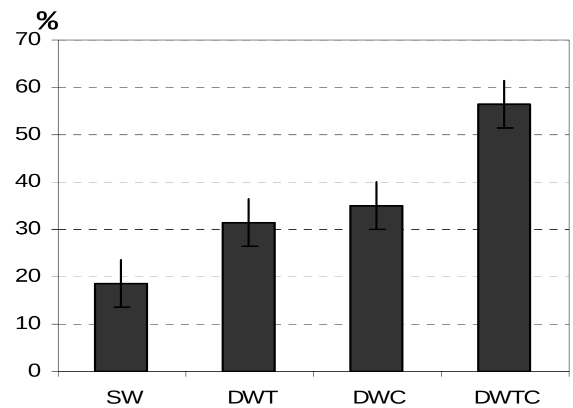


Fig. 2. Differences of organic matter content between treatments



CONCLUSION

Recycling irrigation water twice in tilapia culture and then catfish culture, before being used in agriculture, is possibly a valuable economical and productive methodology to increase the effectiveness of integrated fish farming and agriculture, to produce organic products and to improve soil properties. The impact of DWTC on soil quality and crops productivity is recommended to be tested in the field.

Acknowledgment. The author acknowledges Prof. Helmy Omran and the members of the Biotechnology Research Center (BRC) in Suez Canal University for providing the facilities of the BRC laboratories to carry out the research.

REFERENCES

Altaf, U., N. Bhattihaq, G. Murtaz and M. Ali, 2000. Effect of pH and organic matter on monovalent -divalent cation exchange equilibria in medium textured soils. *Int. J. Agric. Biol.,* 2: 1–2

Ebong, V. and M. Ebong, 2006. Demand for fertilizer technology by smallholder crop farmers for sustainable agricultural development in Akwa, Ibom state, Nigeria. *Int. J. Agric. Biol.*, 8: 728–31

Elnwishy, N., M. Ahmed, M. El-Shreif and M. Abd Elhameed, 2007. The effect of diazinon on glutathine and acetylecholinesterase in tilapia (*Oreochromis niloticus*). *J. Agric. Soc. Sci.*, 3: 52–4

Elnwishy, N., M. Salh and S. Zalat, 2006. Combating desertification through fish farming. *The Future of Drylands Proceedings of the International Scientific Conference on Desertification and Drylands Research, Tunisia 19- 21, June UNESCO*

Eurell, T., S. Leuis and L. Grumbles, 1978. Comparison of selected diagnostic tests for detection of *Aeromonas sepiticemia* in fish. *American J. Vet. Res.,* 39: 1384–6

Gamal, E., 1991. *Principles of Fish Husbandry and Fish Farms Management, Methods of Coming over the Problem (Part 2)*. Zagazig University Publishing, Zagazig, Egypt

Mohammed, F., S. Shreef and A. Mohammed, 2004. What do we know about Extrusion technique and its role in enhancing the efficiency of food pellets used in feeding fish and shrimps? *EACS,* 1: 220–2

Page, A., R. Miller and D. Keeny, 1982. *Methods of Soil Analysis Part 2, Chemical and Microbiological Properties*. American Society of Agronomy, Madison Wisconsin

Richards, L., 1954. *Diagnosis and Improvement of Saline and Alkali Soils*. U.S. Handbook No: 60, USA

Torres, B., 2005. Organic matter decomposition in simulated aquaculture ponds. *Ph D. Thesis,* ISBN: 90-8504-170-8

Wilkie, M., 2002. Ammonia excretion and urea handling by fish gills: present understanding and future research challenges. *J. Exp. Zool.,* 293: 284–301

(Received 10 March 2008; Accepted 23 June 2008)