

***Trichodina* sp. AS BIOINDICATOR FOR EVALUATION OF BIOCHEMICAL OXYGEN DEMAND (BOD5) IN AQUACULTURE FISH FARMS (PONDS)**

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Abstract:

The present study include the using of the prevalence of the fish infestation by the protozoan *Trichodina* sp. as bioindicator for evolution of the biological oxygen demand BOD5 (lowering down of the dissolved oxygen DO) from Ainkawa fish hatchery. For this purpose, two hundred and forty (240) finger ling fishes of *Cyprinus carpio* were collected from six ponds (40 samples from each pond) and fishes were examined from December, 2012 to the end of february, 2013. Biological oxygen demands were measured by azid modification of Winkler method (through measuring of dissolved oxygen DO) for each pond. Results reveal that there are a direct relationship between the prevalence of fish infestation by the *Trichodina* sp. and the values of BOD5. The prevalence of fish infestation in each pond increased (57.5, 40, 27.5, 45, 15, and 42.5% respectively) with the increase of the values of BOD5 (9.2, 8.0, 5.7, 8.1, 2.9 and 8.0 mg.l⁻¹, respectively).

Key words: BOD5, *Trichodina*, Water pollution, Erbil.

Introduction

The concept of aquaculture development as a potential source of food supply is receiving much attention in Iraq. This has resulted in rapid growth in fish farming practice. The intensification of such fish culturing creates disease problems that originate from overcrowding or deteriorating water quality, such as unsuitable water temperature, pH, dissolved oxygen, BOD5 and organic mater (Dujin, 1973 and Kugel *et al.*, 1990).

Trichodina (Ciliophora: Protozoa) are very common ectoparasites which in most cases are pathogenic to both freshwater and marine fish (Wellborn, 1967). Dogiel (1961) reported that trichodiniasis caused by *Trichodina* was stimulated by water quality and the high density of fish in ponds. It causes irritation by feeding on the epithelial cells covering the surface of the gills and skin of the fish, which can result in hyperplasia (proliferation) of the epithelial cells, clubbing and even fusion of the gill filaments. This affects the abilities of both gills and the skin to maintain optimal respiratory and excretory activities, and the ability of the skin to maintain proper homeostatic osmoregulatory properties. Massive infestations of these parasites on fish can also directly result in superficial to deep ulcerative skin lesions which allow for secondary bacterial and fungal

infections to develop at the affected site (Smith and Schwarz, 2009).

In Iraq, The first information concerning genus *Trichodina* was given by Shamsaddin *et al.* (1971), who recorded *T. domerguei* on eight species of fishes brought from different fish markets in Baghdad city. For the next years a total recorded number of *Trichodina* reached eighteen species (Mhaisen, 2014).

In the present study, only *Trichodina* sp. were selected because based on the previous study which were done on the different fish farms in Iraq and Kurdistan region appear that *Trichodina* sp. make a large problem in all aquaculture fish farm after *Ichthyophthirius* and *Lernaea cyprinacea* Mama and Abdullah (2010) and Al-Marjan and Abdullah (2009).

The aim of this study is to know the relationship between fish infestation by *Trichodina* sp. and the BOD5 as a step for evaluation of the water quality of the fish farms.

Description of the Study Area

Ainkawa fish hatchery is located northwest of Erbil city, Kurdistan region, Iraq. This project was built in 2000 on 27 hectare, and started working in 2005. In this region there are eighteen ponds of different sizes, among these six ponds were selected. Fishes of various sizes were stocked for greater growth and artificial reproduction (Fig. B).

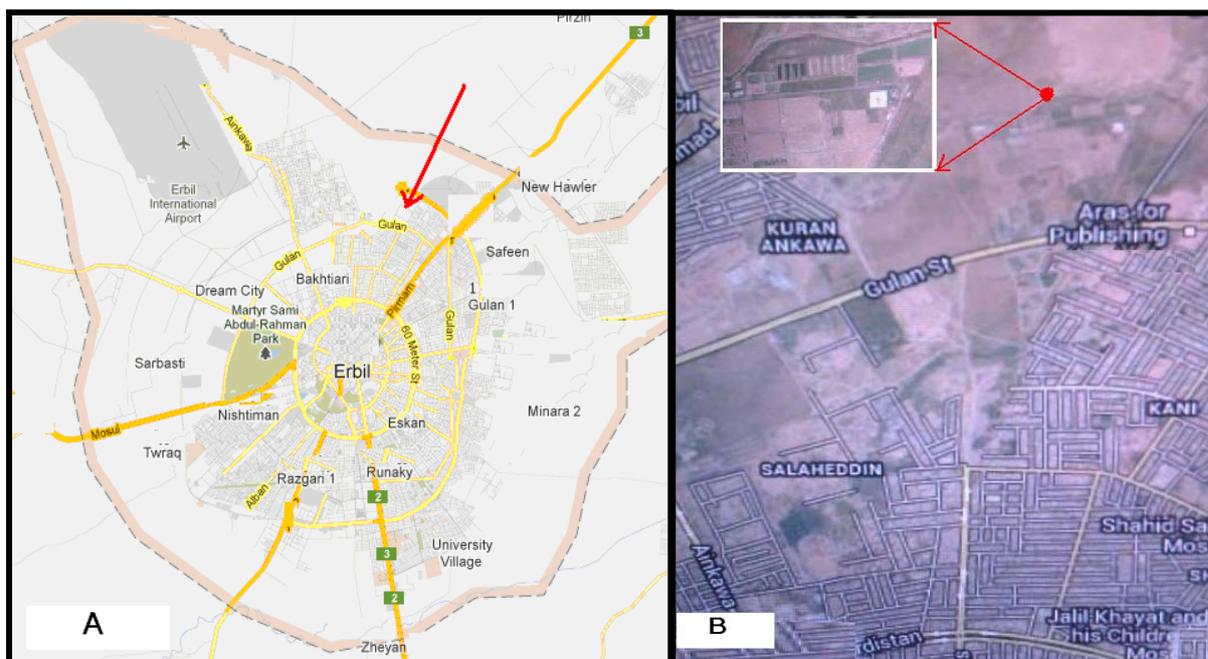


Fig. (1): A-Map of Erbil, B-Studied stations.

Materials and Methods

This study includes two aspects, the first deals with the isolation of the *Trichodina* sp. which infect common carp *Cyprinus carpio* in Ainkawa fish hatchery farms, situated northwest of Erbil city, Kurdistan region-Iraq, for this purpose 240 finger ling fishes were collected from six ponds (40 samples from each pond) and transported a live in a cool box containing tank water (free from chloride) to the laboratory during the period from December, 2012 to the end of February, 2013. Each fish was examined by taking smears from skin, fins, and buccal cavity through slight scraping. The gills were removed, and placed in a Petri dish containing water then microscopically examined. Smears were stained by Klein's dry silver method for observation of the adhesive disk as suggested by Asmat (2001). All slides were examined under a light compound microscope at 700X.

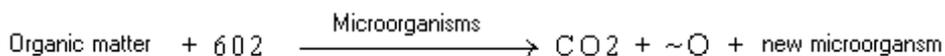
The second aspect included the measurement of the biological oxygen demand (BOD₅) through measurement of dissolved oxygen based on azide modification of Winkler method (Maiti, 2004). Samples of water were collected by a special bottle (BOD bottle, 300ml capacity) from each fish farm separately.

Results and Discussion

The prevalence of fish infestation by *Trichodina* sp. in each pond were variable 57.5, 40, 27.5, 45, 15 and 42.5% respectively with the change of the BOD₅ concentration in each ponds 9.2, 8.0, 5.7, 8.1, 2.9 and 8.0 mg.l⁻¹ respectively (Fig. 2).

The analysis of the results indicate that there are a relation ship between the BOD₅ concentration and the prevalence of fish infestation by the *Trichodina* sp (Fig. 3). The highest prevalence of the fish infestation by the parasite (57.5%) and the highest concentration of the BOD₅ (9.2 mg.l⁻¹) were recorded in the pond number one. Depending on these data, we can evaluate the quality of ponds water because high BOD₅ values is an indicator for poor quality of water (Peter and Ludemann, 1972). On the other hand low concentration of the BOD₅ value (2.9 mg.l⁻¹) and low prevalence of fish infestation by *Trichodina* sp. (15%) was recorded in pond number five.

Biological oxygen demand (BOD₅) is defined as the amount of oxygen required by microorganisms in decomposing organic materials in a sample under "aerobic condition at 20°C over a period of 5 days (Maiti, 2004).



High BOD5 values means presence of microorganisms (like *Trichodina*) in water and consumption of small amount of oxygen, which may supported by fecal coliform results in lowering the amount of dissolved oxygen and elevation of BOD5. Results of the present study agree with those of Othman, (2013).

Several parasitologists and ecologists mentioned the presence of a direct relationship between the concentration of organic materials and the prevalence of infection by the parasite especially Trichodinid ciliates, because they can be used as potential bioindicator fish farms (Yeomans, 1997). A strong relationship between ecological parameters and parasite infection were found from Lesser Zab and Greater Zab rivers in north of Iraq (Abdullh, 2002). Seasonal dynamics of *Trichodina* sp. on whiting (*Merlangius merlangus*) in relation to organic pollution on the eastern Black Sea coast of Turkey was reported by Palm and Harry (2005).

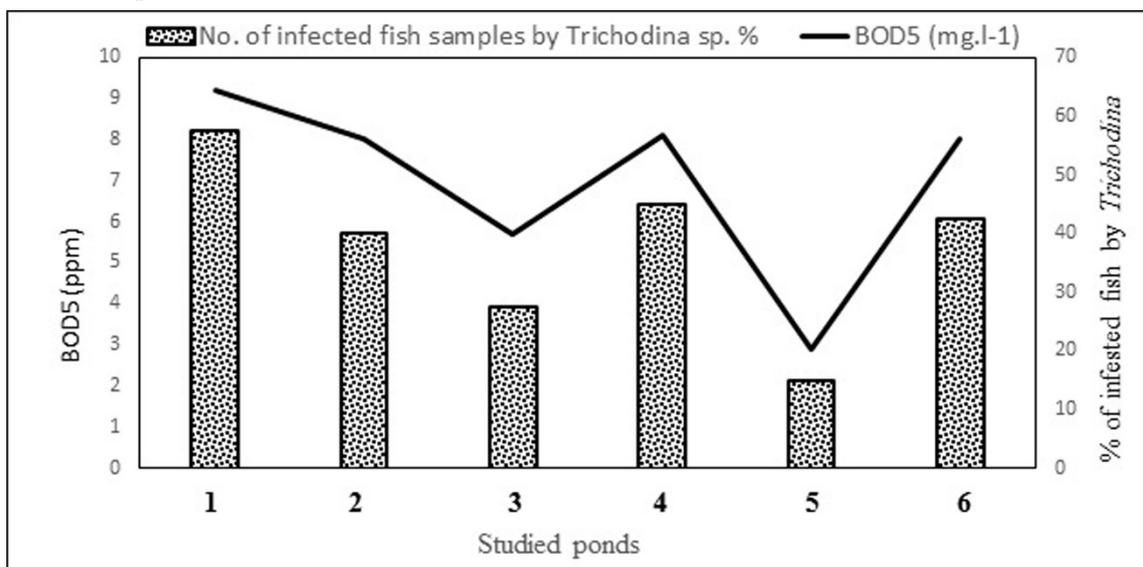


Fig. (2): Shows percentage of infested fish by *Trichodina* sp. and values of biochemical oxygen demand (mg.l^{-1}) in the studied ponds.

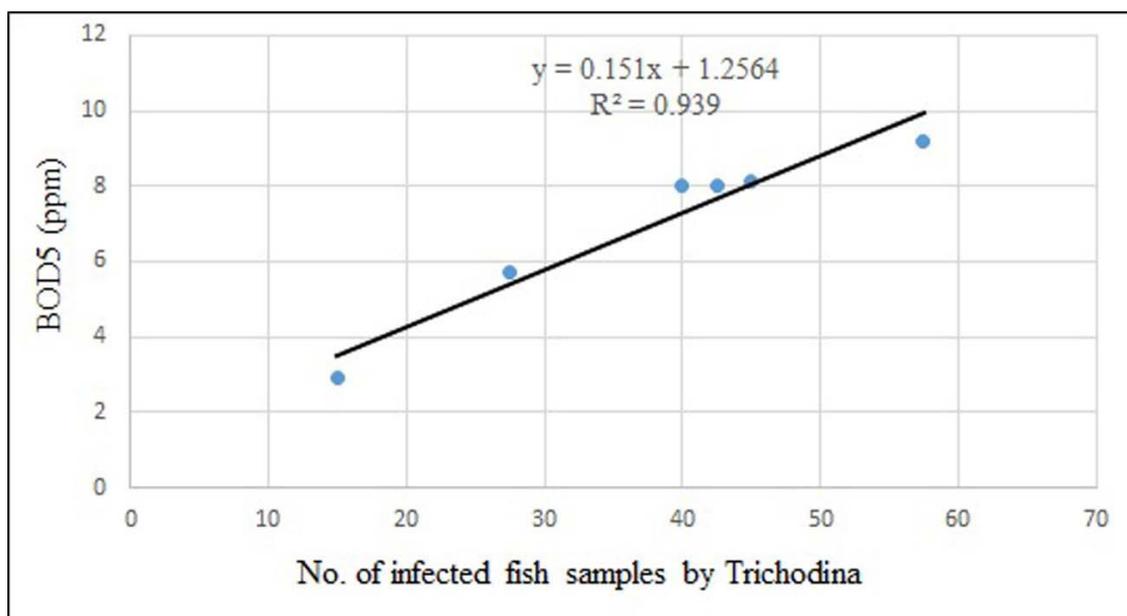


Fig. (3): Shows relationship between percentages of infested fish by *Trichodina* sp. and values of biochemical oxygen demand (mg.l^{-1}) in the studied ponds.

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له (BOD5) وهكو ناسهروهويهك بو ههلسهنگاندني نوکسيجيني زينده كي *Trichodina sp.* كيتلگه كاني بهخيوكردني ماسي

پوخته

نهم تويزينهويه بريني يه له بهكارهيناني بهرايه كان لهجوړي *Trichodina sp.* وهكو ناسهروهويه كي زينده كي بو ههلسهنگاندني نوکسيجيني زينده كي BOD5 (نزمبوننهويه نوکسيجيني توواوه DO) له كيتلگه كاني بهخيوكردني ماسي له عينكاوه. وه بو نهم مهبهسته دوو سه دو چل (٢٤٠) په نجه ماسي له جوړي كاري ناسايي *Cyprinus carpio* كو كرايه وه له شش كيتلگه (٤٠ نمونه ماسي له ههريهك له كيتلگه كان) له ماوهي نيوان كانوني يه كه مي سالي ٢٠١٢ بو كوتايي مانگي شوباتي سالي ٢٠١٣. وه ههلساين به پيوانه كردني BOD5 به ريگايي azid modification of Winkler method (له ريگايي ههژمار كردني نوکسيجيني توواوه DO) له ههريهك له كيتلگه كان. وه له نجه ماسي لنيكولينه وه كه دهر كهوت كه په يوه ندي راسته وانه ههيه له نيوان ريژهي توشبوني ماسيه كان به *Trichodina sp.* وه نخي BOD5 به جوړيك كه ريژهي توشبون زياد ده كات له ههريهك له كيتلگه كان (%٥٧.٥ ، %٤٠ ، %٢٧.٥ ، %٤٥ ، %١٥ وه %٤٢.٥) به زياد بوني خهستي BOD5 لهو كيتلگانه (٩.٢ ملگ/لتر، ٨.٠ ملگ/لتر، ٥.٧ ملگ/لتر، ٨.١ ملگ/لتر، ٢.٩ ملگ/لتر، ٨.٠ ملگ/لتر به دوايي يهك دا).

كليله وشه كان: BOD5 ، ترايكودينه كان، پيسووني ئاو ، نهريل.

Trichodina sp. كدليل حيوي لتقيم المتطلب الحيوي للاوكسجين (BOD5) في المزارع الاسماك

الخلاصة:

اجريت هذه الدراسة على اسماك مفقس عينكاوه لغرض استعمال نسب اصابة الاسماك بالطفيلي الابتدائي ترايكودينا (*Trichodina sp.*) كدليل حيوي لتقييم قيم المتطلب الحيوي للاوكسجين BOD5 (انخفاض قيم الاوكسجين المذاب DO). ولهذا الغرض تم جمع مائتان واربعون (٢٤٠) اصبعيه من سمكة الكارب الاعتيادي *Cyprinus carpio* من ست احواض (٤٠ نموذج من كل حوض) خلال الفترة المحصورة بين كانون الاول ٢٠١٢ الى نهاية شباط ٢٠١٣. وتم قياس BOD5 بطريقة azid modification of Winkler method (خلال قياس تراكي الاوكسجين المذاب DO) لجميع الاحواض.

خلال تحليل النتائج، ظهور وجود ترابط مباشرة بين نسب اصابة الاسماك بالترايكودينا و قيمة ال BOD5 حيث ازدادت نسبة اصابة الاسماك في كل حوض من الاحواض الستة (٥٧.٥ ، ٢٧.٥ ، ٤٠ ، ٤٥ ، ١٥ و ٤٢.٥ %) مع ازدياد تراكي المتطلب الحيوي للاوكسجين في تلك الاحواض (٩.٢ ، ٨.٠ ملغ/لتر، ٥.٧ ، ٨.١ ، ٢.٩ ، ٨.٠ ملغ/لتر على التوالي).

كلمات الدالة: BOD5، الترايكودينيدات، تلوث مياه، اربيل.