Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 5, Issue, 12, pp.3859-3862, December, 2013

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

ECOLOGICAL BASES OF THE BREEDING OF THE TILAPIA OF THE NILE (OREOCHROMIS NILOTICA) IN THE STATION OF FISH FARMING OF DEROUA (BENI MELLAL/MOROCCO)

[1]Adam Adey, S., [2]Benabid, M., *[3]Abba, H., [4]Droussi, M. and [1]Khattabi, A.

[1]Laboratory of Biodiversity, Forest School of the Engineers, Salé Morocco
[2]National Center of Hydrobiology and Pisciculture (NCHP) Azrou Morocco
[3]Biology and Health Laboratory, Environmental and Parasitology Team / UFR Doctoral Parasitology Compared: Medical and Veterinary Applications, "Sciences Faculty, Ibn Tofail University, Kénitra B.P. 133, 14000, Morocco
[4]Station of fish farming of Deroua, (CNHP) Beni Mellal Morocco

ARTICLE INFO

Article History:
Received 10th September, 2013
Received in revised form
14th October, 2013
Accepted 28th November, 2013
Published online 25th December, 2013

Key words:
Aquicultural,
Fish farming, Deroua,
Physico-chemical parameters,
Oreochromis nilotica

ABSTRACT

Morocco was equipped, since 2009, of a new development strategy and competitiveness of the halieutic sector. The development of this sector will make it possible to improve the means of existence by the means of the increase of the incomes, employment and the wellness. The development of the aquacultural sector will contribute in addition to the food safety and the socio-economic development of Morocco. The station of fish farming of concerning Deroua HCEFLCD is part of the one of the stations which can play a lever for the development of this sector by the whole of the scientific studies conducted to its level. The follow-up of the physico-chemical parameters during the period of reproduction of a nonnative species Morocco (Oreochromis nilotica) introduced by Egypt in 2004 shows that during the various phases of breeding as well parents whom larvas show that the physico-chemical parameters raised throughout the experience seem to suit perfectly to Oreochromis niloticus because all the registered values is meanwhile optimal of the species. These results can establish a database for the development of the aquacultural sector of this species.

INTRODUCTION

The peaches of capture and aquiculture currently know a considerable growth during these last decades. The worldwide production out of fishes in 2010 reached 148 million tons for an equivalent value of 217.5 Billion dollars US (FAO 2012). Between 2006 and 2011, the continental aquiculture passed from 31,4millions of tons to 44.3 million tons with an increase of 13 tons million in 5 years. This big raise in production allowed the passage of an average consumption of 9.9 kg (live weight) in the Sixties 18,4Kg in 2009.In Africa, in spite of the made efforts, the quantity of fish consumed per capita (9,1Kg) remain weakest compared to the other continents or the quantity reaches in Asia for example 20,7Kg/personne in 2010 (FAO, 2012). On a worldwide scale, the carp occupies the first place, with 15 tons million, either 90% of the total production of fishes, followed by Tilapia with 1.3 million thunders, or 8% of the total production of fishes and finally come the catfish with 0.42 million thunders or 2%. The production in sea water accounts for 36% of the world total production and that of brackish water 6% of the world aquicultural production (FAO, 2006). In Morocco, the aquicultural production accounts for only 0.19% of the total halieutic production. In 2004, the continental aquiculture knew a production of 685tonnes, this production is largely by the production of the common carp which only accounts for with it 88% of the total production (FENIP-9, 2010). In spite of its favorable climate, its wealth in lakes, lakes, rivers and of considerable number of reserves of stopping's (CHILLASSE *et al*., 2001), the continental fishing season does not release the discounted production (Chaker, 2004). Being integrated in these problems this work treats fish farming of Tilapia of the Nile (Oreochromis niloticus), a species of continental tepid water.

The use of the hydrous medium from the qualitative and quantitative point of view is one of the concerns constant of the aquicultural activity, because it conditions at the same time the choice of the site of breeding and the species to be exploited. And this is valid that it is in breeding extensive, intensive or semi intensive. Thus, the physicochemical characteristics of water of breeding are established starting from the parameters which describe the hydrous medium according to its components physical (temperature, density, transparency and suspended matter) and chemical (salinity, pH, made up nitrogenized and composed phosphorated). This work aims at main aim the determination of the ecological parameters of Tilapia of the Nile (Oreochromis niloticus) in the station of fish farming of Deroua with concerning Béni Mellal High Commission to National Forestry Commission and the Fight Against Desertification (HCEFLCD). The knowledge of the

***Corresponding author: Abba, H.** Biology and Health Laboratory, Environmental and Parasitology Team / UFR Doctoral Parasitology Compared: Medical and Veterinary Applications, "Sciences Faculty, Ibn Tofail University, Kénitra B.P. 133, 14000, Morocco.*

variation of these physico-chemical parameters informs about the conditions of breeding and makes it possible to the pisciculturist to intervene for better optimizing these parameters in the objective to ensure better a production.

MATERIALS AND METHODS

Presentation of the station of Deroua

The piscicultural station of Deroua of geographical contact: Latitude 32° 20 ' North and Longitude 6° 45 ' West and of 428m of Altitude is in the forest (artificial of Pine and Eucalyptus) domanial of Deroua at 20 km at the South-west of the town of Beni Mellal (Morocco). Of point of considering geological, the ponds of the station of Deroua rest on a brown ground isohumic subtropical developed on a layer of sediment of the quaternary means. It is characterized by a reddish color, an argillaceous texture and a low content limestone of the horizons of surface (Massoni and Missante, 1967). The fine texture of the lower horizons confers on this kind of ground a good retention of water. According to the bioclimatic stages of Emberger (1932), this area is classified in the semi-arid field at moderate winter. The water supply of the ponds of the station is done starting from the tablecloth by pumping of the two wells and dam Bin Elouidane.

Presentation of the pond of reproduction

The pond used for the installation of grabbed reproduction and of stocking with fish is the B4 pond of which the density of the tilapias (240 tilapias) is low compared to the other ponds (C4 for example). The B4 pond belongs to the series of the ponds of stocking with fish and enlargement of the station of Deroua (Figure 1). It is a pond of approximately 2000 m ². To make comparisons, one also used the C4 pond rich in plankton (compared to B4) and contains several hundred kilogrammes of Tilapia (important density).

Figure 1. photo of Happas in the pond B4 in the station of Deroua

Measurement of the physico-chemical parameters

Temperature, Oxygenates dissolved and pH

The temperature and oxygen are measured daily in situ on the level of the pond B4 (the pond containing grabbed them) during 12 hours over 12 midnight using an oxymeter of pocket (temperature in degree Celsius and oxygen in mg/l and %). The temperature and oxygen are measured 6 a.m. of the morning at 12 noon to have the evolution of these two parameters in the course of the day and still of 6 hours of the afternoon at midnight to have the evolution of these same parameters in the night. The measurement of the Hydrogen potential was made by portable measuring equipment during the study period.

Chemical parameters

Besides nitrites, nitrates, orthophosphates and ammonia, free chlorine, total chlorine and the carbonates are given by means of the case Hach DR/2400. The samples of water which were useful for measurements of the nitrogenized compounds, cogitated and of chlorine are taken in the B4 pond only. The samples of water are taken before and after the filling of the pond. The taking away is of 5 times during the period of the experimentation which lasted of Mars in the month of May 2007, period coinciding with the period of reproduction of the tilapia.

RESULTS AND DISCUSSION

Temperature

The water of the ponds of the station of Deroua has an average temperature which varies 21°C with 30°C in the month of May and June (Kassila, 2000). For the period of reproduction, be-with-to say 3/25/07 to 4/25/07, the temperature of water varied 15, 5°C with 24°C. For the period of stocking with fish (5/1/07 and 5/24/07), it varied from 21 with 27°C (Figure.2).

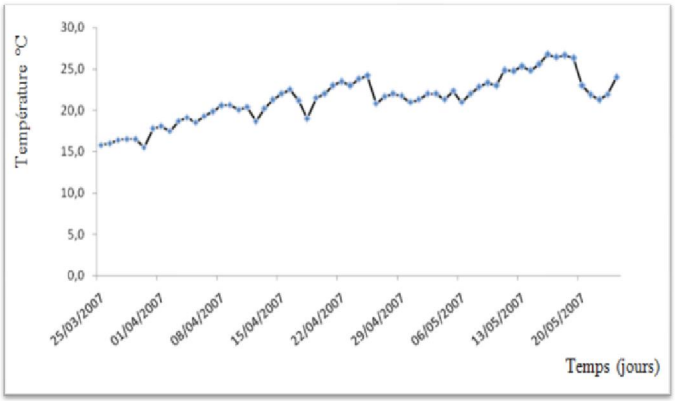

Figure 2. variation of the daily average temperature during the period of the study

During the period of stocking with fish, the temperature was always above 20°C. This range of temperatures enters the standards of breeding of tilapia (Ouattara *et al*., 2005) and makes it possible Tilapia of the Nile to develop the secondary sexual characters and to reproduce (Balarin and To Haul, 1982). The follow-up also of the change of the temperature in the morning and the afternoon on the level of the ponds (B4 and C4) during the period of reproduction (from April 5th to April 25th) shows that the temperature varies in a constant way between 18°C on average at 6:00 of the morning and reached about 21°C. In the same way, the temperature increases of more than 2°C between 10 a.m. and 12 hours. This is due at the height solar radiation. The afternoon, it falls of more than 2°C between 6 p.m. and 22 hours, this fall of temperature is also observed between midnight and 6 hours of the morning (Figure 3).

Dissolved oxygen

Oxygen is an essential component in the watery breeding in confined surroundings (Melard, 1986). The variation of the average day labourers of the oxygen dissolved during the

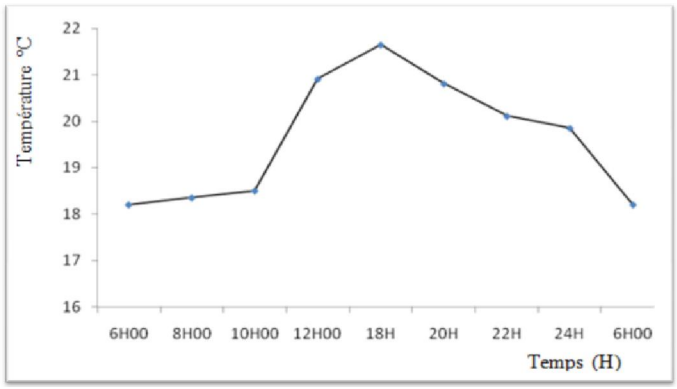

Figure 3. Evolution of the temperature in the morning and in the afternoon during the period of reproduction

period of the study (Figure 4) shows that the concentration is generally higher than 6mg/in the ponds B4 and C4 during all the duration of the period of reproduction and stocking with fish. This oxygen rate dissolved in the water of the ponds reached peaks of more than 12 mg/l on average (150% of saturation) (Fig.4). The lowest content raised expressed as a percentage of saturation was always higher than 50%. Tilapia can support rates of saturation from less 25% (Rappaport and *et al.,* 1976). These variations are explained by the photosynthetic activity ratio which is influenced by the solar radiation (released time or overcast sky).

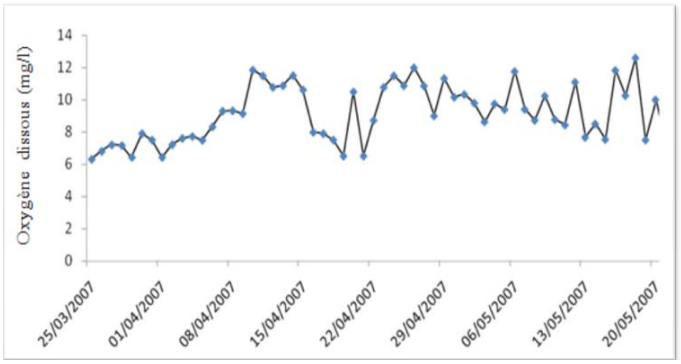

Figure 4. Oxygen dissolved during the period of the experiment

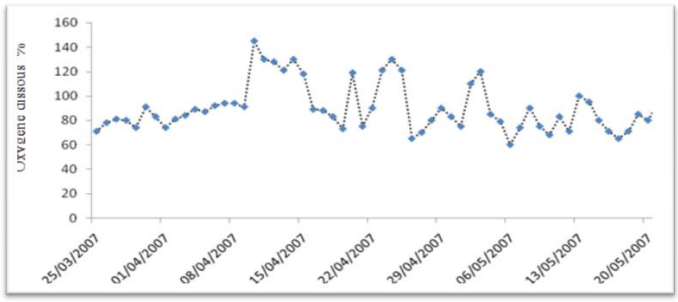

Figure 5. Oxygen dissolved in % of saturation during the period of the experiment

The oxygen content falls on its level low, early the morning around 5 a.m. and 6 hours and reached its maximum level in the end of the day towards 5 p.m. 18 hour (Fig.6). The oxygen content stored during the day in water of the ponds is consumed partly by the fishes which live in the ponds and also by the breathing of the other living beings of the pond (algae, benthos, bacteria, zooplankton etc.) during the night. On the level of figure 13, one notices that the slope of the curve is weak between 6 A.m. and 12 hour but it is important between 12 noon and 18 hour. This shows us that the dissolved oxygen content of water of the ponds depends much more of the phenomenon on photosynthesis that other factors.

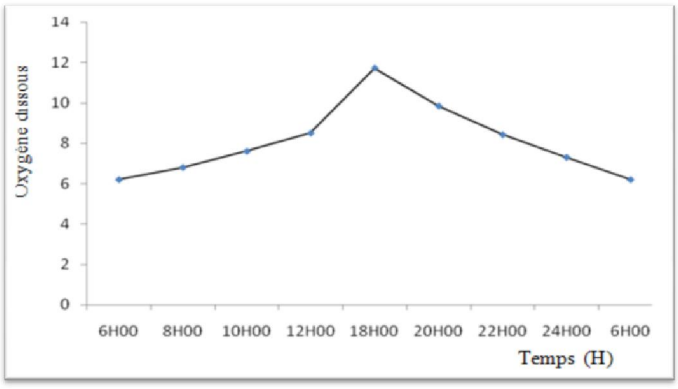

Figure 6. Evolution of oxygen in the morning and the afternoon for the period of reproduction

According to Boyd and Tucker (1998) the temperature is a crucial factor for the growth of fishes. Any variation in the mode of this environmental characteristic can involve a difference in growth (Halvorsen and Svenning 2000). On the level of the Deroua station, the temperature average day labourer varied 16°C with 30°C, and the average temperature for the study period is of 24°C. This one is sufficient for the development of the secondary sexual characters (Fryer and Islands, 1972) and to induce the growth at the Oreochromus niloticus (Lazard, 1984). It was observed that with an average temperature of 24°C, the average content oxygen is of 8mg/l, which is higher than a saturation of 80%. In the intensive semi breedings, this oxygen content is favorable to the growth and the fish reproduction. When the oxygen contents are below 25%, it occurs a deceleration of the biological activities of tilapia and, in particular, the reduction in the speed of growth (Rappaport and *et al.,*1976). For the correction of the falls of oxygen which occur of time to other (high density of fish, overcast sky…), the floating aerators are started until the re-establishment of balance, generally, water of the station of Deroua offers the oxygen concentrations favorable for the tilapia nilotica since the minimum of l' necessary dissolved oxygen being 2 to 3 mg/l (Ouedraogo, 2010). Table 1 summarizes the temperatures and the average concentrations of dissolved oxygen as well as Hydrogen potential pH.

Table 1. Median values of temperature, dissolved oxygen and of the Hydrogen potential on the level of the station of Deroua

Parameters	Medium values
Temperature (°C)	24
Dissolved oxygen (mg/l)	8
Hydrogen potential pH	8,5

The Hydrogen potential (pH) of water of the B4 pond (and the ponds A1, A3, B3), was measured for the same period of our study (Mars, April, May) and this confirmed the values ranging between 7.6 and 9.4 found by KASSILA in 2000. The tolerances being from 5 to 11 (Cheervinski, 1982) and the pH recommended for the breeding varies between 7 and 8.

Table 2. Median values of the chemical parameters on the level of the station of Deroua

Parameters	values
Nitrate NO_3 (mg/l)	2,4
Nitrite NO_2 (mg/l)	- -
Nitrogenize ammoniacal (NH_3) (mg/l)	0,17
Orthophosphore (PO_4^{3-}) (mg/l)	0,35
Total hardnessmg/l	320
Transparency of the pond C4 (Cm)	20
Free chlorine (mg/l)	0,05
Total chlorine (mg/l)	0,08

For the other chemical parameters (Table 2), the content of nitrites in water of the ponds of Deroua, is very weak (in trace). The lethal concentration is beyond 2.1 mg/l (Balarin and To Haul, 1982). The lethal values of ammoniacal nitrogen are beyond 2,3mg/l. With concentrations higher than 0.5 mg/l, one can observe affections of the gills and mortality if there is fall of the oxygen contents or frequent handling of fishes (Balarin and TO Haul, 1979) thing not observed since the concentration of oxygen is very important. For ammoniacal nitrogen, the average concentration was of 0, 17mg/l. The nitrates have a median value of 2,4mg/l and this rate does not pose any problem with the breeding of Tilapia. The average content orthophosphate in the water of the pond is 0.35 mg/l this means that the pond is still rich in orthophosphate cumulated in the sediments during years of commissioning of the ponds this value will contribute to the increase in the total biomass of the pond. For free chlorine and total chlorine, the concentrations are very weak and without negative effects on the toxicity which generated the nitrites can. According to Boyd (1990) water with low hardness (& lt; 20 Mg/L of CaCO3) are unproductive and unsuitable water with any piscicultural activity. The total hardness of water will have to be ranging between 20 and 350 mg/l of CaCO3 (Boyd, 1979). The ground waters of the station of Deroua have a total hardness d' approximately of 320 mg/l thus productive and is appropriate for the fish farming. This value is due to in the of Tadla cross. For the transparency, the comparison of the value recorded on the level of the station of Deroua (200 mm) and that recorded by Ouattara (2005) 285mm ± 90 does not show a great difference. The value is due to the activity and the development alguale what supports the enrichment of the medium out of oxygen favorable for the growth and the development of tilapia.

REFERENCES

Balarin, J. D. and. Haller, R. D.1979. Africa tilapia farm shows profit potential. *Fish farming. International*. 6(2):16-18.

Balarin, J.D. and Haller, R.D. 1982. The intensive culture of tilapia in tanks, raceways and cages. In: Muir and R.J. Roberts (eds.), *Recent Advances in Aquaculture*. Westview Press, Boulder, CO, USA: 265–355.

Boyd, C.E. 1990. Water quality in pond aquaculure, alabana agricultural experiment station. Auburn University Auburn.).

Boyd, C.E. et Tucker C.S., 1998. Pond aquaculture water quality management. Boston Dordrecht London: Kluwer *Academic Publishers*: 700 p.

Chaker, Y., 2004. La détermination des indicateurs socio-économiques de la pêche continentale au Maroc). Mémoire de 3ème cycle, ENFI, Salé, 123p.

Chervinski, J. 1982. Environmental physiology of Tilapia. In: The biology and culture of Tilapia, ICLARM Conf. Proceed., 128p.

Chillasse, L, Dakki. M. et Abbassi. M. 2001.Valeurs et fonctions écologiques des Zones humides du Moyen Atlas (Maroc).

FAO. 2006. Près d'un poisson sur deux provient de l'aquaculture (La dernière consultation en date de 30 Mai 2007.

FAO.2012. Rapport de la situation mondiale des pêches et de l'aquaculture, organisation des nations unis pour l'alimentation et l'agriculture. Rome 2012.

Fenip-. 9. 2010. Maroc Aquaculture. Etude de l'état des lieux de l'aquaculture Services au Maroc et identification des marchés aquacoles cibles et de leurs conditions d'accès. Etude aquaculture

Freyers, G and Iles TD.1972. The Cichlid Fishes of the Great Lakes of Africa: Their Biology and Evolution. Oliver & Boyd, Edinburgh.

Halvorsen, H. and Svenning M.A.2000. Growth of Atlantic salmon parr in fluvial and lacustrine habitats. J. Fish Biol., 57: pp.145-160.

Kassila, J. 2000. Etude physico-chimique des eaux et des sédiments des étangs de pisciculture de la Deroua (Beni Mellal- Maroc) Thèse de doctorat option hydrobiologie faculté des sciences Rabat 157 p.

Lazard, J. 1984. L'élevage du Tilapia en Afrique. Données techniques sur sa pisciculture en étang. Revue Bois et Forêts des Tropiques, 206 p.

Massoni, C. et Missante, G. 1967. La plaine de Tadla. Les Cahiers de la Recherche Agronomique, 24, r 63- I 94.

Emberger, L., 1932. Sur une formule climatique et ses applications en Botanique. La météorologie, 10 p.

Ouattara. N, N'douba. V, Kone. T, Snoeks. J and PHILIPPART J-C.2005. Performance de croissance d'une souche de tilapia isolée du tilapia estuaire Sarotherodon melanotheron (Perciformes, Cichlidae) en bassins en béton, en étangs en terre et en cages flottantes. Ann. Univ. M. NGOUABI, 2005, 6 (1).

Ouedraogo S. 2010. Biologie de reproduction du Tilapia Oreochromis niloticus du lac de Barrage de la Comoe. Mémoire de fin d'étude présenté en vue de l'obtention du Diplôme d'Ingénieur du Développement Rural Option Eaux et Forêts

Rappaport A. 1976. Sarig, S. and Marek, M. Results of tests of various aeration systems on the oxygen regime in Genosar experimental ponds and growth of fish there in 1975. Bamidgeh 28, 35–49.

****