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# Evolution of Earthen Pond Water Chemical and Physical Parameters in Polyculture System (Case of Nile Tilapia, Largemouth Bass, Chinese Carps) at Deroua Fisheries Station (Fkih Ben Saleh, Morocco)

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## Keywords

Evolution • Physical • Chemical parameters • Rearing • Polyculture

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## 1 Introduction

Continental fish farming has become one of the essential activities ensuring food security and maintaining high socio-economic impact values. Yet, inland aquaculture is still facing major constraints, relating particularly to water supply and quality. Water quality represents a major concern in aquaculture, as it may considerably result in limiting fish production. In this respect, the present study was conducted at the Deroua Fisheries Station, Fkih Ben Saleh in central Morocco, over the months of June to December 2013, on the rearing of Nile Tilapia in polyculture with the Black Bass and the Chinese carps. The study was aimed at monitoring the evolution of the fish-rearing water physical and chemical parameters, to determine whether the water's quality displays any variations in regard of the fish-rearing recommended standards. This study has concerned nineteen ponds of 2000 m<sup>2</sup> in surface area.

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## 2 Material and Methods

This study was conducted over the period ranging from June to December, 2013. The physical parameters subject of study were: water temperature, pH, electrical conductivity, dissolved oxygen as well as water transparency, as analyzed via Secchi disk. These parameters were checked twice to thrice a month, and were measured in ponds, either at the beginning or at the end of the day.

As for the chemical parameters, subject of analysis, they were: nitrate, nitrite and orthophosphates. The parameters' relating analysis, performed on a monthly basis, was carried out on a composite sample attained by mixing equal parts of four water samples taken from the pond sides.

The ponds' water supply stems from a groundwater and the water flowing from Bin el Ouidane dam.

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## 3 Results and Discussion

Nitrates, nitrites, and orthophosphates, as derived from the groundwater supply were of rates of 7.14, 0.09 and 0.07 mg/L, respectively. As for those relating to temperature, pH, electrical conductivity and dissolved oxygen, they were, respectively, 21 °C, 7.7, 1080 µs/cm and 5.6 mg O<sub>2</sub>/L<sup>-1</sup>. Actually, groundwater is slightly alkaline, highly mineralized and rich in nitrates.

The chemical parameters, subject of study, proved to vary in terms of the ranges recommended for the reared species. Nitrates appeared to range between 0.12 and 5.89 mg/L. This variation relates mainly to each pond associated richness as well as the difference noticeable in the groundwater addition frequency (rich in nitrates), relevant to the difference in seepage rates at each pond level.

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Actually, nitrites, as observed in pond water, appeared to fluctuate between 0.001 and 0.35 mg/L. These levels do not seem to exceed the farmed species' supported levels (Boyd 1982). The noticeable variation of nitrites is due mainly to the oxidation-reduction phenomenon of ammonium and nitrate to nitrite, under the effect of bacteria.

Concerning orthophosphates, they proved to range from 0.0001 to 2.19 mg/L. In effect, the phosphorus adsorbed at the level of iron and calcium, in the sediments, turns out to be released by dissolved oxygen and pH (Kassila 2000; Hasnaoui 2001). This variability has its origin in the intensity of organic matter and energy flow, as circulating within the trophic levels (Barbe et al. 1991).

Regarding temperature, it proved to fluctuate between 19.7 and 32.5 °C. The variation among ponds, as noted over the same sampling period, did not sound to exceed 3 °C. Temperature seemed to vary during the study period of a range favorable to the growth of cyprinids (Billard 1995), black bass (Heidinger 1976; Ouizgane et al. 2017) and tilapia.

The variations noticeable in dissolved oxygen across the ponds turn out to be important during the rearing period, ranging between 4.11 and 19.66 mg/L. The dissolved oxygen distribution values proved to be comparable among the various ponds, as the waters seemed to be very well oxygenated.

The pH values have oscillated between 7.55 and 9.98 over the study period. Only a single value (11.42) was discovered to exceed this range, noted for October the 12th. Concerning electrical conductivity, it proved to vary between 575 and 1040  $\mu\text{s}/\text{cm}$  in the ponds. Generally, water of rearing ponds is moderately to highly mineralized.

Water transparency, it was evaluated in terms of Secchi Disk disappearance depth. The relevant values seemed to vary from one pond to another. Differences in water transparency could well have its explanation in the development of phytoplankton (Hasnaoui 2001), along with the macrophytes' associated effect (Farid 2015).

#### 4 Conclusion

The present study has been devoted to deal with the cited ponds' water quality evolution. The parameters studied proved to record some noticeable variations in respect of the standards recommended for a favorable fish rearing life. Indeed, most parameters did not appear to exceed the limit values necessary for the farmed species.

Regarding the variation observed in the physical and chemical parameters' pertaining evolution, it has its explanation in each pond related eutrophication level, water supply as well as the farmed species' relevant effect.

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