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Water quality and growth performance of common carp under the exposure effect of electromagnetic fields

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Outline of Presentation

- Introduction
- Materials and Methods
- Results
- Conclusion

Potential Uses of Magnetic Field (MF)

Magnetic field (MF) has been successfully used in different sectors:

- Agriculture
- Wastewater treatment
- Scale prevention.
- Food processing

MF can affect
Surface tension, density, viscosity, hardness and conductivity of water

Benefits of MF in the Agriculture

In farming MF can improve:

- Quality of irrigation water
- Seed germination
- Crop yield

In animal production, MF can also improve the health of livestock.

MF in Wastewater Treatment

In wastewater treatment MF can:

- Control decomposition
- Increase biodegradability of microorganisms
- Improve the solubility of solid matter.

Magnetic drum separator for wastewater treatment

Limited applications of magnetic treatment in aquaculture

- Krzemieniewski et al., 2004 — European sheatfish (*Silurus glanis* L.) larvae
  MF intensity = 400 to 600 Millitesla (mT).
- Tang et al., 2015 — Juvenile sea cucumber (*Apostichopus japonicus*)
  MF intensity = 100, 300 and 500 (mT)
- Nofouzi et al.. 2017 — Rainbow trout (*Oncorhynchus mykiss*).
  MF intensity = 0.1, 0.5, 5 and 50 microtesla (µT)
- Hassan et al. 2018 — Red hybrid tilapia (*Oreochromis sp.*)
  2018 — Egg hatchability of African catfish (*Clarias gariepinus).*
  2019 — Jade Perch (*Scortum barcoo)*
  MF intensity = 0,100, 150 and 200 (mT)

Conclusion of these studies:

- Response of fish to the MF varies from one species to another.
- More experiments need to test the effects on different species of fish.
- There is a debate about the effect of MF on water quality.

Aim of the study

Our study aimed to investigate the effects of electromagnetic field on water quality and growth performance of common carp in a recirculating aquaculture system.

MF Generator

- Commercial electromagnetic field generator
- Frequency: 25 kHz
- Low intensity: 0.8 Millitesla (mT).

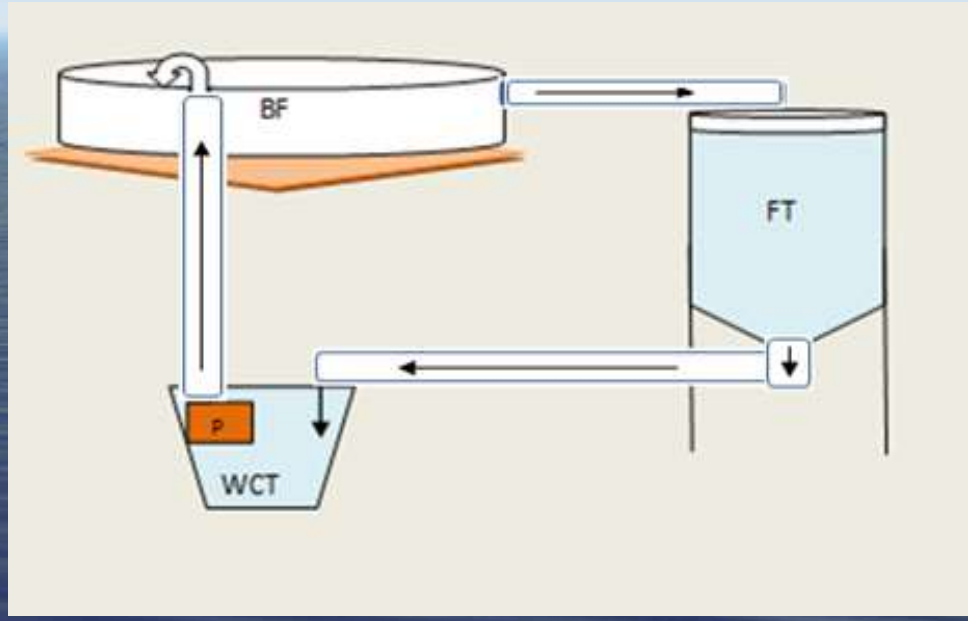
Electromagnetic Field Generator Multi Plus
(IVT,Hirschau, Germany)

Experimental design and rearing conditions

- **Six independent units (two treatments, three replicates each)**

FT: Fish tank (55L)
WCT: Waste collection tank (36 L)
BF: Biological filter (60L)
P: Pump.

- **Fish biomass:** 127g/Tank
- **Initial stocking density:** 2.3 kg/m³
- **Flow rate:** 3 L/min
- **Feeding rate:** 3.5% BW
- **Water replacement:** 30% weekly



Sampling and measurements

- Dissolved oxygen (DO)
- Temperature
- pH

Daily (fish tank)

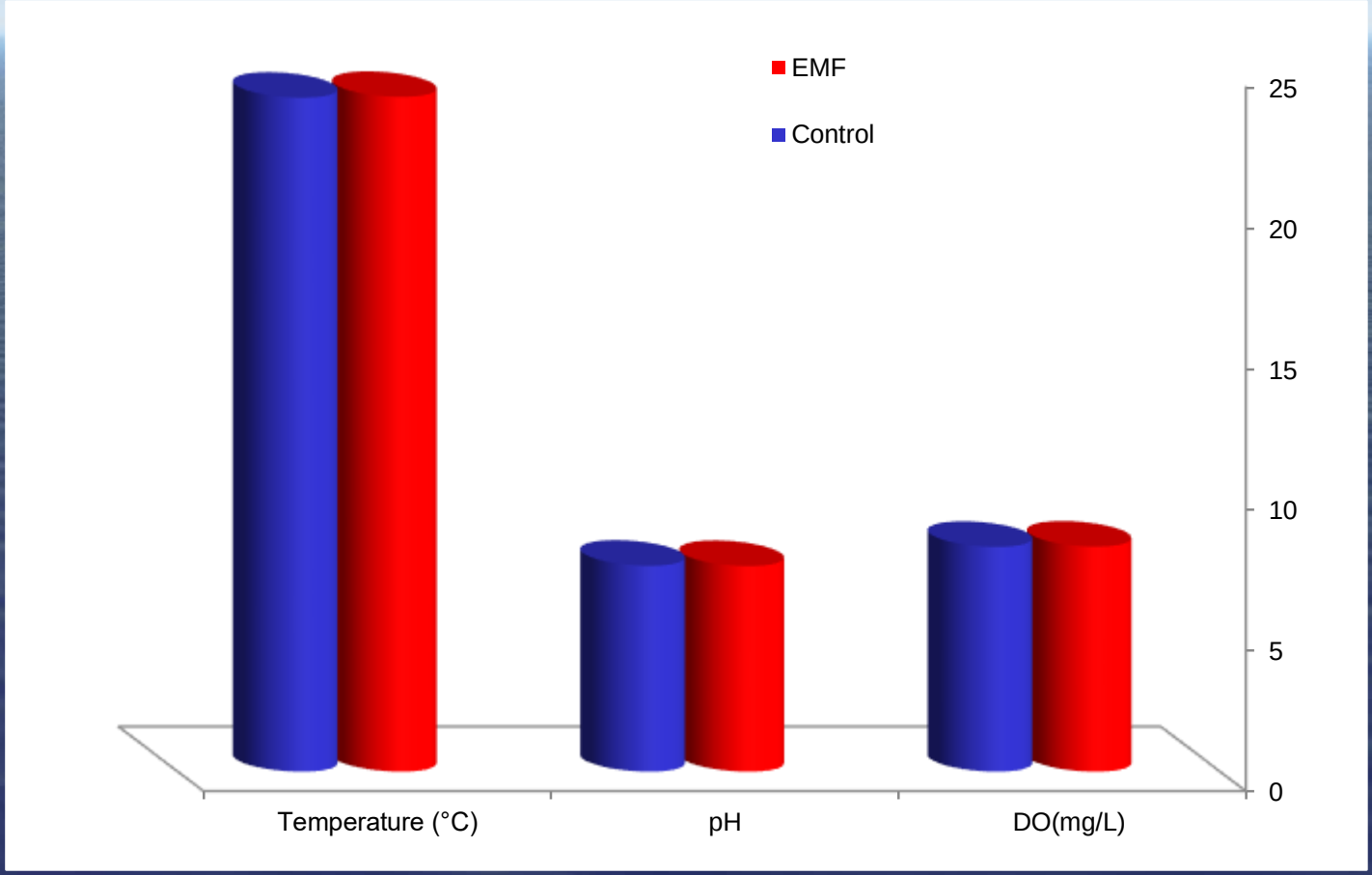
- Ammonium nitrogen (NH_4-N)
- Nitrite nitrogen (NO_2-N)
- Nitrate nitrogen (NO_3-N),

Weekly (fish tank)

- Growth and survival of fish (at the end).

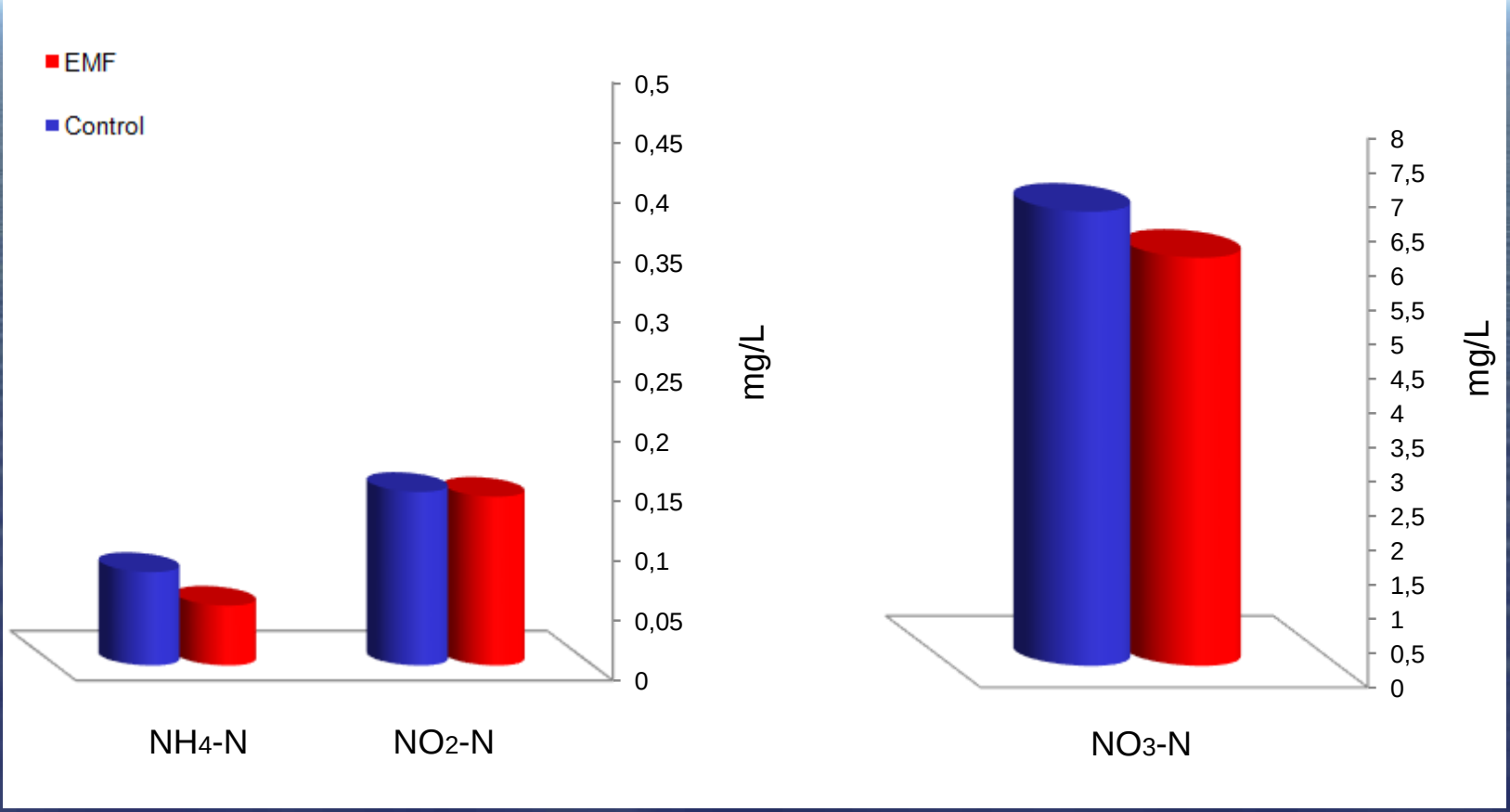
common carp *(Cyprinus carpio* L.*)*

(I) Eelectromagnetic field had no effects on water quality



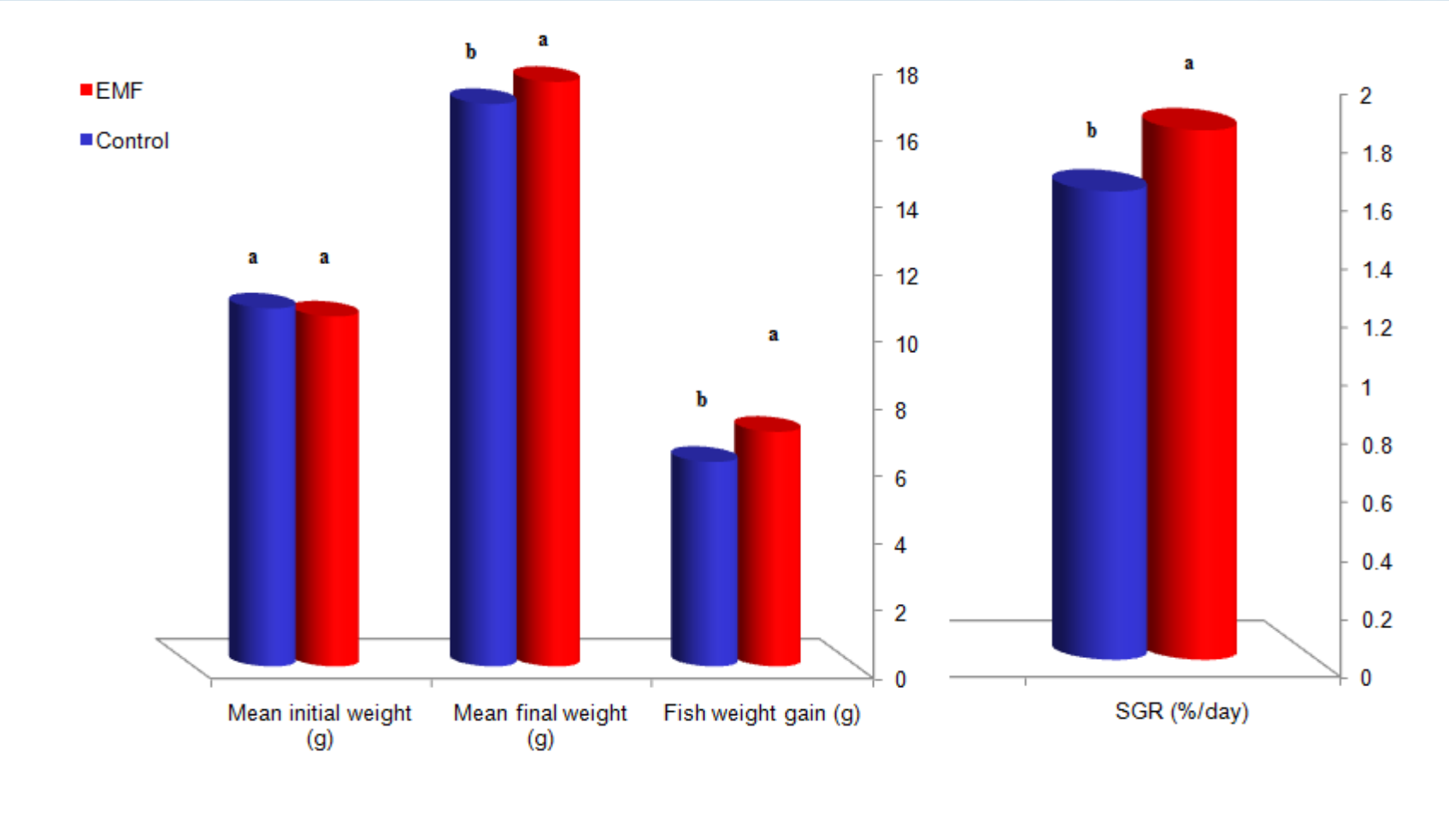
No significant differences P>0.05 (t. test)

(II) Eelectromagnetic field had no effects on water quality



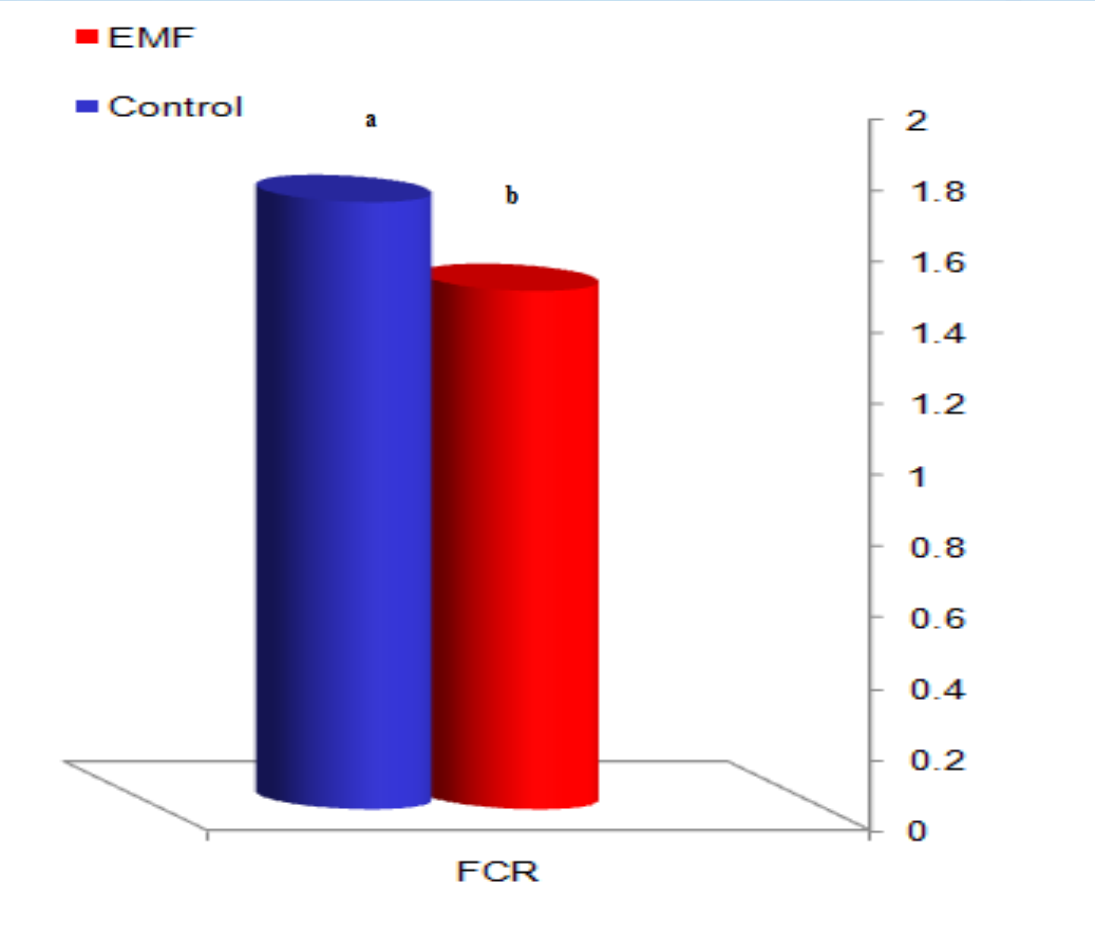
No significant differences P>0.05 (t. test)

EMF increased the growth Performance of fish



Significant differences P<0.05 (t. test)

EMF increased Feed utilization efficiency of fish



Significant differences P<0.05 (t. test)

Conclusion

- The electromagnetic field of 0.8 mT improved the growth of common carp in RAS
- Feed utilization efficiency also improved.
- No significant effect on water quality parameters.
- The electromagnetic field can has beneficial effects on the operation and total production cost of RAS.

Thank your for listening