Effects of different monophosphates supplementation on growth, feed utilization, nutrient digestibility, mineral retention and metalo-enzyme gene expressions in juvenile rainbow trout, *Oncorhynchus mykiss*

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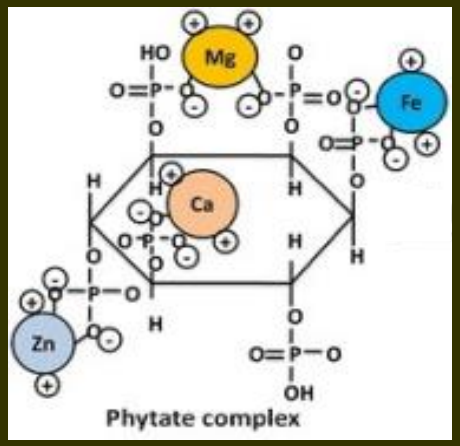
Background

Fishmeal (FM)

➢**Most preferred protein source in aquafeed.**

➢ Modern aquafeed formulations include a lower content of FM and higher inclusion of alternative plant protein sources.

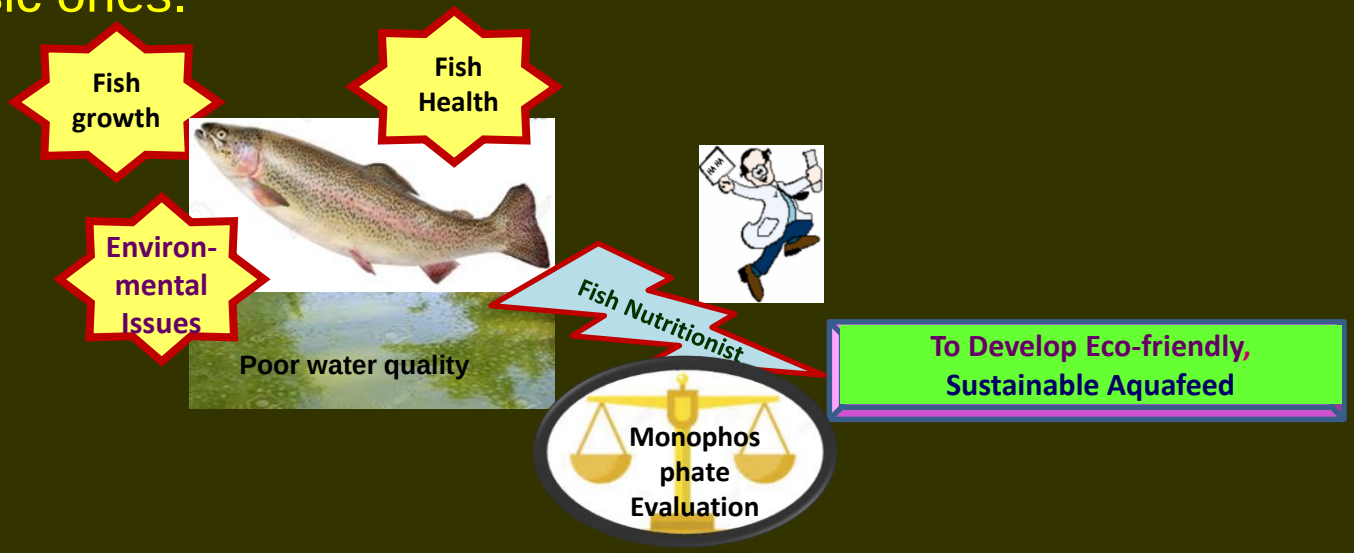
Plant proteins as alternative FM sources used in aquafeed.



- Phytate (myo-inositol hexaphosphate) is the principal storage form of P in plant seeds which are nutritionally unavailable for mono-gastric animals.

- Inorganic phosphates (mon/di/tri basic) are added to formulated animal feeds to accurately cover mineral requirements, especially P.

- Considering bioavailability of minerals, monobasic form is more available than di or tri basic ones.



Specific objectives

- To evaluate the effects of different dietary monophosphates on growth, feed utilization, digestibility and mineral retention of juvenile rainbow trout.

- To observe different monophosphates supplementation effects on the metalo-enzyme genes expression of rainbow trout.

Summary of methodologies

Experimental site: Wet laboratory of ILEE, University of Namur, Belgium.

Experimental system Re-circulatory system (Flow rate 1.5 L min^{-1})

Treatments: Four (4)

Replication: Three (3)

Duration: 60 days

Initial weight : 18.5 ± 0.1 g

Stocking density: 26 Fish/ Aquarium

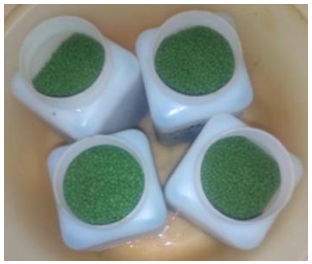
Aquarium size 100 L

Feeding regime: Satiation feeding; Twice daily

Feces collection: Siphoning process (5-6 h after feeding)

Re-circulatory system

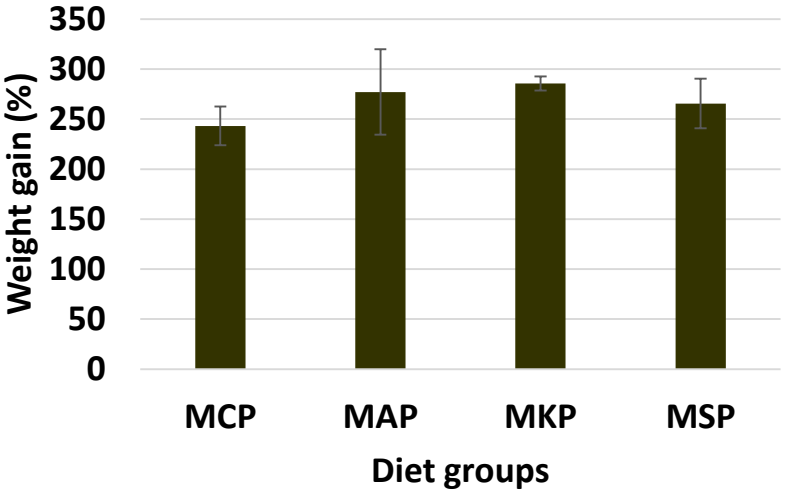
Collection of feces

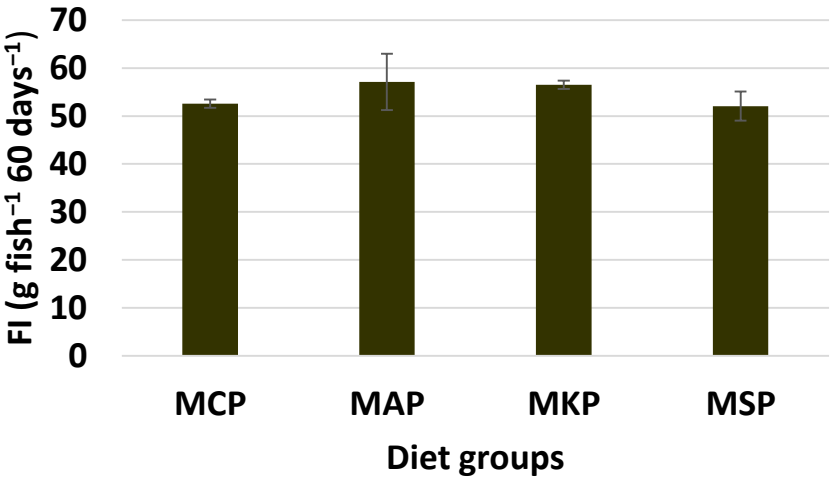


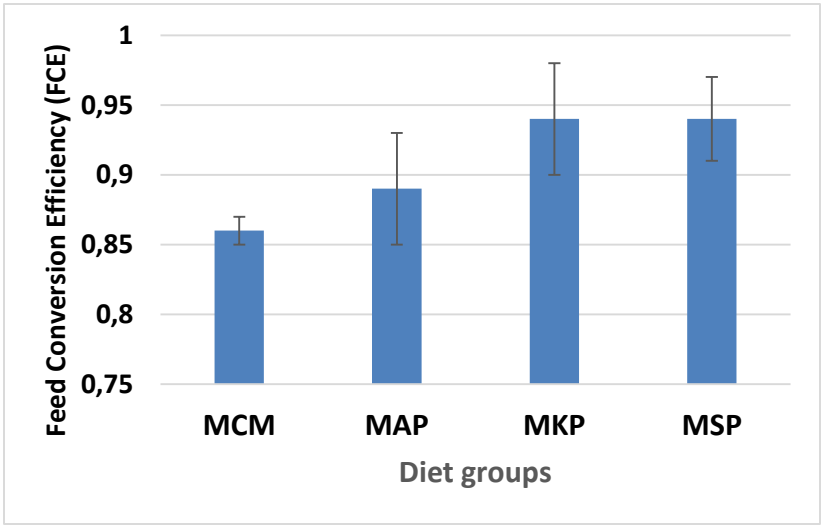
Experimental diets

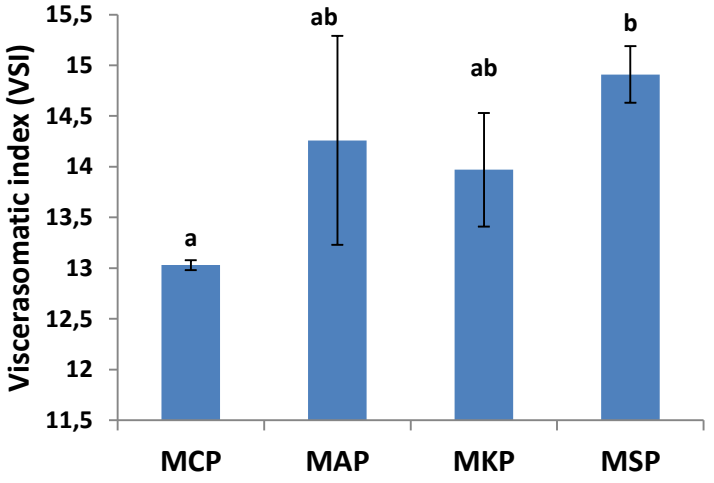
Rainbow trout juveniles

Findings: Growth Performances

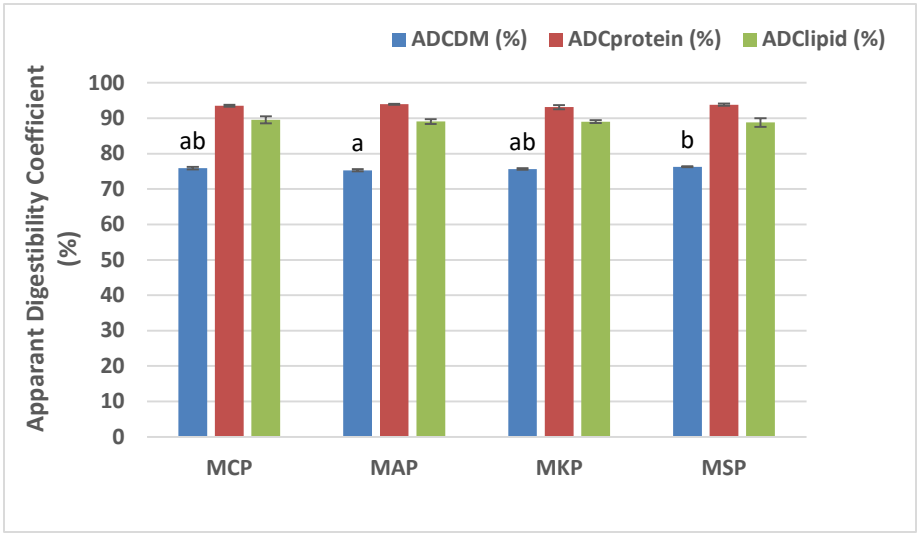


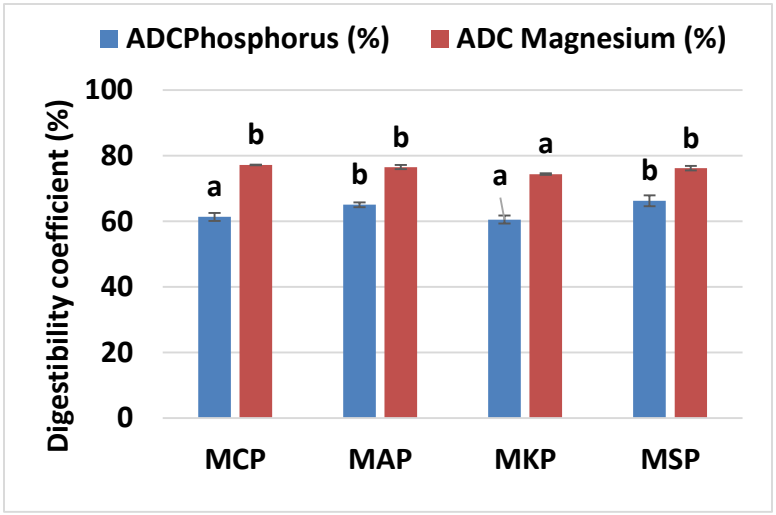


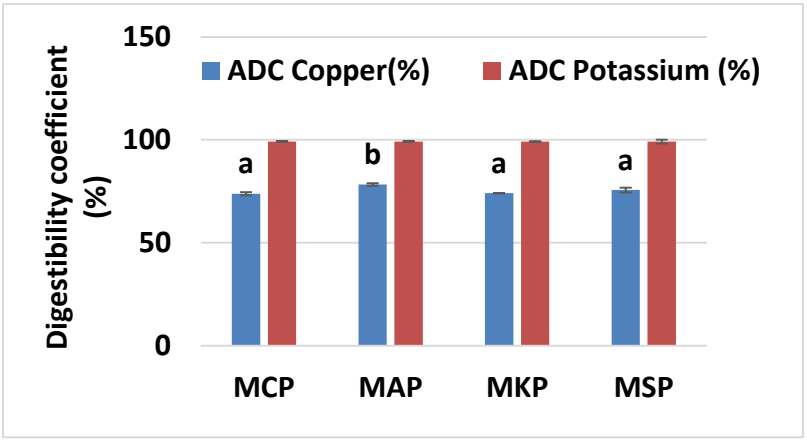


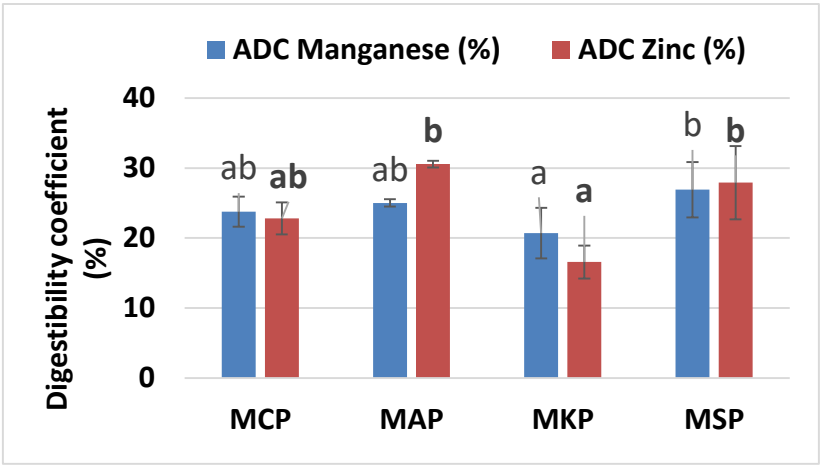


Findings: Digestibility Co-efficient









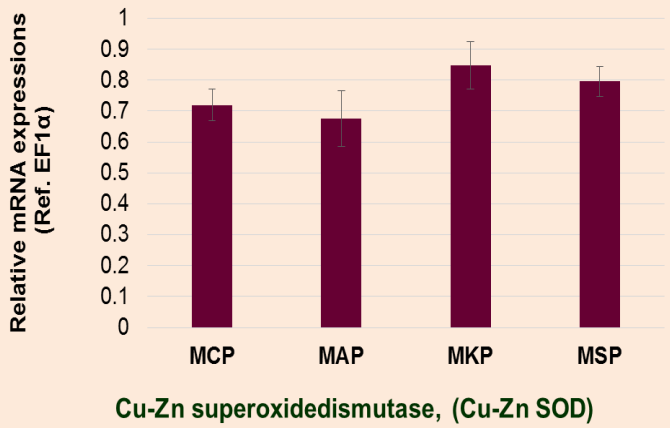
Figures: Apparent Digestibility Coefficient of rainbow trout fed experimental diets.

Findings: Minerals Retention

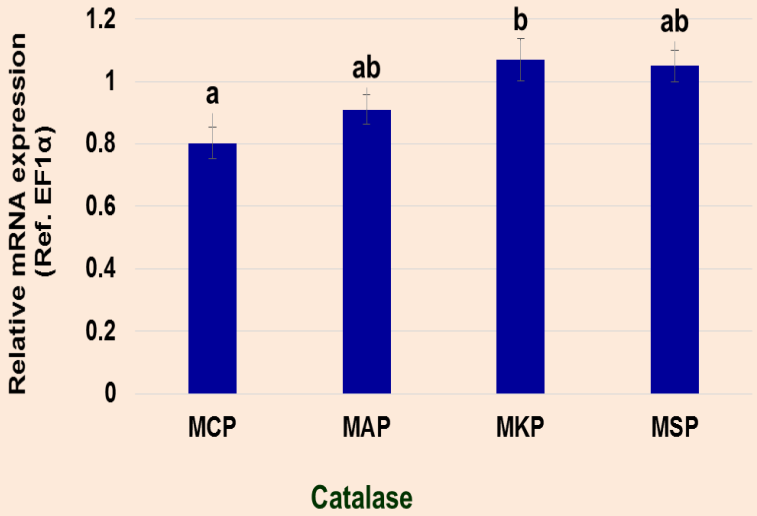
Parameters	Diet groups			
	MCP	MAP	MKP	MSP
Phosphorous (P)	14.37±4.54a	35.86±8.43ab	58.71±8.58b	29.69±9.09ab
Calcium (Ca)	12.10±8.16	45.86±14.97	66.39±13.46	25.90±11.97
Potassium (K)	18.94±5.03	28.34±1.98	28.68±1.09	21.05±4.35
Magnesium (Mg)	7.01±1.90a	17.54±3.23ab	25.75±2.58b	11.34±3.21a
Manganese (Mn)	0.41±0.22	1.15±0.31	2.18±0.85	0.64±0.30
Zinc (Zn)	2.33±0.55a	6.06±0.95b	5.55±0.31ab	3.96±1.02ab
Iron (Fe)	0.80±0.29	1.94±0.30	2.11±0.48	1.25±0.37
Copper (Cu)	1.92±0.50a	4.59±0.58b	4.25±0.15b	3.48±0.48ab

- Mineral gain (MG, g $fish^{-1}$) = {(final dry matter of fish (g) × final whole body mineral content (%)/100) − (initial weight in DM (g) × initial whole body mineral content (%)/100)}
- Mineral retention (MR, % of intake) = {(Mineral gain (MG, g $fish^{-1}$) /Mineral supply (g $fish^{-1}$) } × 100

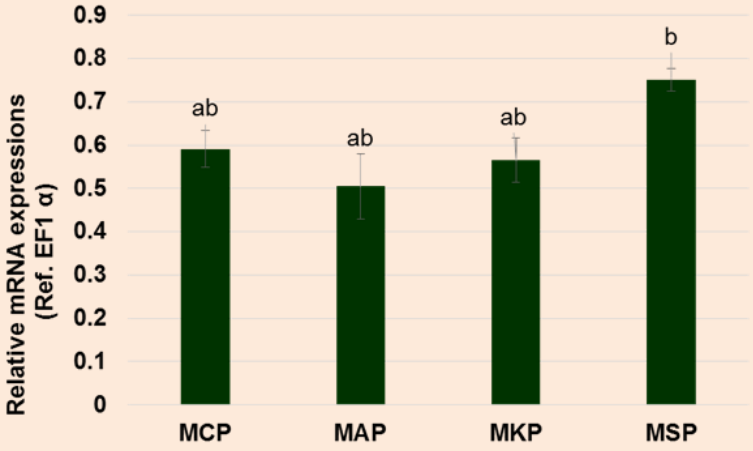
Hepatic metalo-enzyme genes expression



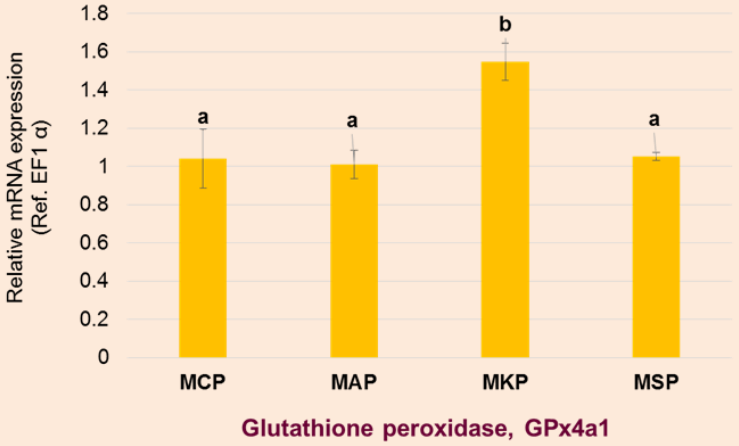
Cu-Zn superoxidedismutase, (Cu-Zn SOD)



Catalase



Glutathione peroxidase, GPx1b1



Glutathione peroxidase, GPx4a1

Take Home Messages….

- Among different monophosphate supplements MAP and MKP improved the growth and feed utilization performances

- MAP and MSP showed significantly higher minerals digestibility in comparison to other supplements.

- Minerals retention was significantly higher mostly in MKP supplemented group.

- Hepatic metalo-enzyme genes (Catalase, GPX1b1 and GPx4a1) showed significantly higher relative mRNA expressions in fish fed MKP and MSP diet groups.

- Finally, we concluded that monophosphates (MAP, MKP and MSP) support improved overall performance of rainbow trout compared to MCP.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