

## **Evaluation of potassium diformate and potassium chloride in the diet of the African catfish, *Clarias gariepinus* in a recirculating aquaculture system**

### Highlights

- Potassium diformate can improve the haematological profile of the African catfish, when included in its diet.
- Potassium feed additives can affect potassium concentration in wastewater for potential use in aquaponics systems.
- Potassium feed additives may potentially minimise potassium supplementation in aquaponics while improving fish health.

### Abstract

This study focused on developing feed for aquaponics that would be beneficial to plant and fish production.

Aquaponics is an integrated production system combining aquaculture and hydroponics.

However, it is difficult to maintain synchrony between fish and plants because they have different nutritional requirements.

Therefore, there is a need to develop feed uniquely for aquaponics systems, to meet the demands of both fish and plants. The results presented are the first phase of a two-phase study.

The first phase was a standard feeding trial in a recirculating aquaculture system using the African catfish. Potassium, an essential mineral for fish and plant production, was added to fish feed from different mineral sources to evaluate it as a dietary feed additive. Potassium diformate (KDF) at 3, 6, and 9 g kg<sup>-1</sup> and potassium chloride (KCl) at 1.7, 3.4, and 5.1 g kg<sup>-1</sup> were used.

The trial used three replicates per treatment of 10 fish with an average weight of  $\pm 112$  g per 100 l tank for 96 days. Samples were taken after 96 days and one fish per tank was sampled to measure proximate composition, non-specific immunity parameters, tissue mineral analysis, and haematology.

To measure production parameters, fish were weighed at the start of the trial and every four weeks subsequently.

In separate trials, the effects of the feed additives on water quality and apparent digestibility coefficient of potassium were evaluated. Proximate body composition of the fish was significantly affected by the feed additives, except for the ash content ( $p > .05$ ). Moisture content significantly differed between the control diet ( $79\% \pm 1.16$ ) and diets containing KCl 1.7 and KCl 5.1 ( $76\% \pm 1.44$ ;  $76\% \pm 0.37$ ). Haematology parameters showed significant differences. Haematocrit (HCT) levels differed significantly from  $36.76\% \pm 1.84$  for KDF 9 to  $32.11\% \pm 2.30$  for KCl 1.7, KDF 9 had the highest Haemoglobin (Hb) levels, while there were no differences in red and white blood cell counts.

The water quality parameters tested were also significantly affected by the different dietary treatments.

Wastewater from KDF dietary treatments showed improved potassium concentration compared to the control. The study showed that the inclusion of potassium from KDF as a dietary source in fish feed can improve the haematological profile of the African catfish compared to the control, based on this, it has the potential for use in integrated aquaponics systems.

#### Keywords

Potassium supplementation Aquafeeds Aquaponics Haematological profile potassium diformate

#### Abbreviations

ADCapparent digestibility coefficientANOVAanalysis of varianceAOACAssociation of Official Analytical ChemistsEDTAethylene diamine tetra acetateFCRfeed conversion ratioKDFpotassium diformateHbhaemoglobinHCThaematocritHSIhaemosomatic indexMCHmean corpuscular haemoglobinMCHCmean corpuscular haemoglobin concentrationMCVmean corpuscular volumeMS-222tricaine methanesulfonatePEGpoly-ethylene glycolRBCred blood cellsSGRspecific growth rateWBCwhite blood cells

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Potassium Diformate, Sodium Diacetate, Calcium Formate

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