

Table 27. Dietary nutritional deficiency, essential amino acid (EAA), fatty acid (EFA) and minerals

Essential amino acid	Deficiency signs/syndrome
Lysine	Dorsal/caudal fin erosion, retarded growth, increased mortality
Methionine	Retarded growth, cataract
Tryptophan	Retarded growth, scoliosis, lordosis, caudal fin erosion
Essential fatty acid	Retarded growth, swollen pale liver, fatty liver

In bold : Reported EFA deficiency signs for *O. niloticus* , not in bold : general EAA deficiency symptoms in fish

Data source: (1) Tacon (1987a); (2) Tacon (1992)

Minerals	Deficiency signs/syndrome
Phosphorus	Lordosis, poor growth.
Calcium	Reduced growth, poor feed conversion and bone mineralization
Potassium	Reduced growth and feed efficiency, anorexia, convulsions
Magnesium	Reduced growth/ whole-body hypercalcinosis
Iron	Microcytic, homochronic anaemia,
Zinc	Reduced growth and appetite, cataracts, high mortality, erosion of fins and skin, short body dwarfism, fin erosion
Manganese	Reduced growth and skeletal abnormalities , anorexia, loss of equilibrium
Copper	Reduced growth, cataracts
Selenium	Increased mortality, muscular dystrophy, reduced growth, cataracts, anaemia
Iodine	Thyroid hyperplasia (goiter)

In bold : Reported deficiency signs for *O. niloticus* , Not in bold : general mineral deficiency symptoms in fish

Data source: Chow and Schell (1980), Tacon (1987a), Tacon (1992), NRC (1993), Jauncey (2000)