

Table 28. Dietary nutritional deficiency, vitamins

Vitamins	Species	Deficiency signs/syndrome
Vitamin B <sub>2</sub> (Riboflavin)	<i>O. aureus</i>	poor growth, high mortality, lethargy, fin erosion, anorexia, loss of body colour, dwarfism, cataracts
Vitamin B <sub>5</sub> (Pantothenic acid)	<i>O. aureus</i>	poor growth, hyperplasia of epithelial cells of gill lamellae, fin erosion, haemorrhage, anaemia, sluggishness
Vitamin B <sub>3</sub> (Niacin/nicotinic acid)	Hybrid tilapia ( <i>O. niloticus</i> X <i>O. aureus</i> )	Haemorrhage, deformed snout, gill oedema, and skin, fin, and mouth lesions
Vitamin B <sub>1</sub> (Thiamine)	Hybrid tilapia ( <i>O. mossambicus</i> X <i>O. niloticus</i> ) and Nile tilapia	poor growth and poor feed efficiency, anorexia, light coloration, nervous disorders, low haematocrit and red blood cell count, and increased serum pyruvate
Vitamin B <sub>6</sub> (Pyridoxine)	Hybrid tilapia ( <i>O. niloticus</i> X <i>O. aureus</i> )	poor growth and poor feed efficiency, high mortality, abnormal neurological signs, anorexia, convulsions, caudal fin erosion, mouth lesion
Vitamin B <sub>7</sub> (Biotin)	Hybrid tilapia ( <i>O. niloticus</i> X <i>O. aureus</i> )	poor growth
Folic acid	Nile tilapia	poor growth and reduced feed intake and efficiency
Vitamin B <sub>2</sub> (Riboflavin)	Nile tilapia	Requirement not reported
Choline	Hybrid tilapia ( <i>O. niloticus</i> X <i>O. aureus</i> )	Poor growth and survival, and reduced blood triglyceride, cholesterol, and phospholipid concentration
Inositol	Nile tilapia	Requirement not reported
Vitamin C (Ascorbic acid)	Nile tilapia	poor growth and poor feed efficiency, scoliosis, lordosis, poor wound healing, haemorrhage, fin erosion, anaemia, exophthalmia and gill and operculum deformity
Vitamin A (Retinol)	Nile tilapia	poor growth and poor feed efficiency, restlessness, abnormal swimming, blindness, exophthalmia, skin, fin, and eye haemorrhages, pot-belly syndrome, reduced mucus secretion, high mortality
Vitamin D (Cholecalciferol)	Hybrid tilapia ( <i>O. niloticus</i> X <i>O. aureus</i> )	poor growth and poor feed efficiency, low haemoglobin, reduced liver size
Vitamin K	Nile tilapia	Requirement not reported
Vitamin E ( $\alpha$ -tocopherol)	Nile tilapia	poor growth and poor feed efficiency, anorexia, skin and fin haemorrhage, muscle degeneration, depigmentation

Data source: Jauncey (2000), El-Sayed (2006), Lim and Webster (2006).