

Toxicity of ammonia to turbot juveniles: 1. effects on survival, growth and food utilisation

Long-term effects of constant exogenous ammonia concentrations were investigated in two different batches of turbot juveniles (53 and 73 g) under controlled environmental and feeding conditions. Over the 84-day experiments, ambient un-ionized ammonia (UIA-N, NH_3) concentrations were steady (coefficient of variation, 12-16%) and water pH range was 7.88-7.99. Survival was maximum up to 0.33 mg.l^{-1} UIA-N and at 0.73, 50% mortalities were observed on day 52 (73 g) or day 77 (53 g). No-growth concentration was 0.73 mg.l^{-1} UIA-N in the two groups and the 84-day lowest-observable-effect concentration range 0.14-0.33 mg.l^{-1} . In the most tolerant group (53 g), the 84-day no-observable-effect concentration was 0.14 mg.l^{-1} UIA-N. The estimated 28-day efficient concentration that gave 50% of the specific growth rate of controls ranged from 0.60 to 0.75 mg.l^{-1} UIA-N. Specific growth rate to ambient ammonia concentration patterns were different in the two groups for the lowest concentrations (0.14-0.34) and similar to food intake to ammonia pattern. Food efficiency was negatively correlated to ambient ammonia concentration, with major changes in food conversion ratio, and protein utilisation observed above 0.33-0.70 mg.l^{-1} UIA-N. The main change in body composition was an increase in water content in all ammonia-exposed fish. A significant increase in urea-N excretion rate was also observed over 0.33 mg.l^{-1} UIA-N. Thresholds for growth were affected by exposure duration. Turbot juveniles growth capacity may be depressed by usual ambient ammonia concentrations under intensive farming conditions.

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