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Different Response of Pure Arctic Char Salvelinus alpinus and Hybrid (Salvelinus alpinus vs. Salvelinus fontinalis Mitchill) to Various Hyperoxic Regimes

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Abstract : Pure strain of Arctic char (AC) Salvelinus alpinus and hybrid (HB) Salvelinus alpinus vs. Salvelinus fontinalis Mitchill belong to fish, which with great potential for culture in recirculating aquaculture systems (RAS). Aquaculture of these fish currently use flow-through systems (FTS), especially in Nordic countries such as Iceland (biggest producer), Norway, Sweden, and Canada. Four different water saturation regimes included normoxia (NOR), permanent hyperoxia (HYP), intermittent hyperoxia (HYP ±) and regimes where one day of normoxia was followed by one day of hyperoxia (HYP1/1) were tested during 63 days of experiment in both species in two parallel experiments. Fish were reared in two identical RAS system consisted of 24 plastic round tanks (300 L each), drum filter, biological filter with moving beads and submerged biofilter. The temperature was maintained using flow-through cooler during at level of 13.6 ± 0.8 °C. Different water saturation regimes were achieved by mixing of pure oxygen (O_2) with water in three (one for each hyperoxic regime) mixing tower equipped with flowmeter for regulation of gas inflow. The water in groups HYP, HYP1/1 and HYP± was enriched with oxygen up to saturation of 120-130%. In HYP group was this level kept during whole day. In HYP ± group was hyperoxia kept for daylight phase (08:00-20:00) only and during night time was applied normoxia in this group. The oxygen saturation of 80-90% in NOR group was created using intensive aeration in header tank. The fish were fed with commercial feed to slight excess at 2 h intervals within the light phase of the day. Water quality parameters like pH, temperature and level of oxygen was monitoring three times (7 am, 10 am and 6 pm) per day using handy multimeter. Ammonium, nitrite and nitrate were measured in two day interval using spectrophotometry. Initial body weight (BW) was 40.9 ± 8.7 g and 70.6 ± 14.8 in AC and HB group, respectively. Final survival of AC ranged from 96.3 ± 4.6 (HYP) to 100 ± 0.0% in all other groups without significant differences among these groups. Similarly very high survival was reached in trial with HB with levels from 99.2 ± 1.3 (HYP, HYP1/1 and NOR) to 100 ± 0.0% (HYP ±). HB fish showed best growth performance in NOR group reached final body weight (BW) 180.4 ± 2.3 g. Fish growth under different hyperoxic regimes was significantly reduced and final BW was 164.4 ± 7.6, 162.1 ± 12.2 and 151.7 ± 6.8 g in groups HY1/1, HYP ± and HYP, respectively. AC showed different preference for hyperoxic regimes as there were no significant difference in BW among NOR, HY1/1 and HYP± group with final values of 72.3 ± 11.3, 68.3 ± 8.4 and 77.1 ± 6.1g. Significantly reduced growth (BW 61.8 ± 6.8 g) was observed in HYP group. It is evident from present study that there are differences between pure bred Arctic char and hybrid in relation to hyperoxic regimes. The study was supported by projects 'CENAKVA' (No. CZ.1.05/2.1.00/01.0024), 'CENAKVA II' (No. LO1205 under the NPU I program), NAZV (QJ1510077) and GAJU (No. 060/2016/Z).

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