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Dietary L-tryptophan and tank colour effects on growth performance of rainbow trout (*Oncorhynchus mykiss*) juveniles reared in a recirculating water system

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Abstract

The aim of the present study was to evaluate the possible anti-stressful effect of dietary tryptophan supplementation on growth of juvenile rainbow trout (*Oncorhynchus mykiss*) reared in different background colour using recirculating water system. Therefore, rainbow trout (4.7 g ± 0.02) were reared for 11 weeks in black, light blue and white tanks and fed either a commercial diet (CD) or the same diet supplemented with tryptophan (2 g 100 g^{-1} diet). Rearing in black tanks led to reduced final weight and total length, lower food consumption, food conversion ratio and body protein, while no differences were observed between fish reared in light blue or white tanks. Feeding the fish tryptophan supplemented diet resulted in depressed growth, increased food consumption and food conversion ratio, decreased body protein and increased body lipid, reduced liver total lipids and a marked increase in hepatosomatic index (least in fish reared in white tanks). It is concluded that rearing on a black background was stressful for rainbow trout juveniles, while the dietary level of tryptophan used failed as a stress-releasing factor and probably evoked an amino acid imbalance.

Keywords: Tryptophan; Stress; Tank colour; Rainbow trout; *Oncorhynchus mykiss*; Growth

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1. Introduction

Reactions to tank colour may vary according to fish species and life stage. Due to the confounding effects of different stocking densities, feed types, photoperiods and light intensities on different or even on the same fish species larvae, no clear results exist about an overall optimum colour for larval-rearing tanks. This may be related to a direct effect of tank colour on fish neural and hormonal processes, to behaviour, to feed acceptance according to tank colour, or to their combined effects (Fanta, 1995; Papoutsoglou, 1998; Bradner and McRobert, 2001; Höglund et al., 2002). For example, larval growth, survival and swimbladder development have been favoured by black or dark tanks in turbot *Scophthalmus maximus* (Howell, 1979), stone flounder *Kareius bicolouratus* (Matsuda et al., 1987) and striped bass *Morone saxatilis* (Martin-Robichaud and Peterson, 1998). Larvae of grouper *Epinephelus suillus* (Duray et al., 1996), haddock *Melanogrammus aeglefinus* (Downing and Litvak, 1999), Eurasian perch *Perca fluviatilis* (Tamazouzt et al., 2000) and Senegal sole *Solea senegalensis* (Dinis et al., 2001) seem to prefer white or lightly coloured tanks, while no effect has been reported for Atlantic salmon *Salmo salar* (Stefansson and Hansen, 1989), grouper *Epinephelus polyphekadion* (James et al., 1997) and African catfish *Clarias gariepinus* (Bardócz et al., 1999).

Moreover, although information for juvenile and on-growing stages is limited, an improper tank colour could cause a considerable level of chronic stress to fish, as shown for tiger puffer *Takifugu rubripus* (Hatanaka, 1997) and scaled carp *Cyprinus carpio* (Papoutsoglou et al., 2000), under specific rearing conditions.

It is clear therefore, that rearing in different background colours may be of interest in aquaculture practice, not only for the effect it might exert, through related hormone interference, on fish growth, but also on fish response under the effect of acute or chronic stressors (Green et al., 1991; Papoutsoglou et al., 2000; Rotllant et al., 2003).

Nutritional adjustment seems to be one of the promising manipulations to improve fish ability in resisting stress (Kanazawa, 1997; Li et al., 1998). Tryptophan enhances fish brain serotonergic activity with stress-releasing effects (Johnston et al., 1990; De Pedro et al., 1998; Winberg et al., 2001; Lepage et al., 2002; Hseu et al., 2003; Oquendo et al., 2003). Additionally, short term feeding supplementary dietary L-tryptophan (LTP) results in either inhibited endogenously derived behavioural performance, like aggressiveness and cannibalism, or reduced cortisol elevation in the cichlid *Aequidens pulcher* (Munro, 1986), knifefish *Apteronotus leptorhynchus* (Maler and Ellis, 1987), male firemouth cichlid *Thorichthys meeki* (Adams et al., 1996), rainbow trout *Oncorhynchus mykiss* (Winberg et al., 2001; Lepage et al., 2002) and grouper *Epinephelus coioides* (Hseu et al., 2003). However, relatively high levels of serotonin could depress food intake in goldfish *Carassius auratus* (De Pedro et al., 1998).

The present study aimed to investigate the possible anti-stressful effect of dietary tryptophan supplementation on growth of juvenile rainbow trout reared in different background colour using recirculating water system.