

*(Oncorhynchus mykiss)*

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( ) ( ) ( ) ( ) ( )  
( ) ( )  
FCR

(r = / P < / )  
FCR

(P < / )

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(*Oncorhynchus mykiss*)

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(Bergero *et al.*, 2001)

(Heinen *et al.*, 1996; Yigit *et al.*, 2002)

*Rhombosolea* )

(*tapirina*

(Verbeeten *et al.*, 1999)

Cowey, 1995<sup>a</sup>; Cowey, 1995<sup>b</sup>; )

(Avnimelech, 1999

(Gelineau *et al.*, 1998)

(Leung *et al.*, 1999)

(Bolliet *et al.*, 2000)

(Spieler, 1992; Jobling *et al.*, 1998)

Kadri *et al.*, 1991; Baras *et al.*, 1996;

(Gelineau *et al.*, 1998)

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( / ± / ) pH ( / ± / )

(WG)  
(CF) (SGR % day<sup>-1</sup>)  
(FCR)

(Farhangi and Carter, 2001)

/ ± / )

) WG: Weight gain = W<sub>2</sub>-W<sub>1</sub>

) SGR: Specific growth rate (%day<sup>-1</sup>) = (log<sub>e</sub>W<sub>2</sub>-log<sub>e</sub>W<sub>1</sub>) / t × 100

) CF: Condition factor = 100×[(whole live body weight(g)) / (fork length(cm))<sup>3</sup>]

) FCR: Feed conversion ratio = g feed intake /g live weight gain

<sup>2</sup> N-NO<sub>2</sub>

<sup>3</sup> N-NO<sub>3</sub>

<sup>4</sup> Total Inorganic Nitrogen (TIN)

<sup>1</sup> TAN: Total Ammunia Nitrogen

Hach (DR 4000)

Diazotiation

(APHA, 1998)

(Pettersen *et al.*, 1999)

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(r = / P < / )  
(P < / )( )  
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(P < / )

$\arcsin \sqrt{x}$

<sup>1</sup> Covariate

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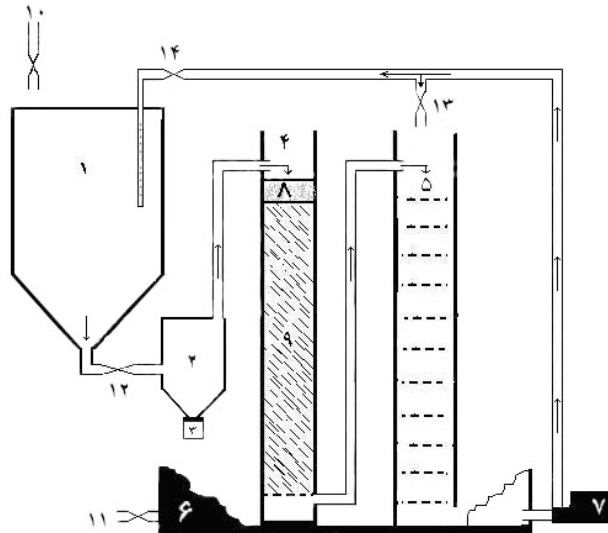
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/ ± / a	/ ± / ab	/ ± / ab	/ ± / b

(P < / )

\*

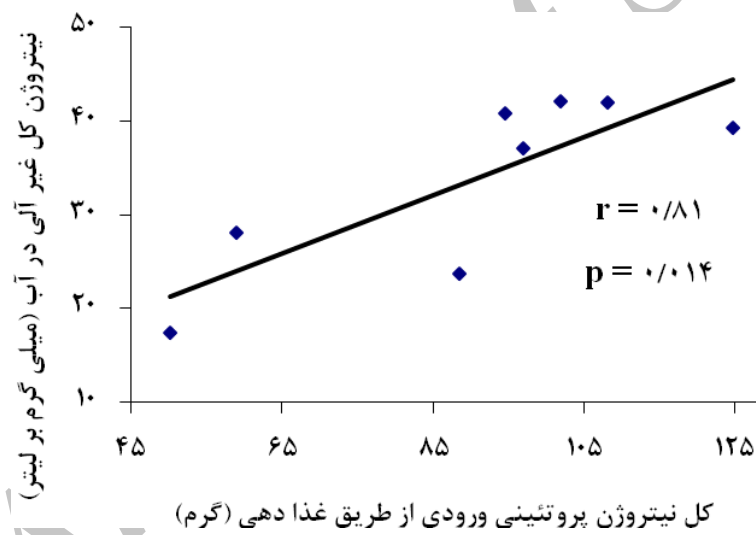
(Schuster *et al.*, 1992)

(Gelineau *et al.*, 2002)

(Gelineau *et al.*, 2002; Azevedo *et al.*, 2004)

Schuster and Stelz, 1998; )

(Yigit *et al.*, 2002)

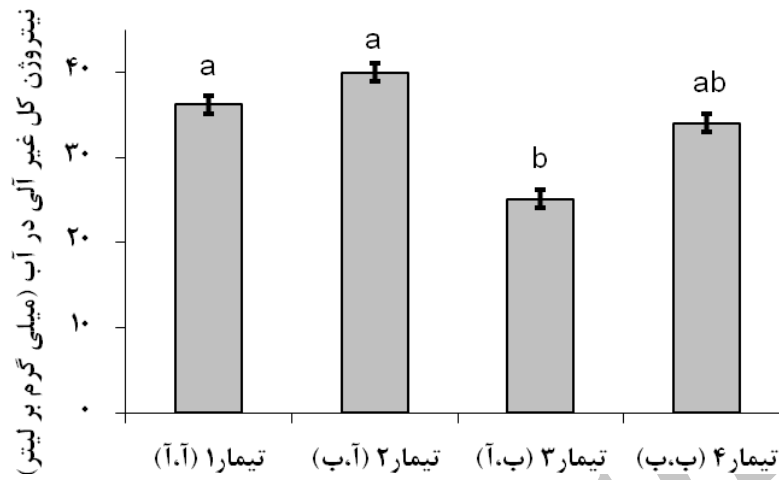


(1998; Bolliet *et al.*, 2000)

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(Gelineau *et al.*, 1998)

Sanchez-Vazquez and Tabata, )



( )

Gelineau )

(Melo *et al.*, 2006)

(*et al.*, 2002

Sanchez-Vazquez-Tabata, 1998; )

(Bolliet *et al.*, 2000

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(Cho and Bureau, 1995; Lee *et al.*, 2002)

(Yigit *et al.*, 2002)

*Rhamdia quelen*

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<sup>1</sup> Protein gain



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## Effect of Two Different Dietary Protein Levels and Feeding Time on Nitrogenous Waste Production in a Semi-recirculating Rearing System of Rainbow Trout (*Oncorhynchus mykiss*)

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### Abstract

The present study aimed to investigate the effect of lowering dietary protein level at different feeding times on nitrogenous wastes production of rainbow trout in a semi-recirculating system. Accordingly, two diets one with higher protein level (41.5%), diet A and the other one with lower protein level (36.5%), diet B were used at two different feeding times, to comprise 4 distinct treatments. Treatment one received diet A at both morning and evening feeding times. Treatment two was fed with diet A in the morning and diet B in the evening, while third treatment was fed exactly opposite as compared with treatment two. Treatment four received diet B at both morning and evening feeding times. The average total nitrogen and total ammonia, nitrite and nitrate were used as indices of nitrogenous wastes production throughout the experiment. Decreased dietary protein levels from treatment one to treatment four did not pose desirable effects on growth, FCR and survival rate, however, a positive correlation was observed between nitrogen intake (protein) and nitrogenous wastes production ( $P < 0.05$ ;  $r = 0.81$ ). Decreased dietary protein level in one meal (treatments two and three) caused no significant difference to growth and FCR compared to treatment one, however third treatment resulted in lower nitrogenous wastes production ( $P < 0.05$ ).

**Keyword:** Dietary protein levels, Feeding time, Feed conversion ratio, Nitrogenous wastes, Rainbow trout, (*Oncorhynchus mykiss*)

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