

( *Daphnia magna* )  
( *Saccharomyces cerevisiae* )  
( *Acipenser persicus* )

( / / : / / : )

(Amax )  
میلی / ± / ( *Acipenser persicus* )

% ( )  
(P < / )  
(P < / )  
Amax  
(P < / )  
(P < / )

گردید.

(Yazawa *et al.*, 1978)

(Bahmani, 1998)

(Gibson and Roberfroid,

1995)

(*Acipenser persicus*)

(Siwicki *et al.*, 1994; Gatlin, 2002;

Irianto and Austin, 2002)

(Pourkazemi, 2006)

B

Ringo )

(Kim *et al.*, 2005)

(and Birkbeck, 1999

(Li *et al.*, 2004)

2003)

(*Saccharomyces cerevisiae*)

(Conceicao *et al.*,

(Ringo and Birkbeck, 1999)

(Stavric and kornegay, 1995)

(Makridis *et al.*, 2001)

Sahoo and )

Gibson and )

(Mukherjee, 2001; Li *et al.*, 2004

(Roberfroid, 1995

---

(Dehert *et al.* , 1992)

( )

) Amax

(Ako *et al.*, 1994)

(

°C±

Kumari and Sahoo, 2006)

(Irianto and Austin, 2002;

(Jafaryan *et al.*, 2007)

(Gomez-Gil *et al.*, 2000)

*et al.*, 1992)

( ) )

(Dhert

(Jafaryan *et al.*, 2007)

...

(*Daphnia magna*)

Amax

( )	
/	
/	
/	
/	
/	
/	
/	

( )

.( Jafaryan *et al.*, 2009)

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(pH = )

( ppt)

.(Jafaryan) ( / mg/l)

(pH = )

( °C)

*et al.*, 2009

)

(

SPSS

(P < / )

---

Amax

Amax

$(p < / )$

*(Verschuere et al., 2000)*

Amax

$< / )$

$(p$

$(p < / )$

Amax

$(p < / )$

*(Jafaryan et al., 2007)*

$(p < / )$

$(p > / )$

*(Yanbo and Zirong et al., 2006)*

$( )$

$(p < / )$

...

(*Daphnia magna*)

(sd ± )

T4	T3	T2	T1	
Amax	Amax	Amax		
/ ± /	/ ± /	/ ± /	/ ± /	( )
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>b</sup>	( )
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>b</sup>	( )
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>b</sup>	( )
± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	± / <sup>b</sup>	
/ ± / <sup>b</sup>	/ ± / <sup>b</sup>	/ ± / <sup>b</sup>	/ ± / <sup>a</sup>	
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>b</sup>	
/ ± / <sup>b</sup>	/ ± / <sup>b</sup>	/ ± / <sup>b</sup>	/ ± / <sup>a</sup>	( )
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>b</sup>	
/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>a</sup>	/ ± / <sup>b</sup>	

(p > / )

$$= [ ( ) / ( ) \times ( ) ] \times$$

$$= ( ) \times$$

$$= [ ( ) / ( ) ] \times$$

$$= [ ( ) - ( ) / ( ) ] \times$$

(*Acipenser persicus*)

( )

T4	T3	T2	T1	
Amax	Amax	Amax		
± / a	± / a	± / a	± / b	pH
± / a	± / a	± / a	± / b	pH
± / a	± / ab	± / b	± / c	
± / a	± / a	± / a	± / b	
± / a	± / a	± / b	± / c	

(p> / )

Tovar *et al.*,

(2002)

(Fuller, 1989)

(Wache *et al.*, 2006)

(*Debaryomyces hansenii*)

(*Dicentrarchus labrax*)

Tovar *et al.*,

(2002)

(Tovar *et al.*, 2002)

... (*Daphnia magna*)

---

(Sahoo and Mukherjee, 2001)

(glycans)

(Raa *et al.*, 1992)

*V.anguillarum*

*Yersinia ruckeri* *V.salmonidae*

( )

(Jafaryan *et al.*, 2007)

Craken and )

(Tovar *et al.*, 2004) (*Dicentrarchus labrax*)

(Gaskins, 1999

(Lara-Flores *et al.*, 2003 )

Amax

( )

2003)

(Conceicao *et al.*,

( )



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## The Effect of Yeast-Enriched (*Saccharomyces cerevisiae*) *Daphnia magna* on Growth and Stress Resistance in Persian Sturgeon (*Acipenser persicus*) Larvae

M. Lashkarbolouki<sup>\*1</sup>, H. Jafaryan<sup>1</sup>, A. Keramat Amirkolaie<sup>2</sup>, M. Farhangi<sup>1</sup> and H. Adineh<sup>1</sup>

<sup>1</sup>Department of Fishery, Gonbad University of Agricultural Sciences and Natural Resources, Gonbad, I.R. Iran

<sup>2</sup>Assistant Prof., Department of fisheries, Faculty of animal science and fisheries, Sari Agricultural and natural resources university, Sari, I.R. Iran

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### Abstract

This study was carried out to evaluate the effect of commercial live bakery's yeast (*Saccharomyces cerevisiae*), (marketed as Amax), on growth and survival of Persian sturgeon (*Acipenser persicus*) larvae ( $74.9 \pm 9.7$ mg) during 30 days. Sturgeon larvae were fed on *Daphnia magna* enriched at three suspensions of yeast, Amax, (0, 50, 100, and 150 mg yeast per liter). The feeding level was 30 percent of total biomass per day. The daily ration was divided into five feeding portions and fed by hand. Growth parameters were influenced by yeast-enriched *daphnia* ( $P < 0.05$ ). Feeding on enriched *daphnia* caused a higher specific growth rate and a better feed conversion ratio than those received control *daphnia* (no enrichment;  $P < 0.05$ ). Feed efficiency was increased significantly ( $P < 0.05$ ) at experimental treatments in comparison to the control diet. The highest growth was observed in the treatment with 150 mg yeast. There was also a positive relationship between enrichment levels and growth related parameters. However, no significant difference observed in the condition factor among the treatments ( $P > 0.05$ ). Survival rate of the larvae improved by using Amax compared to control diet ( $p < 0.05$ ). Fish fed on yeast-enriched *daphnia* showed a higher resistance to unwanted environmental factors ( $P > 0.05$ ). In conclusion, the current experiment indicated that the supplementation of *daphnia* with *Saccharomyces cerevisiae* can increase the growth performance and feed efficiency and also up-grade the stress tolerance in *Acipenser persicus* larvae when facing with unfavorable environmental conditions.

**Keyword:** *Saccharomyces cerevisiae*, Probiotic, Enrichment, *Daphnia magna*, *Acipenser persicus*

\*Corresponding author:

Tel: +981733772214

Fax:01733773744

E-mail: 3772214@gmail.com