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Rotifer (*Brachionus plicatilis*) culture in batch system with suspension of algae (*Nannochloropsis oculata*) and bakery yeast (*Saccharomyces cerevisiae*)

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Abstract. The rotifer *Brachionus plicatilis* is commonly cultured and used in hatcheries as the first feed of marine and fresh water fish larvae. Several cultivation techniques have been developed and applied in hatcheries by aquaculture researchers. In this study, we evaluated the nutritional effect on *Brachionus plicatilis* population growth; rotifer was cultured on suspension of algae (*Nannochloropsis oculata*) and yeast (*Saccharomyces cerevisiae*) in batch culture system. Rotifers that fed with yeast (T2) developed well at the beginning but with increasing of rotifers biomass environment was polluted and after period of time mass mortality observed. Overall, in this case (T2) the biomass production was low. The rotifers that fed with algae (T1) had same population increasing and there was no significant difference between use of yeast and algae. The best growth rate was related to control treatment (C) that feed with blend of algae and bakery yeast. The lowest growth rate was observed in T1 and T2 treatments that fed just with algae and bakery yeast separately.
Key words: rotifer, *Brachionus plicatilis,* batch culture, bakery yeast, algae.

Introduction. Rotifers are among the most widely used aquaculture live food organisms for marine larvae primarily because they are very convenient to use and are readily available (Dhert et al 2001). The cultivation of larvae of many species of marine fish and crustaceans is precariously dependent upon the availability of live food, whether vegetal or animal (Jaspe et al 2011ab). Rotifers have generally served as an excellent source of food for larvae of many species of fish and crustaceans. They are generally obtained through cultivation in batch culture system. High reproduction ability and easy cultivation in experimental environments have made rotifers a frequently used live food. For their cultivation, experts advised some specific methods (see details in Dhert et al 2001). Among them, there is one method that reduces the costs of production based on use of all nutritional material of cultivation environment. Rotifers as the best available live food wildly use as shellfish food; they also can play role of vector in bioencapsulation of many drugs, chemicals, or nutritious components. For improvement of nutritional features using live food especially rotifer is an essential matter. One of the strategies for improvement of nutritional efficiency is feeding rotifer with micro algae such as *Chaetocerus spp.*, *Chlorella spp.* and *Nannochloropsis spp.* and bakery yeast (*Saccharomyces cerevisiae*). Each species of algae or yeast offers some specific advantages if used (Dhert et al 2001; Dragos et al 2010; Watkins et al 2011); for example, *Nannochloropsis* is rich with protein, while yeast can be cultured in various environments (Gaspar et al 2010; Gatesoupe et al 2005). Industrial yeasts usually use in aquaculture as probiotic or as nutritional matters in aquatic animals nutrition (Stones & Mills 2004). Live feeds such as rotifers (*Brachionus spp*.) are currently indispensable for the mass production of marine larvae (Oliva-Teles & Gonçalves 2001). The rotifer *B. plicatilis* has become a valuable and, in many cases indispensable, food organism for first feeding of a large variety of cultured marine finfish and crustacean larvae (Luzbens et al 1987; 2001). However, suppressed growth or unforeseen death of rotifers is frequently

observed in mass culture (Hirata 1974, 1977) and therefore finding new and better methods of rotifer culture would be useful.

In this study we evaluated growth rate and survival rate of *Brachionus plicatilis* that feed with micro algae (*Nannochloropsis oculata*) and bakery yeast (*S. cerevisiae*) and blend of this two feeds.

Material and Methods. In this study, micro algae (*N. oculata*) were purchased from Artemia Research Center of Uremia University (Iran). For cultivation of micro algae we prepared cultivation tanks by mixing water (30 ppt salinity) with Urea (5g/L) and Phosphate (10 mL/L) (Gomishan Shrimp Culture Center, Golestan - Iran). After preparation of cultivation tanks micro algae stock were introduced into the tanks. Cultivation tanks were containing water with salinity of 28 ppt, at 28-30°C with good aeration. We cultured micro algae up to density of 1×10^4 cell/mL. *N. oculata* is a species of marine algae that in commercial hatcheries use as a basic food of prey same as rotifer (*B. plicatilis*).

Table 1

Micro algae and their cultivation features
in laboratory of Gonbad University

Algae	Salinity (ppt)	pH	Temperature (°C)	Light intensity (Lux)
N. oculata	28	7-9	28-30	2500

Rotifers were placed into Erlenmeyer glasses with 500 mL capacity. Water of cultivation was 15 ppt salinity. After rotifer cultivation and achieving the normal population density of rotifers, 10 counts of rotifers were introduced into a one liter Erlenmeyer glass with salinity of 15 ppt, at 28°C with aeration and illumination with 2500 lux intensity. The cultivation parameters were measured every day and the density was counted. Algae were cultured in standard system and every day 10 mL of them were used as food for each Erlenmeyer glass. This amount of food was equal to 30% of rotifer body weight. Density of algae used was 1×10^4 cell/mL (as calculated in laboratory of Gonbad University). For yeast suspension production we added 4 g of yeast to 500 mL water, and 10 mL per day from yeast suspension were added to each Erlenmeyer glass (according to Triantaphllidis et al 1998).

Results and Discussion. Results of growth rate of *B. plicatilis* were prepared and presented in Figure 1. After information analyzing, different survival rates and growth rates were observed in different treatments that fed with different feeds. Analyze of data with SPSS program version 9 (Duncan) showed that suspension of algae and yeast had positive effect on growth of population (C) and rotifers that fed with suspension of algae and yeast (blend) had significantly different results compared with other treatments (T1 and T2) ($P<0.05$).

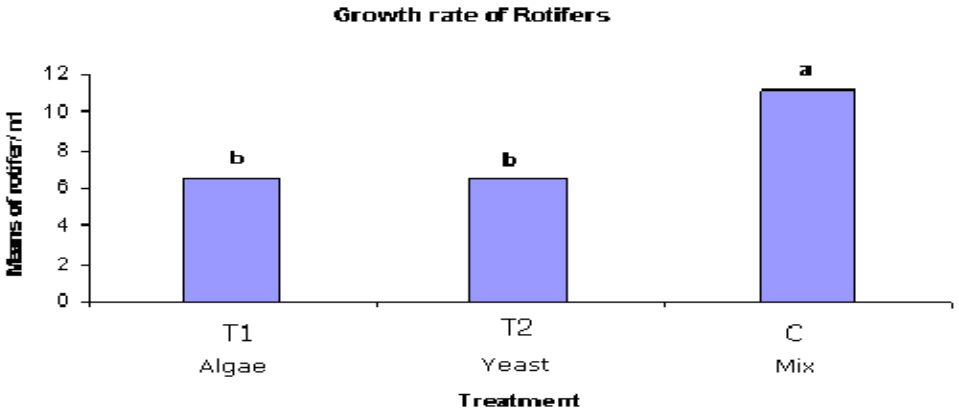

Fig. 1. Blend of algae and yeast have shown the highest growth rate of rotifers. Different letters (a, b) show the statistically significant difference ($P<0.05$).

Rotifers that fed with yeast (T2) developed well at the beginning but with increasing of rotifers biomass environment was polluted and after period of time mass mortality observed. Overall, in this case (T2) the biomass production was low. The rotifers that fed with algae (T1) had same population increasing and there was no significant difference between use of yeast and algae ($P>0.05$). The best growth rate was related to control treatment (C) that feed with blend of algae and bakery yeast. The lowest growth rate was observed in T1 and T2 treatments that fed just with algae and bakery yeast separately.

Kinds and combinations of micro algae and bakery yeast have nutritional matters that cause improvement of rotifer growth rate and survival rate. This study showed that a different diet which has different nutritional price has different effect on growth and survival rate. Micro algae are known for their excellent nutritional properties (Hatton & Wilson 2007) and use of micro algae such as *Chlorella*, *Nannochloropsis* and *Chaetocerus* improve the PUFA levels in animal diets (Lavens & Sorgeloos 1986). Variability and complexity of live food is essential for animals growth rate and survival. In a similar study, Dehghan et al (2011) reported that growth rate of *Artemia parthenogenetica* which fed with complex diets demonstrated better results compared to those fed with simple diets (see also Farahi et al 2010 for growth rate and survival of angelfish larvae).

Conclusion. The best rotifer growth rate was observed in control treatment that feed with blend of algae and bakery yeast. The lowest growth rate was observed in experimental treatments that fed just with algae and bakery yeast separately. Our study shows that different diets have serious effects on survival rate and growth rate of rotifers such as *Brachionus plicatilis*.

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