POSSIBILITIES OF THE USE OF MICROENCAPSULATED DIETS FOR COMMON CARP (*CYPRINUS CARPIO*) LARVAE

NORBERT RÉVÉSZ*, SHIVENDRA KUMAR, KATALIN B. CSÁVÁS, VANDA PERCZE, ZSUZSANNA J. SÁNDOR
*NARIC HAKI, Szarvas, Hungary, *E-mail: revesznorbert@haki.hu*

MOGUĆNOSTI KORIŠĆENJA MIKROINKAPSULIRANE HRANE ZA LARVE ŠARANA (*CYPRINUS CARPIO*)

Apstrakt

Glavni cilj trenutnih istraživanja u oblasti ishrane larvi vezano je za potencijale novih tehnologija i strategija ishrane. Formulisana je suva hrana sa hidrolizovanim proteinima mora i mikroinkapsuliranim vitaminima (C i E). .U toku 24 dana eksperimenta na larvama šarana, počev od 3 dana posle izleganja, testirano je 5 različitih strategija ishrane sa *Artemia nauplii* i suvom hranom. Na kraju perioda u kome su larve bile izložene ograničenom prostoru i uslovima stresa usled hladnoće smeštene su u odgovarajući prostor na jedan sat. Pre i posle izlaganja stresu izmereni su nivoi prethodno pomenutih vitamina HPLC metodom. Statistički značajne razlike na nivo preživljavanja pokazale su se posle 15 Dph, kada su mali prirast i preživljavanje utvrđeni u oglednim grupama, osim u kontrolnoj grupi. Za vreme delovanja stresora sadržaj vitamina C opadao je ka niskim vrednostima slično u svim grupama, međutim potrošnja vitamina E je bila manja. Nivo vitamina E bio je viši u grupama koje su duže vreme hranjene suvom hranom obogaćenom inkapsuliranim vitaminima.. U pozadini slabih rezultata prirasta pri korišćenju suve hrane možemo reći da je sposobnost suočavanja sa stresorom bila dobra kod larvi šarana starih 24 dana. Korišćenje formulisanih mikroinkapsuliranih smeša kao početne hrane za larve obećava, ali moraju da se razviju tehnike ishrane i bolja strategija, na primer modifikovanjem učestalosti hranjenja.

Ključne reči:mikroinkapsulirana hrana, larve šarana, antioksidativni vitamini
Keywords: microencapsulated diet, Common carp larvae, antioxidant vitamins

INTRODUCTION

Larval rearing of the intensive cultured freshwater species still depends mainly on live food *(*i.e algae, rotifers and *Artemia).* Nutritional value and compositions of live foods is not stable and they have a need for supplementation with different macro and micro-nutrients like vitamins or minerals. Also, limited amount of data is available for vitamin utilization before the onset of the first feeding. The modern agro-feed industry is already exploiting the potential of novel nutrient delivery vectors (Hamre et. al., 2013). The aim of our trial was to develop a weaning strategy for better utilization of microencapsulated diet enriched with vitamins for carp larvae.

MATERIALS AND METHODS

The 24-day experiment was started with 3-day old common carp larvae. The same feed was distributed to the 5 groups, in triplicates. The diet was prepared by low-shear extrusion at low temperature (40 ºC). Some of the marine proteins were hydrolysates containing 100 $mgkg^{-1}$ ascorbate phosphate and 250 $mgkg^{-1}$ Vitamin E which have been previously encapsulated to avoid leaching. The larvae were reared in 45 dm^3 tanks in a recirculating system. The water temperature was between 21-23 °C. The stocking density was 1000 fish/tank.

The feeding was carried out by hands following the feeding protocol (Table 1.) four times per day to visual satiation. Co-feeding means that the fish were fed each day two times with *Artemia*, two times with dry feed.

Table 1. Feeding protocol

	Artemia	Co-feeding	Dry feed
	Days of feeding		
Treatment 1. (T1)	0	4	20
Treatment 2. (T2)	12	12	0
Treatment 3. (T3)	8	4	12
Treatment 4. (T4)	6	4	14
Treatment 5. (T5)	6	2	16

During the nutritional trial 4 times weight and length measurements were done. At the end of the 24 days trial, samples have been taken for body composition and biochemical measurements. Stress experiment was implemented using all of the groups, except the T1. Larvae from the first group did not take part of the stress experiment because of the low growth and survival rate parameters. First of all, confinement circumstances were established by reducing the water depth from 22 cm to 2 cm for 1 hour. During this the temperature was decreased from 22 °C to 13.5 °C due to the suspension of the heating. After the stress experiment the larvae was kept further four days with the same conditions as before to check the antioxidant vitamin levels after a recovery session.

Vitamin C and B from carp larvae was determined by an isocratic reverse-phase HPLC method (Papp et al., 1998). The assessment of Vitamin E was performed by method of Ochoa et al (1992).

RESULTS AND DISCUSSION

Observing the body mass data, after 2 days the difference was shown between the treatment 1 and the other groups, the scissor is opened forward from day 4 (Figure 1). Visible and statistically significance appears from day 16 between the treatment 2 and the other groups. In this time under 8 days the larvae grew more than double. That result shows that strategic change needs after that time.

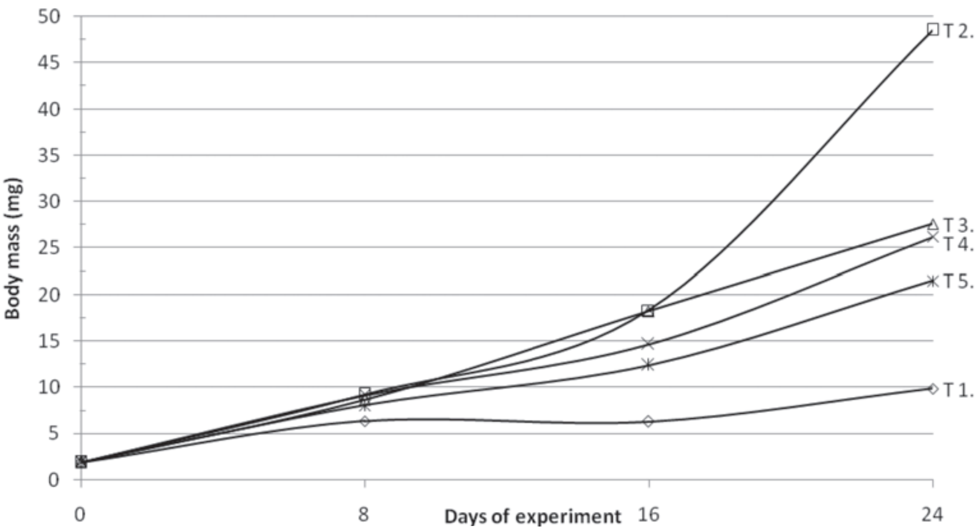

Figure 1. Growth parameters

Studying the survival rate (Figure 2), differences were shown only after the twelfth day of feeding. The best survival rate (89.9 %) had that group (T 2) which was fed the longest time with live prey. The worst is the "dry feed group" (T 1) with 58.1 % survival at the end of experiment. In the case of T3-T4-T5 group the survival has not correlated with weight gain. The fifth group shows better survival rate, but the body mass results shows the opposite of this.

From the confinement and slightly cold stress experiment the next observation could be taken. The highest Vitamin C level (Figure 3) was determined in the control group, which were fed mostly with A*rtemia* (420 µg/g d.w.), but in the other groups presenting appreciable the same state of supply. In case of the Vitamin E (Figure 4) the levels are different; probably more available vitamin E has been taken up by fish from dry feed than from *Artemia*. In the stress situation the antioxidant vitamins, like Vitamin C and E, are used in different way. Vitamin C content decreases similarly to low level in all groups, meanwhile Vitamin E was less consumed. The Vitamin E levels were not decreased as much as Vitamin C. In group 2, 3 and 5 the larvae utilized approx 50 µg/g (d.w) Vitamin E to handle the stress conditions.

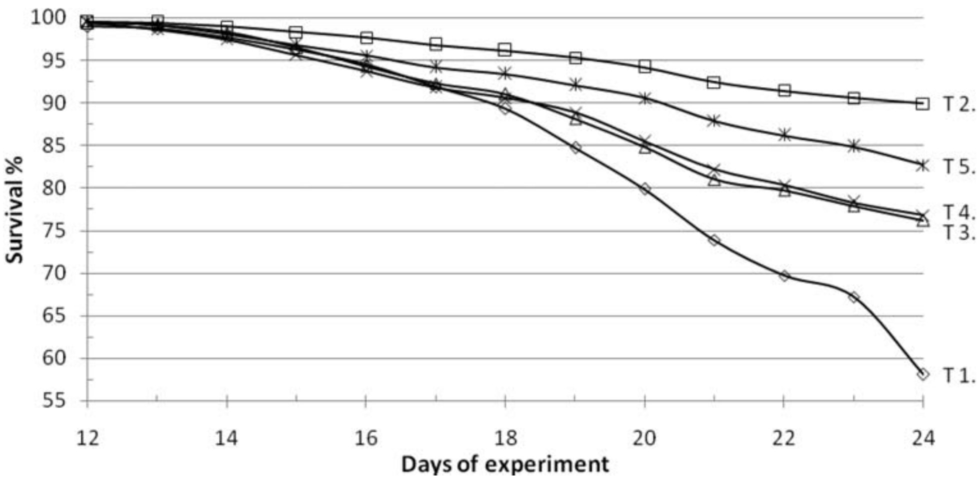

Figure 2. Survival rate

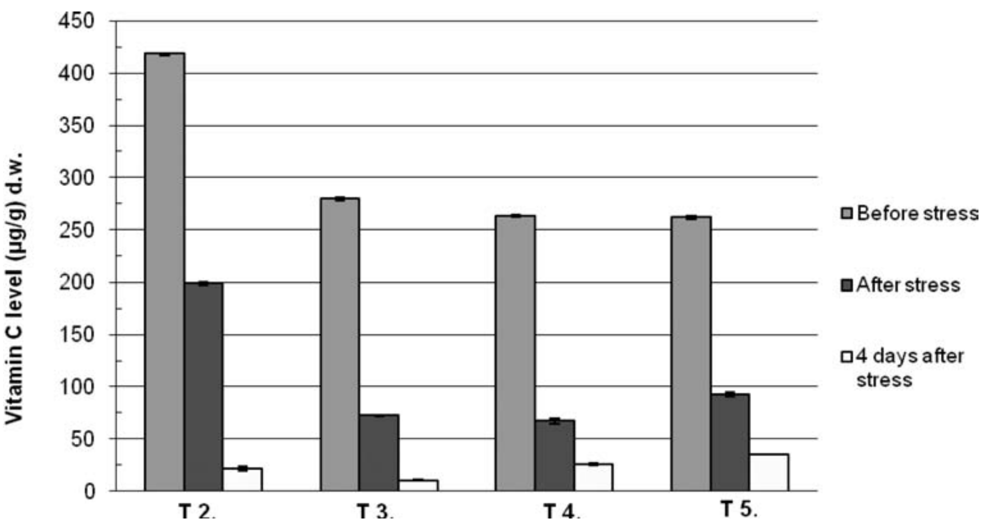

Figure 3. Vitamin C levels

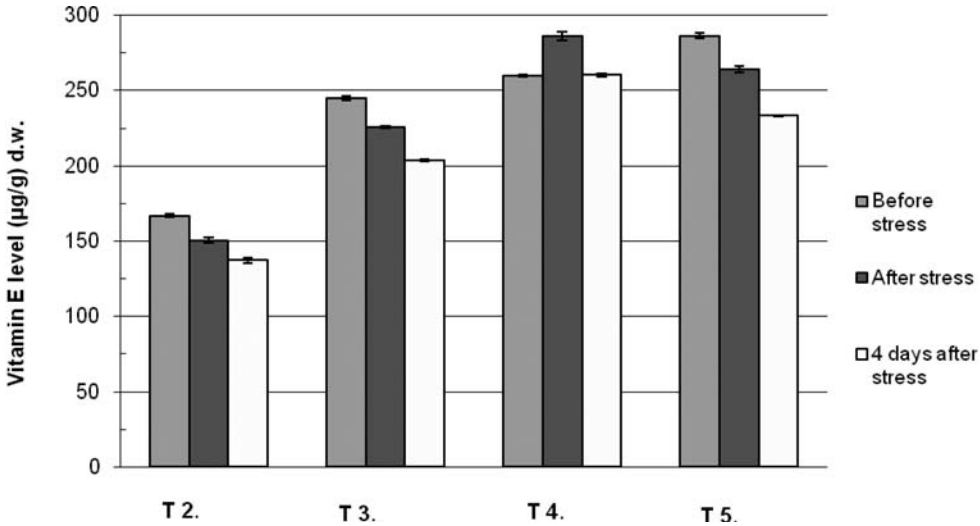

Figure 4. Vitamin E levels

CONCLUSIONS

Behind the weak growth resulted with dry feeding we can say that stress handling ability was good in the case of 24 days old carp larvae. Using formulated microencapsulated diets as starter feed for carp larvae is promising, but have to develop the feeding techniques and a better strategy, for example modifying the feeding frequency.

ACKNOWLEDGEMENTS

This study was supported in part of ARRAINA (FP7 288895) and AQUAREDPOT projects (FP7-316266).

REFERENCES

Hamre, K., Yufera, M., Rønnestad, I., Conceição, L. E. C., Izquierdo, M. (2013): Fish larval nutrition and feed formulation: knowledge gaps and bottlenecks for advances in larval rearing. Reviews in Aquaculture 5 (suppl.), 526-558.

Papp Zs.Gy., Saroglia M., Terova G. (1998): An improved method for assay of Vitamin C in fish feed and tissues. Chromatographia, 48, 43-47.