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Short communication

LARVAL REARING OF IDE (*LEUCISCUS IDUS* (L.)) USING DECAPSULATED ARTEMIA

Alireza Shiri Harzevili, Inne Vught, Johan Auwerx, Daniel De Charleroy

Research Centre – Institute for Forestry and Game Management, Ministry of the Flemish Community, Dwersbos 28, B-1630 Linkebeek, Belgium

ABSTRACT. The use of decapsulated Artemia cysts as food for ide, *Leuciscus idus* (L.), larviculture was investigated. Three days after hatching, the larvae were fed on different diets: (a) dried decapsulated Artemia cysts, (b) Artemia nauplii, (c) Artemia nauplii for 7 days and then trout starter, (d) diet for marine larvae (manufactured artificial diet), (e) trout starter. After a 21-day rearing period, the highest survival rate was obtained with the larvae receiving decapsulated Artemia cysts. Feeding of the larvae with artificial diets resulted in a significantly lower survival rate compared to the other groups. At the end of the experiment, the larvae fed on Artemia nauplii gained significantly higher length compared to the other groups. Feeding different artificial diets resulted in significantly lower average mean length and weight compared to the other groups.

Keywords: IDE (*LEUCISCUS IDUS*), LARVAE, ARTEMIA NAUPLII, DECAPSULATED ARTEMIA, FORMULATED DIETS

Ide, *Leuciscus idus* (L.), belong to the family of cyprinid which are widely distributed in Europe. This species has considerable value in sport fishing and is also as an ornamental fish. They are mostly reared using extensive or semi-extensive culture systems. In extensive culture systems, the rearing process is difficult to control and may result in highly variable growth and survival. Therefore the development of controlled larval rearing is necessary to provide sufficient material for restocking. The use of decapsulated, dried or brine-dehydrated Artemia cysts as experimental diets, solely or in combination with artificial feed, has been tested in the larval rearing of many fresh water fish species (Verreth et al. 1987, Vanhaecke et al. 1990, Pector et al. 1994).

The aim of the present study was to investigate the suitability of decapsulated Artemia cysts for ide larvae during their early feeding stage.

CORRESPONDING AUTHOR: Alireza Shiri Harzevili, Research Centre, Institute for Forestry and Game Management, Ministry of the Flemish Community, Dwersbos 28, 1630 Linkebeek, Belgium Tel /Fax: 0032-02-3807107; Alireza.ShiriHarzevili@lin.vlaanderen.be

Ide eggs were obtained from broodfish held at the Research Centre (Linkebeek, Belgium). Fertilized eggs were distributed on an artificial substrate (nylon-curl) (Montauban N.V., Belgium) submerged in aerated and dechlorinated tapwater at 18 ± 1°C. Larvae hatched after 4 days of incubation. Three days after hatching, the larvae were exposed to different feeding conditions: (a) decapsulated Artemia cysts, (b) freshly hatched Artemia nauplii, (c) Artemia nauplii for 7 days and trout starter afterwards, (d) formulated diet for marine larvae (60% protein, 17% crude fat; Tesgofarm Aqua, Holland), (e) granulated trout starter (58% crude protein, 12% crude fat; Aqua Bio, Belgium). Three replicates were used per treatment. The three week experiment was conducted in a flow-through system consist of fifteen 20 dm^3 tanks using dechlorinated tapwater (water temperature ranged between 19 and 20°C). The larvae were stocked (10 larvae dm^{-3}) at random in rearing tanks. Growth parameters (total length and wet weight) were measured on days 0, 7, 14 and at the end of the experiment (day 21) from 10 larvae per replicate. The initial average total length (mean ± SD) and wet body weight were 8.29 ± 0.29 mm and 2.2 mg, respectively.

Artemia cysts were decapsulated according to procedures recommended by Bruggeman et al. (1980). Every day, fresh stocks of cysts were prepared. Decapsulated cysts were distributed on a 100 µm screen in a layer < 5 mm thick and dried at 35°C for 24 h. The granulated diet was prepared from the trout starter. This starter (0.3-0.5 mm) was crushed with a mortar and sieved to a particle size of < 200 µm. From day 12 onwards, trout starter of 300-500 µm size was used. Larvae were fed ad libitum with the artificial diets and dried decapsulated cysts. Artemia nauplii concentrations were adjusted daily to 4 individuals cm^{-3}. The analysis of variance (ANOVA) was performed to determine any significant difference among the treatments. Significant differences between treatments were determined by Tukey's multiple range test ($P < 0.05$).

At days 7 and 14, the mean length and wet weight of the larvae fed on freshly hatched Artemia nauplii were significantly ($P < 0.05$) higher than the larvae fed on decapsulated cysts and artificial diets (Tables 1 and 2). The mean size (length and wet weight) of the larvae receiving decapsulated cysts was significantly ($P < 0.05$) higher as compared with the larvae fed on artificial diets (Tables 1 and 2). Growth (in terms of length and wet weight) in the larval group (group c) receiving trout starter from day 8 was higher than the groups fed artificial diets during the entire course of the experiment. Feeding larvae with trout starter from day 8 did not produce higher growth as

compared with the treatments receiving Artemia nauplii and decapsulated cysts.

TABLE 1

Total length (mm) of ide larvae measured on days 7, 14, and 21 of the experiment (mean ± SD)

Feeding group	Day 7	Day 14	Day 21
(a) (decapsulated cysts)	9.60 ± 0.40	12.97 ± 0.57	16.3 ± 0.9
(b) (Artemia nauplii)	10.29 ± 0.74	14.11 ± 0.52	18.25 ± 1.03
(c) (Artemia + trout starter)	10.40 ± 0.52	12.82 ± 0.40	13.48 ± 1.00
(d) (diet for marine larvae)	8.90 ± 0.34	11.09 ± 0.54	12.03 ± 0.87
(e) (trout starter)	9.12 ± 0.33	9.97 ± 0.52	11.35 ± 0.64

TABLE 2

Wet weight (mg) of ide larvae measured on days 7, 14, and 21 of the experiment (mean ± SD)

Feeding group	Day 7	Day 14	Day 21
(a) (decapsulated cysts)	3.78 ± 0.23	12.57 ± 1.49	30.92 ± 3.53
(b) (Artemia nauplii)	4.75 ± 0.68	15.83 ± 0.89	38.30 ± 5.45
(c) (Artemia + trout starter)	4.68 ± 020	9.46 ± 0.54	14.65 ± 0.87
(d) (diet for marine larvae)	2.66 ± 0.78	6.56 ± 0.32	12.03 ± 0.26
(e) (trout starter)	2.73 ± 0.37	5.08 ± 0.20	11.34 ± 0.31

At day 7, the survival of larvae fed on Artemia nauplii was not significantly different ($P > 0.05$) from those receiving decapsulated cysts. The larval survival was significantly lower in treatments receiving trout starter (46.40%) compared to the other treatments (Table 3). At the end of the experiment, the highest survival rate (75%) was obtained with the larvae receiving decapsulated cysts. The average survival rate of the larvae fed on Artemia nauplii was 70.80% (Table 3).

TABLE 3

Survival rate of larvae counted on day 7 and at the end of the experiment (mean ± SD)

Feeding group	Day 7	Day 21
(a) (decapsulated cysts)	79.86 ± 6.12	75.33 ± 6.60
(b) (Artemia nauplii)	84.13 ± 7.40	70.80 ± 10.6
(c) (Artemia + trout starter)	70.40 ± 2.84	48.53 ± 2.41
(d) (diet for marine larvae)	70.13 ± 13.86	46.67 ± 8.55
(e) (trout starter)	46.40 ± 3.55	30.13 ± 6.60

The good growth and survival of ide larvae fed on decapsulated cysts indicated that the decapsulated cysts were well accepted and ingested. They seem to be an appropriate food item for larval rearing of ide. Dried and decapsulated cysts, have a high floating capacity and sink slowly to the bottom of culture tank. A similar result

was observed with chub larvae, *L. cephalus* (L.) (Shiri Harzevili et al. 2003). In contrast to decapsulated cysts, the formulated diets were not well accepted. Although the fish were able to ingest the formulated diets, their growth was inferior as compared with the decapsulated and live Artemia nauplii groups. When comparing the two artificial diets, higher growth and survival was obtained with the larvae fed on diet manufactured for marine fish.

In the current experiment, the survival rate of larvae fed on Artemia nauplii was lower as compared to the results of Kestemont et al. (1991) and Kujawa et al. (1998). This was probably related to the quality of the larvae. Wolnicki and Górny (1995) reported low survival and growth rates of ide larvae fed exclusively on an artificial diet. The switching of food for ide larvae from live food to an artificial diet should start few days after exogenous feeding (Kujawa et al. 1998). In this study, the shift of Artemia nauplii to trout starter after 7 days did not improve the growth as compared to decapsulated cysts.

At the end of the experiment, mean total length and wet weight of the larvae fed on Artemia nauplii was significantly ($P < 0.05$) greater than the larvae fed on decapsulated cysts. However, no significant difference ($P > 0.05$) was observed between the survival of larvae fed on Artemia nauplii and those of decapsulated cysts, though the latter was slightly higher.

The results indicate that the tested artificial dry diets were not suitable for ide larvae. Ide larvae need a few days feeding on live food before adapting them to any artificial diet. In conclusion, the results of the present work demonstrate that under intensive culture conditions, the larvae of ide can be raised on dried decapsulated Artemia cysts during early exogenous feeding.

REFERENCES

Bruggeman E., Sorgeloos P., Vanhaecke P. 1980 - Improvements in the decapsulation techniques of Artemia cysts - In: The brine shrimp Artemia: Ecology, culturing, uses in aquaculture. Vol. III (Eds.) G. Persoone, P. Sorgeloos, O. Roels and E. Jaspers Universa Press: Wetteren, Belgium: 261-269.

Kestemont P., Mélard Ch., Poncin P., De Backer L., Micha J.C., Philippart J.C. 1991- Controlled breeding and intensive larvae rearing of fresh water cyprinids at a pilot scale - Aquaculture and Environment. Short communications and abstracts contributions presented at the International Conference Aquaculture Europe 91(Eds.) N. De Pauw and J. Joyce. European Aquaculture Society, Special Publication 14, Bredene, Belgium: 169-170

Kujawa R., Kucharczyk D., Mamcarz A., Skrzypczak A. 1998 - The rearing methods of ide (*Leuciscus idus* L.) and dace (*Leuciscus leuciscus* L.) on artificial diets - In: Aqauculture Europe 98 (Eds.) H. Grizel and P. Kestemont. European Aquaculture Society, Special Publication 26, Oostende, Belgium: 153-154.

Pector R., Tackaert W., Abelin P., Ollevier F., Sorgeloos P. 1994 - A comparative study on the use of different preparations of decapsulated Artemia cysts as food for rearing catfish (*Clarias gariepinus*) larvae - Journal of the World Aquaculture Society 25(3): 366-370.

Shiri Harzevili A., De Charleroy D., Auwerx J., Vught I., Van Slycken J. 2003 - Larval rearing of chub, *Leuciscus cephalus* (L.) using decapsulated Artemia as direct food - Journal of Applied Ichthyology 19: 123-125.

Vanhaecke P., De Vries L., Tackaert W., Sorgeloos P. 1990 - The use of decapsulated cysts of the brine shrimp Artemia as direct food for carp *Cyprinus carpio* (L.) larvae - Journal of World Aquaculture Society 21(4): 257-262.

Verreth J., Storch V., Segner H. 1987 - A comparative study on the nutritional quality of decapsulated Artemia cysts, micro-encapsulated egg diets and enriched dry feeds for *Clarias gariepinus* (Burchell) larvae – Aquaculture 63: 269-282.

Wolnicki J., Górny W. 1995 - Controlled rearing of ide (*Leuciscus idus* L.) larvae using live food and dry feed – Aquaculture 129: 255-256.

STRESZCZENIE

PODCHÓW LARW JAZIA (*LEUCISCUS IDUS* (L.)) Z UŻYCIEM DEKAPSULOWANYCH CYST SOLOWCA (*ARTEMIA* SP.)

Celem eksperymentu było określenie możliwości wykorzystania dekapsulowanych cyst solowca (*Artemia* sp.) do podchowu larw jazia. Larwy, w wieku 3 dni po wykluciu, podzielono na pięć grup doświadczalnych, które żywiono: (a) dekapsulowanymi cystami solowca, (b) nauplisami solowca, (c) naupliusami solowca przez 7 dni, a następnie starterem pstrągowym, (d) komercyjną paszą sztuczną przeznaczoną larwom ryb morskich, (e) starterem pstrągowym. Po 21 dniach podchowu najwyższą przeżywalność stwierdzono w grupie żywionej dekapsulowanymi cystami solowca (grupa a; tab. 3). Żywienie ryb paszą sztuczną (grupy c, d i e) przyczyniło się do istotnego obniżenia wartości tego wskaźnika. W dniu zakończenia eksperymentu larwy żywione naupliusami solowca (grupa b) osiągnęły istotnie wyższe przyrosty długości i masy ciała. Najwolniejsze tempo wzrostu larw zaobserwowano w grupach żywionych paszami sztucznymi (grupy d i e; tab. 1 i 2).