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Aquaculture

**USAGE OF NaCl AS A PROPHYLACTIC MEDIUM FOR EGG
INCUBATION AND FOR REARING OF THE AFRICAN CATFISH
(*CLARIAS GARIEPINUS*) AT THE STAGE OF HATCH AND FRY.**

PRELIMINARY RESULTS

**ZASTOSOWANIE CHLORKU SODU JAKO ŚRODKA
PROFILAKTYCZNEGO W INKUBACJI IKRY ORAZ PODCHOWIE
WYLĘGU I NARYBKU SUMA AFRYKAŃSKIEGO (*CLARIAS
GARIEPINUS*). WYNIKI WSTĘPNE**

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Results of NaCl treatment of African catfish culture are presented. The study was composed of four experiments carried out in different developmental stages of the investigated species, from egg to fry. No positive effect of sodium chloride on egg incubation nor hatch rearing was stated. The highest survival of embryos and hatch was recorded in the control group. Good results were obtained in the rearing of fry. In the first experiment with 5‰ concentration of salt the survival and growth were better than in the control group. Also in the second experiment in alternatives with increased concentrations, the results were better than in the control group, nevertheless the differences were statistically non-significant.

INTRODUCTION

Sodium chloride (table salt) is among the commonly applied therapeutic agents in controlled fish culture. It showed good bacterio- and parasitostatic properties, being well tolerated by fishes (Kouřil et al. 1984; Dvořák et al. 1985). Owing to this properties table salt is frequently used for preventive baths and also for maintaining a required concentration level in the culture tanks. According to some authors (Filipiak et al. 1993; Adamek 1994) African catfish fry manifest considerable susceptibility to bacterial and parasitic diseases, on the other hand, showing resistance to increased concentrations of table salt. The aim of the present study was to investigate the possibility of using this compound in the culture of the African catfish.

MATERIAL AND METHODS

The investigation was conducted in the period of January 15, 1996–March 14, 1996 in the Gołysz Institute of Ichtiobiology and Aquaculture of the Polish Academy of Sciences. It included four experiments (Tab. 1): one with eggs (January 15–17, 1996), another with hatch (January 17–31, 1996), and the remaining two with the fry of African catfish (one in the period of February 6–13, 1996 and another from February 29 to March 14, 1996). The incubation of the eggs and the rearing of the hatch were carried out in 7-litre tanks in a closed cycle and the rearing of the fry—in 70-litre culture tanks. In the experiment with the eggs, a 1000 roc corn/tank was used, the stock of hatch being 100 indiv. and of fry 25 indiv. per tank. The experimental alternatives differed by the level of water salinity in the tanks (from 0‰ to 15‰). Each of the four alternatives was tested in three replications while in the control alternative with hatch, two replications were done. The stock was obtained from a spawning conducted in the Gołysz Institute. The hatch and fry of African catfish were fed with feed produced in the experimental feed plant of the Institute. The fish were fed by hand *ad libitum* every hour from 7:00 AM to 7:00 PM.

Table 1

Design of the experimental cycle with sodium chloride

No. of experiment	Time	Experimental material	Salinity (‰)				Stock (indiv./tank)
			A	B	C	D	
1	15–17 Jan 96	eggs	0	5	10	15	1000
2	17–31 Jan 96	hatch	0	5	10	15	100
3	06–13 Feb 96	fry	0	5	10	15	25
4	29 Feb–14 Mar 96	fry	0	2.5	5	7.5	25

Survival of the embryos inside the eggs was determined every 200°h while survival of the hatch—after 3, 12, 24, 48 h and also after 7 and 14 days. The number and weight of the fry was checked after 7 and 14 days.

The results obtained permitted the calculation of the specific growth rate using the formula (Ricker 1979):

$$SGR = \frac{\log Wik - \log Wip}{T}$$

where:

T —number of days of the experiment

Wip —initial mean unit weight of fish (g)

Wik —final mean unit weight of fish (g)

and the coefficient of the mean unit increase and survival— WS (Szlamieńska et al. 1990):

$$WS = \frac{Wik \cdot p}{1000}$$

where:

Wik —final mean unit weight of fish (g)

p —survival in percentage

The Fisher LSD test was used in determining the significance of the differences between the mean values of the above indices in the different experimental alternatives. Letter symbols placed beside the values of indices in the column were used as determinants of the differences. In the columns of tables the results marked with the same letters (e.g. ^a) do not differ statistically.

In the course of the experiments, salinity and temperature were controlled 4 times a day using CC-315 conductometer while the content of dissolved oxygen and pH were determined at irregular intervals. If a decrease in salinity occurred, NaCl was added to the equalising tanks.

RESULTS AND DISCUSSION

In the course of all the experiments the temperature of the circulating water was maintained at the level of $30 \pm 0.5^\circ\text{C}$. According to Hogendoorn and Vismans (1980) also Hogendoorn et al. (1983) the water temperature of $27.5\text{--}32.5^\circ\text{C}$ ensures optimum conditions for the incubation of eggs and for the rearing of juvenile forms of African catfish. The oxygen saturation of water did not drop below 80% in the course of the experiments with eggs and hatch, this index being much lower in the case of fry which were able to cover a part of their respiration demand with atmospheric oxygen.

The aim of the present study was to test the feasibility of African catfish culture in the conditions of an increased concentration of table salt. The salt was used as a method of preventing bacterial or parasitic diseases, the secondary aim of the study was to determine the optimum concentration of NaCl. In the course of all experiments the basic determinant of the optimum concentration was survival (in %). During the incubation of eggs the effects of sodium chloride treatment were unsatisfactory (Tab. 2). After 200°h the survival of

embryos was significantly lower in the control group (A) than in groups B and C, yet after 400°h all embryos died in all the alternatives with an increased concentration of salt (B, C, and D). The hatching of larvae began in alternative A after 600°h and ended about 850°h. The calculated hatching index was 9.5%,

Table 2

Mean values of embryo survival in the variants
of the experiment

Salinity alternatives	Survival of embryos (%)			Percentage of larvae after 855°h
	200°h	400°h	600°h	
A—0‰	25.8 ^a	17.5	beginning of hatch	9.5
B—5‰	90.7 ^b	0	—	—
C—10‰	67.1 ^c	0	—	—
D—15‰	14.3 ^a	0	—	—

being much lower than the values given in the literature (Hogendoorn and Vismans 1980). The low value of the index was probably effected by the poor quality of eggs used in the experiment.

The experiment with the hatch of African catfish was carried out in the conditions of the same salinity levels (Tab. 3). No positive effects of sodium chloride were recorded in this case while it was only the tolerance to the increased salinity which exceeded that of eggs. The survival values did not manifest any statistically significant differences within the concentration range of 0–10‰ during the first 3 hours of exposure. According to Dvořák et al. (1985) this period is sufficient for preventing parasitic infections.

Table 3

Mean values of hatch survival in the different alternatives

Salinity alternatives	Initial stock No. of indiv.	Survival in %					
		after 3 h	after 12 h	after 24 h	after 48 h	after 7 days	after 14 days
A – 0‰	100	100.0 ^a	96.0 ^a	90.5 ^a	88.0 ^a	63.5 ^a	35.5 ^a
B – 5‰	100	97.7 ^a	85.7 ^{ab}	85.5 ^a	82.3 ^a	54.7 ^a	0 ^b
C – 10‰	100	96.0 ^a	61.0 ^b	0 ^b	0 ^b	0 ^b	0 ^b
D – 15‰	100	0 ^b	0 ^c	0 ^b	0 ^b	0 ^b	0 ^b

Table 4

Mean values of the basic parameters of rearing in the different alternatives of the first experiment with fry

Salinity alternatives	Stock		Unit weight (g)		SGR %	Survival %	WS
	initial	final	initial	final			
A – 0‰	75	6	6.23	9.58	5.25	8.0	0.77
B – 5‰	75	74	6.26	10.17	6.93	98.7	10.03
C – 10‰	75	0	6.48	—	—	—	—
D – 15‰	75	0	6.50	—	—	—	—

During the experiment with catfish fry an infection of parasites of the genus *Trichodina* occurred, bringing about pronounced mortalities in the control group. As in

earlier studies the concentrations of NaCl were too high in alternatives C and D. In alternative B the survival was very high, no signs of parasitic infection were observed. This shows the positive effect of 5‰ concentration of table salt on the pattern of catfish rearing (Tab. 4).

Table 5

Mean values of the basic parameters of rearing in the different alternatives of the second experiment with fry

Salinity alternatives	Stock		Unit weight (g)		SGR %	Survival %	WS
	initial	final	initial	final			
A – 0‰	75	43	25.36	36.41	4.56 ^a	57.33 ^a	20.87 ^a
B – 5‰	75	50	26.12	34.29	3.40 ^a	66.67 ^a	22.86 ^a
C – 10‰	75	58	24.79	28.78	1.86 ^a	77.33 ^a	22.26 ^a
D – 15‰	75	24	24.42	36.11	4.59 ^a	32.00 ^a	11.56 ^a

Another experiment with catfish fry was carried out in a slightly different regime, the concentration of NaCl was reduced by half in the different alternatives. Also in this

case the highest survival was recorded for alternative C with a 5‰ concentration of NaCl, though these results were not statistically different from the remaining ones. Neither the values of the WS index showed significant differences in the alternatives (Tab. 5).

RECAPITULATION

The results obtained permit us to postulate that during the incubation of eggs and the rearing of hatch the application of short preventive baths only seems justified. Apart from the bath, in the case of fry of the size above 5 g/indiv. the concentration of table salt not exceeding 5‰ may be maintained during the rearing process. On account of the considerable costs of such treatment it may be only applied in closed systems of water cycling.

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ZASTOSOWANIE CHLORKU SODU JAKO ŚRODKA PROFILAKTYCZNEGO
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STRESZCZENIE

W pracy przedstawiono wyniki doświadczeń nad zastosowaniem NaCl w chowie suma afrykańskiego. Na całość składały się cztery doświadczenia przeprowadzone na różnych stadiach rozwojowych tego gatunku, od ikry do narybku. Nie stwierdzono pozytywnego wpływu chlorku sodu na inkubację ikry oraz podchow wylęgu. Przeżywalność embrionów i wylęgu była najwyższa w grupie kontrolnej. Dobre rezultaty osiągnięto przy podchow narybku. W pierwszym doświadczeniu, przy stężeniu soli wynoszącym 5‰ przeżywalność i przyrosty były lepsze niż w grupie kontrolnej. W doświadczeniu drugim w wariantach z podwyższonym stężeniem chlorku sodu uzyskano lepsze wyniki niż w wariantach kontrolnych. Różnice te nie były jednak statystycznie istotne.

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