

THE INFLUENCE OF COBALT ON THE GROWTH RATE
OF ARTIFICIALLY FED MULLET (*Mugil spp.*) SPAWN
- PRELIMINARY DATA.

Ionîta Reveica and Boghici Viorica

Romanian Marine Research Institute - Constanța

ABSTRACT:

Results of laboratory experiments concerning administration of cobalt in the food of grey mullet (*Mugil spp.*) spawn are presented. The achieved growth rate differs by a 14 % increment from that of the witness.

The investigations having been carried out up to now on the use of cobalt as a growth stimulator pertain to the field of fresh water pisciculture and are aimed at the carp spawn (1; 2; 3).

Since 1974, experiments on cobalt influence on the growth rate of some marine species (*Mugil spp.*) have been carried out by the Romanian Marine Research Institute.

MATERIALS AND METHODS

The experiments have been carried out in two identical aquaria having the following characteristics: 0.25 m³ working volume, 0.05 l/sec/m³ water supply discharge and 0.06 m³/min air discharge for every 1 m³ of water. The water was pumped out directly from the sea, undecanted and unfiltered. Both basins were identically populated with mullet (*Mugil cephalus* L., *Mugil auratus*

RISSO, Mugil saliens RISSO) spawn with an average individual weight of 0.85 grams. The spawn population density in the basins was of 84 specimens/m³ of water. The used artificial food, under the form of daily prepared grains, had the following composition: 80% marine fish wastes (predominantly Odontogadus merlangus euxinus Nordmann), 8% sunflower oil extraction residues, 5% wheaten flour, 5% maize flour, 1% fish meal and 1% mollusk meal. The daily ration distribution was made of two meals, until saturation, with a quantitative variation between 5 and 50 grams per basin. CoCl₂ was used in the experiment with approximately 41% of cobalt content, meaning 1 gr. of cobalt for every 20.000 gr. of food.

The dynamics of the main physical-chemical factors (T°C, O₂, pH, salinity, quantity of organic matter suspension) was observed in both basins every day during the experiment period (1974, July 3 - October 1). The cobalt effect was periodically analyzed by comparing the individual weight increment obtained in the two basins. The registration of the average individual weight was accomplished twice a month, each time after one day with no food administration.

RESULTS AND DISCUSSIONS

Both the experimental basins and the sea environment have been characterised by permanent instability of the physical-chemical factors. We specify that the variation of the physical-chemical factors in the two basins was uniform, except the organic matter variation. This permanently took higher values (4.26 mg O₂/l, on the average) in the basin with cobalt as compared to the witness basin (3.75 mg O₂/l). We attribute the difference to the stimulating influence of cobalt on the development of the microorganisms living together in the basin.

The individual increase in growth that was recorded in both experimental basins, improved on the whole, with higher thermic values (Table 1).

The maximum values of the increment (29% of the total in the basin with cobalt, respectively 37% in the witness basin) were achieved with the maximum water temperature (23.80°C). However, the ascension of water temperature values, though generally

followed by an ascension of the growth increase for both basins, shows two exceptions: first, during July 5-19, when the slightest increase (14% in the basin with cobalt and 10% in the witness basin) is recorded at a mean water temperature of the period of 21.78°C. Second, during September 2-16, when no increase is recorded at a mean water temperature of 22.50°C.

Table 1
Observed weight increase variation (g/individ.) in
experimental basins

Date of control	T water°C	Individual increase %		Increase dif- ference(co- balt-control) %
		Control	With cobalt	
03.07.1974	15.96	0.0	0.0	0.0
15.07.1974	18.29	13.0	16.0	+16.0
05.08.1974	21.78	28.0	23.0	+10.5
19.08.1974	23.80	10.0	14.0	+20.0
07.09.1974	22.50	37.0	29.0	+ 6.4
16.09.1974	20.07	0.0	0.0	+ 6.4
30.09.1974		12.0	18.0	+15.5
		100.0	100.0	
		(4.40 g/ind)	(5.05 g/individ.)	
Attained mean weight/individual				
		(5.25 g /ind.)	(5.90 g /individ.)	

It is to be mentioned that the diminishing of the growth increase during the first period was due to a sudden simultaneous variation of the physical-chemical factors, which exerted a stress on the growth. These were: a sudden raise in water temperature - from 18°C to 22°C -, a sudden lowering in water dissolved oxygen - from 5 to 2.4 cc/l - and a sudden lowering in water salinity - from 18 to 14‰. The stagnancy of growth increase during the second period was a result of the specific conditions created by the flowering of water due to the peridinium Exuviella cordata OSTNF. in the feed water. It comes out, from the data we have, that this unicellular alga was found in a concentration of 20

million cells/liter, in the nearshore zone of the Black Sea.

From the analysis of the achieved growth increase in each basin, it appears a permanent value superiority of the basin with cobalt confronted by the control. The amplitude of the increase difference between the basins varied on the whole from 10.5 to 20% (Fig.1). Exception was made by the decomposition period of alga Exuviella cordata, when the difference was only 6.4%.

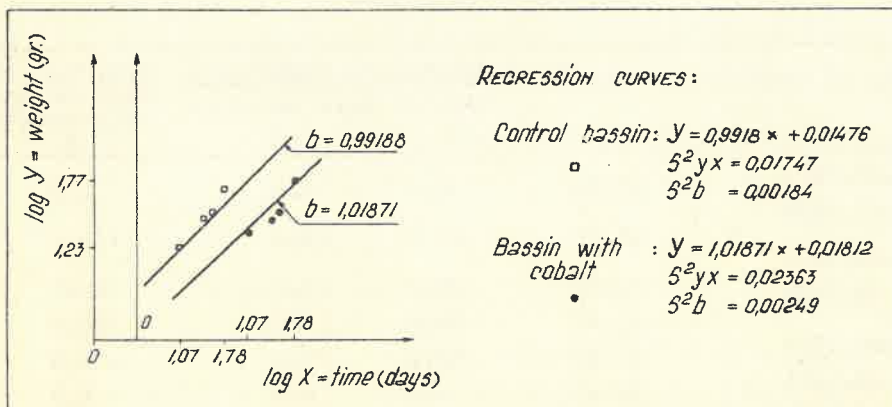


Fig.1. Growth equations of mullet spawn

A difference in the values taken by the slopes of the growth curves of the witness basin as compared to those of the basin with cobalt is observed. The variance of the regression observations S^2yx and the variation of the regression coefficient S^2b take very low and close values, which indicates a limited dispersion radius of the obtained points, considering Y and X variables as linear dependents.

The amplitude of the increase difference between the two basins, which varied from 6.4% to 20.0%, was levelled up after this calculation, the slope values for the growth curves remaining different ($b=0.9918$, respectively $b=1.01871$).

The variation limits of the nutrition coefficient were 4.2 - 14.4 (average 9.2) for the basin with cobalt and 6.0 - 22.5 (average 12.9) for the witness basin. Survival was 100% with both

basins during the period of July 3 to August 19; the massive losses - to as much as 43% - were recorded in August 19 - September 2, that is during the Exuviella cordata invasion. During the whole experimental period, the survival was of 43% in the basin with cobalt and only 39% in the control basin.

CONCLUSIONS

Preliminary experiments concerning the effect of cobalt when administered into the food of artificially fed mullet (Mugil spp.) spawn in proportion of 1:20.000, have pointed out the following differences from the control:

- greater growth increase, by 14.7% ;
- smaller nutrition coefficient, by 28.6% ;
- better survival of population, by 4%.

The value of the nutrition coefficient (4.2) in administering the food with cobalt, the cost of 0,924 lei/kg of the alimentary receipt, are some of the elements which may substantiate the efficiency of the use of cobalt in fish breeding.

We consider that the results of these initial attempts call for carrying on the researches in order to establish the best ratio between cobalt and distributed food.

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