



Title	ワカサギ卵の水生菌被害防止に於けるホルマリンの効果に就いて
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# THE EFFECT OF FORMALIN AS A DISINFECTANT AGAINST THE AQUATIC FUNGUS WHICH ATTACKS THE EGGS OF THE POND SMELT

BY

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As is well known among fish culturists one of the most serious diseases is connected with the so-called aquatic fungus, belonging to the genus *Saprolegnia*. The fungus is noted as the cause of very destructive epidemics attacking fish eggs as well as the fry and the adults of almost every kind of fresh water fish. When it attacks fish eggs it forms a fine white growth of a cottony appearance upon the dead eggs and spreads out so as to involve in its threads many of the near by living eggs leading to their death from asphyxiation. This disturbs the hatchery not a little.

The prevention from the attack has been hitherto secured only by picking out the dead eggs. Recently, however, the sterilization of the eggs by means of chemical agents such as  $\text{KMnO}_4$  (TAKAYASU, TAKEDA and OHNO 1934) and  $\text{NaCl}$  (Davis 1929) has been proved to be applicable. The author has succeeded from several years ago in preventing many kinds of disease of the salmon eggs using diluted formalin as the disinfectant (TANAKA 1932).

It has been found at the Nishibetsu Hatchery where the writer is in charge that the fungus works a 54-55 % damage upon the eggs of the pond smelt, *Hypomesus olidus* (PALLAS), when incubated in fresh water without any treatment. The sterilization with formalin for the prevention of the fungus in this case has proved highly effective. In the following paragraphs some of the recent records obtained in the author's experiments will be given.

The fertilized eggs of the smelt were obtained from three different localities, namely from Lake Toro in Kushiro, Lake Abashiri in Kitami and Lake Furen in Nemuro. They were incubated in the Nishibetsu Hatchery in water at the temperature of 9-12°C. In the experiment 7 series of formalin bath of different concentrations were prepared, adding respectively 50, 100, 150, 200, 250, 300 and 350 parts tap water to 1 part of formalin containing 35 % formaldehyde.

The bath was administered mostly every 5 days after fertilization, sometimes every 7 days and only in one case every 3 days. It takes about 20-25 days from fertilization until hatching of the smelt eggs and therefore the frequency of bath is usually 3 times during incubation excepting 5 times for every 3 days series. The duration of the bath varied from 30 minutes to 60 minutes.

In the table given in the next page the percentage value of the dead eggs was calculated for convenience of comparison (see Table 1.).

Looking through the table it may be seen that in the case of 1/50 formalin the best result was obtained in the series which was bathed for 30 minutes every 5 days, having 39.19 % dead. A long duration of bathing gave very bad results as is shown for example in the 60 minutes series, yielding a 98.89 % loss. The 1/100 formalin was proved best acting for 50 minutes at the interval of 7 days. Almost the same result was obtained in the series with 5 days interval acting for 60 minutes. In this case the best result was 28.24 % loss. A still better result was secured in the 1/100 formalin bath at 5 days interval for 30 minutes action, showing only 21.85 % dead.

In the 1/200 formalin bath only 26.28 % of the eggs were dead even in the worst case in which the bath was given for 50 minutes every 7 days. All others in this concentration showed much better result than any other case. Particularly the bath was proved best when it acted for 30 minutes every 3 days, yielding only 5.24 % loss of the total. In the case of more diluted formalin there was no better result obtained than those of the above. The dead amounted in the best case to 21.14 % in 1/250 formalin and 15.28 % in 1/300 formalin.

The control which received no treatment showed 45.03 % loss, that is almost half of the eggs were destroyed by the fungus. It is surprising that formalin which is usually harmful to the living organism has not affected the living eggs when diluted. Moreover the effect of formalin employed as the disinfectant against the aquatic fungus is quite remarkable. The best result was obtained with 1/200 formalin in which the eggs remained for 30 minutes every 3 days and accordingly 5 times during the incubation. Naturally this concentration of formalin is to be recommended for the sterilization without any harmful result. The advantage of sterilization of the hatching eggs is particularly emphasized for the eggs of such small size as those of the smelt in which the picking out of the dead during the incubation is hardly applicable.

Table I.

conc. of formalin	duration of action in minutes	interval after fert. in days	freq. of bath	number of eggs	number of dead eggs	dead eggs in %
$\frac{1}{50}$	30	7	3	1689	1062	62.88
"	30	5	3	541	212	39.19
"	40	"	3	541	261	48.24
"	50	"	3	541	511	94.45
"	60	"	3	541	535	98.89
$\frac{1}{100}$	30	7	3	2218	536	24.17
"	40	"	3	563	299	43.11
"	50	"	3	"	160	28.42
"	60	"	3	"	302	53.64
"	30	5	3	1775	592	33.35
"	40	"	3	"	260	46.18
"	50	"	3	"	465	82.59
"	60	"	3	"	159	28.24
$\frac{1}{150}$	30	7	3	2412	696	28.86
"	40	"	3	563	150	26.64
"	50	"	3	1151	439	38.14
"	60	"	3	63	259	46.00
"	30	5	3	"	123	21.85
"	40	"	3	"	147	26.11
"	50	"	3	"	149	26.47
"	60	"	3	"	258	45.83
$\frac{1}{200}$	30	7	3	2803	572	20.41
"	"	5	3	1561	138	8.84
"	"	3	5	916	48	5.24
"	40	7	3	2091	542	25.92
"	50	"	3	2747	722	26.28
"	60	"	3	2569	544	21.18
"	40	5	3	789	63	7.98
$\frac{1}{250}$	30	7	3	1903	709	37.26
"	"	5	3	563	119	21.14
$\frac{1}{300}$	30	7	3	2016	679	33.68
"	"	5	3	563	86	15.28
$\frac{1}{350}$	30	7	3	2241	640	28.56
Control				3571	1608	45.03

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(from the Nishibetsu Hatchery, Kushiro, Hokkaido)

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