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COOPERATING WITH THE
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Original: Fish Division ✓
cc: Education - Game
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March 25, 1954

Report No. 1412

Prophylaxis of trout eggs with malachite green at
Marquette, Harrietta and Paris hatcheries in 1953-54.

by

Leonard N. Allison

Abstract

Fungus develops rapidly on dead trout eggs in incubating trays and spreads to living eggs causing them to die. Mortality from fungus can be prevented either by periodically removing all dead eggs by hand picking or by prevention of the growth of fungus by chemical prophylaxis. The hand picking method has been standard procedure in Michigan, although it requires more man-hours than the chemical prophylaxis.

In 1951 at Marquette hatchery, prophylaxis with malachite green as described in the literature (Foster and Woodbury, 1936;

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O'Donnell, 1947; Burrows, 1949) was modified to suit conditions at Michigan hatcheries. Following this modification, tests with malachite green were made at Harrietta and Paris hatcheries in 1953-54. The preliminary tests were necessary because of several variations in water supply and trough construction.

Reports of the hatchery superintendents from each hatchery are included verbatim in this report.

With slight modifications of the method employed at Marquette, effective dilutions of malachite green were determined which successfully suppressed the growth of fungus on trout eggs at Harrietta and Paris hatcheries. One objection raised at these stations was that dead eggs made an unsightly mess that was difficult to remove from the troughs. Improvement in technique should overcome this difficulty.

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The prevention of fungus on incubating trout eggs in hatcheries requires constant attention. Fungus grows readily on dead eggs and, if permitted to develop, will encompass living eggs. When this happens the living eggs are smothered. The problem can be handled in one of two ways, either by removal of dead eggs before fungus develops excessively or by the use of fungus-inhibiting prophylaxis. The picking of dead eggs is a time-consuming operation and, since eggs in an early stage are easily shocked, the method may result in increased mortality.

Experiments reported in the literature (Foster and Woodbury, 1936; O'Donnell, 1947; Burrows, 1949) demonstrated that malachite green could be used safely to prevent development of fungus on fish eggs. Several methods for application of the chemical were described but none seemed to be entirely suited to our use.

In 1950-51 and 1951-52, Mr. R. Robertson conducted tests at Marquette hatchery using malachite green on lake trout eggs. He reported the results in May, 1952, recommending that 3 ounces of a stock solution ($1\frac{1}{2}$ oz. malachite green in 1 gal. water) be added daily, morning and

evening, at the head of troughs having a water flow of 6 gallons per minute. In treating two troughs in series, 3 ounces of stock solution are added to the upper trough; after approximately 75 percent of the solution has left the upper trough, $1\frac{1}{2}$ ounces of stock solution are added to the lower trough. Under conditions of heavy silting, 6 ounces of stock solution for the upper trough and 3 ounces for the lower trough was recommended. Prophylaxis at Paris and Harrietta was based on these recommendations.

This year (1953-54) all lake trout eggs at Marquette were given prophylaxis with malachite green and an accurate record kept of the cost of materials and time. Initial tests of the method were made at Paris and Harrietta hatcheries. Results of the tests were reported by the hatchery superintendents who also gave their opinion of the procedure. This report is a summary of their results.

Marquette hatchery

Lake trout eggs are collected by commercial fishermen from fish caught in Lake Superior and taken to the Marquette hatchery for hatching. Some operators are not as efficient in spawn-taking as are others so the mortality among some groups of eggs is high. This year (1954) 2,800,000 eggs were brought to the station for hatching. Because of the comparatively high mortality, and since fungus grows readily on dead eggs, time spent in picking dead eggs would have been considerable in such a large group of eggs. Mr. Robertson reports as follows:

"The following facts and figures I believe will show that the use of Malachite green on trout eggs is cheaper and labor saving from this past winter experience.

"The following figures are based on a 14 week period for lake trout eggs:

Malachite use: 30 lbs. @ 2.00 per lb. -	66.00
Times in administering treatment 1/2 hour daily	
14 week period - 49 hours @ 1.58 per hour	<u>- 77.42</u>
Total cost	\$143.42

"With the amount of eggs we had on hand this year it would take approximately 30 man hours per week to pick the dead eggs off or 420 man hours during this period at a cost of \$663.60. It also required a total of 629 man hours to pick off dead eggs after they were "rung up". This is necessary to obtain percentages for individual fishermen. There is a very good possibility that if their eggs were not "rung up" we could have gotten by without egg picking until they hatched out. Figuring in the man hours required to pick dead eggs after they were "rung up" the cost would be much higher.

"I believe the less the green eggs are handled or picked, that higher percentage of eyed eggs will be assured. No picking was done on these eggs prior or after the ringing up stage. Use of malachite is being used until they hatch out."

Using Mr. Robertson's figures, prophylaxis with malachite green resulted in a savings of \$520.18.

At Marquette, eggs are hatched on trays stacked in open troughs; the sac fry are transferred to wire "baskets" until able to feed.

Harrietta hatchery

Prophylaxis for fungus was tested on a small group of rainbow and brook trout eggs to determine the most effective dose without exposing the entire hatchery production to a possible lethal overdose. This procedure was followed because arrangement of egg trays in the troughs differed from that at Marquette and the water supply had to be estimated. At Harrietta, the troughs are fitted with a series of baffle plates to direct the water through blocks of egg trays. Here we were not sure that the chemical would be evenly distributed and might be concentrated in eddies. The water supply to each trough is introduced at the bottom of the trough so the flow could not be measured without considerable alteration of the pipes. Mr. Southwick estimated the flow at 10 gallons per minute. For the above reasons, various amounts of stock solution were tested. Mr. Southwick's report is as follows:

"Original treatment of eggs with malachite green began with five ounces of stock solution ($1\frac{1}{2}$ ozs. malachite green to 1 gal. of water) given twice daily to each trough, with the flow of water at approximately 10 gal. per min. Eggs after an interval of about three weeks were apparently all dead, being somewhat cloudy in appearance but they eyed up as well as those not receiving treatment. After eyeing up, no picking was necessary and no fungi appeared; but the dead eggs disintegrated badly and were hard to clean up when the time came to put the fingerlings in troughs. This experiment was carried through until the eggs were

hatched with no apparent harm to the fish except that they were definitely retarded in hatching, about eight days longer being needed for hatching out than the eggs not given the treatment.

"The next time spawn was taken, another experiment was set up, using different amounts of stock solution. Using two upper troughs we put $3\frac{1}{2}$ ounces of the solution in one trough and 5 ounces in the other; rate of flow was approximately 10 gal./min. We also used the two troughs directly below the others and cut the amount of solution in half. For instance, for the trough with $3\frac{1}{2}$ ounces, 1 $\frac{3}{4}$ ounces was used in the trough below it after an interval of twenty minutes. For the trough in which 5 ounces had been put, we waited one hour and put $2\frac{1}{2}$ ounces in the one below it. This was also done twice daily and the results were good on all of them.

"After that experiment, we started treating all eggs with $3\frac{1}{2}$ ounces to the upper troughs and 1 $\frac{3}{4}$ ounces to the lowers. No fungi appeared on any of the eggs and they were not picked off until rung up. Treatment on these later experiments was discontinued as soon as the eggs were eyed up and results were very good. On the last spawn taken, treatment was continued but not as often. Eggs were treated once daily four or five times weekly, also with good results.

"The total number of man hours spent treating the eggs from the time of spawn-taking until the eyed stage was 116; in comparison, 176 man hours were spent picking eggs not receiving the treatment for the same period. Approximately one pound (\$2.50) of the chemical was used during the entire treatment period; to treat all eggs would require about four lbs.

"Because of the presence of silt in the water, it is necessary that the eggs be taken out and cleaned once a week, regardless of the type of treatment. It is therefore felt that the malachite green treatment can be used to best advantage during the first 15 days after spawn is taken, at which time care must be taken not to handle or cause injury to the green eggs. After this time, the difference in labor costs for the malachite treatment and hand picking are relatively unimportant because of the necessity to clean silt from the eggs once a week."

Paris hatchery

Tests using various amounts of malachite green to control fungus on eggs of brown trout were undertaken this year. Here, as at Harrietta hatchery, conditions varied from those at Marquette where the recommendations were made. Paris hatches trout eggs on trays stacked in cement troughs.

The troughs are wider than the standard wooden trough and are supplied with water through two pipes that empty above the water surface of each trough. Since it was not known whether the chemical would proceed more slowly or more rapidly through the troughs than at Marquette, various amounts of stock solution were tested to find the amount necessary to control fungus most effectively. Mr. Lydell's report is as follows:

"For our experiment we used four troughs with a prepared stock of 42 grams of malachite green to one gallon of water with eggs being treated twice a day at 8:00 a.m. and at 5:00 p.m. The balance of our eggs were hand picked and given regular care.

"The experiment was begun on December 4, 1953 and continued until January 18, 1954 when all eggs were hatched. On December 14 treated eggs were rung up and no eggs were picked from trays thereafter. Fungus appeared at the end of the first two weeks. Dr. Allison was notified and amount of stock was increased 2 ounces and from then on fungus did not appear.

"The following figures show results of experiment:

Treated Eggs

61,824	- Amount on hand at start
<u>11,270</u>	- Loss on January 18
50,554	
<u>36,722</u>	- Total fry hatched
13,832	- Unaccountable loss

Cleaning troughs and eggs totaled 18 man hours @ \$1.55 \$127.90

Cost of malachite green unknown.

"If this treatment is to be used eggs should be picked at intervals, especially after ringing up, as troughs and trays were a dirty mess. Visitors who looked over eggs always commented and required an explanation as to what was wrong between the two experiments, the treated eggs showing the loss and picked ones looking clean.

Regular Hand-Picked Eggs:

563,460	- Amount on hand at start
<u>87,739</u>	- Total loss
475,721	- Total fry hatched

Total of 125 man hours @ \$1.55 \$193.75

"I can not see enough difference in the two methods to make much difference. I would favor the old method for several reasons. The eggs as a general rule are clean and look good and the figures show,

per 1,000 eggs ratio, not enough difference to make one so much superior to merit a change on procedure for the small amount of eggs we handle."

Comments

The purpose of prophylaxis of trout eggs with malachite is twofold: (1), time spent in picking eggs can be greatly reduced, thus releasing personnel for other duties; and (2), it improves the percentage of hatch. The more often green eggs are disturbed, the greater is the mortality. When prophylaxis to prevent fungus is used, the eggs are disturbed less and a better hatch results. The use of prophylaxis, then, is a step towards greater efficiency in hatching operation.

As is indicated in the reports above, the use of malachite green in prophylaxis for fungus on trout eggs is not as simple in its operation as it might appear to be. At stations where troughs are different from those where the original work was done, the technique must be varied to suit the conditions.

Tests with malachite green as a prophylaxis for prevention of fungus on trout eggs were initiated in the winter of 1950-51 at Marquette hatchery. By the end of the following winter a method of treatment of lake trout eggs had been developed that proved to be far more efficient in saving of time and money than the hand picking method. Since then, this prophylaxis has been adopted as regular procedure and improvements in technique are made each year. As was mentioned before, prophylaxis is particularly valuable here because of the large number of eggs handled and comparatively high mortality due to carelessness or inexperience in spawn-taking.

At both Harrietta and Paris, an effective dosage was found, but objections were made that the disintegrated dead eggs were a problem to remove from the trough. This is a problem in technique that can be overcome through experience if the treatment is to be adopted as regular procedure.

Mr. Southwick suggested that the prophylaxis of eggs could be used best at Harrietta during the first 15 days they are on the trays since that is the most sensitive period. Because of excessive silting, eggs have to be removed from the trough once a week for cleaning, so he felt that the dead eggs might just as well be picked at that time. He also stated that the treated eggs required about eight days longer to hatch. Whether this is generally true of rainbow trout eggs, or not, is a point that should be checked by further observations. No such retarding among brown or lake trout was noted at the other stations.

It is suggested that further tests be conducted next year (1954-55) in an attempt to develop suitable techniques for removal of debris from the troughs and to evaluate the benefits or disadvantages of prophylaxis with malachite green. Since the men at the Marquette station have had several more years of experience with the methods than the men at other stations, Mr. Robertson or one of his crew should visit Harrietta and Paris hatcheries during the time this problem in the troughs is present. The tests should show any difference in percentage of hatch between treated and non-treated eggs, and any difference in man-hours required in servicing the two groups. They should also demonstrate any

difference in hatching time. It might be well also to try treatments at two-day intervals instead of the recommended daily intervals. If the former would be effective, servicing time would be lessened.

The problem of silt is present at all three stations mentioned in this report although there is some variation of intensity. For several reasons this is a problem that merits attention if we are to further increase the efficiency of our hatcheries. Silt on eggs may result in suffocation if not removed. Consequently, the eggs must be handled to be kept clean and handling not only requires time, but may increase the mortality among green eggs. Also, silt is an added hazard to the health of small fry and occasionally causes heavy losses due to gill trouble.

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